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Surplus Production and Socio-Political Change During the Viking/Medieval Transition: A Paleoethnobotanical Investigation of Quoygrew Farm, Orkney

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SURPLUS PRODUCTION AND SOCIO-POLITICAL CHANGE DURING THE VIKING/MEDIEVAL TRANSITION: A PALEOETHNOBOTANICAL INVESTIGATION OF QUOYGREW FARM, ORKNEY

by

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Professor Gayle J. Fritz, Chairperson

In this dissertation, I examine the process of state formation during the Viking/Medieval transition (c. 1050 A.D.) as it took place in the North Atlantic region. Specifically, I use paleoethnobotanical analysis of remains from Quoygrew farm, an archaeological site located on Westray in the Orkney Islands, to examine the reciprocal relationship between farm production and changes associated with state formation and the Viking/Medieval transition.

Towards this goal, I analyzed carbonized plant remains from midden contexts as well as from floor deposits, hearths, pit fills, and dumps. Seed densities and distributions reveal a closely integrated system of farm production including cereal agriculture and flax production, pastoralism, and fishing at Quoygrew. Crops present at the site include barley, oats, flax, gold-of-pleasure, a very small amount of wheat, and woad. I interpret shifts in ratios of oat to barley and distribution of cereal caryopses to an increasing use of oats as animal fodder and the formation of semi-

specialized fishing middens to potential changes in household organization and labor distribution. Seed assemblages suggest expanding use of highly fertilized infields as well as expanding use of naturally fertile machair (sandy loam) soils for agriculture. Seeds from plants with a variety of ecological preferences show wide use of outland resources, especially collection of turf and peat.

In addition to describing production at Quoygrew, I examine how patterns of increasing production at Quoygrew revealed through archaeobotany are tied to changes associated with the Viking/Medieval transition elsewhere in the North Atlantic, including increasing state administration practices, changes in household structure and gender roles, increasing trade networks and the rise of urban centers. Major contributions of this work include: 1) full description and analysis of a significant arcaheobotanical assemblage, including description of the earliest find of woad (*Isatis tinctoria*) in Scotland; 2) discussion of farm management practices at Quoygrew including interrelationships between areas of production; and 3) thorough discussion of implications of paleoeconomic data for understanding socio-political aspects of state formation as they occurred at Quoygrew.

“Taxation, gentlemen, is very much like dairy farming. The task is to extract the maximum amount of milk with the minimum of moo. And I am afraid to say that these days all I get is moo."

-- *(Terry Pratchett, Jingo)*

CHAPTER 1: STATE FORMATION, FARM PRODUCTION, AND THE PALEOETHNOBOTANY OF QUOYGREW FARM, ORKNEY

State formation as a process involves intense negotiation between would-be rulers and their subjects (Arnold 1995; Brumfiel and Earle 1987; Feinman 1995). The transition from the social organization that characterized the Viking Age to the one that characterized the Medieval period involved big changes in social, economic and political relationships (Barrett et al. 2000; Blindheim 1982; Fossier 1999; Johanek 1999; Thurston 1997, 2001). Legitimacy of new forms of government and of new ways of financing those governments had to be established and maintained. Legitimacy, like other outcomes of negotiation, can be described as “the flickering result of wavering energies” (Cohen and Tolund 1988:16). Because of differing bargaining positions of actors and interest groups involved in the Viking/Medieval transition across the North Atlantic region, this transition occurred with spatial inconsistency in terms of its chronology, completeness, and tempo (Barrett et al. 2000).

One of the developments that took place at this time was the institutionalization of regular land-based taxes, a major source of income for nascent states (Andersen 1991; Crawford 1987; Thomson 2001:206-219; Williams 2004). Since taxes were in kind (grain, butter, cloth, oil), much of the new state authority revolved around agricultural production and affected farm management at every level. Taxation and control of production became a source of lively negotiation between state leaders and subjects during the whole of the transition period and beyond (Crawford 1987; Fenton 1978; Thompson 2001).

The Viking/Medieval transition affected nearly every aspect of life, and included changes in economy, including a shift towards trade in bulk resources, intensification of production, and a shift towards internal financing of government. Agricultural production, as well as pastoral production and fishing changed greatly during this period as discussed at length in Chapters 3 and 6. The transition saw changes in how land was worked, in which land was used for agriculture, changes in production technology, shifts in landownership and inheritance, changes in major plants grown, differences in how labor was recruited and maintained, shifts in household organization, and new trade networks established to supply developing urban areas.

Regional landscape-based studies show how land organization and the layout of the landscape changed with increasing state control in Denmark and how it was resisted in areas with more autonomy where people escaped state control for longer (Thurston 1997, 2001, 2007). Orkney was greatly influenced by the formation of states at this time, perched as it was between the nascent states of Norway and Scotland. However, the earls controlling Orkney managed to stay more or less autonomous until late in the twelfth century, ruling in a manner more reminiscent of earlier Viking Age chiefs.

Research Goals

In this dissertation, I provide a very detailed look at Quoygrew, an Orcadian farmstead through the period of transition from the Viking Age to the Medieval period. Specifically, I describe changes taking place in all aspects of farm production through the lens of plant remains. By interpreting the plant remains in light of what is known from history and archaeology of the region, and by using an agent-centered approach, I show how paleoethnobotany can contribute to understanding the process of secondary state formation, that is, the integration of a peripheral chiefdom into a state system. Analysis of plant remains can contribute to this understanding by providing evidence relevant to the following research questions:

- How is production at Quoygrew related to increasing state administration practices?
- How do changes in household structure and increases in social stratification affect production at Quoygrew?
- What are power structures like within households? What are gender roles and how does gender and labor distribution affect production?
- How is production influenced by increasing trade networks and the rise of urban centers?
- How is the local ecology impacted by increasing surplus production?

Organization of the Dissertation

The dissertation is arranged into three parts. The first part, which includes the next two chapters, provides the theoretical underpinnings that are elaborated in the rest of the work. Chapter 2 traces theoretical debates in political anthropology and archaeology regarding state formation. I provide a discussion of states, state formation processes, and socio-political relationships. In that chapter I both introduce agency theory and defend my use of this approach to understanding the processes of change at Quoygrew. Chapter 2 provides theoretical underpinnings of Chapter 3, where I set the scene of the dissertation by providing background on the Orkney earldom and the sociopolitical and economic situation during the Viking/Medieval transition. In Chapter 3 I focus on how the issues explored in the previous chapter apply to the specific case of Scandinavia, Scotland, and Orkney. This chapter includes a detailed description of the transition from the Viking Age to the Medieval period and explains how this transition is reflected at the farm level. Issues of Orcadian regional identities and possible motivating factors for Orcadian producers are entertained there.

The second part includes the paleoethnobotanical data from Quoygrew. A methods and taphonomic concerns chapter (Chapter 4) is followed by the results of the analysis of carbonized remains (Chapter 5), which includes a description of the plant taxa found, organized by their ecological preference. Chapter 5 also includes a description and short discussion of differences between areas, phases, and contexts at the site in terms of plant remains.

The third and last section provides discussion of the results of my analysis of the plant remains from that site, which are used to describe how the management decisions Quoygrew's farmers made interacted with their motivations and the transitional Viking/Medieval socio-political arena. In Chapter 7, I return to the research questions listed above, and consider each based upon my study of the paleoethnobotany of Quoygrew, using the plant data supplied in this dissertation in combination with information available from other specialists' reports on Quoygrew, as well as results of other archaeological excavations, and data from historical documents and ethnographic records from the region. A glossary is provided at the end of the dissertation for reference.

CHAPTER 2: POWER, AGENCY, AND THE STATE: A THEORETICAL FRAMEWORK FOR STUDYING STATE FORMATION AT THE HOUSEHOLD LEVEL

In historical and archaeological literature alike, the Viking/Medieval transition has been described as a social and economic revolution (Barrett et al. 2000; Barthelemy and White 1996; Bisson 1994, 1997; Hodges 1989; Moore 2000; Randsborg 1980; Reuter and Wickham 1997). This revolution involves many arenas of social life, and is deeply connected to the integration of the North Atlantic region (including Scotland, the North Atlantic Islands, and Scandinavia) into the rest of Europe (Barrett et al. 2000; Blindheim 1982; Fossier 1999; Johanek 1999; Thurston 1997, 2001). During this period, many areas of the North Atlantic experienced a transition from one form of social organization, described as chiefdoms, to another, described as states or proto-states (Barrett et al. 2000; Thurston 1997, 2001).

It is impossible to discuss the processes involved in this revolution without having a framework for understanding what the terms "chiefdom" and "state" denote; it is not only essential to define these terms, but also to describe some of the background to the origin of these terms, and to the research of state formation and social organization in general.

In this chapter, I provide a brief discussion of the trajectory of state formation research in the social sciences, and within anthropology and archaeology in particular. I also include a broad view of the issues of social organization, from how states are defined, to the ways in which they form, how they maintain themselves, how force and power are utilized, how rulers establish and maintain legitimate rule, and how state power is resisted internally and externally.

To wrap up the section and to introduce the next chapter, on food production and power, I discuss the state at the household level, introducing topics such as manipulation of gender relationships within households, the reaction of households to taxation demands, and changes in land ownership and inheritance patterns and their effects on household organization.

Defining the State

The State as a Stage in Societal Evolution

It is first necessary to derive a definition of the state, which is a surprisingly difficult task given the prevalence of the term's use within the social sciences. State formation is a huge topic throughout the disciplines that make up the social sciences; numerous studies have been done not only within archaeology (Claessen 1984; Claessen et al. 1985; Hall and Chase-Dunn 1994; Paynter 1989; Service 1975; Thurston 2001, Wright 1977, Yoffee 1993) and anthropology (Ensminger 1990; Silverblatt 1988) but also sociology (Berezin 1997; Thomas and Meyer 1984), economic history (North 1981, 1991), history (Warde 2006), and psychology (Tyler 2006). The concept of what states are and how they form has changed significantly since early scholars (Childe 1951 [1936], 1946 [1942]; Morgan 1964 [1877]) tackled the problem; both changes in research trajectories and new data have provided impetus to shifting definitions.

As one researcher writes, “We have come to take the state for granted as an object of political practice and political analysis while remaining quite spectacularly unclear as to what the state is” (Abrams 1988 [1977]:59). Partially, this is because the state does not exist as a “thing,” an object one can point to, seize or destroy, but is more of a system, or more abstractly, an idea (Abrams 1988 [1977]; Corrigan and Sayer 1985; Joseph and Nugent 1994). Another reason for the current uncertainty surrounding the concept of the state, especially within the discipline of archaeology, is the basis of the term and concept in neo-evolutionary models of social systems (e.g., Fried 1967; Sahlins and Service 1960; Service 1975), where states are placed high in a ranking of social systems based upon their relative social “complexity.”

In recent decades, these rankings and the ideas of what it means to be a “complex” society are being called into question (Feinman 1995; Pauketat 2007; Trigger 2006). In particular, there has been a lot of unpacking of suites of characteristics once thought typical of various neo-evolutionary levels of social complexity. For example, that a group practices hunting and gathering means of subsistence is no longer grounds for assuming that the group is also highly mobile with an egalitarian social organization. New data and more careful interpretation of archaeological and anthropological case studies have led to more complicated characterizations of cultures and the lifestyles of their members, and has left some of the early definitions of “hunter-gatherers,” “chiefdoms,” and “states” strikingly bare and of less value as descriptive terms. For example, it is becoming more and more obvious based upon recent data, that “simple” societies on the opposite end of the neo-evolutionary continuum from states can sometimes be surprisingly complex in their own right; in some cases these societies accomplish large public works projects, engage in competitive feasting and participate in other activities once associated with chiefdoms and states, all while maintaining hunting and gathering or hunting/gathering/fishing economies (Ames 1994; Feinman 1995; Paynter 1989). In addition, further research has shown how difficult egalitarian social structures are to maintain, suggesting that, far from being an original condition, that these relatively simple social organizations are the endpoint of their own adaptive history (Ensminger 1990; Flanagan 1989).

Recent archaeological studies have further broken down the concept of social complexity. Complexity can be understood as a continuum between heterarchically arranged complexity (where multiple power structures exist simultaneously) and hierarchically arranged complexity (where power is primarily ranked in one dimension) (Crumley 1995, 2001, 2003). Archaeologists have also recognized differences between corporate and network strategies for obtaining social power, where network strategies are based more on individual aggrandizers competing with each other using extra-local exchange relationships, while corporate strategies involve less individualistic behaviors of members, but more of a corporate solidarity of members who see themselves primarily as identifying with a larger group (Blanton et al. 1996, Feinman and Nicholas 2004). Both of these new ideas are simply ways of understanding socio-political complexity, and some societies can be placed along a continuum between these parameters, while in others some aspects of society follow one strategy or arrangement while other aspects can differ.

Another problem in defining the state is that much of the research on state formation, especially in disciplines outside of anthropology, considers only the rise of the modern western European states beginning around the fifteenth century, without coming to many conclusions about the point at which, and extent to which, this "modern state" differs from "pre-capitalist" states elsewhere in the world, or the degree to which non-western states are similar to early European states and/or to modern states (Wolf 1982). Some archaeologists working in Europe are careful to make a distinction between modern, capitalist states and early, precapitalist states (Claessen 1984, 1985; Oosten 1996), although the exact point at which the modern capitalist state arose is still under debate. The important point for the purposes of this dissertation is that the states affecting the transition from the Viking age to the Medieval period in Orkney are not modern states in the strictest sense, but are rather "early states" which are also sometimes referred to as "pre-capitalist" or "proto-capitalist" states.

Working Definitions of "State" and "Chiefdom"

Despite these complicating factors, a good starting place for a definition of a state for the purposes of this study is still Fried (1967: 230-235), who defines the state as a complex of institutions (some formal and others informal) by means of which the power of the society is organized on a basis superior to kinship, and which maintains an order of stratification. Flannery (1972: 403-404) has more to add to this definition:

> The state is a type of very strong, usually highly centralized government, with a professional ruling class, largely divorced from the bonds of kinship which characterize simpler societies. It is highly stratified and extremely diversified internally, with residential patterns often based on occupational specialization rather than blood or affinal relationship. The state attempts to maintain a monopoly of force, and is characterized by true law; almost any crime may be considered a crime against the state, in which case punishment is meted out by the state according to codified procedures, rather than being the responsibility of the offended party or his kin, as in simpler societies. While individual citizens must forego violence, the state can wage war; it can also draft soldiers, levy taxes, and exact tribute.
>
> States have a powerful economic structure; they are characterized by both reciprocal and redistributive exchange, and often by markets as well. The economy is largely controlled by an elite (usually hereditary) with preferential access to strategic goods and services; this elite constitutes the usual stratum from which high officers are recruited. As in chiefdoms, the office itself exists apart from the man who fills it: and states have many more offices.

These definitions can be contrasted with the definition of a "chiefdom" that Earle (1987:279) gives as:

> …intermediate-level societies, providing an evolutionary bridge between acephalous societies and bureaucratic states…[that is] political entities that organize regional populations in the thousands or tens of thousands… [with] … organization provided by a centralized hierarchy of leaders set off from the rest of the population. Sociopolitical differentiation creates certain dynamics of competition,

> management, and control that underlie the eventual evolution of the state.

As intermediate societies, chiefdoms are by definition somewhere along the spectrum of state development, where they have some state-like aspects of social organization, such as a centralized hierarchy of leaders, and sociopolitical differentiation. Still, the state is something different both in degree (more centralized power, more sociopolitical differentiation) and in kind (separation of person from office, the monopolization of force, etc.).

Although Earle (1987) acknowledges the unpopularity of evolutionary categorizations of chiefdoms and states, he notes that these categories are helpful for providing functional categories for comparison. Although all chiefdoms are not the same, nor are all states, there is some fundamental difference between chiefdoms and states. This makes it useful to have such categories, provided they are used carefully.

Currently, the focus within archaeology is less on what differentiates states from chiefdoms. Rather, archaeologists have focused on how social changes allow for more centralization of power and how increasing horizontal and vertical inequalities are negotiated within and between societies (Krohn-Hansen and Nustad 2005). In short, the processes behind and interaction between competing forces involved in maintaining a form of social organization, and in shifting from one form of social organization to another are questions of current interest that go beyond classification of chiefdoms and states as levels in an evolutionary continuum.

Factors Contributing to State Formation

Now that "state" and "chiefdom" have been defined and some of the theoretical differences between them have been discussed, it is possible to trace research about the process of state formation, and specifically, to understand: 1) what factors contribute to state formation in primary states (states arising *de novo* without contact with other states); and 2) whether these same factors affect the process of secondary state formation (new states arising in contact with other states, or peripheral areas coming under state control). Secondary state formation is particularly relevant to this work, as it is secondary state formation that occurred in the North Atlantic during the Viking/Medieval transition (Thurston 2001).

Primary States: Ecosystemic and Agency-Based Approaches

Primary state formation and the "rise of civilization" has been a question dealt with in anthropology since Morgan's *Ancient Society* was published in 1877 (Wright 1977). The formation of primary states (and increasing inequality that often accompanies state formation) has been linked to many causal factors over the years, including agriculture (Childe 1951 [1936], 1946 [1942]), irrigation (Wittfogel 1957), warfare and resource availability (Carneiro 1970, Webster 1975), labor control in high risk environments (Webster 1990), trade and exchange (David and Kramer 2001; Kipp and Schortman 1989; Masson 2005; Renfrew and Shennan 1982), specialization (Earle 1987; Patterson 2005), and urbanization (Wallace 1983) among others.

There has been movement away from "prime mover" and ecosystemic explanations for state formation (Sanderson 1990), in part because it is becoming clear that state formation takes different courses in different areas, and there is unlikely to be a single causal factor that can be cited as the impetus for all, or even most instances of primary state formation. However, all of the authors mentioned above convincingly argue how and why the factors listed would have influenced the process of state formation, using a range of examples from history and archaeology.

While ecosystemic factors such as environmental conditions and inter-group dynamics like warfare, technological innovation, and changing social structures are all involved in the process of state formation, an agency-based perspective provides a complementary way of looking at the process.

Ecosystemic approaches to state formation and social change tend to view societies as integrated wholes that respond to external environmental changes, such as climate changes, and imbalances between population density and resource availability (Saitta 1994). This view tends to underestimate the active role of individuals in societal changes, as well as adopting the unrealistic assumption that individuals in a society are similar in the lives they lead, and in the ways in which they react to external societal pressures (Hodder 1982; Marquardt 1992; Paynter 1989). As Braun (1991) puts it, they are assumed to play by and accept the same set of rules, and their adaptive objectives are assumed to be the same.

In contrast, agency theorists follow the theoretical traditions (following Weber 1968) of Bourdieu (1977) and Giddens (1979, 1984), and are interested in the reflexive relationship between agency and structure. The main interest is in recognizing the creative activity and decision-making processes of individuals and interest groups. Although agency theorists recognize social constraints of cultural values and norms, they also acknowledge that individuals are involved in the process of changing and circumventing these values and norms. Ensminger and Knight (1997:1) summarize by saying, “Cultures do not respond to pressures. Rather, individual human beings cope as best as they can, formulate rules, follow and break them, and by their statistical patterns of cumulative decisions, they set a course of cultural drift.” Thus agency theorists are not just interested in how a culture changes in response to stresses, but in what decisions individual actors in the culture are making and actions they are taking during the transitional process.

Brumfiel and Earle (1987:3) lay out the foundations of an agency-based political economic model for understanding state formation, as it relates to specialization and exchange, in this way: “It is proposed that political elites consciously and strategically employ specialization and exchange to create and maintain social inequality, strengthen political coalitions, and fund new institutions of control, often in the face of substantial opposition from those whose well-being is reduced by such actions.”

According to a political economic perspective, state formation can perhaps best be understood by first setting the scene with the causal factors described in detail by ecosystemic theorists, but then looking for evidence as to how individuals might have used these conditions to further their own interests. Powerful individuals, or aggrandizers, use power both to improve their own circumstances, known as "self-serving" behavior, and to improve the circumstances of their society, known as "system-serving" behavior (Flannery 1972).

Both ecosystemic and agency approaches have been used to discuss primary state formation. It is more complicated to explain the development of secondary states since they are likely to arise through a more diverse suite of circumstances. The diversity of circumstances that different peripheral areas find themselves in lead to differing reactions to state power and an inconsistent spread of state power into peripheral areas. It is this inconsistency in peripheral groups' reactions to encroaching state power that makes secondary state formation particularly interesting as case studies for agency approaches.

Secondary States

Secondary state formation takes place in areas outside of direct state control, but that have some interaction with states. The process of secondary state formation includes both incorporation of peripheral areas into states, and the formation of new states on the peripheries of established states. Secondary state formation is by far the most common type of state formation. Despite this, when compared with primary state formation, archaeologists have left secondary state formation relatively understudied.

From a political economic standpoint, secondary states are particularly fascinating, because the rules of the game within peripheral societies are already in flux, providing a flexible social environment in which ambitious actors can negotiate to their advantage. Identification with the social norms of the local group, or with those of the neighboring state can be invoked depending upon the situation. Peripheral areas of states usually engage to some degree in interactions with states, and these interactions often necessitate learning new social norms and acquiring knowledge of new laws and justifications for leadership.

The process of integration of a periphery into an established state is often uneven in both spatial and temporal dimensions, and depends upon the agency of the actors involved, as well as compatibility between traditional and new social rules. State leaders often spend considerable time working to integrate their peripheries into the state system, to avoid difficulties associated with the "uncaptured peasant": groups working within their own separate material and institutional structures, where they can resist and avoid state policies (Hyden 1980).

Wallerstein's (1975, 2004) "World Systems" is a way of understanding how modern states interact with peripheral areas within a capitalist framework: state "cores" extract resources, especially raw materials from peripheral areas and process these resources into finished goods, which are spread into the peripheral areas. Aspects of this model have been generalized to precapitalist states (Hall and Chase-Dunn 1994).

Secondary states and peripheral, "uncaptured" areas and peoples surrounding states are often destabilized by interaction with the state, and warfare is often intensified in these areas (Ferguson and Whitehead 1992). Ensminger's (1990) study of the Orma uses a New Institutional Economics approach to understanding how new areas are incorporated into state control. Ensminger describes how the council of elders, traditionally charged with creating rules through consensus for the Orma community, turned to the state for help in enforcing changing rules about land use that pitted some interest groups within the Orma against others. Ensminger describes some unintended consequences of this decision for the future of the Orma council, when she proposes that future decisions may well favor state enforcement, and that key elements of Orma autonomy from the state may well have been lost. She cites Colson (1974:67) who describes one reason why autonomous peripheral groups cede control to adjacent states: "people may be prepared to accept authority, even though they find it both threatening and frustrating, because they see it as the guarantor of an overarching security which they value or as promising a security that is lacking."

I agree with Cohen and Toland (1988) that a phenomenon associated with secondary states deserving further research is why, how, and under what conditions do people come to accept and identify with new forms of authority, and reciprocally, why, how and under that conditions do people withdraw their support from state-level forms of government. The way to really understand secondary state formation is not only to understand the external stressors and factors that affect power dynamics (a line of research that has a long history in archaeology), but also to take a look at how the actors involved in the internal political dynamics of a group actively work to change social structures of chiefdoms to allow for a state system to take hold. In both primary and secondary states, power dynamics between interest groups and individuals are an important component shaping social change. Some aspects of these power dynamics have been studied at great length within the social sciences, and deserve further treatment here.

Force, Power, and the State

Defining Force, Power, and Hegemony

According to Luttwak (1976, in Thurston 2001), the defining difference between force and power is that force requires an outlay of physical resources, while power is derived from authority and does not require the use of resources. Force is associated with the use of both negative sanctions, as in domination, and with positive sanctions, as in bribery. Both are means of achieving an end result of compliance to one's wishes using an outlay of resources. In Luttwak's view, power is fundamentally different in that no resources are consumed by the use of power. Power may require the presence of resources, such as to provide a credible threat of domination, or a credible anticipation that one may be rewarded for compliance, but does not actually require that the resources be used either positively or negatively. States and most forms of government or leadership function most often through power, and only seldom through force. Mainly, this is because it is very expensive to maintain a social hierarchy based upon the use of force alone.

Agency theories begin by assuming, following Foucault (1979, 1980), that all societies necessarily encompass power differences and that conflicts of interest between individuals are ubiquitous (Miller and Tilley 1984; Pearson 1984; Paynter 1989; Paynter and McGuire 1991; Rowlands 1982:168).

According to Parsons (1977), power does not have a finite distribution in society, nor does power gained by one individual or group necessarily equal power lost by another. Rather, the total amount of power in a society can be increased as trust in leadership increases, and it is possible for multiple power structures to coexist. Agency theorists view power similarly to Parsons in that power is not considered to be a measured quantity, nor is it that if one person "wins" a certain point, the other necessarily "loses" it. Rather, power is a property of social relationships (Miller and Tilly 1984, Paynter and McGuire 1991). Power is heterogenous, and can be expressed in various settings, and at various scales (Crumley 1995; Marquardt 1992; Wolf 1990).

Thurston (2001:12) defines hegemony as "complex interweaving of political-economic conditions and sociocultural values that work to bind together disparate peoples by creating a desire to identify with the most influential group." The basic idea is that actors who seek to gain or maintain high status positions in states work very hard to maintain authority, from which they gain power to control others' actions and access to resources. This requires strategic action, but also strategic justifications; leaders must create a strong foundation of ideology, laws, and cultural norms supporting their leadership. Authority, defined by Parsons (in Giddens 1977:336) as "the institutionalization of the rights of leaders to expect support from the members of the collectivity," is closely linked to the ideas of power, trust, and hegemony.

Luttwak's (1976) distinction between force and power is closely related to Gramsci's (1971) distinction between coercion and hegemony. Gramsci (1971:263) describes the state as "hegemony protected by the armor of coercion," which highlights the relationship between force and power as he sees it. Although he makes the distinction clear, he also acknowledges that in practice states use both strategies. Paynter (1989:382-383) reinforces the same idea: "Most theorists of power recognize that its exercise is based on a variety of strategies. At one extreme is the 'break their kneecaps' tactic of guaranteeing compliance; at the other is the daily participation of the lower classes in their own oppression."

Power is used to obtain control or dispute control over various social arenas related to the generation of power, thereby limiting who can obtain power to those who already have it, or to those clever enough to circumvent barriers to obtaining it. Some routes to power often limited or controlled include reproduction (access to marriage partners), prestige goods, knowledge, differential control of luxury goods, labor resources, staple goods, subsistence resources, transportation, and property (Arnold 1995; Flannery 1972; Kipp and Shortman 1989; Meillassoux 1972; Paynter 1989; Shennan 1987). It is important to consider that powerful individuals and groups obtain and use their influence not only by controlling the production of surpluses, but also equally by restricting production and the flow of goods and information (Brumfiel 1994).

In short, power is sought, resisted, and negotiated. Alliances are formed between individuals with similar interests, against groups or individuals with conflicting interests. Power is used to pursue interests, although sometimes with unintended consequences. Power is also used to negotiate ideologies and to avoid, subvert, overturn and create new social institutions; laws, customs, and norms of behavior (Giddens 1979; Hodder 1991; Miller and Tilly 1984).

Financing the State

The ways a state is financed have repercussions for power structures within the state. There are many ways in which states have been financed, including by plunder, staple finance, tribute in luxury goods, taxation in goods or money, rental of state lands, commercial investment, and taxation in labor (D'Altroy et al. 1985; Smith 2004). One difference separating these methods is where a state lies on a continuum stretching from those which are internally financed, by taxation of its subjects in goods or labor, to those who are externally financed through plunder or tribute from peripheral, non-state areas or other states. External finance is easier to legitimate and provides rulers with a source of wealth that does not rely on depriving the subjects of their rule. Often, leadership is reliant on maintaining some level of trust among subjects, which is easier to do if increasing wealth of the leadership does not come at the expense of that of the subjects (Lindkvist 1991; Smith 2004). Shifts toward internal exploitation took place during the Viking/Medieval transition and will be discussed further in Chapters 3 and 6. Decisions about state finance have effects on the development and elaboration of social differentiation, a key factor in state formation processes.

Social Differentiation and the State

Social differentiation is a key aspect of state formation. A defining aspect of states, according to the definitions used by Flannery (1972: 403-404), are both highly stratified and highly internally diversified, with a professional ruling class. As Thomas and Meyer (1984) point out, two influential social scientists have taken different approaches to understanding social organization within states; Parsons discusses the internal diversification of states, while Marx focuses primarily on the stratification aspect of states in his work. However, both horizontal and vertical differentiation is important to forming and maintaining the complexity of the state system.

Researchers have also considered how social differentiation is built and developed over time. One way that social differentiation increases is when debts are incurred in cycles of exchange, especially debt cycles where repayment is difficult, especially repayment in kind (Gosden 1989; Sahlins 1974).

Another strategy central to the power dynamics of state formation, which leads to increasing social differentiation, is marginalization. Arnold (1995:100) describes marginalization as "isolating some people from central positions of social and economic influence (decision-making) at the same time that they are moved into increasingly interconnected, dependent socioeconomic circumstances." In most cases, the group being marginalized is given at least the appearance of having opportunities for consultation and negotiation with those in power. This is an essential part of elite strategy for building trust among non-elites, not only, or even primarily among the marginalized party. Rather, appearing to negotiate with these groups promotes trust in the rulers' processes of decision-making, making other non-elite groups more willing to involve the state in its affairs in the future (Arnold 1995). Increasing the trust in leadership leads to the increasing power of that leadership (Parsons 1977). Strategies such as these are key factors in the successful creation of legitimized social hierarchy. Although marginalization can be a strategy taken by state leaders, they are not always successful in attempts to marginalize; non-elites can resist marginalization with varying degrees of success using several strategies discussed later in the chapter.

Legitimacy and the Process of Legitimation

A key factor for the success of leadership and government is the ability to achieve legitimacy. Legitimacy has been defined as "the situation in which the rulers as well as the ruled share the conviction that the existing division of power, and as a consequence of this the rules and regulations issued by the government, is right" (Claessen 1984:368). Additionally, legitimacy can be seen as "a type of support that derives not from force or its threat, but from the values held by the individuals formulating, influencing, and being affected by political ends" (Swartz et al. 1966:10, in Claessen 1988). Legitimacy is closely tied to the development of power, and the creation of hegemony.

Legitimacy is important to allow efficient leadership to occur by limiting the resources needed to force compliance to rules and laws. The requirements of establishing and maintaining legitimacy also place some limit on the ability of leadership to enact new policies, however. A ruler must have a certain degree of acceptance of new policies, and to achieve this a ruler must either present activities as following established rules or norms, or use influence to try to change norms and values (Claessen 1984:368). As Rousseau notes, states get authority from consent, and thus have some requirements placed upon their exercise of power to maintain legitimacy (Rousseau 1978,1984).

Establishing Legitimacy

Knowing what legitimacy is, and some reasons why it is important for rulers to maintain, how do rulers go about establishing and maintaining it? Ideology is an element of social structure that can be used, modified, or newly created to aid in the establishment of legitimacy. A government's legitimacy can be built upon "top down" or "bottom up" ideological structures. Either rulers can reinforce ideas that their leadership is endowed by a higher power (top down), or they rule by popular mandate, that is, the government is in place to protect the interests of the people they rule over (bottom-up) (Oosten 1996; Ullman 1979:12-13 in Oosten 1996). The shift from top-down to bottom-up legitimizing ideologies was observed in Europe during the medieval period (Bendix 1978).

Ideology can also be used to modify the willingness of a population to work to produce a surplus above their own needs (Kurtz 1994). The conversion to Christianity in Europe is also associated with a suite of ideological positions favorable to state formation, including a change related to work ethic. In Christian theology, the idea of an afterlife that rewards effort and contributions to church during life on earth is an example of this sort of ideology (Mostert 1994; Oosten 1996).

Identity is also related to legitimation (Kurtz 1994; Van Bakel et al. 1994). According to Doornbos (1994), there is a mutual convertibility between identity and power. Leaders create and manipulate identity and identification of the populace with one group or another to create power bases. Similarly, identification of individuals with others pursuing common goals creates interest groups that can affect changes. The more powerfully group members identify with each other, the more power they generate. An example of how ideological conceptions of identity and place can be manipulated to achieve identification is the demarcation of "homelands" that have consequences for power relationships between those people who reside in places determined to be within or without these conceptual borders (Gupta and Ferguson 1992).

Importantly for archaeologists, ideologies related to establishing and maintaining legitimacy can be materialized in objects and places and used to reinforce relationships of power (DeMarrais et al. 1996). Practice theory, which links ideology and other social structuring mechanisms to the ways that objects are created, can be used to elucidate how the archaeological record relates to power and identity changes that take place during periods of political centralization, such as occur with state formation (Roscoe 1993).

Legitimacy in Practice

Legitimacy is in a constant state of negotiation between rulers and ruled. Cohen and Toland (1988:16) put it well when they describe legitimacy as "the flickering result of wavering energies."

In some ways, legitimacy works because in general people become complacent with the status quo, and come to accept the rules that shape society to a certain extent, even as rulers are changing these rules. Geuss (1981: 16-17) describes "false consciousness" as a negative ideology held by subjects that allows rulers to apply "surplus repression." The idea of false consciousness developed from a critical observation that agents in a society are deluded about themselves, their position, or their interests, and that this delusion causes agents to act contrary to what is in their real interest (Geuss 1981:12). Habermas (1973) describes this phenomenon as a "fettered imagination" where non-ruling classes have a very limited set of options for behavior because they work within the structure of the societal norms and laws rather than thinking beyond them. They are restricted from the process of societal change in a way that rulers are not because they do not believe change is possible for them, or have not been given the tools, information, or socioeconomic freedom to go about making those changes.

Often, the unintended consequence of following rulers provisionally is a loss of power and autonomy among subjects. Even Rousseau noted that once power and support is given to a ruler, it is very difficult to overcome the power or withdraw support (Rousseau 1984: 122). In many ways "inequality accepted, authority consulted and obedience delivered make of something that 'is' something that 'ought' to be" (Cohen and Toland 1988:12). This seems to be what Ensminger (1990) observed among the Orma; it is difficult to imagine that the council of elders will be able to withdraw support and excise the state once the state system has been invited in to enforce some laws.

Nonetheless, an important point about legitimacy that bears reinforcement is that it is not absolute, and that both overt and covert resistance to legitimating ideologies and practices is common. Without negating the power of legitimacy, it is also possible for state subjects to participate in legitimation activities without buying into the propaganda (Dietler 1995). According to Scott (1985, 1990), there can be differing public and private "transcripts" (ways of speaking and behaving) among underclasses. In public fora servants or peasants appear to participate in speech and activity that legitimate their lowered status in society, where in private they speak and act in entirely different ways. People are quite capable of appearing acquiescent or in agreement with state policies and their ideological justifications when they feel it is in their interest to do so, i.e., when in the presence of dominant groups.

Acceptance of legitimation strategies does not imply that all people must believe that government is legitimate - they must only act in most circumstances as if it was. There are several strategies that subjects use to express their displeasure about state government in low-cost ways, such as by participating in cynicism, corruption, subversion of policy, sabotage, tax evasion, and feigned compliance (Cohen and Toland 1988; Scott 1985,1990). It is legitimation in practice that is studied by archaeologists, especially when looking at the household. When do households support state policies and when do they resist? How are legitimation strategies reflected in the archaeological record, and how might resistance be observed? Brumfiel (1996) has shown that the archaeological record can be used to uncover forms of state resistance. In her study, an example of this sort of resistance was the decreasing quality of tribute cloth produced by native women to meet demands of Spanish colonizers.

States and Households

Food Production, Power, and the State

The production and consumption of food products is an important aspect of power relations in states and other forms of social organization (Dietler 1995, 1996, 2001). The relationship between the political arena and food production can appear in the many changing ways that people choose to carry out food production, including intensification, specialization, diversification, disintensification, and others (Thurston and Fisher 2007). Looking at the ways in which food is produced and consumed in a society is important because these decisions are made not only by rulers, but by every person in a society. Not everyone has access to luxury or exotic goods, but everyone eats. Archaeologists and other social scientists are beginning to shift emphasis from the agency of rulers and aggrandizers towards that of non-elites and subaltern groups (Thurston and Fisher 2007:3).

At the household level, access to land, information, trade partners, technology, methods of transportation, labor, tools, and raw materials (seed corn, livestock, soil enrichments) is all more or less based upon power relationships - both local power relationships, and those between trade partners, peripheral areas, and states. How these resources are parceled out over time, by control of inheritance practices, is also based upon the same power relationships. Choices need to be made within a household about whether to increase production to produce a surplus. If state governments or other powerful institutions (like the church) require new or higher taxes in money or in goods, often this choice is a limited one, where consequences of not increasing production range from a reduction in relative wealth and power in the region to coercive measures being taken against the household or community by the state power. In the case of the church, ideological sanctions can be used to encourage compliance.

If and when a decision is made to produce a larger surplus, the household must decide how increased production is going to be obtained. Several strategies exist, including intensification, extensification, and specialization (Renfrew and Shennan 1982, Thurston and Fisher 2007). Specialization, as a strategy for surplus production, implies an obligation to integrate into a trade network to obtain needed goods that are no longer being locally produced from elsewhere.

Each of these strategies for producing surpluses have measurable effects on a farm's organization, and on the landscape as a whole. Landscape approaches have been used with great success to study the process by which households and communities react to centralizing leadership and expanding state authority (Hamerow 2002; Thurston 2007). Combining landscape approaches with detailed site-by-site analysis is the best way to understand the way regional patterns are realized at the local level.

Historical Ecological Approaches to Household Food Production

It is important to consider not only household agency when considering increases in production and surplus production, but also to take a closer look at what new farm management techniques mean for the local environment, and the strain that new technologies and systems of production and land use put on local ecosystems. This is the ecological framework within which human strategies must work (Feinman 1995), and is related to research done within a context of historical ecology (e.g., Balée 1998, Crumley 1998, Crumley et al. 2001). As Hardesty and Fowler (2001:80) describe, historical ecological approaches can be used to create "archaeological ecobiographies," which they define as "tracing the behavioral trajectories of humans seeking to accomplish goals through a historical context of ecological and social constraints and opportunities."

Power Dynamics within the Household

Much work done in the social sciences takes the household as the basic unit of decision-making (Agarwal 1997). In many cases this is a fair approximation of the way that labor is controlled, and it is certainly useful to use this as a basic unit for analysis when comparing communities. However, research in recent decades has shown that there is also something to be gained from taking a closer look within the household, and looking at gender relationships and relationships between age sets to provide more information on agency and power dynamics within households as well as between them (Agarwal 1997; Beck 2007; Moore and Scott 1997; Silverblatt 1988).

It is particularly important to consider agency and power dynamics within the household during periods of state formation, because rulers of states recognize household power dynamics and often make use of this knowledge to disrupt patterns of power that reside within households to displace the power back to the state. Households are kinship-based, and to free the resources of the household, states often redefine kinship and transform household social relationships (Brumfiel 1994; Gailey 1985).

Households and the State in Archaeology

Archaeologists can use a combination of historical sources, landscape approaches, and detailed site analysis to study household and within-household reactions to increasing centralization of power and state control, with the understanding that even non-elites and subaltern groups display agency and can affect the course of state formation by their compliance, resistance or the combination of reactions they have to changing societal laws and norms (Brumfiel 1994; Crumley 1974; Thurston 1997; Wattenmaker 1994). The balanced approach taken in this dissertation makes the best use of the site-based paleoethnobotanical data within a historical and landscape framework to explain agency and power dynamics both at the household level and, when possible, within the household as well.

Chapter Summary

In this chapter I have developed a theoretical outline of the archaeological and anthropological discussions surrounding state formation, especially as they relate to household-level power dynamics, agency theory, and the control of production. In the next chapter I further explore the relationship between state formation, agency and agricultural production, while narrowing the focus to the Viking to Medieval transition in the North Atlantic.

CHAPTER 3: BACKGROUND TO THE VIKING/MEDIEVAL TRANSITION IN THE NORTH ATLANTIC AND ORKNEY

In the previous chapter, I introduced the Viking/Medieval transition and its relationship to secondary state formation. I defined states and chiefdoms and provided a discussion of political and economic processes that accompany transitions from chiefdoms to states, and how these processes affect agency and decision-making at the farm and household level. In this chapter, I revisit concepts introduced in the previous chapter, and discuss their relevance to the process of secondary state formation as it occurred in medieval Scandinavia, Scotland, and the Northern Isles (including Orkney). In this way I place the study of Quoygrew (the Viking/Medieval farm forming the central case-study of this dissertation) within a spatial and temporal context, while continuing to develop a discussion of how larger political and economic trends play out in a household farm environment.

Terminology

Before launching into an overview of the Viking Age and Medieval periods in Orkney and elsewhere in Northern Europe, it is helpful first to discuss some terminology, and explicitly to tie the chronology used in this study (developed by Dr. Barrett for the forthcoming Cambridge monograph and used across the Quoygrew site) with a larger chronology of the periods under consideration. This is especially necessary since these periods and especially their starting and ending points are not universally accepted, but rather are constantly negotiated as more archaeological evidence comes to light (Barrett et al. 2000).

The first terms that require some discussion and explanation are “Viking” and “Viking Age.” These terms are exogenous, and in etymology refer not to Scandinavians or Scandinavian settlers of the North Atlantic, but rather to a smaller subset of Scandinavians who participated in raiding along the coasts of the British Isles. The term “Viking” is an Old English term that can be translated as “robber”, “coastal marauder” or “pirate” (Graham-Campbell & Batey 1998:1; Richards 2005:2).

As Julian Richards (2005:3) points out, at the beginning of the Viking period or Viking Age, Scandinavians would have identified themselves by their region of origin: Jutland, Scania, Hordaland, etc. They would have been more bound to their leader than to a place of origin, and they would have had no national identity. Scandinavians in the early Viking period would primarily have shared the same language (Old Norse) and would have had very similar subsistence strategies, religion, and political structures (Barrett 2003; Hansen 2003; Mytum 2003; Richards 2005:4). Hansen (2003:62) asserts that Scandinavia emigrants would have been able to travel throughout the North Atlantic islands and feel at home, as there were significant similarities in architecture and life-ways throughout. It was primarily through items of portable material culture, and the mix of Scandinavian and Celtic imagery and decoration therein that the colonizing Scandinavians differentiated themselves from those remaining in Scandinavia (Hansen 2003:62-63).

This changed over the course of the Viking period, as the kingdoms of Norway, Denmark, and Sweden developed, and Scandinavians were more likely to refer to themselves as Norse or Danes (Richards 2005:5). Norway gained more control over the North Atlantic Islands as time went on. For example, the Faroe Islands became a Norwegian estate in 1035, and by 1277 Norwegian law was imposed there, restricting local lawmaking and creating a trade monopoly between the Faroes and Norway (Hansen 2003:63).

The Scandinavians who settled in the Orkney Islands were from northern Scandinavia, and would most likely have identified themselves as Norse. However, mixed identities were common during this period, as one can imagine would be the case during a period of widespread colonization and cultural expansion. There is evidence that individuals with claims to more than one cultural identity used their cross-cultural standing and knowledge to advantage in the Viking/Medieval period and that having a foot (or, perhaps more importantly, family contacts) in both the Scottish/Irish and Norse worlds could be very advantageous in certain situations (Barrett 2003; Hudson 2005).

In this dissertation, "Viking" will be used to refer to the period 800-1050 A.D. and to artifacts from this period, as this is the most conventional chronological and regional label (Graham-Campbell and Batey 1998: 3). When used to describe individuals, however, the term will be used to refer to raiders, while "Scandinavian" and "Norse" will refer to the settlers of the North Atlantic Islands during this period.

Use of the latter terms tends to obscure the fact that the genetic and cultural heritage of a significant but unknown minority of the individuals living in this area (primarily but probably not entirely composed of women and slaves) are unlikely to have been Scandinavian or Norse, but rather were from one of the native populations of the British Isles or members of the other groups that the Scandinavian/Norse had contact with (Helgason et al. 2000; Jesch 1991:87-88; Wilson et al. 2001).

Also, there is some evidence to suggest that a major source of income and basis for wealth in the Orkney Earldom during the Viking Age and Early Medieval period was a direct result of "Viking", that is raiding, capturing and trading slaves, protection racketeering and other activities that would certainly meet the piratical definition of the term (Barrett 2007). While the terms chosen for use in this dissertation are imperfect, they are used for the sake of comparability with other archaeological and historical surveys of the region.

Chronology

"Viking Age" was the term used by the Copenhagen museum in the 1940s to categorize the artifacts from the period following the Iron Age in an evolutionary sequence (Richards 2005:5). Since then it has remained a common way to refer to the period between the Iron Age and Medieval period, although the exact starting and ending points are frequently disputed. The controversy is understandable because the Viking Age is in many ways an extended transition between the cultural and economic patterns of the Iron Age and those of the Medieval period. The transition occurs at different rates in different areas (Barrett 2000; Edwards 2005; Graham Campbell and Batey 1998; Thurston 1997, 2001). Our conception of the period becomes more complicated and more problematic as archaeological data become available for a wider range of sites and regions.

The most traditional historical starting point for the Viking Age lies at 793 A.D., marked by recorded raids on the English monastery of Lindisfarne. However, some archeologists and historians would prefer to place the beginnings of the Viking age earlier, around 710, when some see the beginnings of state formation and outward expansion taking place (Richards 2005:5). The end of the Viking Age is usually defined as the defeat of Harald Hardrada at Stamford Bridge (Battle of Hastings) in 1066, the death of the last Scandinavian king of England, Harthacnut, in 1042 (Richards 2005:5-6), or the death of Earl Thorfinn the Mighty (one of the most famous Orkney earls) in 1065 (Graham-Campbell and Batey 1998:2). These dates are also problematic, however, especially in the Northern Isles where Norse cultural influences and language were in force at least until the fourteenth century.

In Orkney, the most commonly used chronology and terminology for these periods are a little different than elsewhere in Europe. The starting date for the Viking Age in general use for archaeology is typically given as 800 A.D., while the end of the Viking age and beginning of the Medieval period is considered to occur c. 1050 A.D. These are the dates and terms used in this dissertation, and in the Quoygrew site monograph (Barrett in press). For a summary of the chronology used in Orkney, and for corroboration between the archaeological periods, date ranges, and Phases present at Quoygrew, a brief chart is provided (Figure 3.1).

Phase	Date Range	Archaeological Period
Phase 1	c. 10th century	Viking Age
Phase 2	c. 11th-12th century	Viking/Medieval Transition
Phase 3	c. 13th-14th century	Medieval Period
Phase 4	c. 15th-16th century	Late Medieval Period

Figure 3.1 Quoygrew Phasing and Chronology

Sources of Evidence for the Viking/Medieval Transition

There are three main sources of evidence for this period of history: historical records; traditional archaeology (including settlement patterns, artifacts, burials, and hoards); and paleoecological studies. Additionally, ethnographic and ethnoarchaeological studies of the region are useful to suggest analogies and aid in interpretation of archaeological finds and patterns. I will briefly discuss each source of evidence as it relates to the aims of this study. All four sources of information have been consulted in the course of this dissertation.

Historical Records

Much about the economic history of the Middle Ages is known from English records, because of the quantity of account rolls, court rolls, extents and surveys available from that country (Masschaele 1994). Historical records from northern

Scotland (Fossier 1999; Webster 1975) and Scandinavia (Andren 1989:586) during this critical period are much more scarce, placing archaeology in a prime position to address questions about changes taking place at this time.

Given the dearth of legal and economic records from these areas, much of what is known about social and political relationships and farm life from the Viking Age and Medieval period is known from sagas, many of which were written in Iceland. Orkneyinga saga, written by an Icelander around 1200 A.D., is the most relevant saga to this dissertation as it relates the history of the lives of the Orkney earls (Pálsson and Edwards 1981). The historical accuracy of sagas has been long questioned (Bugge 1909; Foote 1965) and archaeologists must use these information sources carefully to shed light on traditions and contemporary social attitudes (Bolender 2007; Byock 1988, 2001; Friðriksson and Vésteinsson 2003; Jones 1991; Miller 1990). However, as far as sagas go, the Orkneyinga saga is one of the more reliable, more historical accounts (Barrett 2005).

Histories and sagas are very helpful for getting perspective on political events, everyday life in the areas represented, and some information about the cultural and symbolic aspects of life during this period. However, it is important to view the history of the region with some caution, to understand that there are biases in the record, and that records drawn from one region or time period cannot be indiscriminately used to explain the archaeological record.

Not only are some records written by outside groups with no motivation to portray accurately the histories or actions of their enemies, but nearly always records are kept in more central regions where conditions and ways of doing things might have been very different than they were in more marginal regions. As discussed in the previous chapter, people in centralizing regions may well have used stories or histories as a means to claim power over groups that were in fact much more independent than they were portrayed as being. To turn Cohen and Toland's (1988:12) quote from the previous chapter around, it may well have been possible for saga authors to instill ideas about how things "ought" to be or have been through stories and manipulated histories. This could then reinforce the way things "are": modern, centralized ways of thinking about power relationships.

To resolve some of these issues, there has been great interest in bringing together archaeological work in the Orkney Islands and elsewhere in the North Atlantic region during this time period with historical data. Literature reviewing the Viking Age in the North Atlantic region using historical and archaeological data is extensive (Armit 1996; Barrett 2000, 2003, 2005, 2007, 2008; Batey et al. 1993; Batey and Sheehan 2000; Bigelow 1992; Brown 1997; Byock 1988, 2001; Crawford 1986, 1987, 1993, 1995, 1999, 2000; Graham-Campbell and Batey 1998; Hunter 1997; Morris 1982, 1985, 1995, 1996, 1998; Ó Corráin 1998; Owen 2004; Ritchie 1993; Roesdahl 1987 [1998]; Sawyer 1982; Sharples and Parker Pearson 1999; Thomson 1987; Thurston 1997, 2001, 2007). The authors of these synthetic works take a cautious approach to historical data, using the information as the basis of testable hypotheses about the archaeological record.

Traditional Archaeology

Viking Age and Medieval Scandinavia, the British Isles, and the North Atlantic Islands have been heavily investigated archaeologically. Some of the most famous ship burials, the Gokstad (excavated by Nicolay Nicolaysen in 1880) and Oseberg (excavated by Gustafson and Shetelig in 1904), which were discovered and excavated in Norway, were among the earliest Viking Age archaeological finds. (Richards 2005:47-49). Many Viking Age burials in Caithness, Northern Scotland were excavated in the late 18th and 19th centuries (Batey 1993). Although the earliest excavations tended to focus on burials and hoards, there were some early excavations of Viking age settlements in the North Atlantic islands, including the Brough of Birsay in Orkney, Jarlshof in Shetland, and þjorsardalur in Iceland (Dugmore et al. 2007; Hansen 2003:40). Modern excavations have been widespread and frequent, especially beginning in the 1970s and 1980s in parallel with the development of medieval archaeology in Europe (Biddick 1984; Randsborg 1989; Redman 1989; Sawyer and Sawyer 1993). Orkney has proven especially rich in archaeology from this time period. There is, however, a frequent need for rescue excavations, especially in shoreline sites, as rapid wind and sea erosion exposes interesting sites to the surface regularly. Since the turn of the century and earlier some archaeological investigations have been turning up patterns in burial practices, pottery and lithic assemblages, hoards of coins and precious metals, as well as settlement patterns and house construction methods (Batey 1989, 1993; Buttler 1991; Forster and Bond 2006; Graham-Campbell 1993).

As landscape archaeology has grown, more sophisticated landscape approaches to archaeology in this region have correspondingly grown, which have been very helpful for understanding political and spatial relationships, the rise of trade emporia, urbanization, and state control (Andren 1989; Arge et al. 2005; Bertelsen 1991; Blindheim 1982; Martens 1992; Randsborg1989; Saunders 1995; Schledermann 1970; Sharples, Parker Pearson and Symonds 2004; Solli 1996; Thomson 1993; Thurston 1997, 2007).

Paleoecology and Environmental Archaeology

Although the traditional archaeology done in the Orkney islands and elsewhere in the North Atlantic is growing and becoming more standardized and informative as archaeological techniques are refined and new areas and methods of investigation are developed, the advance most relevant to this dissertation can be found in the rapid increase and sustained development of paleoecology and environmental archaeology, which are arguably as developed in this region of the world as anywhere else worldwide.

Most recent excavations have included consideration for plant and animal remains. There are many good examples of integrated site analyses from Norway (Barrett et al. 2007; Sandvik 1994), Shetland (Brown and Heron 2006; Crawford and Ballin Smith 1999; Dockrill and Batt 2006; Nicholson and Dockrill 1998; Owen and Lowe 1999; Turner et al. 2006), Orkney (Barrett et al. 2000; Barrett et al. forthcoming; Batey and Morris 1992; Bond 1998; Hunter 1986; Morris and Rackham

1989; Morris 1989, 1996), Caithness (Fairhurst 1984; Morris et al. 1992; Morris et al. 1995), the Western Isles (Sharples 1996; Sharples et al. 2006; Smith and Mulville 2006; Smith, Marshall and Parker Pearson 2001), the Faroes (Church et al. 2005; Edwards 2005; Vickers et al. 2005), Iceland (Amorosi 1992; Amorosi et al. 1992; Amundson 2006; Buckland et al. 1991; Friðriksson 2006; Hastrup 1989; McGovern et al. 2006; Smith 1995; Sveinbjarnardóttir et al. 2007), and Greenland (McGovern 1992), as well as regional syntheses (Barrett et al. 2000; Bigelow 1992; Coles and Housley 2006; McGovern 1990; Perdikaris and McGovern 2005, 2007).

Excellent preservation of macro- and microremains in this region are partially responsible for the popularity of ecological approaches, as is the development of several large interdisciplinary research projects and organizations that specifically outline an ecological emphasis, including the North Atlantic Biocultural Organization (McGovern 2004), The Mosfell Archaeology Project (Directed by Dr. Jesse Byock, UCLA, and Dr. Phillip Walker, UCSB), and the Viking Age Transitions Project, directed by Dr. James Barrett (Barrett et al. 2000).

Paleoecology and environmental archaeology are richly studied subfields in the North Atlantic especially, as well as in medieval archaeology in general. Archaeologists and collaborating scientists from a host of fields have produced relevant data from this region on fish, bird, and mammal bones (Amorosi et al. 1992, 1996, 1998; Harland 2006; Lie 1988; Perdikaris 1999; Tinsley 2006), insect populations (Buckland and Perry 1989; Buckland and Sadler 1990; Buckland 1992; Buckland et al. 1993; Buckland et al. 1998; Buckland and Dinnin 1998; Jóhansen

1994; Jones 1988; Kenward 1988), plant macroremains (Geraghty 1996; Greig 1991; Griffin 1981; Griffen 1988; Huntley 1994, 2000; Jensen 1979, 1991; Jørgensen et al. 1986; Krzywinski et al. 1983; Økland 1988; Poaps and Huntley 2001a, 2001b; Robinson 1994), pollen and phytoliths (Huntley 1994, 1999; Zutter 1999), and shells (Milner et al. 2007). Also, micromorphology and geoarchaeology have added a lot to understanding land use and taphonomic processes (Adderley and Simpson 2005; Davidson et al. 1983; Davidson et al. 1986; Dockrill and Simpson 1994; Guttman et al. 2003; Simpson 1997, 1998; Simpson and Guttmann 2002; Simpson et al. 1998a, 1998b, 2003, 2005a, 2005b). Modern and often novel techniques and approaches in archaeological science that have been used in the region include using mineral magnetism to track taphonomic processes (Church 2002; Church and Peters 2006; Peters et al. 2006), identifying lipid biomarkers of manuring practice (Simpson et al. 1999), identifying the effects of manuring on nitrogen isotope ratios in cereals (Bogaard et al. 2007), identifying dairying using biomolecular indicators (Craig et al. 2005), identifying lipids and milk proteins in containers (Challidor 2006), studying charred food residues (Campbell et al. 2004), conducting paleodietary analysis using radioisotopes (Barrett et al. 2001; Barrett and Richards 2004; Richards et al. 2006) and DNA analysis of X and Y chromosomes of modern North Atlantic populations (Roberts 1985, 1990). These studies all add to the information available on this period in Orkney history.

Milek (2001:276-277) describes an interpretive divide between what she calls "specialists" and "synthesizers" that she argues has occurred in modern archaeology in this region. The divide means that while more and more interesting data are being amassed, they are rarely synthesized into the knowledge base that exists to establish greater meaning for the data. Although the data are used by synthesizers to extract meaning for the period, the creators of the data, the specialists themselves, seem to be answering the "what" and "when" questions and leaving out the "why".

Although it can be argued that this continues to occur today, in recent years the boundaries between science-based archaeometry and environmental archaeology versus traditional archaeology and history seem to be breaking down somewhat. Collaborations are also occurring wherein specialists are contributing more to the discussion of their data rather than simply producing reports which are then integrated by the director of excavations. This dissertation as an attempt to bridge this gap, and to go beyond reporting the archaeobotanical data from Quoygrew, instead using the botanical data along with synthesis of other known data to provide interpretations of behavior and to better understand the meaning of the plant data for the site and period.

Ethnographic studies

Helpful accessory lines of investigation have been ethnographic studies, ethnoarchaeology, and experimental archaeology studies of plant taphonomy as well as studies of traditional farming practices in the Orkney Islands and Shetland, Iceland, and Scandinavia. Paleoethnobotanists and others studying the interaction of communities with the ecosystem have recognized the importance of gathering detailed information about how traditional agriculture is carried out in different areas. This allows models to be created from which analogies between traditional modern and historically documented ways of carrying out farm processes and the way these processes may have been carried out during the Viking Age and Medieval period can be tested.

Towards this end, crop processing methods and their associated waste deposition patterns have been studied in the North Atlantic (Dennell 1976; Fenton 1978; Hillman 1981, 1984; Jones 1991; Smith 1996; Smith 2001; Stevens 2003; Van der Veen 1992; Viklund 1998). Taphonomy of seed remains have also been studied experimentally (Boardman and Jones 1990; Church 2002; Hubbard and al Azm 1990; Viklund 1998) in order to answer questions about the ways in which seeds enter and are preserved in the archaeobotanical record of a site. Alternative taphonomic pathways for seeds are also considered, especially seed remains that enter the record as a result of fuel: in turf or animal dung (Bottema 1984; Carter 1998; Church 2002; Derreumaux 2005; Dickson 1998; Hall 2003; Hally 1981; Miller 1984; Miller and Smart 1984). Analyses of modern fields and the physiological requirements of crop weeds are also necessary to get the maximum information out of ancient seed assemblages (Bogaard et al 2001; Charles et al. 1999; Engelmark 1989; Henricksen et al. 1996; Huntley 2000; Jones et al. 2000; Van Zeist et al. 1994).

The strength of this dissertation rests on the availability of such richly detailed information regarding the Viking Age and Medieval period in Orkney. It is this information that provides a context for examining the plant-related activities at the Quoygrew site. In the rest of this chapter, I use a combination of the sources mentioned above to present a very brief introduction to the physical setting of the North Atlantic and especially Orkney, as well as to provide more substantial discussion of the transition between the Viking Age and Medieval period as it relates to political changes (especially aspects of increasing state control), and the effect of these changes on household dynamics.

The North Atlantic and the Orkney Islands – Physical Setting

Definition

During the Viking period, Scandinavian influence spread, mainly in two directions, toward the North Atlantic to the west and into Russia and the Black Sea region to the east (Fitzhugh 2000)). I use the term "North Atlantic region" to encompass much of western-facing Scandinavia, including Norway and Denmark, and to follow the Viking expansion to the west. The North Atlantic region (see Figure 3.2) encompasses the Viking expansion into the British Isles as well as the other island groups in this region: the Isle of Man, the Western Isles or Hebrides, and

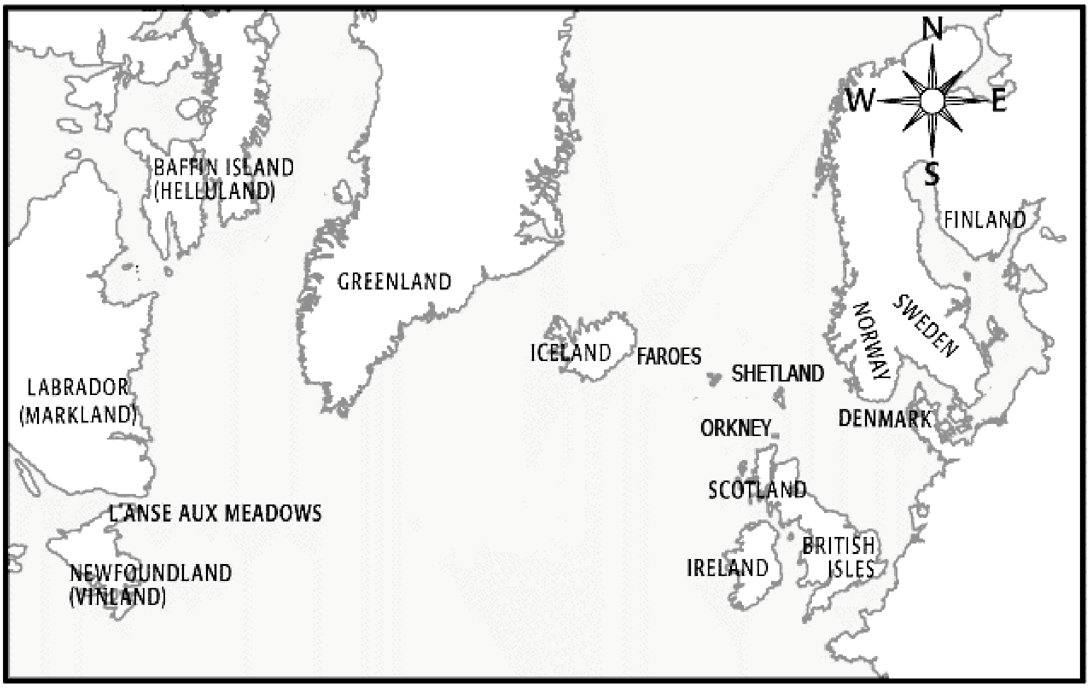


Figure 3.2 Map of North Atlantic Region

the Northern Isles of Orkney and Shetland. Along a western path are also the Faroe Islands, Iceland, Greenland, and the far western outposts of Baffin Island (Helluland), Labrador (Markland) and L'Anse aux Meadows site in Newfoundland (Vinland) (Fitzhugh 2000). The expansion mostly involved rural settlement in the islands of the North, although in the far north trade in exotic items like fur, walrus ivory, amber, and exotic animals was important for maintaining ongoing contact with Europe. Towns of Viking and early Medieval periods that have been excavated include Trondheim, York, Dublin, Bergen, and Kaupang. Rural settlements of high and lower status have been excavated in Denmark, Norway, England, Scotland, Ireland, Orkney, Shetland, Man, the Western Isles, the Faroes, Iceland, Greenland, and Newfoundland.

Geography

The geography of these regions is varied, as one might expect from their vast separation in space. Despite spanning the whole of the North Atlantic, the Scandinavian-occupied islands act like stepping-stones across the ocean. There are never more than 650 kilometers between landfalls, allowing settlers to make their way from one occupied island to another without extended time at sea (Fitzhugh 2000:13). The North Atlantic region is located between 50 degrees north and c. 65 degrees north (Arctic Circle). Differences in ocean currents between the eastern and western portion of the North Atlantic mean big differences in climate at the same latitude (Coles and Housley 2006).

When comparing Orkney to the rest of the North Atlantic region, it appears a very inviting place for settlement. Agriculture has been practiced in the Orkneys for at least 5,500 years (Wickham-Jones 2007:7; Ritchie 1985:36). The growing season is variable, lasting between five and six months, which is short compared to the 7-8 month growing season of England and parts of Denmark, but long compared to that experienced in most of Norway, Iceland and Greenland (Wickham-Jones 2007:9).

Because of Orkney's proximity to the Arctic Circle, days are short in the winter (the shortest days have about six hours of daylight) and long in the summer (Wickham-Jones 2007:9). In modern times it rains in Orkney on average 241 days per year, snows or sleets an average of 64 days per year, and the average rainfall is 89-102 centimeters (35-40 inches) per year. The average date for first frost is November 20, and the last frost is April 23 (Wickham-Jones 2007:8-9). When compared to its nearest neighbor, Shetland, which is geologically based upon harder Lewisian Gneisses, Orkney has better soil and has traditionally supported more farming (Graham-Campbell and Batey 2001:4).

Orkney is comprised of 70 islands located about 16 kilometers (10 miles) north of the northernmost coast of Scotland. About 20 of the islands are inhabited currently. Many of the smaller islands have lost populations in the recent past, and abandoned farm buildings can be found on these now-uninhabited islands (Berry 2000:5). The islands range in size, with the largest island (341 square kilometers, or 212 square miles), named Mainland, considerably larger than the rest. The islands vary in type from Sanday, which is relatively flat, sandy, and has a large proportion of arable soil to Hoy, which is the highest of the islands and much rockier. Most of the islands are formed from Old Red Sandstones eroded into gentle hills (Graham-Campbell and Batey 2001:4).

Natural resources include peat, seaweed, Old Red Sandstone stone shingles that make up the predominant house building material, nesting sea birds, abundant fishing, sufficient grazing areas and fertile mahair (sandy loam) soil (Berry 2000; Wickham-Jones 2007:5). Strategically, the Orkneys offered low-lying fertile soils in coastal locations with sheltered bays and harbors to provide safe places to anchor and draw out boats (Wickham-Jones 2007:6), as well as excellent sea routes to other

Scandinavian-occupied lands (Graham-Campbell and Batey 2001:4). Not all islands have identical resources, leading to substantial inter-island trade in fuel and other resources. Westray, the island upon which Quoygrew is located, is the sixth largest of the Orkney Islands. It is 29.3 square kilometers (18.2 square miles) in size, with several bays and inlets. Currently the population is 550 people.

Climate

The climate of Orkney is a rare type that can be described as “hyper-oceanic” (Berry 2000:50). The islands are mostly free from summer drought and winter frost, and there is only an 8° C difference between average summer (12° C [53.6° F]) and winter (4° C [39.2° F]) temperatures. The weather is milder than one might expect given the latitude of the islands. The little snow that falls during Orkney tends not to last for long on the ground (Wickham-Jones 2007:8) This is large part due to the gulf stream, which brings warm water north past the islands. Despite the relatively mild winter temperatures, winter weather in Orkney can be severe. An uncharitable WWII serviceman stationed in the Orkneys described the island weather as “all bloody clouds and bloody rain” (Berry 2000:8). Frequent gales make winter travel unpredictable and imperil ripening grain in the fields. As an example of the worst of the wind’s severity, record gale winds were recorded in Kirkwall in February of 1969 at 136 miles per hour. In 1952, similar winds destroyed the poultry industry in the islands by carrying away 7,000 poultry houses and 86,000 hens (Berry 2000:12). The strength of the wind on Orkney has significant effects on the plant and animal communities. Trees are very rare and only occur in sheltered areas. On the higher islands, like Hoy, it is possible to stand in arctic tundra communities at 300 meters (1000 feet) above sea level while looking down below at thriving agricultural fields at lower altitudes. This telescoping of altitudinal plant communities is due in large part to the high winds common to the islands (Berry 2000:52). Storm surges carve out the shoreline, frequently exposing new archaeological sites, but also making speedy excavation and site rescue a necessity.

Climate change during this period bears mentioning, as it has been sometimes cited as a major factor in the Viking expansion during this period and the abandonment of the westernmost North Atlantic settlements in the Late Medieval and Early Modern period. The Medieval Warm Period (MWP) is thought to be a period associated with warmer conditions than those of the following five centuries and occuring at some point between the ninth and mid-fifteenth centuries, although the dates and the extent of the warming trend are contentious (Hughes and Diaz 1994:136). The MWP and the Little Ice Age that followed it have been used to explain the cause of the Viking Age (Dansgaard et al. 1975), and the abandonment of the Greenland colonies (Diamond 2005; McGovern 1990). As McGovern (2000:330) describes the later case, "the basic argument can be fairly summarized as "it got cold and they died." In neither case is this simple deterministic argument sufficient to explain events, especially since the nature of the MWP is more complicated and all modern climate evidence suggests that it cannot be described as a sustained period of better weather (Barrett 2008; Buckland et al. 1996; Dugmore et al. 2007; McGovern

1990; Ogilvie and McGovern 2000; Ogilvie et al. 2001). Ogilvie (1991) has tracked this period through historical literature, and while warmer weather is not confirmed, it appears that during this period there was an increase in climate fluctuation and unpredictability. In the Scottish Highlands, despite climate unpredictability and change, farmers were able to maintain their agriculture and settlement for long periods (Davies, Tisdall and Tipping 2006). This increased climatic variability is likely to have been the case in the Orkney Islands as well as the Scottish Highlands (which includes the northernmost parts of Scotland, which were at most times at least partly contained within the Orkney Earldom). The climatic variability during this period did not cause the abandonment of the Quoygrew farm, which was continuously occupied from its founding in the Viking Age until the 1930s. However, potential effects of the MWP and Little Ice age on agriculture at the farm are investigated using botanical macroremains and more fully discussed in Chapter 6 of this dissertation.

The physical environment of the Orkney Islands has shaped the way that people have made a living there since its settlement in the Neolithic. The maritime focus of the western expansion of the Viking Age made the Orkneys a particularly active arena during the Viking/Medieval transition. The next section includes a summary of political activity that took place during this period and a discussion of the effects of increasing state control on the political administration of the islands, household organization, and the landscape.

Political Background (A Summary)

In the early Viking Age the Orkney Islands were probably occupied by Vikings in the literal sense of the word, who used the islands as a base for raiding Scotland, England, and Ireland (Richards 2005:90-91). There was also most likely a native population of Pictish people living on the islands (Barrett 2003; Richards 2005:90). By the second half of the ninth century, Norse architecture and material culture had completely replaced the native Pictish styles, and no native Pictish place names were retained, suggesting little interaction between the two cultures after this date (Barrett 2003; Richards 2005:90-91). The fate of the Pictish population in the Orkneys, and the extent to which Norse contact resulted in assimilation or elimination of native populations is hotly debated and is the subject of much excavation and discussion (Barrett 1996; Barrett 2003; Gourlay 1993; Richards 2005; Ritchie 1974). As there is no pre-Norse occupation apparent at the Quoygrew site, this discussion somewhat precedes the period of interest of this dissertation, and so I restrict the discussion of this issue to the brief mention here.

Moving into the period that is relevant to the Quoygrew site, during the later part of the Viking Age and Early Medieval period Orkney was part of a territory known as the Orkney Earldom, which at various points included Shetland, Northern Scotland, The Hebrides, the Isle of Man, and at the peak of expansion probably included parts of the western seaboard of Scotland. This Earldom was ruled by a succession of earls. At some points, power was consolidated in the hands of one earl, while at others the Earldom was divided between competing earls, or ruled jointly by more than one earl (Crawford 1987; Thomson 2001:70). For brief times the Earldom was under direct control of Norwegian kings, especially during or immediately after times when the Orkney Earldom was being used as a major staging point for Norwegian military expeditions in the British Isles (Barrett 2007; Crawford 1987).

The legendary beginning of the Earldom as told in the sagas was when Harald I of Norway (Harald Finehair) invaded and took the islands from pirates who were using it as a base to raid (among other areas) the Norwegian mainland. During the conflict, Ivarr son of Rognvald of Møre was killed, and in compensation King Harald gave Rognvald Orkney and Shetland to rule after the conquest. Rognvald gave the rulership to his brother, Sigurd the Mighty, who became the first earl of Orkney.

This series of events was supposed to have happened in the late ninth century according to the Icelandic sagas. However, it is most likely that the Møre family had gained power in the islands on their own, and that the Icelandic saga writers from the late twelfth century created the origin story to legitimize contemporary Norwegian sovereignty in the islands (Thomson 2001: 24-28). The voyage and conquest of King Harald is only known from the sagas, the chronology of the takeover is confused between sagas, and it is unlikely that such a large campaign would have escaped notice in all contemporary records from England and Ireland (Crawford 1987:53; Thomson 2001: 25-26).

In the earliest contemporary historical records, Orkney was already ruled by one or several earls. These earls owed allegiance to Norway, but also had more or less independent involvement with Scotland and the rest of Europe. Although the independence and power of the Orkney Earldom waxed and waned over time, the period where Orkney had the most military power was probably under Earl Thorfinn the Mighty (1014-1065) (Thomson 2001: 101-105). Earl Thorfinn was able to expand the Earldom substantially with successful military campaigns. During this period of military strength King Magnus the Good, who ruled Norway during the middle portion of Earl Thorfinn's rule (1035-1047) was unable to establish and maintain military power over the Earldom even when provoked by the Earl (Barrett 2007:5).

However, later in the eleventh century, King Magnus Bare-Legs of Norway was successful in taking over control of the Earldom, putting his son Sigurd in charge temporarily. When King Magnus died, Sigurd returned to Norway and the Earldom reverted to local control (Barrett 2007: 5). A century after the reign of Earl Thorfinn, under Earl Rognvald (1135-1158), historians argue the islands' population exerted the most cultural influence in the North Atlantic. It was this later period that has been termed Orkney's "golden age" or "renaissance" (Crawford 1988; Thomson 2001:101-112).

By the rule of Harald Maddadsson (1138-1206), the Norwegian state had gained more control of the islands, and despite periodic resistance and rebellion by Earl Harald and men from the Earldom, it was more often the Norwegian kings that won disputes over power in Orkney. It was as a result of a failed rebellion against Norway's King Sverrir in 1195 by Harald Maddadsson and the men of Orkney that the Norwegian crown was able to impose stricter new regulations on the Earl's power in the islands, including the installation of a *sysselman*, or royal bailiff in the islands. Norwegian power was strengthened again by concessions made to the king after the murder of the first *sysselman* later during Maddadsson's rule (Thomson 2001:126-129).

There was a trend towards rising Scottish influence and power in the islands beginning in the Medieval period as well, and royal power from both Norway and Scotland was more regularly applied in the islands as time went on, limiting the power of the earls. By the fourteenth century, Norwegian kings decreed that all fish exported from Orkney be traded through Bergen in Norway, and the dried fish trade came strongly under Norwegian royal control (Barrett 2007:20; Urbanzyk 1992:76). In 1468, King Christian I of Denmark and Norway ceded the Orkney Islands, along with Shetland to Scotland to provide a dowry for his daughter's marriage to King James III of Scotland. At this point rulership of the Orkneys was taken over by Scottish nobles (Thomson 2001:189:193).

Although peripheral to centralizing regions like Norway and Scotland, the Orkney Earldom was in a uniquely valuable position because of its relatively central location in the North Atlantic, and as a stepping stone from Norway to the rest of the British Isles and further reaches of the Norse North Atlantic: the Faroes, Iceland, and Greenland. In some important ways, Orkney acted as a bridge between more marginal areas of the North Atlantic, like Iceland, the Faroes and Greenland, and the urbanized centers of Scotland, Ireland, England, and Norway (Bertelssen 1991). Bigelow (1985:95) posits that "the islands' location as a nautical crossroads meant that they often experienced socioeconomic change derived from developments in diverse and sometimes quite distant regions." It was strategic location, as well as relative landscape hospitability that made the Earldom so important at this turning point in Northern European history.

Orkney can be shown to have been both wealthy and powerful during the Viking Age and Early Medieval period (Barrett 2007). Silver hoards show that more silver flowed into Scandinavian Scotland at this time than to other areas of rural North Atlantic, although not as much as was brought to urban areas in Ireland and Norway (Barrett 2007:303). Power is indicated by powerful marriages between Orkney earls and their families and Scottish and Norwegian royalty and their families (Barrett 2007:304).

Because the Earldom had such strategic importance and wealth, control of the Orkneys was a primary concern for states (Crawford 1987). However, the Orkney Earldom, while theoretically under control of Norwegian kings, remained relatively independent, especially before the thirteenth century. The feudal system was never established in Orkney as it was in southern Scotland, and individual farmers, especially wealthy landowners were notoriously hard to control. The Orkney Islands appear to have remained more heterarchical than other areas of the North Atlantic throughout the twelfth century (Barrett 2007). As recorded by King Sverrir's contemporary biographer (Sephton 1899:156, in Barrett 2005:220), Earl Harald Maddadarson's excuse to the king when negotiating reparations after the failed rebellion in 1195 A.D. was as follows:

> Less blame is mine in this business than is imputed to me. I did not plan the rising of that band. It is true I did not fight against it, for I could not be hostile to all the people in the land as long as I should be Earl over it. The men of Orkney do not always act as I wish; many leave the Orkneys to plunder in Ireland and Scotland, to pillage merchants, and all contrary to my wish.

The relationship of the Orkney earls with both Norwegian and Scottish rulers was rocky to say the least, and alliances, intermarriages, and rebellions made these relationships fluid, especially during the centralizing period of the Viking/Medieval transition. The Orkney Earldom provides a fascinating case study of an area brought under the influence of several secondary states while they themselves were forming and developing. Changes taking place everywhere in the North Atlantic during this transition take particular forms in this region because of its wealth, strategic importance, and unique history.

In the rest of this chapter, I outline some of the large-scale changes taking place across the North Atlantic in political administration, household structure, and landscape, and tie them to the concepts of state control and legitimation discussed in the previous chapter. I briefly describe what is going on in the entire region, and provide what (sometimes limited) information is known about how these changes took place within the Earldom

Administrative Control during the Viking/Medieval Transition

Scandinavia

The wealth of competing chiefs during the Viking Age and Early Medieval period came from warfare, looting, protection racketeering, and long-distance trade. The majority of the wealth of the period came from external exploitation of peoples and lands outside of the political unit. Perdikaris and McGovern (2007:196) give this description of leadership during this period: "An ideal Iron Age chieftain had sharp elbows and a quick temper, expanded his holdings opportunistically, defended his own aggressively, and was always ready to reward loyalty with silver and treachery with iron." Power was for the most part based on a chief's ability to maintain loyal followers, which involved providing both generous financial rewards in the form of shares in loot, and comfortable accommodations with sufficient food to last the winter and meat and beer to allow for the presentation of feasts (Saunders 1995).

During the Viking Age, landholding farmers had significant powers of self-determination and there was an ideal of equality among free people (Karras 1988:5). Assemblies (known in Old Norse as *þing*) were important meetings held periodically and attended by nearly every adult male. At these meetings political decisions were made, and disputes were resolved (Gurevich 1978:415). The military was based on a militia-type system where farmers were required to provide a period of service and equip themselves (Andren 1989). The free farmers' relationship to leaders was one based upon the aforementioned ideal of equality and the idea of reciprocity and exchange of material rewards for loyalty (Saunders 1995). There were also strong leveling mechanisms at work: according to Thurston (2007:162), in the Iron Age and early Viking Age "assassination of overly-ambitious leaders was actively encouraged." Taxes, if levied at all during this period, were usually levied on the household rather than on the land holdings. Most often taxes were only levied occasionally when the need was obvious, such as during military conflict or to build a large public work (Anderson 1991:79-81; Thomson 2001:218).

In contrast, by the Medieval period, power had been centralized to the point where nobles acquired power through their relationship to the central power (the king and retinue) and through their lands, their tenants, and the fruits of the labor these two resources provided (Andren 1989; Gurevich 1978:413). Although *þing* assemblies continued into the Medieval period in most of Scandinavia, the nature of the meetings had changed, and representatives of each community (usually members of the clergy, richer landowners, and royally appointed representatives) were the attendees rather than all landowning farmers (Gurevich 1978:415). The military shifted from temporary local militias requiring periods of military service to a permanent military supported by taxation (Andren 1989; Gurevich 1978:415). Most of the personal duties that had once been obligations of the peasant were converted to taxes in kind (Andren 1989).

This mode of production involved a drastic shift towards internal exploitation. Power was determined more by the quality of one's land holdings and the production potential one had through one's control of land and the rights to a share of that land's productivity (Saunders 1995). In Danish Scania, farmers and villages were relocated on the landscape to maximize agricultural production in a state-planned and administered way (Thurston 2007:177-179). Taxes were levied regularly and administered through a well-developed system of land assessment. Administrative farms with royally appointed administrators were developed to collect taxes in goods like butter, fish, cereal grain, malt, cloth, and oil.

This is a summary of the basic political setting at the beginning and end of the transition period in Scandinavia and North Atlantic region at large. The transition, as mentioned before, occurred at different rates in different places (Barrett et al. 2000). The next section takes a closer look at administrative control during the transition in the Orkney Earldom, where Quoygrew is located.

Orkney

An important factor shaping administrative control in Orkney is the role of the Orkney earls in their relationships with contemporary Norwegian and Scottish kings. From the formation of the Norwegian and Scottish states until the close of the thirteenth century, any direct power these kings had over the Orkney Islands was sporadic. The title of Earl, derived from the Old Norse *jarl*, originally described formerly independent rulers or tributary chiefs rather than regional royal administrators (Sawyer 1991:284). Although the earls of Orkney owed alliance to the kings of Norway, they were also in alliance with Scottish Kings. "Such a position may have had its advantages, for an astute earl could play off one overlord against another. Indeed, we see the beginnings of that in the alleged but somewhat anachronistic reply that Earl Thorfinn is said to have made to King Olaf of Norway that he could not do him homage ‘for I am already an earl of the King of Scots, and a vassal of his’” (Crawford 1987:79). This is one of the unique features of the secondary state formation process in the Orkney Islands, which is complicated by the presence of competing secondary states nearby.

Force, Power, Hegemony. Although the Orkney earls were powerful and wealthy, they still needed to legitimate their rule in a public arena where social norms were in a state of flux (Solli 1996). Many of the Orkney rulers, particularly Earl Thorfinn and Earl Rognvald were particularly aware of the necessity of legitimizing their rule not only to the Orkney households under their rule, but also to the greater powers of the rest of Europe and especially to contemporary European kings and to the leaders of the Christian Church. Many of the Orkney earls traveled extensively, making trips throughout Europe to visit dignitaries, including Norwegian and German kings and the pope, as well as making pilgrimages/crusades to Jerusalem (Thomson 2001:85,101).

The new religion of Christianity was adopted strategically and used to place the Orkney earls on the leading edge of the push towards secondary state formation occurring in the North Atlantic. The conversion of the first earl of Orkney, Earl Sigurd the Mighty, by King Olaf Tryggvesson of Norway in 995 A.D. was done by force. “As far as the king was concerned the temporal submission of the earl was no doubt just as valuable an achievement as his conversion; the taking of the earl's son as hostage for his good and loyal behavior was an inevitable part of such royal visits to the Earldom" (Crawford 1987: 70). However, Earl Sigurd's son Thorfinn used his power on becoming earl to firmly seat Christianity within the Earldom and thus use the power of the church to better integrate his Earldom with the rest of Europe, establish one of the earliest bishoprics in the North Atlantic, and make the Earldom an acceptable Christian principality with recognition from the ruling powers at the time (Crawford 1987:81; Morris 1995; Thomson 2001:69). Earl Thorfinn was also involved in making changes in customary law to better accommodate church laws, which would have been a necessary accompaniment to assisting the bishop to establish authority in the area (Crawford 1987:83). In many ways, Christianity and royal power were mutually supportive, especially during the Early Medieval period (Gräslund 1991:45). As mentioned earlier, a religion that promoted an afterlife rewarding a lifetime of effort and contributions to the church would have been beneficial for establishing a system of church tithes and encouraged surplus production (Mostert 1994; Oosten 1996). This may have paved the way for later lay taxes and increasing tax burdens.

The Orkney earls were also involved in substantial investments in monumental architecture, including building the Bishop's Palace and St. Magnus' cathedral in Kirkwall, Mainland Orkney, as well as other churches, towers, and castles. It has been argued that most of the resistance to Christianity in the Earldom and elsewhere was not caused by conflicting belief systems, but rather involved resistance to the use of

Christianity as an instrument towards obtaining rulers' ambitions on the world stage (Solli 1996).

One interesting example of how Christian ideology and symbolism was used in political battles can be found in the origins and expansion of the cult of St. Magnus. Earl (and later Saint) Magnus was betrayed and murdered by his co-earl Hakon and later canonized as a martyr by Orkney's bishop William the Old. The cannonization and popularization of St. Magnus was mostly started by the saint's nephew Rognvald, who was in a battle against Earl Paul (son of the co-earl responsible for Magnus' murder) for control of the Earldom. The saint became especially popular in Shetland, where Rognvald found much of his support for his takeover of the Earldom (Thomson 2001:103-105). This may be an example of how group identity can be manipulated as a means to power (Doornbos 1994). Most of the miracles associated with St. Magnus purportedly took place in Shetland (Brunsden 1997; Morris 1995). Patron saints from this period, St. Magnus included, seem also to have also acted as a bridge between pre-Christian ideas of protector-spirits or land-spirits and the new ideology of one God. "Many of the miracles seem inspired by Biblical testimony that has been filtered through local tradition. Like Christ before him, Magnus spends time making the blind see and the lame walk. However, helping a man win at dice is definitely something the son of God would never do…" (Brunsden 1997:135-136).

St. Magnus soon became a popular patron saint of Orkney. Acknowledgement of a patron saint was one way for Orkney to establish its own identity as a Christian principality. The Orcadian saint was also popular in Iceland, where in many stories, St.

Magnus is pitted against the Norwegian patron St. Olaf. In these stories St. Magnus comes to the aid of Icelanders and even Norwegians when St. Olaf is otherwise occupied (Brunsden 1997). In 1298 some of the saint's relics were transferred from St. Magnus' cathedral in Kirkwall, Orkney to Iceland, confirming the popularity of the saint in that region. Much of the popularity of St. Magnus in Iceland was probably due to Icelandic apprehension about increasing Norwegian power. The Orkneys and its patron saint acted as a sort of buffer between Iceland and Norway with its strong centralized power (Brunsden 1997).

Another arena of ideological legitimation that those in power may have used is the sagas themselves. As was mentioned, the origin story of the Earldom might have been a way to legitimate the rulership of Norwegian kings over the Orkney Islands. Most of the sagas were written in the twelfth and thirteenth centuries, and legitimization of contemporary rulership was probably a large factor determining how the stories were told. Contemporary relationships and ideas are likely to have shaped who the pro- and ant-agonists were and especially had a hand in the way that poorly remembered or motivating factors were augmented and reshaped in the retelling of historical stories (Bolender 2007; Byock 1988, 2001; Friðriksson and Vésteinsson 2003; Jones 1991; Miller 1990).

*Financing the Earldom***.** As Barrett points out (2007:23), the Orkney earls in the eleventh and twelfth centuries had several sources of wealth available to them.

> Putting the evidence together, one can envision a world where both humble tenants and wealthy magnates farmed and fished. Each then made payments to their respective superiors – typically in goods such as dried cod, fish oil, butter and cereal products. Some of this produce was used to maintain military retinues of various scales, which in turn were used to extract wealth through organized violence at home and abroad. From perhaps the mid twelfth century, when Bergen was founded, the rest was probably exported to Norway for transshipment to English and continental markets. Less frequently, surplus fish and other products my also have been sent directly to lowland Scotland, England and possibly Ireland. Concurrently, merchants visiting the islands (intentionally or unintentionally) were probably obliged to pay toll or to offer the earls of Orkney first option on their wares (Barrett 2007:23).

The most important, especially before the thirteenth century, seems to have been wealth obtained from military expeditions, which provided a great deal of external financing given the frequency of military campaigns (Barrett 2007:10). Other sources of wealth included shipping tolls and provisioning ships that were forced to stop or overwinter in Orkney due to weather or trip timing, as well as export trade, especially in dried fish and fish oil, but also potentially trade in slaves, cereal grains and malt, butter, and *wadmal* (woolen cloth) (Barrett 2007). Taxation, which could have provided a great deal of wealth to rulers who were able to extract it, is an important subject that merits its own discussion.

Taxation in Orkney. The origins and especially the development of the taxation system in Orkney is controversial, especially when relating the origins of Orkney taxation with the origins of taxation in Norway. Early taxes were most likely assessed based upon the household or person and not based on land holdings. In Norway, it wasn't until the thirteenth century that goods were taxed as they were sold. Before this point, merchants were assessed a fixed tax regardless of the value of their transactions (Andren 1989:592).

Although these trends are generally agreed upon, it is the development of regular lay taxation, especially the development of the unique system of tax assessments known as ouncelands or *urislands* and pennylands that is more controversial (Andersen 1991; Crawford 1987; Thomson 2001:206-219; Williams 2004). The system is a unique form of land assessment that is present in the Orkney Islands, Shetland, Caithness, the Hebrides, and Western Scotland. In the Orkney Islands and Caithness, an ounceland contains 18 pennylands, while in the Hebrides and Western Scotland, one ounceland contains 20 pennylands. Ouncelands had boundaries on the landscape, while pennylands were mostly intended to denote shares in the ounceland. Someone who owned property worth two pennylands thus owned a ninth or tenth of the ounceland, and was taxed accordingly. Most interestingly for the purposes of this dissertation, the actual amount of land in an ounceland was not fixed, but rather was dependent on an assessment of the arable potential of the particular land when the ounceland system was established. This has implications for farmer strategies, especially the benefit of reclaiming agricultural land that will be discussed later in the chapter (Thomson 1987).

The two systems of ounce- and penny-lands are probably developed simultaneously, and ouncelands probably preceded pennylands. Barbara Crawford (1987:89-91) argues that Orkney earls Sigurd or Thorfinn were in a powerful enough position to establish taxes within their realms early, creating a sophisticated tax system that provided one major basis of their wealth.

Other scholars disagree, preferring to place the establishment of systematic lay taxation, and most especially the development of taxation based on valued land in Orkney to after the development of church tithes, thus after 1137 (Andersen 1991). The compromise view is that the ounceland/pennyland system probably was solidified sometime in the period 1137-1194, but that the system was likely to have had precedent in a simpler system of tribute collection based on districts that were later standardized as ouncelands (Thomson 2001:219). Conservatively, payments of rent and regular secular taxes were in use by at least the twelfth century (Barrett 2007).

Whether Norway or Orkney had regular taxation first is an important question for the development of the Earldom and the development of the Norwegian state, and the interplay between the two polities during the state formation process. If Orkney earls were able to enforce a regular tax in the Earldom earlier than Norwegian kings, this would be one more factor making Orkney an attractive fiscal prospect for control by the Norwegian crown (Crawford 1987:91). Throughout the Earldom's history, but especially before the fourteenth century it is highly improbable that the majority of taxes collected in Orkney would make it past the earl and be paid directly to Norwegian kings. More likely, the earls profited from taxes and were occasionally required to pay tributes to Norway, as when a new earl was coming in to power, or in recompense for a failed rebellion attempt or for killing a king's representative, as happened under the reign of Harald Maddadsson (Crawford 1987:83-84; Thomson

2001:128). As written records are scarce for these regions, this question remains to be answered by studies of name evidence and archaeology.

Resistance to Taxation

Taxation was one of the sources of Earldom income that became more important during the transition to the Medieval period. The increase in tax demands did not go unchallenged, however, and landowners and tenants of Orkney did resist imposition of new tax schemes by their earls in various ways and with varying levels of success.

Resistance to taxation took a number of forms. Forms of subtle resistance such as underestimation of taxable land and goods and overestimation of tax payments were likely ubiquitous, and led to constant games between tax assessors and farmers over assessment and collection of taxes already in place. Although not an example of tax resistance, Fenton (1978) records ways in which Orcadians stretched and circumvented laws in the late 1800s, as for example when shipping peat out of the islands.

> The peats were generally carted to the shore by night when it was cool. When landed they were stacked for measurement and shipment. As the stacks were loaded, much overnight replenishment of them went on by night illegally, so that sellers could often dispose of much more than the amount they were allowed to cut. Another way of increasing the output was by taking advantage of the fact that stacks were measured at the bottom without reference to the top. The *steethe* or base, therefore, was exact, but if it was, say, 16 ft (4.9 m) square,

> then the top might be built out to fully 18 ft (5.5 m) square. Such "peat smuggling" was relatively easy, since the tenants had unlimited rights to cut peat for their own private use.

This is just one example of subtle resistance by tenants during the nineteenth century given in Fenton's (1978) work. It is likely that such subtle resistance took place regularly during the Medieval period as well, although it is hard to see resistance of this sort in the archaeological record, and contemporary historical records usually describe only the laws and rules that ought to be followed, and neglects to acknowledge less than ideal adherence.

Apart from this subtle resistance, there are numerous recorded instances in the sagas where landowners were in negotiation with the earls over changes to tax policies, especially when new taxes were being imposed. Often, special circumstances were used to justify new tax impositions, and although it was often possible for landowning farmers to negotiate to some extent, their bargaining power was limited. As an example, a land tax on cultivated land was instituted during Earl Rognvald's rulership of the Earldom in order to finance the building of St. Magnus' cathedral. In the sagas, this new tax is the result of negotiations between Rognvald and the landowning farmers of the islands, and is a compromise from Rognvald's original proposal that farmers should pay an entry fee on the inheritance of family estates, an inheritance tax that would have brought the udal inheritance system more in line with the feudal and as such was strongly resisted (Crawford 1987: 201-202).

Tenants may also have had some room for tax resistance and negotiation. Thomson (1993) describes a situation that developed on the earl's bordland of Rapness, on the island of Westray. This land was intended as, and earlier was land for the earl to use for provisioning his household. As such, it was considered tax-free in that the earl did not owe taxes on it to Norway. This tax-free status was under debate later when the land was rented to tenants, who argued that no one had ever paid tax on the land, and that they should not have to pay either.

> Bordland had been intended to exempt the earl from paying tax, but it now exempted other people from paying tax to him – a complete reversal. Clearly it was potentially a source of landlord-tenant conflict; tenants of bordland were bound to maintain that their land had always been skat-free; on the other hand, the earl could argue that they were getting their land cheap and ought to pay the same rates as other people (Thomson 1993:345).

As a last resort, violent uprisings by landowning farmers took place, although these uprisings usually ended up being quelled with disastrous results for the farmers involved. In Caithness during the reign of Harald Maddadsson a Scottish bishop, Bishop Adam, was burned to death in his manor house by farmers resisting the imposition of greater taxes than they deemed reasonable (Crawford 1993; Thomson 2001). The rebellion did not go well for the farmers involved, as King Alexander of Scotland marched north in response to what he saw as a direct affront to his authority in the region, and had 80 of the farmers involved maimed for their participation in the rebellion by cutting off a hand and a foot from each man. The land in dispute was given to the church in recompense and another Scottish bishop was assigned.

Although not all forms of tax resistance were equally successful, and the trend in the islands was for tax increases and more extraction of resource over time, it is significant that landowners were able to retain udal rights to their lands despite pressures to become more feudal. It is also significant that tenants of bordlands retained tax-free status in many areas through the Medieval period (Thomson 1993:346-347). Landowners were not without agency during this period, although their relative bargaining strength may have waxed and waned over time. In general, financing the Earldom relied on military power over outside groups, and on domestic production of the islanders. Both of these sources of wealth required a well-organized household structure to schedule labor needs and to make farm production and military service possible.

Household Organization/Structure

Inheritance and Land Ownership

Although household organization and structure in the Orkneys was modified during the Viking/Medieval transition, inheritance and land ownership practices that began during Scandinavian settlement in the Viking Age were conserved to a large degree well into the Medieval period. Viking-Age Scandinavians could reckon kinship by mother or father’s line. This flexibility made social status somewhat more variable and allowed a person to choose which line of descent suited him better in whatever undertaking he was engaged in (Hastrup 1985:70-73).

Inheritance and land ownership in Viking Scandinavia was by an odal or udal (as it is later known in Orkney) system, which substantially contrasted with the feudal system common in the rest of Europe, including Scotland. There are several points of difference between these systems. Fundamentally, the difference is that in the feudal system, property is owned based on a relationship to a lord who grants use-rights to a property. Titles must be recorded, and properties without other titled ownership are considered properties of the state. In the odal system, landowners hold absolute title to the land, and do not receive this title as a grant from the state. Thus, titles to the land are unnecessary. There are also important differences in inheritance practices that accompanied the odal system. In the feudal system, inheritance was based on primogeniture, where the oldest male child inherits the entire estate. In contrast, under the odal system partible inheritance was used: an estate was partitioned between all children, with daughters usually receiving half the share of sons (Bentley 1987; Crawford 1987:200-202; Hastrup 1985:70-73). Although equitable division was the ideal, in practice partible inheritance was not always followed, especially when the estate was too small to allow successful division while maintaining the means to support a family (Bentley 1987).

Inheritance practices in Scandinavia during the Viking Age and early Medieval period were in general more favorable towards women than the feudal ones that were adopted later in the Medieval period. Partible inheritance meant that women were able to inherit land in their own right. In addition to the odal properties, marriage dowries belonged to the woman, and reverted to her even in cases of divorce. Widows had full inheritance rights to their husband's property and were able to maintain it or dispose of it as they liked (Dommasnes 1991).

The Orkney, udal property law and the Scottish feudal law system have been in conflict since the Later Medieval period when Scottish influence in the islands increased, but became even more contentious after the pawning of the islands in 1468 A.D. Interestingly, the udal system is still used in Orkney and Shetland today, even though it was abandoned in Norway. Because of the unusual circumstances of the way Orkney came to be under the rule of the Scottish state, udal law takes precedence in the islands over Scottish feudal law. One of the major differences between the two systems, apart from details of inheritance and title, is that under udal law a property owner has rights to property out to the lowest tide. The area between highest and lowest tide, known as the foreshore, is elsewhere in Scotland property of the state, as are things that wash up there, most importantly seaweed and ship salvage. Salmon fishing rights to the shoreline and construction rights are also affected by differences between udal and feudal law. As perhaps the most striking example of this difference in modern times, in the mid 1970's the Occidental Oil Company built an oil pipeline to Flotta across the shoreline of the island of Cara, and paid the Scottish Crown a fee to do so. However, the landowners successfully sued to have the fee paid to them instead of to the Scottish state, since under udal land ownership, the intertidal zone was part of their personal property, and the state did not have rights to it (Gourlay 2003).

Women's Roles

The Viking gender concept is, like much else in their social system, somewhat flexible. It is proposed from sagas and other historical evidence that Scandinavians during the Viking Age had a one-gender system, with a continuum from female/weak to male/strong. Where an individual fell along this axis was highly variable and depended not only on sex, but also on attributes such as physical health, position in the life cycle, and mental toughness and aggressiveness. Those of female sex tended to fall towards the weak or female end of the spectrum, with some exceptions. Also at this end of the scale were children (male and female) and the elderly (male and female). The only "male" persons were those at the peak of their strength. One was male/strong by acting male/strong, and sex was not irrelevant but was also not the most important determining factor of gender. Sex roles were then also somewhat flexible based on need and a person's physical and mental ability to fulfill them (Clover 1993). The argument can be summed up by stating that "… the general notion, that sexual difference used to be less a wall than a permeable membrane, has a great deal of explanatory force in a world in which a physical woman could become a social man, a physical man could (and sooner or later did) become a social woman, and the originary god, Óðinn himself, played both sides of the street" (Clover 1993:387).

Burial studies show certain "typical" grave goods for each gender, but also show some flexibility that would fit with the one-gender system (Jesch 1991). The medieval shifts to this system were very large and generally resulted in reduced gender flexibility, and a much greater separation between male and female social spheres, with generally an expansion of the male realm and a contraction of the female (Clover 1993:386).

Women as Farm Managers

Women had much influence in the household if not overt power, and generally women were considered to be the farm managers, who made decisions regarding agriculture and especially livestock management. Women managers are thought to have made decisions responsible for getting the family and their livestock through each winter, including determining adequate storage of livestock fodder and deciding the scope of the annual fall culling of animals necessary to reduce the number that would be overwintered. Dairying was primarily a female activity, and much of the winter diet relied on cured milk products like butter and cheese. Other important trade items that were primarily produced by women include textiles and malted barley (Christiansen 2002:189; Dommasnes 1991; Stalsberg 1991).

Some weighing equipment has been found in female graves, which suggest that women had some role in trade or conducting business. Most likely, females traded out of the household, especially when men were not on the farm, a common occurrence in the Viking Age (Jesch 1991; Stalsberg 1991). The lifestyle where men left the islands for raiding during good weather and periods of lower agricultural labor demand continued into the Medieval period, as is attested by the description of Svein Asleifarson's lifestyle during the late twelfth century:

> This was how Svein used to live. Winter he would spend at home on Gairsay, where he entertained some eighty men at his own expense. His drinking-hall was so big, there was nothing in Orkney to compare with it. In the spring he had more than enough to occupy him, with a great deal of seed to sow which he saw to carefully himself. Then when that job was done, he would go off plundering in the Hebrides and in Ireland on what he called his "spring trip", then back home just after mid-summer where he stayed till the cornfields had been reaped and the grain was safely in. After that he would go off raiding again, and never came back till the first month of winter was ended. This he used to call his "autumn trip" (Pálsson and Edwards 1978:215).

Such a pattern would require a resident farm manager to manage affairs during the less labor-intensive periods of the agricultural year, as well as to carry out daily requirements of a multi-faceted agro-pastoral farm. In early periods, female managers were likely in charge of a labor force of household slaves (both male and female), while later they may have contracted the services of surrounding tenants, cottagers, or wage laborers during periods of high labor needs.

Women and Textile Production

It is hard to separate commercial textile production from household production of textile wares. In the Viking period, it is thought that women did all weaving, and that all textiles were produced in the home. However, textiles were an important economic asset during this period, and were used in barter and exchange, to pay taxes, and for longer-distance trade (Andersson 1999). Because of the maritime focus of the Viking Age and Medieval period, and because of Orkney's position in the North Atlantic, sailcloth was a particularly valuable commodity (Andersson 1999). Some taxes were paid to Norway in *wadmal*, a type of wool twill that was produced exclusively in the North Atlantic islands, including Orkney and Shetland (Henry 1996).

There is evidence that the way textiles were produced changed between the early and late Viking Age in England and Scandinavia. First, there was a shift from using warp-weighted looms towards using two beam upright looms. This was accompanied by a shift toward weaving narrower textiles. This may have been a response to changing household structures. Early in the Viking period, large high-status farms would have had weaving workshops set up in specialized pit houses. These have been found in Southern Scandinavia and at York, England, with a few found in Norway (Mortensen 1998) and may have been especially useful for maintaining a damp atmosphere necessary for working with linen, although linen and wool production were seldom separated. Walton (1997:1822) argues that the shift toward using two beam looms at York during the middle of the tenth century may have been a response to the trend towards smaller households. The two-beam looms are narrower and can be more easily worked by a single woman, in contrast to warp-weighted looms that needed several women to deal with passing the shuttle through the width of the work.

A second change took place in urban communities in the eleventh and twelfth century, when the horizontal treadle loom was introduced and weaving became an industry with guilds. The weavers guild in York began around 1164-1165 A.D., and reflected a marked shift toward male weavers. At this time, guild weavers using the treadle looms were able to produce cloth more rapidly, worked in urban workshops, and were mostly male. There were other associated finishing processes, like fulling and dyeing, which were also specialized processes taking place in urban areas. Cloth production by women in households did continue, and most of the yarn that was used by the urban guilds was spun by women in their households (Henry 1998). In Iceland, production of *wadmal* on wide warp-weighted looms continued in some places until the eighteenth century (Henry 1996:453). It is likely that household-based weaving by women continued to take place in many rural areas, including Orkney. By the end of the period, it is possible that larger landowners may have developed workshops for cloth finishing, or that high-quality textiles that had been fulled and dyed in urban workshops were imported into the region (Rogers 1997).

Social Stratification

Viking families were closely tied to the landscape and to the farmstead. Land ownership was integral to social status, and it was essential for a person to belong to a specific household and to reside on a farm. Loss of land meant the dissolution of the family into other households (Bolender 2007).

Feasting was an important part of chieftainship and was essential to the creation and maintenance of social differentiation in the Viking Age. Dietler (1991:92-98) categorizes feasts into: 1) entrepreneurial feasts, which are intended to increase a host's status within a group; 2) patron-role feasts, which are intended to legitimize status differences within a group; and 3) diacritical feasts, which are food patterns that are chosen to establish and maintain their participants within a social class. Agricultural production by important landowning families had to take into account the demands of hosting feasts. "Public distribution and consumption of a basic need derives symbolic salience from the demonstration of confidence and managerial skill in the realm of production" (Dietler 1991:90). In the Viking period, the ability of a chief to provide feasts to his retinue, especially including meat and beer, was essential to his retention of power in a competitive heterarchical society. There are examples from the sagas where a local magnate, Asbjorn Sigurðarson of Trondeness is unable to keep hosting feasts because of crop failures and an embargo on grain and malt imposed by the king. The inability to supply beer to a retinue affected Asbjorn's ability to maintain his status, and led him to kill the king's agent in his region (Heimskringla Olaf-Saga, Chapters 117-121 in Christansen 2002:146).

It was very much an indication of confidence and managerial skill to maintain a retinue through the winter in an area like the North Atlantic Islands. It is likely that the first two of Dietler's feast types (entrepreneurial and patron-role feasts) were most critical during the Viking Age. In Orkney, this heterarchical structure and the feasting associated with its maintenance may have continued into the Medieval period, at least until the rule of Harald Maddadsson in the late twelfth century (Barrett 2005).

By the eleventh century, inequalities in tenant-landlord relationships had increased. Tenancy became much more common than landownership and this broadened and deepened the social spectrum. New farmsteads arose on the periphery of larger ones. Household-based slave labor was replaced by labor done by surrounding tenants and cottagers. A household could include landowners, tenants, and slaves (Byock 1988).

Villages during the Medieval period had their own hierarchies, with some landowners with large estates producing a surplus, selling their produce, hiring labor and occupying official positions. At the other end of the social spectrum were smallholders, who in general bought food, earned wages, and lacked status or official positions. There was a mutual dependance between these two segments of the rural population for labor and goods, and this led to a dynamic local exchange system, often involving barter in kind (Dyer 1994).

In England, marketing chains between town and country were one way that stratification between large landowners and smallholders could increase. The same phenomenon was likely occurring in Orkney as well.

> Wealthier peasants who accumulated the commercial assets (sheep and malting grains) put themselves in marketing chains

> different from peasants who circulated their surplus in local markets… those who traded in regional markets could better control the distribution of their products through greater opportunities for credit and better information on prices. With such advantages, they could easily broker between villages and regional markets, thus gaining more social and economic power within their own communities (Biddick 1987:297).

The effects of this situation on smaller farmers fit Arnold's (1995) definition of marginalization discussed in the last chapter. Smaller farmers were becoming more and more isolated from positions of influence and from sources of information, while at the same time being drawn into and becoming more reliant upon regional and super-regional markets.

During this period, as households became smaller and as raiding in foreign lands decreased, the diacritical feast may have become more important to the social hierarchy than the patron-role feast. Those with better trade connections could import exotic foods and in such a way emphasize their status above those with fewer trade connections. Entrepreneurial and patron-role feasts, especially those used to encourage and reward work parties, likely continued throughout this period, and may have gained importance since households were smaller and the power manor farms had on tenants to exact labor requirements was likely weaker than the hold slave owners had to exact labor from slaves. Feasting and generous daily provisioning may have been one way to have made labor requirements seem less onerous and the relationship between landowner and tenant seem more voluntary or reciprocal even if the reality of the situation was different. There are several examples of food used as a reward for labor in nineteenth and early twentieth century Orkney (Fenton 1978:338-339, 582-583). Fenton describes harvesting in historic Orkney in this way:

> The need to get the ripe crop cut and stoked quickly meant that many more people were needed at this most intensive period of the farming year. On smaller places all the grown-up members of the family went to the rig, and on bigger farms extra hands were hired in addition to the family and servants. It was a time of group participation in work that was hard, but made pleasant by its communal nature. Even the food provided was better than the everyday fare, and workers looked forward to the *hoosavel* … originally meaning the homefield but extended to the food or refreshment brought to the harvesters. There were also celebrations at the end of harvest. The workers got a specially thick spread of butter on their bread, which went by the name of the "*heuk butter* or *aff-shearing* (Fenton 1978: 338-339).

This example of food used as a reward for labor also underscores the need for landowners to produce enough surpluses to maintain their ability to remain generous providers, as this was an important reflection of their managerial skill.

Slavery during the Viking Period

Slaves were common in Viking Age households. Slavery was organized around the household, and slaves were integrated into the family. There were no slave quarters, instead slaves lived with the family. Many households had slaves, not only the larger households with extensive lands. Not only landowners held slaves, but some tenant farmers were able to have slaves as well (Karras 1988:96-121).

Slavery did not disappear with the introduction and adoption of Christianity. Although the church did have recommendations about slave ownership, asserting that slaves ought to be given the sacraments of baptism and marriage, and discouraging killing one's slaves or exposing slave children, the church did not take a stance against slave ownership. Slaves were bought and maintained by the church. However, manumission was presented as a pious act. (Karras 1988:140).

Slaves could be freed and were quite often. There was a two-step process to freeing a slave. First, the owner would lead a slave into a church or public place, place a gospel book on their head and say words of freedom. After that, the freed person was required to accumulate enough wealth to prepare a legally appointed quantity of beer and hold a "freedom ale" banquet for his/her owner. If this was done, the slave was considered freed, although there were still obligations that slaves owed their former masters, especially that they could not bear witness against their manumitter in court. However, newly freed slaves did gain the right to inheritance and the ability to dispose of their own property. The fact that the manumission first step took place in the church was probably both because it was a symbol of the beneficence of the donor (freeing slaves was considered good for one's soul) and also it served as a convenient way of making the new status of the slave known to the community at large (Pelteret 1991).

Slavery declined in medieval times as tenancy increased and greater labor needs were obtained on a more temporary basis from surrounding tenants or cottagers. Viking farms were larger than medieval farms. Extra household labor that was provided by slaves was replaced by rent and service from tenant farms established on the perimeter of the original farmsteads. Tenants could be former slaves, or could be family members. Many freed slaves became unlanded labor as well, who could be hired during the periods of the year where labor was in high demand, but who did not need to be supported in times when their labor was not required.

Resistance to Slavery

Most slaves had a reasonable hope of being freed, which tended to reduce a slave's overt resistance. Slaves did have a reputation of being lazy, and as mentioned in the previous chapter, this role was probably a subtle form of resistance (Scott 1985, 1990). "Disloyalty and resentment probably took the form of not being there when needed or not going out of their way to defend their masters rather than attacking them in the night" (Karras 1988:127). It is especially interesting that freed slaves were sometimes set up in workshops or with a small landholding when they were freed, to serve as clients to the masters who freed them (Karras 1988: 133). There is some evidence that freed slaves were established in specialized herring fishing activities and as metalsmiths (Karras 1988:146).

The transition from slavery to landowner/tenant/cottager relations is complicated, controversial, and somewhat outside of the scope of this dissertation. It is hard to say what effects the transition from slave to tenant might have had on individuals living in the Medieval period. Although this social group may have gained a small measure of autonomy from the switch from one class to the other, it is unlikely that their situation improved much if at all. It could be argued that as tenants or cottagers, they had less reliable access to basic resources than they did as slaves. The effect of the shift on the landscape is more likely to have left archaeological correlates, and thus is more relevant to the dissertation. In general, we might expect to see an increase in smaller buildings with signs of semi-independent household living, perhaps also with more specialized activities occurring in them such as fishing or metalsmithing. These may be associated with larger farms, occurring on the periphery of these farms where seasonal labor could be extracted or contracted for.

Landscape Organization and State Control

Many of the socio-economic changes taking place during the Viking/Medieval transition discussed above affected the landscape, both how settlements were arranged on the landscape, where and how boundaries were marked and maintained, and how people used the resources available to them in and on their landscapes. As these changes are particularly relevant to paleoethnobotanical study of the period, this section focuses on how landscape organization changed in rural and urban regions, and how these landscape changes are related to the ebb and flow of state control during the Viking/Medieval transition.

Towns

Urbanization is often cited as one of the features of the transition from the Viking Age to the Medieval period. In keeping with a view of the Viking Age as a long transition between the Iron Age and the Medieval period, trade emporiums and ports began to form in the late Iron Age, later developing into larger, more fully urban medieval towns with specialized craft guilds, merchant associations, and royal bureaucracy (Andren 1989; Barrett et al. 2000; Blindheim 1982; Hall 1996; Saunders 1995).

Although the focus of this dissertation is a rural farm, the relationship between developing towns and the rural areas surrounding and/or supplying them was an important factor shaping the way rural production and consumption changed over the period (Barrett et al. 2000; Barrett 2007). It is likely that the development of urban centers like Dublin, York, and especially Bergen affected production and export of staple goods like butter, oil, grain, and dried fish at Quoygrew. In this section I describe the development of medieval towns from their Viking Age precedents, and address ways in which urban centers were associated with increasing centralized power. I also include discussion of the ways in which towns interacted with the physical environment as well as the social environment during the transition period.

It can be tough to define early towns as such, especially in the earlier Viking Age where trading centers are termed "proto-urban" and lack many of the features that have been used to define later urban centers (Schledermann 1970). In Norway, Viking trading centers like Kaupang would be considered such "proto-urban centers." Early ninth century phases from town plots and from the harbor areas of Kaupang have been excavated, and a detailed report of the plant, insect, and animal remains published (Barrett et al. 2007) This settlement, as an example of others like it, developed during the Viking period and was associated with older social structures, such as marketplaces or emporia, the *þing*-assembly, or cult places (Blindheim 1982).

Bergen, in contrast, was a state-planned town that was founded by the crown and was based on English models. It was founded in a somewhat unlikely place for a town, as it is backed up against mountains and has no available hinterland whatsoever, nor much room for expansion (Blindheim 1982:61-63). Thus all necessities for the town's maintenance needed to be imported via ship to the port. This situation had serious ramifications when the extent of support that a medieval town needed from its hinterland is considered. For example, Krzywinski et al. (1983:156) estimate based on waterlogged plant remains that this import included approximately 15-20 tons of moss for use as toilet "paper" alone, assuming that the town had a population of 5,000 people, each of whom used 10 grams of moss per day for such purposes. Although this is certainly not the most essential of the staples supplying the town, it does reinforce how a lack of accessible hinterland would have required all of the town's consumables to be shipped in from considerable distances. The town's streets and structures had a much more planned organization that contrasted with the organic organization of towns that had developed without state intervention (Blindheim 1982). Bergen was to become the center of the North Atlantic fishmarket, and one of the economic and political capitols of Norway (Andren 1989; Barrett 2007).

Towns in Scandinavia were often loci of royal control, or as Thurston (1997:254) poetically describes them, "islands of royal power in an unfriendly sea." State-founded towns like Bergen were governed by a royal sheriff or *gälkare* (geld exactor), who was a representative of royal power (Andren 1989:592). Historians acknowledge the strategic advantage that could be gained by founding new, competing, crown-controlled towns as a means of disrupting and superceding entrenched bases of power controlled by regional powers. "According to Icelandic sagas the Norwegian kings expressively founded towns to get control over different parts of the country. In this way Trondheim was founded about the year 1000 in direct opposition to the heathen chieftains in Trøndelag" (Andren 1989:588). Another difference between early emporia and later state-founded towns was in the focus of the activities occurring there. Early trade emporia mainly were areas focused on import of exotic goods from outside of local trading structures. In contrast, royal towns of the Medieval period were primarily sites where taxes were collected, surpluses amassed, and packaged for mass export. These were places where taxes in kind were converted into state wealth through trade to merchants and export (Saunders 1995).

Other towns with Viking and Medieval phases that have been excavated, including consideration of waterlogged and carbonized plant remains include York, in Viking-occupied England, and Dublin, in Viking-controlled Ireland. In York during the pre-Viking period, occupation was mainly in a dispersed network of settlements. During the early tenth century, long narrow property plots were established and by the late tenth century, buildings and plots had filled the landscape, with more usable space incorporated within the buildings. By 1066 York was the second largest city in England, and the city was walled in the twelfth century. A new merchant area developed along the river Ouse that runs through the city. This area, known as Coppergate, was extensively excavated, and this excavation forms the basis for the York Viking Museum that exists on the site today. Coppergate was the industrial center of Viking and early medieval York, where "large scale production by specialist craftsmen for a mass market became the norm for many products" (Hall 1996:293). Although crafts were specialized to a certain extent, evidence from the area suggests that craftsmen would work on several products requiring similar equipment. For example, there were high temperature specialists working in glass, copper, iron, gold, silver, and lead, while textile finishers probably were involved in fulling, bleaching, and dyeing cloth (Hall 1996:293). Much interesting information on craft specialization was obtained from analysis of plant and insect remains (Hall and Kenward 2003).

At Dublin, plant remains were used to describe a transition from use of a wide range of wild plants from the immediate hinterland during the Viking Age to reliance nearly entirely on cultivated and imported species later in the Medieval period (Geraghty 1996:57).

Rural Landscapes and Social Organization

While urban centers were developing during this transition period, rural landscapes were also changing in response to new markets and increasing demand for surplus production. At the beginning of the Viking period, farms encompassed large areas of land, and were usually managed based on an inland/outland system (Smith 1995). There was a central settlement with intensively fertilized infields, houses and outbuildings, but also important to the farm were areas of outland where shielings (summer pastures), turf and peat gathering, haymaking, smelting, hunting, etc. took place (Bigelow 1987; Martens 1992:5). In Scandinavia, outland areas usually included forests and mountains.

In the North Atlantic islands, the first areas to be settled by Scandinavians had several features in common. Home fields were usually located on good agricultural lands, including sandy loam machair soils, were in close proximity to sources of peat fuels, and in areas where boats could land safely and be drawn out of the water past high tide (Arge et al. 2005; Sharples and Parker Pearson 1999). Such ideal areas were relatively rare, and later settlements had to make due with less ideal places. There is some evidence that those who made first claim to peat resources in

Iceland were able to limit access to this resource strategically for substantial gain in both money and prestige (Simpson et al. 2003:1415). In areas such as Orkney and Shetland, which had a resident Pictish population, many of these prime areas were already occupied, and evidence suggests that Pictish estates were overlain by Viking Age Scandinavian settlements in these prime locations (Sharples and Parker Pearson 1999).

Burial location was one way of establishing claims to land, especially in newly colonized landscapes. Early in the period, important people were often buried along disputed edges of territories to establish and reinforce land boundaries and ownership (Boleander 2007:409). Although pagan burial practices changed as Christianity was adopted, burial location did not cease to be politically important. High status farms were likely to have financed church building as Christianity grew in popularity, and many of the earliest farm sites have an associated church and Christian cemetery. Important ancestors were often exhumed and reburied in churchyards during this period (Boleander 2007:415). Location of a burial within a churchyard could often be associated with status of the person during life, with southern plots and those closest to the church preferred over those further away or in the northern end of the cemetery (Solli 1996:101). Because churchyards were often built on land owned by wealthy farmers, this allowed the landowners to exercise another arena of power and control over tenants and cottagers who believed that their afterlife depended upon burial within a churchyard.

As the Medieval period continued, the landscape filled in and land was divided up among tenants who paid rent to the landowner, usually in grain and butter, but also sometimes in coin. According to the *Gragas* Law Code, there were three basic types of farmers in early twelfth century Iceland: 1) *bondi* (landowners); 2) *leiglendingr* (tenant farmers); and 3) *budsetumadr* (shack-men or cottagers) (McGovern et al. 1988). Landless day laborers occupied the lowest social rank, a position considered outside of society as they were displaced from the land. Hastrup (1989) argues that as the number of landless day laborers increased, farmers were less likely to pursue strategies that required hiring them, as these strategies were perceived as having too high a risk.

Tenant farming was likely to have had consequences for the environment and on resource conservation strategies in the region. Tenant/landowner contracts were usually held on a yearly basis, and landowners had certain legal responsibilities to bail out their tenants in bad years. Landlords were unlikely to renew contracts with tenants who were unable to make it successfully through the winter without aid. This meant that tenants were always potentially one bad season away from homelessness, and they may well have responded to this risk by following a conservative management strategy without much room for agricultural experimentation. On the other hand, they were also under a great deal of pressure from landlords to extract as much from the environment as possible. The stakes for them may have been too high and the consequences of poor production too immediate to allow for long term ecological planning and conservation measures, with the result of local resource degradation (McGovern et al. 1988:261-262).

The legal categories from the Icelandic *Gragas* Law Code were very likely to have existed in contemporary Orkney. Agricultural estates during the Medieval period in Orkney were divided into the manor farm, also known as the demesne or reserve, and the surrounding region, which was allocated to small individual holdings. The people who lived in the smallholdings around a large farm were usually employed by the large farm during at least some parts of the year. Thus, the pattern of landscape and status would be something like this. The highest status farms would be manors with large estates surrounded by very small holdings. These tiny holdings were occupied by farmers (cottagers) who were more or less dependant on the manor farms for a portion of income. In addition to paying rent to the landowner, a tenant owed service as well, especially during times of the year when agricultural work labor demand was highest. Further out from the manor farms would be smaller farms without satellite farms. These would be more independent, either larger tenant farms or smaller farms with udal ownership. Both of these situations would imply a status somewhere in the middle between large landowners (nobility, the church) and small tenants or cottagers (Thomson 1993). Quoygrew is most likely to fit this later category of a smaller but independent farm.

Land in the Orkneys was valued in ouncelands, which as described above are assessment units based on agricultural productivity and potential of a region. Pennylands were a further division of ouncelands, which were not visible on the landscape, but rather represented a share of the township. By the time the ounceland/pennyland system was in place (the dating of which, as mentioned earlier, is controversial), the Orkneys were probably being farmed in an infield/outfield system as opposed to the inland/outland system of the early Viking Age. The infield outfield system included highly fertilized lands close to the home that were kept under constant cultivation, and unfertilized lands further out from the settlements that were farmed in some kind of fallow rotation (Christiansen 2002:193-194). The most fertile agricultural land that made up the infield was fragmented due to the udal partitive inheritance scheme discussed earlier (Dodgshon 1999). This may well have resulted in land being farmed according to a runrig system, where each farmer in a township owned many small strips of land distributed about the area. The chief advantages to this system were: 1) the ease with which the areas of runrig lands could be inherited by daughters and bought and sold without disrupting the main farm's sustainability; 2) the parity and risk distribution that came from owning land in a wide range of microenvironments; and 3) the ease of scheduling labor and the support provided to displaced workers during the busiest agricultural seasons (Bentley 1987). Although in historic periods consolidation was often recommended in order to increase farming efficiency in the Orkneys and Shetland, in fact the complicated arrangement and the advantages that farmers perceived in risk mitigation and maintaining parity made any attempts to consolidate extremely unpopular, and the benefits to doing so (especially when considering the relationship between available labor and available land) were uncertain (Bentley 1987; Thurston 2007:170-171).

During the tenth and eleventh centuries, there was a push to reclaim marginal lands for agriculture. In Danish Scania, new *torp* farms were formed on the outskirts of established villages (Thurston 2007:174). In Somerset (Viking England), marshlands were filled to provide additional farmable areas (Rippon 1996). As the landscape filled, more intensive ways of growing crops and raising livestock were devised, including higher organic input to fields that accompanied better manuring practices, quicker rotations of crops, new plow technologies, and management of herds for dairy production. More land was likely brought under cultivation both through forest clearing (in Scandinavia), salt marsh reclamation, and greater machair soil use (Orkney, Shetland, Faroes and the Hebrides) (Bigelow 1992; Bond 1998; Martens 1992; Perdikaris and McGovern 2007; Rippon 1996; Thurston 2001)

There is a question as to the source of the impetus for this change. Thurston (2007:181) argues that in Denmark, the main impetus for rural landscape change was top down from elite taxation schemes: "Intensification, in general, was not focused on increasing production for food, but for political and economic reasons, related to the rise of a centralized political elite and the consolidation of the state's power over rural constituents." Danish rural settlements were subject to increasing royal relocation and control, especially in the most fertile region of Scania, which resembles Orkney in many ways: lots of good agricultural lands; a relatively independent local nobility and strong regional identity; and a large, wealthy and stable population that could be taxed. By around 1000 A.D. the rulers of Denmark were very concerned about increasing the production of rural subjects, especially those in Scania, and took steps to ensure that uninhabited landscapes were colonized, that new technologies were introduced, including crop rotation, and that settlements had been reorganized to increase the efficiency of tax evaluation and collection (Thurston 2007). Reorganization was in some cases a way to make tax assessment easier.

> There were no written tax records kept at this time, and we can assume that if possible, then as now, taxpayers would prefer to underestimate their taxable lands if they could get away with it. But, with a regulated toft, established one time only, as a landscape text that would be read in perpetuity, royal officials could estimate taxes and military obligations in a time of widespread illiteracy. Land reform and reorganization around AD 980 probably marks the beginning of this system (Thurston 2007:178).

In contrast to the state-controlled landscape change taking place in Danish Scania, Smith (1995:340) argues that in Iceland, the landscape filled due to a natural process of farm division and expansion taking about a century. Rather than the sudden relocation and planned *torp* villages of Denmark, in Iceland late settlements show great local diversity in farmer strategies and farmer experimentation suggesting individual control of the process. Whether this expansion was a result of elite pressures to produce more surpluses for tax complicates the issue, but regardless of the source(s) of the impetus for change it appears that the method of change was much more under control of the farmers themselves in the Iceland case. This question remains to be investigated in the Orkney Islands. However, if use of the ounceland/pennyland system meant that ounceland district size depended upon agricultural potential or land under cultivation when the system was established, but that the district size was not adjusted as the landscape changed, this may have created substantial incentives for farmers to reclaim new lands for agriculture or to intensify production. This would apply especially in those areas where district size was large based on early estimations of poor agricultural potential.

Quoygrew Landscape

Information about the landscape of the Orkney Islands during the Viking and Medieval period is very incomplete. Some areas of the islands get extensive mention in the Orkneyinga saga (Pálsson and Edwards 1978), while other regions have little part in the story and so go unmentioned. The first written records, a series of rental documents from 1492 describing landownership in the islands, are significantly later than the Medieval period and provide only limited information about what the landscape would have looked like at the time (Sinclair 1492, in Thomson 1993). Archaeological finds in the islands can give some information about what the landscape was like, and many sites of high and low status have been identified and excavated.

In this section, I focus on the island of Westray, and try to piece together somewhat of a sketch of the island. Luckily, some interesting happenings occurred on Westray that are mentioned in the saga, and this gives us a starting point for understanding at least where the largest farms were during the Medieval period.

During the struggle between Earl Rognvald and Earl Paul (which was mentioned briefly earlier in the chapter in regards to the symbolic use of St. Magnus), the sagas mention that the southern tip of Westray, an area known as Rapness, was part of Earl Paul's bordland or "table lands", which were tax-free lands used to supply the Earl. There is some evidence that Rapness had been a Pictish agricultural estate that was taken over by the Norse early during settlement. Earl Paul had placed a powerful supporter named Kugi on these lands as an administrator. Earl Rognvald took over the island of Westray and imprisoned Kugi in 1136 during his struggle with the competing earl.

There were two other large farmers on Westray according to the sagas, one named Helgi and the other Thorkel Flettr. Thompson places these large farms on the landscape (see Figure 3.3) with Thorkel associated with the high status site (under excavation [Owen 1993]) of Tuquoy and the early church of Crosskirk in the southwest of Westray. Helgi occupied the area of present day Pierowall, currently the major occupation focus of the islands, located in the northeast quadrant of the island. A church and Viking-Age cemetery have been excavated in Pierowall (Clouston 1930-1931). Quoygrew farm is approximately 1 km from Pierowall, so it is likely to have been most closely associated with this large farm and important landowner.

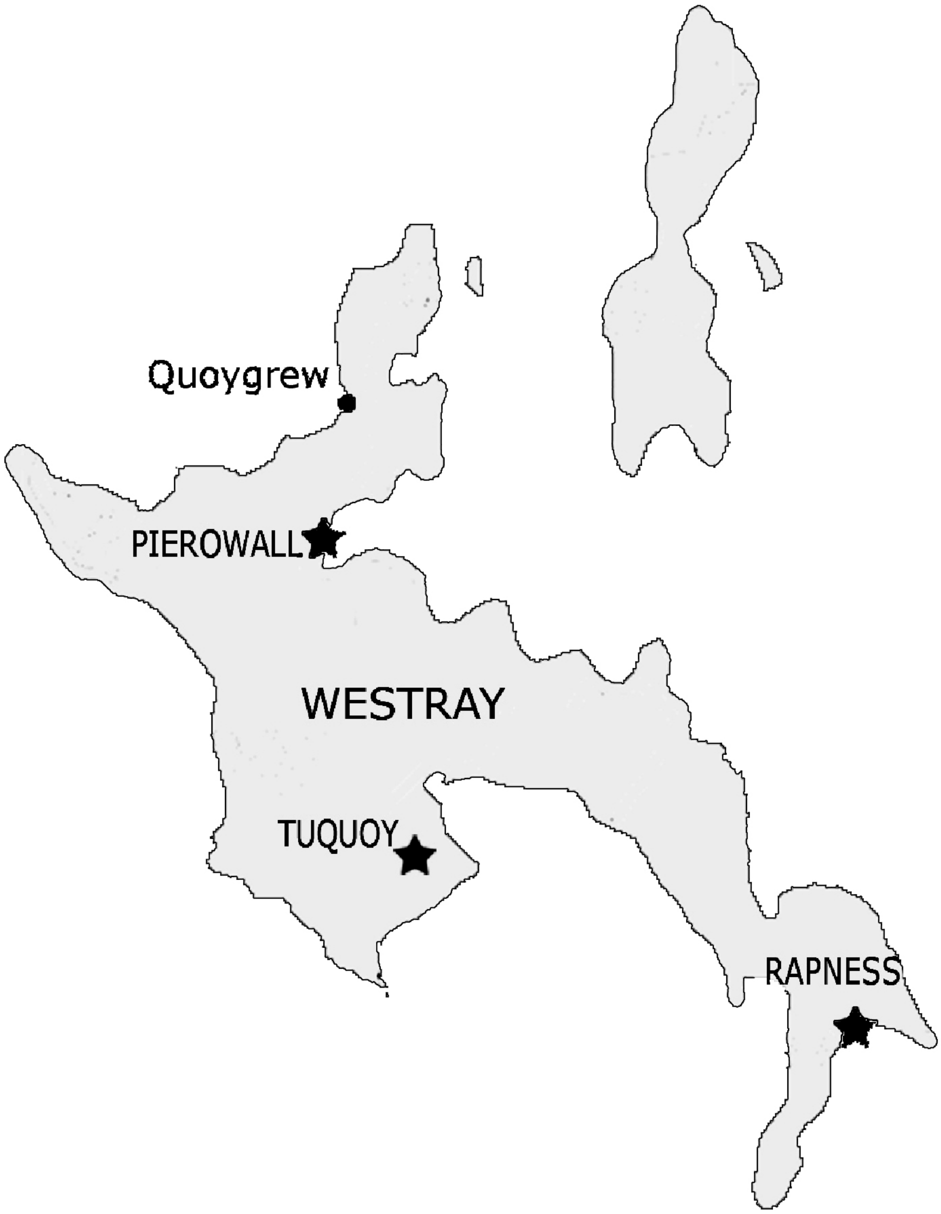


Figure 3.3 Map of Westray Showing Three Major Farms in Twelfth Century

According to the 1492 rental records, the Rapness bordland would have extended approximately 5 miles from the Rapness farm, which maintained its high status into the era of the historical records (Thomson 1993). Surrounding this was an area known as the Wasbister Bordland, which included 22 very small holdings, perhaps the lands of cottagers. Outside of this was the North-Swartmeil bordland, which included tenants with more independent estates. By the time of the rental documents, the area around Pierowall, including Quoygrew or "Neather Trenabie" as the site is historically known, was included within a large block of territory assigned to the bishopric of Orkney.

Archaeological Correlates of Socioeconomic and Political Change at Quoygrew

In this chapter, many socioeconomic and political changes that took place during the Viking/Medieval transition have been outlined and described. However, because this is primarily a dissertation describing archaeological remains at Quoygrew farm, with a specific focus on the carbonized plant remains, it is important to bring the discussion of these changes back to the farm level, and to emphasize correlations between these large-scale changes to the political landscape, their effects on the physical landscape and their potential for altering the material remains of a farm site in interpretable ways.

One of the most interesting features of the archaeological record in this region is the obvious increase in surplus production that takes place at some point between the Viking and Medieval period. In some areas of the North Atlantic, more surpluses are produced through specialization, but in Orkney the increase seems to involve intensifying and/or extensifying many facets of farm production: fishing, dairying, and cereal production at least. One of the goals of the excavation program at Quoygrew has been to better understand the chronology of the increases in surplus production at this farm site, and the relationship between these sometimes competing, sometimes complementary facets of the farm's production (Barrett et al. 2000). Archaeobotanical analysis is an essential component to understanding the way in which this shift occurred. Plant remains are not only helpful for tracking agricultural production shifts, but archaeobotanical signatures of fodder, animal bedding, fuels, household waste, and textile creation identified at Quoygrew mean that unique information about all of the facets of production are provided by careful paleoethnobotanical analysis.

Increases in surplus production are tied to increases in state administration and taxation. They are linked to changes in household structure and increasing social stratification. They affect and are affected by changes in gender roles and relative power within households. They are crucial to trade relationships with the nearby states of Norway and Scotland, and are influenced by emerging and changing market demands for goods, both by rural consumers and by demands from enlarging proto-urban centers. They affect and are affected by the local environment, and by rules and agreements governing local resource conservation.

This means that all of these issues can be approached using data acquired through excavation and analysis of Quoygrew's plant remains, especially given the extensive comparative paleoethnobotanical dataset available in the region. The next chapters provide information about the archaeological and paleoethnobotanical analyses that were conducted at Quoygrew, and present the botanical data obtained.

As an "archaeological ecobiography," this dissertation traces Quoygrew's occupants as they sought "to accomplish goals through a historical context of ecological and social constraints and opportunities" (Hardesty and Fowler 2001:80). Taphonomic complexity does limit the interpretive power of the plant remains for answering some questions at the site, as is discussed in the next chapter on methods and taphonomy. Despite these challenges, many conclusions are drawn from the archaeobotanical data that relate to larger socio-political and environmental implications that follow from the details of how, why and when surplus production increased at Quoygrew.

CHAPTER 4: METHODS AND TAPHONOMIC CONCERNS

Analysis of preserved plant remains contributes to understanding human/plant interactions, as these remains primarily represent seeds and other plant parts carbonized as a result of direct or indirect human action. Plant parts incorporated into the paleoethnobotanical record are a selection of those plants available from trade or from the local environment around the site, which were 1) brought to the site in order to be used (as food, fodder, bedding, construction material, medicine, fuel, etc.) or unintentionally gathered with materials intended for these purposes, and which 2) have survived carbonization or mineralization and subsequent dispersal around the site. This chapter reports the methods used to analyze botanical macroremains from middens and other selected contexts at Quoygrew, and provides a short discussion of some of the taphonomic issues and concerns surrounding the deposition, post-depositional processes, and recovery of plant remains from the site.

Quoygrew

Quoygrew is comprised of several house structures (Area F, Area G3), a yard to the south of one of the house structures (Area J1 and J2), a series of fish middens located along the shoreline (Columns A, B, and C), an area of anthropogenically enriched plaggen soil (Area G2), and a farm mound midden (Area G1). A map of the excavated areas is available in Figure 4.1. The majority of the macrobotanical data results from analysis of the farm mound midden (Phase 1 and Phase 2-3) and fish midden contexts (Phase 2-3).

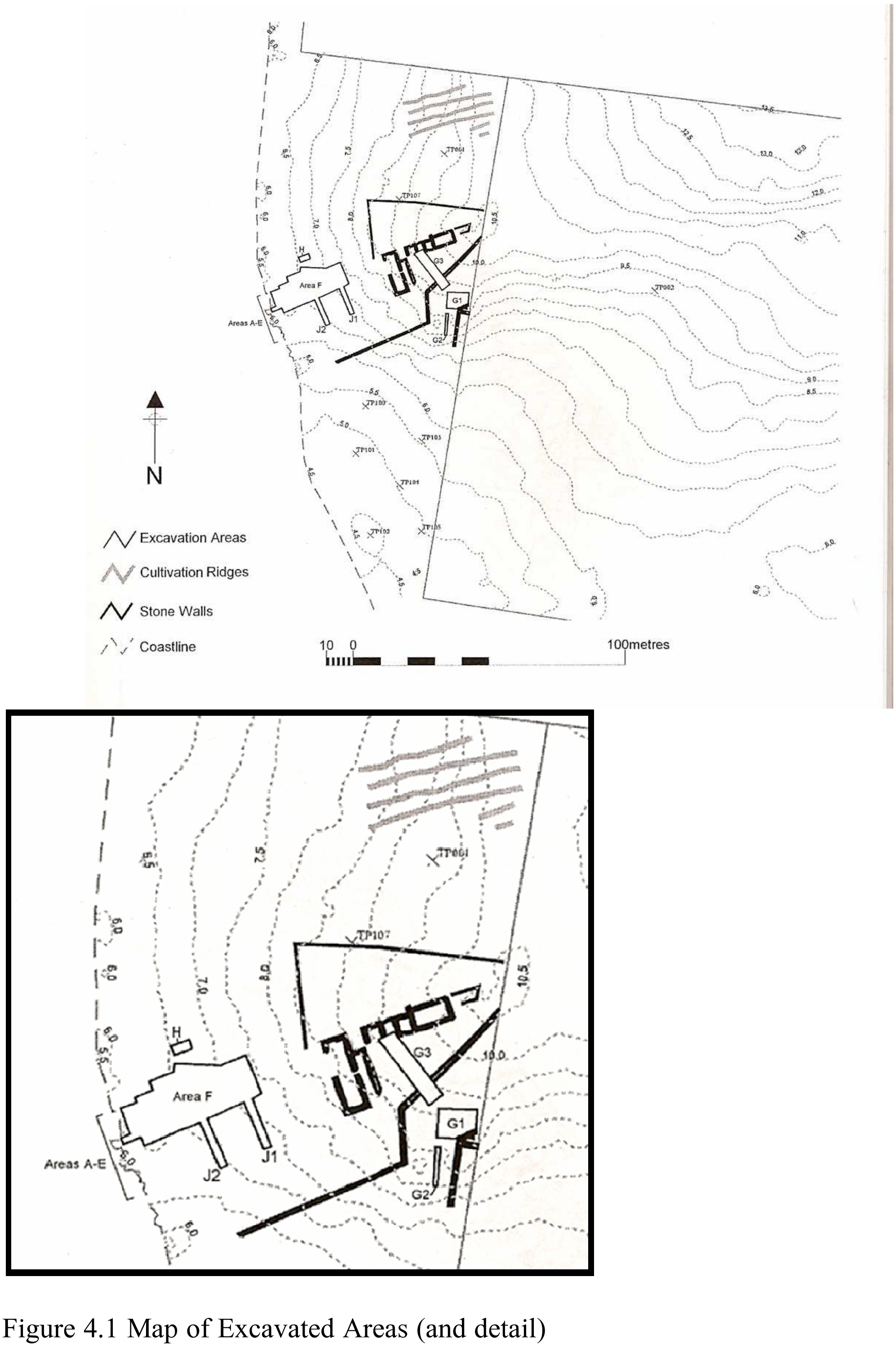


Figure 4.1 Map of Excavated Areas (and detail)

Paleoethnobotanical analysis of the fish midden contexts at Quoygrew was completed by Sandra Poaps in consultation with Jacqui Huntley (Poaps 2000, Poaps and Huntley 2001a), partly as an M. Sc. thesis project (University of Toronto), and was later expanded to include more contexts (Poaps 2000; Poaps and Huntley 2001a). The farm mound midden was analyzed beginning in 2002 by the author, with preliminary results reported as an M.A. thesis (Washington University) (Adams 2003).

All archaeobotanical data on midden material from Quoygrew, including those from fish midden material analyzed and reported by Sandra Poaps, have been integrated and form the basis for chronological and spatial analysis of the site. Discrepancies in sorting and identification procedures between fish midden contexts (conducted by S. Poaps) and all other contexts (conducted by the author) are fully examined in this chapter, and potential consequences of differing methods for data interpretation are considered. In addition to the two major midden areas, analyses of a selection of additional contexts at the site, including middens associated with the structures, hearth features, pit fills and dumps, and house floors, have been included to aid in understanding activity areas and taphonomic processes occurring at Quoygrew.

Field Methods

Collection

Samples were taken from identified contexts during excavation. The number of samples taken from each context as well as the volume of the samples depended upon the volume of the context. Small contexts provided fewer samples, and sometimes these samples were less than 10 liters in volume. In addition to samples for flotation (used in this analysis), sediment samples and samples for coarse sieving were also collected. Samples for flotation were placed into labeled rectangular plastic buckets by excavators and taken to a flotation area near the site.

Flotation

Soil weight was measured using a spring balance, and volume was estimated by using a bucket marked in 1 liter increments. The sample was then placed into a Sirâf-style flotation machine (Williams 1972) while the machine was off, and allowed to become thoroughly wetted. This was to prevent dry sediment from floating on the surface of the water and flowing into the light fraction collection sieve. The machine was then turned on, and the sample agitated in the water by a combination of gloved hands and the action of the water turbulence from water exiting perforated tubes. The sample was continuously agitated until no more material was floating to the surface, and the heavy fraction (especially shells) appeared cleaned of silt and fine sediment.

The light fraction (flot) was collected on a 0.5 mm geological sieve, and the heavy fraction was collected in a 1 mm mesh cloth screen. After the sample had been processed, the two fractions were placed in separate plastic bags and the sieve and screen were cleaned to prevent cross-contamination between samples. The sediment was allowed to collect in the tank between samples until it reached the level of the perforated tubes. At this point the tank was drained and the sediment washed from the tank before continuing with flotation. The risk of contamination from silt was low because of the distance from the mesh, the fact that water turbulence was above the settled sediment, and because the mesh would restrict any material greater than 1 mm in diameter from entering the sample.

At the end of each day, samples were taken to an indoor processing room where the plastic bags were opened and the contents were placed, on their opened bags, onto aluminum trays. These trays were placed on modified bakers' racks, draped in heavy plastic, and dried with a heater at a temperature no greater than 30°C. When the samples were dry, they were re-bagged for storage. Most samples were analyzed at the Paleoethnobotany Laboratory at Washington University. Sandra Poaps' (2001, Poaps and Huntley 2001a) analysis of fish midden samples took place at the University of Toronto (Columns A, B, and C). All samples were shipped in plastic bags inside of padded boxes and plastic tubs. No analysis was done in the field, so it is not possible to estimate damage to seeds caused by shipping.

Laboratory Methods

Sampling

Many more samples were available than could be analyzed. A summary of the contexts that were analyzed for plant remains is given in Table 4.2. Several sampling strategies were employed when deciding which processed flotation samples to analyze. A summary of the laboratory methods and sampling strategies used for each group of samples is provided in Table 4.3.

Sandra Poaps decided to analyze all samples from the fish midden (Columns A, B, and C) (Poaps 2000; Poaps and Huntley 2001a). Analysis of the farm mound midden samples (Area G1) was done by randomly selecting a number of samples from each context in proportion to the number of samples available from that context. Thus larger contexts are represented by more than one sample, while smaller contexts are often represented by only one sample.

Judgment sampling was used across the remainder of the site to include those contexts where interesting botanical remains were likely to be found, such as pit fills, dumps, hearths, and floor layers. A small sample of these contexts was chosen to provide a broader view of plant use and plant-related activity patterns across the site.

Because of the range of sampling strategies used, and because contexts varied widely in size, the total volume of soil analyzed for each context varies. As a result, density measures (number of seeds/10 liters) are used to compare macroremains found to minimize problems associated with comparing the archaeobotanical contents of contexts represented by differing soil volumes. However, it should be noted that density comparisons could be affected by the volume of actual soil (as opposed to stone, bone or shell) present in each sample. These inclusions were not excluded before volume measures were taken, so it is possible that in middens with more shell and bone inclusions, the volume of soil is overestimated by the bucket method of volume determination. This would have the effect of underestimating seed density in these samples.

Because of costs associated with shipping and because heavy fractions (residues) greater than 4 mm in size were used in bone analysis, only the light fractions (flots) of samples were analyzed fully for macrobotanical remains. Heavy fraction materials greater than 4 mm in size from the fish midden samples (Columns A, B, and C) were sorted at the University of Toronto, and potential plant remains were forwarded to Sandra Poaps for analysis (Poaps 2000). During a visit to York, I scanned three heavy fractions (<4 mm size fractions) corresponding to light fractions from midden contexts reported here. No plant materials identifiable to species were found in any of the heavy fractions selected for analysis. However, it is impossible to say if dense remains such as nutshell and fruit stones were present at Quoygrew without a more systematic and complete analysis of the heavy fractions of the samples, especially those of smaller (<4 mm) size fractions.

Processing for Fish Middens: Columns A, B, and C

All fish midden material at Quoygrew was analyzed by Sandra Poaps in consultation with Jacqui Huntley. Column A material was analyzed as part of an M. Sc. thesis (Poaps 2000), while Columns B and C were analyzed later (Poaps and Huntley 2001a). Slight modifications to the identification procedures were made as a result of Poaps’ experiences during the initial analysis and are noted in this section.

According to Poaps' (2000, Poaps and Huntley 2001a) records, processing and analysis proceeded in this fashion. Light fractions were weighed using an electronic scale and recorded to 3 decimal places. They were then separated, using geological sieves, into various size fractions (>4 mm, 2-4 mm, 1-2 mm, <1mm) for ease of sorting and were weighed again. When Column B and C were analyzed, the <1 mm fraction was separated into 1-0.5 mm and <0.5 mm.

All of Column A material was examined for seeds and cereal chaff. To record the seaweed, she examined all material from the >2 mm fractions plus the finer fractions (>1 mm and <1 mm) from at least one sample from each context. For Columns B and C, she examined all >1 mm material for seeds and cereal chaff. Column B also had all of the 1-0.5 mm material analyzed. No 1-0.5 mm material was examined from Column C due to time constraints. She did not examine any of the <0.5 mm material, and wood charcoal and plant rhizomes were ignored due to time constraints. Also, other non-plant matrix components (bone, shell, vitrified fuel ash, insects) were not analyzed.

Poaps conducted identification using a Bausch and Lomb binocular microscope (14x to 60x magnification). Carbonized seeds were identified with the assistance of Mrs. Jacqui Huntley, University of Durham, England; by comparison with material from the botanical reference collection at the University of Durham, England; and by comparison with seed manuals (Martin and Barkley 1973; Montgomery 1977; Katz et al. 1965).

The sorting procedure Poaps used for columns A and B, and especially C emphasized sorting more samples at the expense of examining the smallest size fractions (<0.5mm for columns A and B, and <1mm for column C). The consequences of this decision are that very small seeds, including heath seeds, some arable weed seeds, and some other wild seeds are likely to be underrepresented in fish midden contexts. This will be explicitly considered in discussions of this material throughout the chapter. However, it is important to note that the cereal caryopses, most cereal chaff (except oat awns), flax, woad, and seaweed are not affected by the differences in sorting procedure, as these plant remains are larger than 1mm in size and consistently appear in larger size fractions.

Processing for Contexts from Other Areas of the Site

All other samples were sorted by the author at Washington University's Paleoethnobotany Laboratory. Once light fractions had arrived in St. Louis, they were weighed using an electronic balance to the nearest 0.01 g, and separated using geological sieves into size fractions (>2.0 mm, >1.0 mm, >0.5 mm, <0.5 mm) to facilitate sorting. Each size fraction was weighed again once separated. Sorting was done using binocular stereomicroscope with a fiber-optic light source at magnifications of 5x-60x. Two main microscopes used were a Wild M-11 and Olympus S60.

All material in size fractions larger than 2.0 mm was sorted, counted, and weighed to the nearest 0.01 g including matrix components (non-plant remains such as stone, clay, bone, and shell). In size fractions larger than 1.0 mm, plant remains such as wood, rhizomes, and seaweed as well as seeds, cereal chaff, and carbonized leaves were sorted, counted and weighed. The 'wood' category was represented primarily by small (<2.0 mm) pieces, which included small twigs and woody stems. No further identification was done on the wood charcoal, in part because of time constraints, and in part because a sufficient comparative collection was not available. In size fractions below 1.0 mm, samples were scanned for plant material including seeds, carbonized leaves, cereal chaff, and seaweed. Unless especially numerous, these materials were very light and were not weighed. Uncarbonized seeds were counted separately, but are unlikely to represent ancient material, and so are not included in analyses.

Carbonized plant materials from the samples were compared to seeds from modern reference material, as well as to photographs and drawings from seed identification manuals (Beijerink 1947; Flood and Gates 1986; Hather 1993; Hillman et al. 1996; Jacomet 2006; Katz et al. 1965; Martin and Barkley 1973; Mason and Hather 2000; Stace 1997). Specific unidentified seeds were identified with help from Allan Hall (University of York) and Jacqui Huntley (University of Durham). Identified materials were placed along with an acid-free paper label containing full context information inside gelatin capsules, and placed within labeled tins to protect the capsules.

Identifications were generally made to the lowest level possible given the condition of the seed. Sometimes the seeds were too damaged to allow a species-level identification. In other cases, especially in the cases of some docks, grasses, and sedges, family level identifications were used due to an inadequate comparative collection and the similarity between species in these categories. These seeds were labeled with the family name and archived with the sample, and are retrievable for reanalysis if a question that requires species-level identification of these specimens arises.

Some specimens closely resembled seeds of a certain species, but the identification was not felt to be secure, either because of damage to the specimen, or to lack of a modern reference correlate with which to verify similarity to a photograph or drawing. These specimens are prefaced by the abbreviation ‘cf.’ in the data tables. These seeds were included in total seed counts of the ecological groups used for analyses, but only securely identified members of the group were counted when discussing the taxa individually, unless otherwise noted.

Counts and Measurements

Cereal caryopses were counted as one if they were complete or represented more than half of a caryopsis. Cereal scutella (specialized structures in grasses representing the embryo and cotyledon) were counted separately when separated from the caryopsis. Scutella were not included in the cereal count, and not identified further. Each individual fragment of chaff was counted as one, as were seaweed fragments. Other seed fragments were counted as one unless there were several fragments that obviously came from one individual, in which case an estimated number of individuals (ENI) was recorded.

Conventions and Terminology

Phases were determined post-excavation based upon analysis of finds and radiocarbon dating. Approximate calendar dates associated with these phases are included in Figure 4.2. 'Context' is used to refer to stratigraphic units that were recognized by excavators during excavation. Several samples were typically taken from each stratigraphic unit and analyzed separately for ecofacts.

Raw data regarding plant remains identified from each individual sample are available as supplemental material. In the following chapters, samples from each context type, area, and phase are added together to aid interpretation. Contexts are placed in stratigraphic order, earliest (left or bottom) to latest (right or top). Botanical nomenclature used throughout follows The New Flora of the British Isles (Stace 1997). The term 'seed' is used in a loose sense to refer to all plant disseminules.

Scientific names, common names, and habitat groups used throughout this chapter can be found in Figure 4.4. Taxa were placed into groups based on ecology and habitat preferences to facilitate analysis of crop strategies, land and fuel use. However, it is important to note that many of the taxa that have been assigned to a particular ecological group can exist and thrive in a variety of habitats, and thus many of the taxa could have been placed equally well in other groups. The assignment used here is based on habitat preferences recorded by ecologists and paleoethnobotanists (Dickson 1998; Hall 2002; Hill et al. 2004; Stace 1997). It is important to note that other paleoethnobotanists have defined categories differently, in many cases assigning a larger number of species to arable weed categories (Poaps and Huntley 2001a; Poaps and Huntley 2001b; van der Veen 1992).

Although there is evidence that in the past certain plant species, such as the sedges (*Carex* spp.), were present in archaeological fields in Orkney, here I have chosen to put these species into a group based on their preference for wet ground so that potential changes in the use of wet ground or changes in field drainage might be noted. Similarly, I have chosen to put grassland taxa such as ribwort plantain (*Plantago lanceolata*) with other grassland taxa, rather than grouping it with arable weeds, because of the possibility that it arrived at the site in turf. Because most of the samples are midden material and do not come from a context in which we can assume they represent the results of crop processing activity, I felt that a more thorough analysis would result from splitting than from lumping, when the choice was available.

Taphonomy

Before interpreting plant remains, one of the most important issues to consider is taphonomy. The vast majority of plant macroremains from Quoygrew were preserved through carbonization, with a small number of seeds mineralized in house floor and pit fill contexts. To understand plant use at the site, it is important to examine means by which plant remains became carbonized and thereby preserved. Because there is no evidence of major catastrophic house burning episodes, carbonization would have been a result of purposeful human activity and is likely to represent an important filter between the plant materials used and those represented in the archaeobotanical record.

It is also important to have established a hypothesized framework for understanding how contexts were formed and in what ways carbonized plant remains could become incorporated in them. In this section, I discuss the routes of preservation for macroremains and biases introduced by inconsistent preservation. I also provide a hypothesized taphonomic sequence for understanding the spread of carbonized plant materials from context type to context type based on work done at other sites in the North Atlantic region.

Carbonization

Carbonization experiments (Boardman and Jones 1990; Renfrew 1973; Viklund 1998) have shown that any carbonization regime will alter the contents and potential for identification of any plant assemblage. In particular, oily seeds, chaff, and fragile seeds tend to fare poorly while cereal caryopses, underground plant parts and heartier seeds (e.g. *Galium* sp., *Viola* sp.) tend to be better preserved (Viklund 1998:102-104).

Experimental studies have shown that the type of fuel burned in a hearth can alter conditions of carbonization of seed materials by altering the temperature and intensity of the heating regime. This can lead to biased preservation of a seed assemblage entering the hearth. Church and Peters (2004) conducted a study of the magnetic enhancement of soils, which showed that ash from hearths was a common inclusion in many contexts from sites in West Lewis, Scotland. They also determined that peat is the most likely source of fuel at these sites. Archaeobotanical analysis showed that the ash spreads and midden contexts from the West Lewis sites contained few plant remains, which were poorly preserved. Peat fuels burn hot and tend to reduce most plant remains to ash, leaving heartier remains such as cereal caryopses in poor condition.

Turf fuels, on the other hand, are more likely to provide a carbonization environment conducive to preservation of fragile remains (Hall 2002:26). Condition of the seeds at Quoygrew varied by context, but in many cases fragile remains, such as *Plantago maritima* seed capsules (Figure 4.5a), small fragile seeds (e.g. *Erica* sp., *Papaver* sp. (Figure 4.5b)), buds, flowers, small oil seeds, such as *Capsella bursa-pastoris* (Figure 4.5c), and moss stems (Figure 4.5d) were preserved and could be identified. Many of these materials are easily consumed by flames when exposed to direct heat, and thus their presence may indicate an indirect heating without direct exposure to flame, such as would occur when seeds were enclosed within sediments. This suggests that many contexts at Quoygrew included input from turf fuels.

Condition of cereal grains

Many of the cereal caryopses from the site are distorted, either shrunken or exuding a carbonized tarry material from the distal ends of the caryopses (Figure 4.5e and 4.5f). In some cases several grains were fused together. These changes indicate that the cereals may have been charred while wet, or may represent grains that were charred while in the milk- or dough-ripe stage, which can indicate early harvesting (Hubbard and al Azm 1990).

Some seeds, both cereal (Figure 4.5g) and weed seeds (Figure 4.5h), showed evidence of early stages of germination, although no context showed consistent germination of cereal as would be expected if malting of cereals for beer production were taking place. A more likely explanation is that cereals were not dried completely for storage, and occasionally wet conditions led to germination (which can be expected given the Orkney climate). An alternate explanation, especially for the germinating weed seeds, is that the seeds were contained within a seed bank in turf, and were in the process of germinating when the turf was burned as fuel.

Mineralization

An alternate route to seed preservation is through mineralization. Several of the pit fill contexts and the Phase 2 house floor context included seeds and other remains which were preserved through phosphatisation (Figure 4.5i). Remains preserved by this route include Caryophyllaceae, Centrospermae, *Stellaria media*, *Atriplex* sp., an unidentified seed type, and molds of root structures. Mineralization of seeds in midden contexts is rare, but occurs when abundant decaying matter creates an environment that is slightly acidic and anoxic. When pore water phosphate and calcium ions develop from degradation of the organic remains from the pit or adjacent layers, the decaying seed tissues can be replaced by calcium phosphate and thereby preserved (McCobb et al. 2003).

Taphonomic pathways and interpretation

I assume that most of the carbonized plants from Quoygrew originally became carbonized in small-scale, controlled burning events in and around the settlement. These might include indoor hearth fires, or outdoor fires for processing fish livers for oil, smoking fish or meat, producing charcoal for lye production, drying grain for storage, metalworking, etc. However, it is possible that some of the carbonized heathland seed remains are the result of natural heathland or grassland burning episodes, or fire-related land management practices. If areas of previously burned ground were gathered as turf for building materials, it is possible that carbonized seeds would be present in the seed bank of these turf blocks and would preserve without requiring additional carbonization in the household fire (Dickson 1998; Hall 2002). Still, it is likely that the majority of the carbonized seed remains from Quoygrew became carbonized in the hearth or in other small controlled fires at the site.

Given this carbonization mechanism, it is next necessary to determine which plant seeds are likely to have been exposed to hearths or other small fires and why. Taphonomic pathways are complicated at sites in the North Atlantic, making interpretation of plant remains difficult (Church and Peters 2004; Viklund 1998). Two main factors complicate taphonomic pathways in this region.

First, the lack of wood means that peat, turf, and dung are often the most prevalent sources of fuel for hearths and other fires. Because these fuels contain their own seed and plant-part assemblages, any additional seeds added to the plant record as a result of household activity are combined with seeds in the fuel. Determining the plant-related human activity associated with the carbonized assemblage becomes more difficult, because there is nearly always a good chance that seeds came from both crop processing and fuel. This is a particularly troublesome complication for determining patterns in field use, since crop weed seed assemblages and turf and dung fuel assemblages can have significant overlap in terms of taxa represented.

The second complicating factor is that ash produced from fires was likely used for many things around the site, from soaking up fluids in the byre to fertilizing fields (Fenton 1978: 195-196). It is difficult to reconstruct what sequence of events led from hearth to midden. It is possible that multiple pathways existed and the route from hearth to midden may not have been straightforward. Still, it is helpful to have some sort of framework for understanding the flow of carbonized remains from one context type to another. Since hearths are the hypothesized origin of carbonized plant remains, I begin by discussing this context type, and move from there into discussion of pit fill and dump contexts, house floors, and finally middens.

Even relatively pure hearth contexts can contain plant remains from a range of sources (Minnis 1981), including inputs from household activity waste and fuel, as well as incidental seed inputs from the environment surrounding the fire. According to ethnohistoric accounts, in an Orcadian context household activities resulting in the carbonization of plant remains might include cooking, crop processing, fiber production or textile working, woodworking, basketry, line baiting, etc. Fuel sources could include any or all of the following: turf, peat, driftwood, heather twigs, straw, dung, or seaweed. Seeds could also be introduced from house building, roofing, and flooring materials, animal fodder, bedding or waste (from an indoor byre), and even seed rain into a fire (Fenton 1978). Hearth contexts are likely to contain ash accumulation from a few days, and can shed light on fuel use.

Pit fill and dump contexts are likely to be variable, but may be the result of a single activity, or single depositional episode. A closer look at the botanical contents of these contexts can provide more information about their function. House floors accumulate over time and are likely to contain ash inputs from hearths. Midden samples are likely to be the most mixed of all context types, and represent the accumulation of many depositional episodes. Midden samples are perhaps most likely to contain carbonized botanical remains from more than one hearth or other controlled fire.

Despite the drawbacks associated with interpreting mixed contexts, middens can provide information about the spatial arrangement of activities across the site and provide data that can be used to test the idea that refuse deposition differed by site location. For example, by comparing the shoreline fish midden to the farm midden and the middens located in the structures, it is possible to see how patterns of deposition differ between areas. Even if individual activities cannot be separated, the botanical assemblage may show different suites of activities, or differing intensity of plant-based activity taking place in different areas.

In addition, comparative study of potential midden source contexts such as hearths, pit fills, dumps and house floors exhibiting, presumably, less mixing of activity wastes, can also be a useful way to understand some of the source components composing the middens. Because they differ in taphonomic history, midden contexts and non-midden contexts are presented separately in the following analysis.

Figure 4.2 Summary of Contexts Analyzed for Botanical Remains

Phase	Date Range	Context Type	Area	Structure	# Contexts	List of Contexts
4	15th-16th century	floor layer	F	Structure 2	1	F221
		floor layer	F	Structure 1	1	F423
		hearth	F	Structure 1	3	F473, F071, F011
		midden	F	Structure 4	2	F602, F676
3-4	14th-15th century	midden	J2	yard south of Structure 1	1	J009
3	13th-14th century	floor layer	F	Structure 1	1	F543
		hearth	F	Structure 1	3	F840, F518, F462
		pit fill/dump	F	Structure 3	1	F1051
		pit fill/dump	F	Structure 1	3	F548, F550, F564
		midden	F	Structure 3	1	F671
2-3	11th-13th century	midden	A	fish midden	25	A002, A003, A004, A005, A005/6, A006, A007, A008, A009, A010, A011, A012, A013, A013/5, A014, A015, A017, A018, A019, A020, A021, A022, A023, A024, A025
		midden	B	fish midden	9	B004, B005, B006, B007, B008, B009, B010, B012, B013
		midden	C	fish midden	20	C005, C006, C007, C008, C009, C010, C011, C012, C013, C014, C015, C016, C017, C018, C019, C020, C021, C022, C023, C024
		midden	G1	farm mound	12	G058, G056, G055, G054, G020, G052, G015, G013/015, G048, G016, G014/019, G008
		hearth	G3	Structure 7	1	G101
2	11th-12th century	floor layer	F	Structure 5	1	F1129
		dump	F	Structure 5	1	F1115
		midden	F	Structure 1	1	F475
		midden	F	Structure 5	3	F685, F1111, F1125
1	10th century	midden	G1	farm mound	9	G023, G042, G061, G037,G035,G038,G022,G059,G060

Figure 4.3 Summary of Differences in Sampling and Sorting Procedures by Area

Area	Description	Sampling of Flot (Light Fraction)	Sampling of Residue (Heavy Fraction)	Publications	Size Fractions	Sorting Procedures
Column A	fish midden	total	>4mm scanned for plant material	Poaps 2000, Poaps and Huntley 2001	>4mm; 2-4mm; 1-2mm; <1mm	Seeds and cereal chaff were examined from all size fractions. Seaweed was examined from >2mm fractions and from finer fractions from at least one sample per context.
Column B	fish midden	total	>4mm scanned for plant material	Poaps and Huntley 2001	>4mm; 2-4mm; 1-2mm; 1-0.5mm; <0.5mm	Seeds and cereal chaff were examined from >0.5mm size fractions.
Column C						Seeds and cereal chaff were examined from >1mm size fractions.
Area G1	farm mound	random sample, proportionate to number of samples available by context	three residue samples <4mm scanned for plant material	Adams 2003	>2mm; 1-2mm; 0.5-1mm; <0.5mm	Seeds and cereal chaff were examined from all size fractions. Non-seed botanical material (charcoal, underground plant materials, seaweed) and matrix material (stone, bone, shell, vitrified fuel ash) were examined from >1mm size fractions. Moss stem and leaves were identified from all size fractions.
Area F, Area G3, Area J2	Structures 1-4, Structure 5, Structure 7, yard	judgement sample: contexts likely to contain interesting botanical material	none			

Figure 4.4 Seed Remains Found at Quoygrew

Group	Family	Scientific Name	Common Name
Cereals	Poaceae	*Avena* sp.	Oat
	Poaceae	Cerealia	Cereals
	Poaceae	*Hordeum* sp.	Barley
	Poaceae	cf. Triticum sp.	Wheat
	Poaceae	*Avena* sp. *awn*	Oat
Cereal Chaff and Straw	Poaceae	*Avena* sp. *floret base*	Oat
	Poaceae	*Avena sativa* /*A. strigosa* floret base	Oat/Bristle Oat
	Poaceae	*Avena sativa* floret base	Oat
	Poaceae	*Hordeum* sp. *rachis internode*	Barley
	Poaceae	*Hordeum* cf. *distichon* 2-row rachis internode	2-rowed Barley
	Poaceae	*Hordeum* cf. *vulgare* 6-row rachis internode	6-rowed Barley
	Poaceae	*Hordeum* sp. *awn*	Barley
	Poaceae	*Triticum* sp. *rachis internode*	Wheat
	Poaceae	indeterminate rachis internode	
	Poaceae	Culm nodes	
	Poaceae	Lemma	
	Poaceae	embryo/scuttella	
	Poaceae	chaff indeterminate	
Economic	Linaceae	*Linum usitatissimum*	Flax
	Linaceae	cf. *Linum usitatissimum*	Flax
	Brassicaceae	*Isatis tinctoria*	Woad
	Brassicaceae	cf. *Isatis tinctoria*	Woad
Arable	Rosaceae	*Aphanes arvensis*	Parsley-piert
	Brassicaceae	*Camelina sativa*	Gold-of-pleasure
	Brassicaceae	cf. *Camelina sativa*	Gold-of-pleasure
	Brassicaceae	*Capsella bursa-pastoris*	Shepherd's-purse
	Chenopodiaceae	*Chenopodium album*	Fat-hen
	Asteraceae	*Chrysanthemum* sp.	Crown Daisies
	Euphorbiaceae	*Euphorbia helioscopa*	Sun Spurge
	Papaveraceae	*Papaver* sp.	Poppies
	Papaveraceae	*Papaver rhoeas*	Common Poppy
	Polygonaceae	*Polygonum aviculare*	Knotgrass
	Polygonaceae	*Fallopia convolvulus*	Black Bindweed
	Polygonaceae	cf. *Fallopia convolvulus*	Black Bindweed
	Polygonaceae	*Polygonum maculosa* (was *persicaria)*	Redshank
	Polygonaceae	*Polygonum* sp.	Knotgrasses
	Polygonaceae	Polygonaceae	
	Caryophyllaceae	*Spergula arvensis*	Corn Spurrey
	Caryophyllaceae	*Stellaria media*	Common Chickweed
	Caryophyllaceae	cf. *Stellaria media*	Common Chickweed
Grassland	Poaceae	*Danthonia decumbens**	Heath-grass
	Poaceae	*Danthonia* sp.*	Heath-grasses
	Poaceae	*Poa annua*	Annual Meadow-grass
	Poaceae	Poaceae <1 mm	Small grass
	Poaceae	Poaceae 1-2mm	Medium grass
	Poaceae	Poaceae 2-4mm	Large grass
	Poaceae	Poaceae scutella	
	Asteraceae	*Leontodon* sp.	Hawkbits
	Linaceae	*Linum catharticum**	Fairy Flax
	Plantaginaceae	*Plantago lanceolata**	Ribwort Plantain
	Plantaginaceae	cf. *Plantago lanceolata**	Ribwort Plantain
	Plantaginaceae	*Plantago maritima* capsule*	Sea Plantain
	Rosaceae	*Potentilla erecta**	Tormentil
	Rosaceae	*Potentilla* cf. *erecta**	Tormentil
	Ranunculaceae	*Ranunculus acris* type*	Meadow Buttercup
	Ranunculaceae	*Ranunculus ficara* tuber*	
	Scrophulariaceae	cf. *Rhinanthus minor**	Yellow-rattles
	Polygonaceae	*Rumex acetosa**	Common Sorrel

Figure 4.4 Seed Remains Found at Quoygrew (cont.)

Heathland	Ericaceae	*Calluna vulgaris* leaves	Heather
	Ericaceae	*Calluna vulgaris* flowers/buds	Heather
	Empetraceae	*Empetrum nigrum*	Crowberry
	Empetraceae	*Empetrum nigrum* leaves	Crowberry
	Ericaceae	Ericaceae leaves	
	Ericaceae	Ericaceae seed	
	Ericaceae	*Erica* sp.	Heaths
	Ericaceae	*Erica cinerea*	Bell Heather
	Ericaceae	*Erica* cf. *cinerea*	Bell Heather
	Juncaceae	*Juncus squarrosus*	Heath Rush
	Juncaceae	*Juncus* sp.	Rushes
	Juncaceae	*Juncus* sp. *capsule*	Rushes
	Juncaceae	*Luzula* sp.	Wood Rushes
	Juncaceae	cf. Luzula sp.	Wood Rushes
	Ericaceae	*Vaccinium myrtillus*	Bilberry
Ruderal	Chenopodiaceae	*Atriplex* sp.	Oraches
	Chenopodiaceae	cf. Atriplex sp.	Oraches
	Brassicaceae	*Brassica* sp.	Cabbages
	Euphorbiaceae	*Euphorbia peplus*	Petty Spurge
	Fumariaceae	*Fumaria* sp.	Fumitories
	Rubiaceae	*Galium aparine*	Cleavers
	Clusiaceae	*Hypericum* sp.	St John's-worts
	Clusiaceae	cf. *Hypericum* sp.	St John's-worts
	Asteraceae	*Lapsana communis*	Nipplewort
	Asteraceae	cf. *Lapsana communis*	Nipplewort
	Boraginaceae	*Myosotis* sp.	Forget-me-nots
	Scrophulariaceae	*Odontites* sp. / *Euphrasia* sp.	Bartsias/Eyebrights
	Plantaginaceae	*Plantago major*	Greater Plantain
	Plantaginaceae	*Plantago media*	Hoary Plantain
	Rosaceae	*Potentilla anserina*	Silverweed
	Brassicaceae	*Raphanus raphanistrum*	Wild Radish
	Brassicaceae	*Raphanus raphanistrum* pod	Wild Radish
	Polygonaceae	*Rumex acetosella*	Sheep's Sorrel
	Polygonaceae	*Rumex obustifolius* type	Broad-leaved Dock
	Asteraceae	*Tripleurospermum inodorum*	Scentless Mayweed
	Asteraceae	*Tripleurospermum maritimum*	Sea Mayweed
	Asteraceae	cf. *Tripleurospermum maritimum*	Sea Mayweed
	Asteraceae	*Tripleurospermum* sp.	Mayweeds
	Urticaceae	*Urtica dioica*	Common Nettle
	Violaceae	*Viola* subgenus *Melanium*	Pansies
Wetland	Lamiaceae	*Ajuga* sp.	Bugles
	Cyperaceae	*Carex hostiana*	Tawny Sedge
	Cyperaceae	*Carex hostiana* type	Tawny Sedge type
	Cyperaceae	*Carex* sp.	Sedges
	Cyperaceae	*Carex* sp. *lenticular type*	
	Cyperaceae	*Carex* sp. *trigonous type*	
	Cyperaceae	*Carex* sp. *utricle*	Sedges
	Cyperaceae	Cyperaceae	
	Cyperaceae	*Eleocharis pallustris**	Common Spike-rush
	Cyperaceae	cf. *Eleocharis pallustris**	Common Spike-rush
	Cyperaceae	*Eriophorum angustifolium*	Common Cottongrass
	Cyperaceae	cf. *Eriophorum angustifolium*	Common Cottongrass
	Cyperaceae	*Eriophorum latifolium / vaginatum*	Broad-leaved/Hare's-tail Cottongrass
	Cyperaceae	cf. *Eriophorum* sp.	Cottongrasses
	Plantaginaceae	*Littorella uniflora*	Shoreweed
	Plantaginaceae	cf. *Littorella uniflora*	Shoreweed
	Caryophyllaceae	*Lychnis flos-cuculi*	Ragged-Robin
	Portulacaceae	*Montia fontana*	Blinks
	Portulacaceae	cf. *Montia fontana*	Blinks
	Potamogetonaceae	*Potamogeton* sp.	Pondweeds
	Rosaceae	*Potentilla palustris**	Marsh Cinquefoil
	Rosaceae	*Potentilla* cf. *palustris**	Marsh Cinquefoil
	Ranunculaceae	*Ranunculus flammula**	Lesser Spearwort
	Ranunculaceae	*Ranunculus* cf. *flammula**	Lesser Spearwort
	Cyperaceae	*Schoenoplectus lacustris*	Common Club-rush

Figure 4.4 Seed Remains Found at Quoygrew (cont.)

Unclassified	Asteraceae	cf. *Anthemis cotula*	Stinking Chamomile
	Caryophyllaceae	*Arenaria* sp.	Sandworts
	Caryophyllaceae	*Arenaria* sp./*Stellaria* sp.	Sandworts/Stitchworts
	Asteraceae	Asteraceae	
	Asteraceae	cf. Asteraceae	
	Asteraceae/Apiaceae	Asteraceae / Apiaceae	
	Brassicaceae	Brassicaceae	
	Brassicaceae	*Brassica oleraca*	Cabbage
	Brassicaceae	*Brassica* sp. / *Sinapsis* sp.	Cabbages/Mustards
	Brassicaceae	*Brassica* sp. / *Cannabis* sp.	Cabbages/Hemp
	Cyperaceae/Polygonaceae	*Carex* sp. / *Rumex* sp.	Sedges/Docks
	Caryophyllaceae	Caryophyllaceae	
		Centrospermae	
	Caryophyllaceae	*Cerastium* sp.	Mouse-ears
	Caryophyllaceae	*Cerastium* sp. / *Stellaria* sp.	Mouse-ears/Stitchworts
	Chenopodiaceae	Chenopodiaceae	
	Chenopodiaceae	cf. Chenopodiaceae	
	Chenopodiaceae	*Chenopodium* sp.	Goosefoots
	Clusiaceae	Clusiaceae (was Hypericaceae)	
	Brassicaceae	cf. *Descurainia* sp.	Flixweed
	Euphorbiaceae	*Euphorbia* sp.	Spurges
	Fabaceae	Fabaceae	
	Fabaceae	cf. Fabaceae	
	Fabaceae	Fabaceae pod	
	Rubiaceae	*Galium* sp.	Bedstraws
	Lamiaceae	Lamiaceae	
	Rosaceae	*Potentilla* sp.	Cinquefoils
	Ranunculaceae	*Ranunculus* sp.	Buttercups
	Ranunculaceae	cf. Ranunculus sp.	Buttercups
	Ranunculaceae	*Ranunculus repens**	Creeping Buttercup
	Ranunculaceae	*Ranunculus repens* type*	Creeping Buttercup type
	Polygonaceae	*Rumex* sp.	Docks
	Polygonaceae	*Rumex* sp. *fruit w/perianth*	Docks
	Lamiaceae	cf. *Salvia* sp.	Claries
	Caryophyllaceae	*Scleranthus annuus*	Annual Knawel
	Caryophyllaceae	*Silene dioica*	Red Campion
	Caryophyllaceae	*Stellaria* sp.	Stitchworts
	Caryophyllaceae	*Stellaria nemorum*	Wood Stitchwort
	Scrophulariaceae	*Veronica* sp.	Speedwells

* = species associated with machair

CHAPTER 5: RESULTS

Data Summary

A total of 1,413 liters of soil from 99 contexts was processed. Eighty-three of these contexts (1,290 liters) are from midden contexts, and 16 of the contexts (123 liters) represent non-midden contexts. A total of 14,331 plant specimens/fragments were identified, including chaff and ericaceous leaves but excluding other vegetative remains such as seaweed, wood, and underground plant parts. Figures 5.1 through 5.10 summarize the data presented in the following sections, providing a total count and density in seeds/10 liters of soil identified for each taxon by context type. These data are given for each area of the site, and for each phase.

Cereals and Chaff

Barley (*Hordeum* sp.), oats (*Avena* spp.), and wheat (*Triticum* sp.) are the three cultivated grains identified at Quoygrew. Identification of these grains and their chaff was made with reference to archaeobotanical identification guides (Hillman et al. 1996; Jacomet 2006). Oats were found in samples from every area and time period of the site, while barley was identified in all but Phase 3 hearth and Phase 3-4 midden samples. Wheat was very rare at the site, found only in the fish midden (Phase 2-3) (see Figures 5.1 and 5.2).

Barley includes the hulled six-row *bere* type (*Hordeum vulgare* ssp. *vulgare*), which is identifiable because of both its shape, and because in many cases, where preservation is good, caryopses retain fragments of the hull. Both straight and asymmetrical barley caryopses were identified, further supporting that the six-row type was present. Rachis internodes of six-rowed barley (Figure 5.11a) are present in many areas of the site.

The few oat floret bases well enough preserved to allow identification to species confirm that cultivated oat (*Avena sativa*) is present. Some of the well-preserved floret bases allowing further identification have a wide articulation point, suggesting *A. sativa*, common oat (Figure 5.11b). Others are small and have a narrow articulation point (Figure 5.11c). These may represent either the second floret of *A. sativa* or the first floret of *A. strigosa*, bristle oat. Several oat awns from the Phase 2 dump (context F1115) are well preserved enough to show a 90 degree bend at the base (Figure 5.11d, 5.11e) characteristic of the geniculate awns of bristle oat *A. strigosa* and/or wild oat *A. fatua* (Dickson and Dickson 1984). It is likely that both common oat (*A. sativa*) and bristle oat (*A. strigosa*) were cultivated at Quoygrew.

One wheat (*Triticum* sp.) caryopsis and one wheat rachis internode were identified from Phase 2-3 of Quoygrew's fish midden. Although wheat is an uncommon find for this period, it is not unprecedented, as small amounts of wheat have been identified at other sites in the North Atlantic (Huntley 2000; Huntley and Turner 1995; Poaps and Huntley 2001). There is some debate about whether wheat would ripen in the Orkney climate (see Poaps 2000 for a discussion). Because of the low number of wheat caryopses found, it is unlikely that wheat was a major crop at Quoygrew. More likely the wheat was a weed in the barley fields, or wheat sheaves were imported from other regions rather than grown as a local crop. The frequency is low and the preservation is not ideal, however, so few definitive conclusions can be made.

The presence and distribution of chaff is interesting to note, and can be essential for identification of cultivated species; however it is difficult to draw much information about crop processing or the amount of cereal cultivation taking place at Quoygrew from the quantitative analysis of chaff for several reasons. First, the preservation of chaff has been shown to be highly dependent upon the conditions of carbonization, including the temperature and exposure to direct flame (Boardman and Jones 1990). With the variation in fuel use likely at Quoygrew, carbonization regimes were probably inconsistent, which would have the most effect on the preservation of fragile remains such as chaff. Secondly, straw was used for many purposes in the Orkneys, such as for baskets, mats, as tinder, and as animal bedding and fodder, and was often traded between areas as a commodity (Fenton 1978). Thus it cannot be assumed that chaff would necessarily have been treated as a crop processing waste, and other factors might have affected its presence in the carbonized plant record.

Other Economic Taxa

In addition to the cereal remains found, two other species represent economically valuable plants not native to the region: flax (*Linum usitatissimum*), and woad (*Isatis tinctoria*). Flax is by far the more abundant of these two species, and is present in low amounts at most areas of the site, in midden, hearth, and pit fill/dump contexts. Woad is much more rare, and present only in the Phase 1 farm mound (G1) and in a pit fill context from Phase 3 of Area F (see Figures 5.1 and 5.2).

Flax

Flax (Figure 5.11f) is useful both for the plant's fiber production and for its oil seed. Flax seeds are common in the contexts at Quoygrew; though they are never present in large amounts, most contexts and areas contain at least a few seeds. Ten of the 15 areas and phases contain flax. There is a total of 461 flax seeds at the site, with a density of 3.24 seeds/10 liters of soil. No capsule fragments or other production waste was found, though, so it is difficult to say for sure whether the flax was produced at the site or imported. However, the presence of gold-of-pleasure (*Camelina sativa*) (Figure 5.11g), a common weed of flax crops, suggests local production. Flax was likely an important crop for Quoygrew.

Woad

Woad (Figure 5.11h, 5.11i. 5.11j) is a perennial plant with a deep (12-18 inch) taproot and yellow flowers, which grows to a height of two to four feet. It is a member of the Brassicaceae family and is a major source of the blue pigment indigotin (Edmunds 1998). Two carbonized woad seeds were found in Phase 1 farm mound midden contexts, and one seed found in a Phase 3 pit fill/dump context. A more detailed treatment of this plant and its distribution is made in the discussion section.

Arable Weeds

Arable weed taxa identified in the midden include: *Aphanes arvensis*, *Camelina sativa*, *Capsella bursa-pastoris*, *Chenopodium album*, *Chrysanthemum* sp., *Euphorbia helioscopa*, *Fallopia convolvulus*, *Papaver* sp., *Papaver rhoeas*, *Polygonum aviculare*, *Polygonum maculosa* (formerly *Polygonum persicaria*), *Polygonum* sp., Polygonaceae, *Spergula arvensis*, and *Stellaria media* (see Figures 5.3 and 5.4).

The most abundant arable weed species at the site was chickweed, *Stellaria media* (n = 1252) (Figure 5.11k). This species prefers areas with soil disturbance and nitrogen enrichment. This includes fertilized fields, as well as shingle banks where seaweed provides nitrogen enrichment, or on cliffs and coastal banks with colonies of sea birds. *Stellaria media* can also grow in areas where cattle have been enclosed. This species is a powerful competitor with barley, and grows well in wet but not waterlogged conditions (Sobey 1981). Both the leaves and seeds of this plant are edible and it is recorded as a famine food (Defelice 2004).

Spergula arvenis (n = 130) was also common, especially in the midden contexts. This species is most competitive in coarse-grained, sandy soils with low pH (Stace 1997, Viklund 1998), which means it would also do well on machair soil (a stable grassland ecosystem unique to Scotland and Ireland that forms on sandy, lime-rich soils near the coastline). Corn spurrey is edible, and was used as a famine food in the Shetland Islands (Darwin 1996; Donaldson and Nye 1989), and is an ingredient in a traditional *klino* bread made in Orkney (Fenton 1978).

An interesting species found only in the farm mound midden is *Camelina sativa*, Gold-of-Pleasure. Gold-of-Pleasure is not a common find in the British Isles, as it, like woad, is native to Southern Europe. It was grown in the Medieval Period as an oil-seed crop, but it is likely, given the small number of seeds on the site, that it occurred as a weed of the flax crop. Hall and Kenward (2003) note that *C. sativa* is often found in association with flax, and it was found in flax-rich samples from medieval contexts at Layerthorpe Bridge, York.

Grassland Taxa

Grassland taxa identified include: *Danthonia decumbens*, *Danthonia* sp., *Poa annua*, large, medium, and small grasses (Poaceae) and their scutellae, *Leontodon* sp., *Linum catharticum*, *Plantago lanceolata, Plantago maritima*, *Potentilla erecta*, *Ranunculus acris* type, cf. *Rhinanthus minor,* and *Rumex acetosa.* Grassland taxa are present in every area and phase of the site (see Figures 5.3 and 5.4). Grassland plants are often present within an assemblage of plant and matrix components that are indicative of turf, which may be composed in part or in whole of remains of turf burned as a fuel source. Grassland seeds can also be associated with crops or with animal fodder, bedding, or dung, and may alternatively have come to the site by these means. Many of these taxa are also present in machair environments.

A single *Ranunculus ficaria* tuber (Figures 5.11m and 5.11n) was found in the Phase 2-3 farm midden. It was identified based on pictures from Hather (1993), and Mason and Hather (2000). These tubers are edible and have some medicinal properties (Darwin 1996; Dickson and Dickson 2000); however, it is most likely that the tuber arrived in the sample via the use of grassland turves as fuel (Hall 2002). Heath grasses (*Danthonia* sp., *Danthonia decumbens*) are usually considered another indicator of turf as these species are common in acidic grasslands and at the edges of heath.

Heathland Taxa

Heathland taxa identified include: *Calluna vulgaris*, *Empetrum nigrum*, *Erica cinerea*, *Erica* sp., undifferentiated Ericaceae, *Juncus squarrosus*, and cf. *Luzula* sp. (see Figures 5.5 and 5.6)

Heathland seeds were rare, and most of the seeds representing this environmental group are those of the relatively large and hearty *Empetrum nigrum*. Seeds of heather species and the rushes are very small and fragile. Most of these seeds were recovered from pan fractions of the samples, as they are less than 0.5 mm in size. Heathland taxa were well represented by leaves and flowers, however, and it is likely that much of the "wood and stem" category represents heather twigs.

Heather was a plant with several uses. It was gathered as floor covering, bedding, thatching, and used for making rope and baskets. Crowberry (*Empetrum nigrum*) was also used for making rope, and has an edible berry that could have been gathered for food. Both heather and crowberry plants produce a good yellow dye (Andrew 1994; Dickson and Dickson 2000; Fenton 1978). Heathland plants could also have been brought to the site as a component of turf fuels (Hall 2002).

Ruderal Taxa

Ruderal taxa identified include: *Atriplex* sp., *Brassica* sp., *Euphorbia pepulus*, *Fumaria* sp., *Galium aparine*, *Hypericum* sp., *Lapsana communis*, *Myosotis* sp., *Odontites* sp./*Euphrasia* sp., *Plantago major*, *Plantago media*, *Potentilla anserina*, *Raphanus raphanistrum*, *Rumex acetosella*, *Rumex obustifolius* type, *Tripleurospermum* sp., *Tripleurospermum inodorum*, *Tripleurospermum maritimum*, *Urtica dioica, and Viola* subgenus *Melanium* (see Figures 5.5 and 5.6).

Seeds assigned to these taxa prefer disturbed habitats, and are likely to have grown around the settlement. *Tripleurospermum maritimum* grows in sandy shore areas, and may have been present on the seaweed-rich strand lines near the site (Stace 1997). *Galium aparine* prefers nutrient rich soils. Many of these taxa are sometimes included as weeds of arable land, and indeed it is possible that these seeds came to the site along with crops (Poaps and Huntley 2001a; van der Veen 1992).

Wet Ground Taxa

Wet ground taxa identified include: *Ajuga* sp., *Carex hostiana*, *Carex* sp., Cyperaceae, *Eliocharis pallustris*, *Eriophorum angustifolium*, *Eriophorum latifolium/vaginatum*, *Eriophorum* sp., *Littorella uniflora*, *Lychnis flos-cuculi*, *Potamogeton* sp., *Montia fontana*, *Potentilla pallustris*, *Ranunculus flammula*, and *Schoenoplectus lacustris* (see Figures 5.7 and 5.8).

Many of these seeds, especially those from sedges, can occur in poorly drained crop fields and may have been discarded as a component of crop waste (Poaps 2000; Poaps and Huntley 2001a; van der Veen 1992). *Montia fontana* is a particularly quick colonizer of muddy areas exposed when water levels drop, and may have been present around water edges, especially those in pasture areas where vegetation was trampled (Geraghty 1996). Pondweed (*Potamogeton* sp.) is an aquatic genus. Some species are common in slow running streams, others in standing pools, and so on. Crowfoot (*R. flammula*) commonly occurs on wet mineral soils (fen/marsh/swamp), and is another likely candidate for appearing at the wet, muddy edges of pasture near drinking areas (Hill et al. 2004; Stace 1997).

Ecologically Unclassified Taxa

Ecologically unclassified taxa are those that did not fit within one of the aforementioned groups. Often these taxa have broad tolerances for a variety of environments and/or were not identified to a low enough taxonomic category to make inferences about habitat preference. Unclassified taxa include: cf. *Anthemis cotula*, *Arenaria* sp., Asteraceae, Apiaceae, *Brassica oleraca*, *Brassica* sp./*Sinapsis* sp., *Brassica* sp./*Cannabis* sp., *Carex* sp./*Rumex* sp., Caryophyllaceae, Centrospermae, *Cerastium* sp., *Cerastium* sp./*Stellaria* sp., Chenopodiaceae, *Chenopodium* sp., Clusiaceae, cf. *Descurainia* sp., *Euphorbia* sp., Fabaceae, *Galium* sp., Lamiaceae, *Potentilla* sp., *Ranunculus* sp., *Ranunculus repens/acris/bulbosus*, *Rumex* sp., cf. *Salvia* sp., *Scleranthus annuus*, *Silene dioica*, *Stellaria* sp., *Stellaria nemorum, Trifolium* sp., *Veronica* sp., unidentifiable seed fragments, and unknown seeds (see Figures 5.9 and 5.10).

The group "Centrospermae" refers to seeds with a free-central or basal placentation, and corresponds with the order Caryophyllales (Bhattacharyya and Johri 1998). This is a group in which all of the damaged seeds that have lost seed coats but obviously had circular embryos have been placed. These may include seeds from the families Portulacaceae, Caryophyllaceae, Amaranthaceae, Chenopodiaceae, and Phytolacaceae.

Unknown seeds are those seeds which are well preserved enough that identification may be made on them at some point in the future, but for which matches among the seeds available in the comparative collections and seed manuals available were not found. The most abundant of these unknown seeds, present in numerous contexts, is pictured in Figure 5.11l. In addition to these unknown seeds, many fragments of seeds were found that were too damaged, distorted, or fragmented to be identified other than as a seed fragment. These were labeled 'unidentifiable seed fragment'. Counts of these fragments are recorded in the table, but these counts were not included in the total seed count.

Machair Taxa

Machair is a special grassland ecosystem that includes the strandline, dune beaches, the machair plain (a sandy grassland with high pH) and, on the landward side, a marshy area, coastal loch, or fen (Owen et al. 1996). Machair is an ecosystem unique to Ireland and Scotland, and is uniquely fertile because of its lime-rich sands (Gaynor 2006). The modern machair vegetation has been described by several authors (Gaynor 2006; Kent et al. 1996) and typically includes plants I have here classified within grassland, wetland, and unclassified categories. Grassland taxa found at Quoygrew associated with machair include: *Danthonia decumbens*, *Linum catharticum*, *Plantago lanceolata, Plantago maritima*, *Potentilla erecta*, *Ranunculus acris* type, *Ranunculus ficaria*, cf. *Rhinanthus minor,* and *Rumex acetosa.* Wetland taxa associated with machair include: *Eleocharis pallustris*, cf. *Eleocharis pallustris*, *Potentilla pallustris*, *Potentilla* cf. *pallustris*, *Ranunculus flammula*, and *Ranunculus* cf. *flammula*. Unclassified taxa include *Ranunculus repens* and *Ranunculus repens* type. These taxa are starred on the list of taxa provided in Figure 4.4. Machair taxa are found in many areas of the site, but are particularly high in the pit fill and dump contexts from both Phase 2 and Phase 3.

Non-seed Remains and Matrix Components

Seaweed (a brown fucoid type, perhaps a bladderwrack, *Fucus vesiculosus*) is common across the site (Figure 5.11o). Non-seed and matrix components were identified from many areas of the site (except for Columns A, B, and C) and included: underground plant parts, including rhizomes, grass culm bases, and tubers (Figure 5.11p); wood and stem, including heather twigs; buds; prickles; undifferentiated fruits, usually with a fleshy fruit wrinkled and dried to the seed; moss stem; fungus; and heathland leaves and flowers, including *Calluna vulgaris* leaves and flowers, *Empetrum nigrum* leaves, and Ericaceae leaves. Matrix components such as bone, shell, stone, vitrified fuel ash (vitrified silica nodules of plant origin) are also present.

Carbonized insect remains were present in some of the pit fill and dump contexts. These remains were identified by Dr. Harry Kenward (University of York). All had been distorted to some degree through heating (personal communication, August 17, 2007). Although identifications are not specific enough to provide much detailed information about habitats, the preservation of carbonized insects within contexts is interesting from a taphonomic standpoint, as it suggests that the plant material was standing for some time before it was burned, and that the heat was slow and indirect enough to allow the preservation of the insect bodies by carbonization.

Midden Contexts

In this section archaeobotanical assemblages are described by context type (midden, hearth, pit fill/dump, house floor). The first goal is to determine the activity or activities represented by the plant assemblage deposited in each. The second goal is to identify spatial and chronological trends in the midden contexts, and to a lesser extent in the non-midden contexts.

The majority of archaeobotanical data from Quoygrew are from midden contexts. Midden contexts contained representative taxa from every ecological group and included a mixture of material likely resulting from multiple activities across the site. Despite the mixed nature of middens, some contexts are noticeably different from others. Unique samples can provide insight into the taphonomy of the midden accumulation. Figure 5.12 presents the densities of each ecological group by area and phase for all midden contexts. These data are used to compare assemblages of plant remains from all areas of the site.

Farm Mound, Area G1

The farm mound midden includes two distinct levels, assigned to Phase 1 and Phase 2-3 at the site respectively. Phase 1 portions of the midden accumulated during the 9th-10th centuries. The Phase 2-3 portion represents mostly material from Phase 2, dating to the 11th-12th centuries (Barrett 2009). Phase 2-3 contained substantially more fish bone than Phase 1, which made the interface between the two phases clearly apparent during excavation. According to micromorphological analysis of soils, the midden is likely to result from "persistent deposition of a range of domestic occupation debris, including turf construction materials, animal bedding material, peat and turf fuel residues, deposited throughout the period of cultural sediment accumulation" (Simpson et al. 2005:371).

Although much of the midden material from the farm mound contained similar plant remains, there are several contexts that stand out as containing exceptional assemblages of plant remains. For example, several contexts from the farm mound (G037 from Phase 1 and G054 and G016 from Phase 2-3) contain higher than average amounts of wood/stem, vitrified fuel ash, underground plant parts, Ericaceae leaves, and grassland seeds. These remains occur commonly in turf, and may indicate that these contexts are composed largely of residue from turf burned as fuel (Hall 2002). Seaweed appears most commonly in some of these contexts (G037 and G016), which may mean it was introduced to the midden as a fuel waste.

Context G022 from Phase 1 of the farm mound is interesting because of its extremely high cereal density. Arable weeds and chaff also exhibit higher-than-average density in this sample, but not strikingly high as in the cereals. This context probably represents a dump of charred cereals that were in a relatively clean stage, having had some of the weed seeds and chaff already removed from the crop. G022 also contains higher-than-average densities of heathland leaves, which do not fit the interpretation of crop processing waste or uncleaned/partially cleaned grain stores. This emphasizes the problems of interpreting the almost certainly mixed nature of midden samples.

In contrast, Context G020 from Phase 2 includes a high proportion of arable weed seeds and chaff compared to cereals. This may indicate that this context is primarily a dump of crop processing waste containing seeds and chaff that have been removed from a crop, or that this is a crop that has not yet been processed to remove these contaminants. Further speculation is difficult, however, because of the mixed nature of midden samples.

Another pattern that is worth mentioning is that, in this midden, arable weed seeds seem to follow the pattern of the cereals, and not that of seaweed. Seaweed strandlines can provide a nutrient-rich environment similar to that of a fertilized field, and thus arable weeds can sometimes arrive from activities (such as seaweed collection) on the shoreline, as seemed to be the case at Robert's Haven (Huntley 2000). In this area, this does not seem to be the case, nor was seaweed a particularly prevalent inclusion in the farm mound midden contexts, in contrast to those from the fish midden.

The Fish Midden (Columns A, B, and C)

The fish midden is located on the eroding shoreline, and stretches for approximately 40 m. The fish midden accumulated primarily during Phase 2 (eleventh – twelfth centuries), with upper contexts potentially dating to early Phase 3 (thirteenth century) (all of which are designated Phase 2-3). The fish midden is contemporary with the Phase 2-3 contexts of the farm mound midden (Area G1).

According to soil micromorphology, the fish midden is composed of peat ash, bone, and shell, and is "best interpreted as a specialized fish-processing area with intermittent but regular activity" (Simpson et al. 2005: 368). Column A material includes two exceptional contexts, the very rich context A005 and the grain rich context A012. Otherwise, there is a small group of contexts in the center of the midden with rather more evidence for *Empetrum nigrum* leaves occasionally mixed with seaweed (A012, A013, A015, A017). There are three clear blocks of contexts that contain more seaweed than average. The earliest block includes contexts A006, A006, A007, and A008. The second block includes contexts A013, A014, and A015. The latest block (A021, A022, A023 and A025) of seaweed-rich contexts also contains more *Stellaria media.* In these contexts, *Stellaria media* may be associated with nutrient rich strandlines rather than with fertilized crop fields as was the case in the farm mound midden. Wet ground taxa including trigonous *Carex* sp. and *Montia fontana* are more characteristic of the upper samples than the lower ones.

Column B is much more homogenous, containing large amounts of seaweed, oat and barley grains with sedges, grasses, blinks and chickweed. Column C demonstrates some patterning; the earliest material is rather poor in remains, with oat and barley grains more or less the only items recovered. The middle midden layers have higher concentrations of seeds with a block of flax-rich contexts (C012, C013, C014, C015, C016, C017, C108, C019, C020) along with the cereals. These are then all replaced in the upper levels by large numbers of seaweed fragments and rather few other items (Poaps and Huntley 2001a). Small seeds < 1 mm are likely to be underrepresented in Column C material due to sorting methods. This does not affect cereals, flax, or seaweed, all of which were recovered from larger size fractions.

Area F Middens

Although the farm mound and the fish midden are by far the largest midden areas at Quoygrew, smaller midden accumulations were identified around the site and samples were taken from them for flotation.

Two areas of midden were identified dating to Phase 2. In this period, middens accumulated against the southern wall of Structure 5. Three contexts (F685, F1111, F1125) were sampled for plant remains from this area. These contexts contain moderate amounts of oats and barley, with slightly more barley than oats. There is little chaff, including one oat awn and two separated scutella. Flax is present but not abundant (n = 3). *Stellaria media* and small grasses are represented. Context F1111 has more Ericaceae and Calluna leaves than the other contexts, as well as more moss stem (n = 11), more *Carex* sp. (n = 28) and more wood, although wood is abundant in all of the contexts from this area. Context F1125 contains more seaweed than the other contexts (n = 16). All contexts have a lot of underground plant material as well as wood and stem.

The second midden context dating to Phase 2 is from the northern part of Structure 1. One context from this area (F475) was analyzed for plant remains. This context contains a number of cereal caryopses, including more barley (n = 70) than oat (n = 39). Some chaff is present, most notably an *Avena sativa/strigosa* floret base and a six-row barley rachis internode. Flax is represented by a single seed. There is a small amount of heather and Ericaceae leaves in the samples, as well as 21 small grass caryopses. *Carex* spp. seeds are abundant (n = 212), particularly the trigonous type (n = 165). *Montia fontana* is well represented (n = 16). There is some seaweed present in this sample, and moderate amounts of wood and underground plant parts.

Phase 3 midden is represented by a single context (F671) from the southern portion of Structure 3. This sample contains some cereals, with more barley than oats. There is a small amount of flax (n = 3) and a number of *Carex* sp. seeds (n = 17). Many wood and underground plant parts are present in this context.

An area of midden was also recognized in Area J2. One context (J009) from Phase 3-4 was considered. Oats (n = 11) are the only cereals present in this context. Some Ericaceae and heather leaves are present, along with some *Carex* sp. seeds (n = 26). This sample is also very high in wood and underground plant parts, and additionally contains a substantial amount of charred moss stem (n = 32) and a small amount of vitrified fuel ash (n = 3).

From Phase 4, two contexts, F602 (midden) and F676 (midden fill) were examined. Both of these contexts contain some flax, *Stellaria media*, small concentrations of Centrospermae and Chenopodiaceae seeds, much wood and moderate amounts of underground plant parts. Context F602 contains equal amounts of oats and barley, while context F676 contains more oats than barley and more small grasses (n = 12).

Spatial Patterns

Spatial patterning is easiest to see during Phase 2-3 of the site, as this is the only period when the farm mound, fish midden and Area F middens were simultaneously in use. By comparing the botanical contents of middens during this time period, the most information about potential activity areas can be gathered.

In many ways plant remains from Phase 2-3 of the farm mound midden are similar to plant remains from contemporary deposits of the shore fish midden and Area F middens. In all midden areas of the site during this period, barley is more prevalent than oats. In the fish midden, barley represents 70 percent of the cereals identified, and is numerically dominant over oats in 43 of 48 contexts. The density of barley in this area is 24.80 seeds/10 liters, versus 11.82 of oats. In Phase 2-3 of the farm mound, barley represents 63 percent of the cereals identified and is dominant over oats in 11 of 12 contexts. Here the density of barley (12.48 seeds/10 liters) is also higher than that of oats (7.18). Barley is dominant over oats in all area F midden contexts from this period, and the density of barley is higher in both Phase 2 (32.89 seeds/10 liters vs. 20.67) and Phase 3 (8.75 vs. 2.50).

Flax is represented in all areas. There is a total of 293 seeds in the fish midden, present in 33 of 55 contexts, with a density of 3.68 seeds/10 liters. In the farm mound Phase 2-3, 78 seeds are present, occurring in 11 of 12 contexts, with a density of 4.01 seeds/10 liters. Area F middens have less flax, four seeds (0.89 seeds/10 liters) in Phase 2 and two seeds (2.5 seeds/10 liters) in Phase 3. No area contained flax capsule remains or other indications of flax crop processing waste. Arable weeds and cereal chaff were found in all areas of the site, suggesting that crop-processing waste was a component of the waste discarded in middens across the site. Many of the same wild seeds are identified in all midden contexts at the site.

However, there are some differences between areas of the site. The most obvious difference is in the frequency and amount of seaweed present in the middens. The fish midden contains a density of 25.6 fragments/10 liters of seaweed. Phase 2-3 of the farm mound contains a mere 21 fragments, with a density of only 1.04 fragments/10 liters. The prevalence of seaweed suggests that the result of some activity involving this resource was discarded preferentially in the fish midden. Two unusual species were found only in the farm mound midden: *Camelina sativa*, gold-of-pleasure, and *Isatis tinctoria*, woad. Woad was found only in one context from Phase 1, and gold-of-pleasure was found primarily in Phase 1 (11 seeds total), with one seed found in Phase 2-3. Perhaps these seeds reflect a small-scale domestic activity such as dyeing.

The Phase 2 Area F midden has a higher density of plant remains than average (153 seeds/10 liters vs. the average of 106). Most of the ecological categories were represented by higher densities of seed remains than elsewhere, with the exception of economic taxa, which appeared at noticeably lower densities than in other midden contexts.

In particular, *Carex* spp. seeds are much more dense in the Area F middens than elsewhere, and in the Phase 2 midden from Area F, *Montia fontana* densities were also high. This may indicate more input from byre materials including fodder (or dung) and flooring or bedding materials.

Changes Over Time

There are also marked differences in the site between the Phase 2 contexts represented by the farm mound and fish midden, and the Phase 1 contexts at the farm mound. In Phase 1, barley is much less dominant, representing only 40 percent of the total cereals identified. It is the dominant cereal in only one of nine contexts (the anomalous G020). This represents a reversal of the trend noted in Phase 2-3 contexts across the site, where barley is clearly the dominant cereal. Arable weeds are less well represented in the Phase 1 midden, although they are present. Chaff is denser in Phase 1 of the farm mound (4.19 fragments/10 liters) than in Phase 2-3 of the farm mound (0.68 fragments/10 liters), Phase 2-3 of the fish midden (1.31 fragments/10 liters), or Phase 2 Area F middens (3.33 fragments/10 liters). This may indicate that more crop processing waste is being incorporated into the midden during this phase. It is possible that chaff was being used for animal fodder or bedding in later phases and thus less was being charred and deposited in the midden.

Non-midden Contexts

Non-midden contexts include hearths, pit fill and dump contexts, and house floors. Figure 5.13 describes the distribution of ecological groups by area and phase for non-midden contexts.

Hearth Contexts

Hearth contexts were analyzed from several phases and areas of the site. Hearth seed density varied from 86 seeds/10 liters in Phase 4 to 23 seeds/10 liters in Phase 3.

One Phase 2-3 context (G101), from Area G3 Structure 7 was interpreted as a hearth during excavation. However, this is a very unusual context both in its appearance (as a niche within a semi-subterranean building) and because it contains a massive concentration of charred seaweed (n = 1,306, density 1,451 fragments/10 liters). This is a higher density than contained in the fish midden, and strongly suggests the results of a specialized process. Because of the concentration of carbonized material, early interpretations were that this structure may represent a kiln, similar to those in use at a contemporary site of Beachview, Birsay (Barrett and Gerrard 2005). However, given identification of the concentration as seaweed ash, this interpretation now seems unlikely. In other sites from the same period in the Orkneys, pits have been found with concentrations of burned seaweed, which were interpreted as pits for producing lye (Dickson 1999). It is possible that this context served a similar purpose. There are few other remains in the context, but slightly more remains than are present in Phase 3-4 hearths. Along with seaweed, the context also contains some wood, some amorphous plant material (possibly peat), and some vitrified fuel ash. A few cereal grains are present, including somewhat more barley than oat. No chaff was identified in the context, but one flax seed is present. A few weed seeds, especially Caryophyllaceae and *Rumex* sp. are present, but there are no large concentrations of weed seeds. This context will be mentioned in greater detail in the discussion of seaweed use at the site.

Several hearth contexts (F840, F518, F462) from Structure 1, Area F, Phase 3 were selected for analysis. These hearths appear to have been used sequentially during consecutive sub-phases. There are a few damaged Cerealia caryopses and some oats, but no identifiable barley. There are some weed seeds, especially damaged seeds identified only as Centrospermae. These contexts contain a very low density of seeds (23.04 seeds/10 liters). There was no chaff identified, but one piece of seaweed, a little wood and a few underground plant parts are present. It is possible that the fires from these hearths were fueled with peat, which burns very hot and may have more completely incinerated plant remains (Church and Peters 2004). It is also possible that the hearths were kept clean by sweeping out the uncombusted materials into midden contexts and other areas of the site.

An additional three contexts (F473, F071, F011) from Structure 1 in Area F were selected. These Phase 4 hearth contexts contained a higher density of remains than others (89 seeds/10 liters). One context (F071) did not contain cereals, but the other two had small amounts. The dominance of barley over oats is variable. There is one flax seed in these contexts. Context F473 includes a concentration of *Stellaria media* seeds ($n = 51$), Centrospermae ($n = 67$), and *Chenopodium* spp. ($n = 32$). Other inclusions include relatively high amounts of amorphous plant material (which could represent peat), some vitrified fuel ash, some wood (particularly in F011), and some underground plant materials. This combination suggests that the remains of a mixture of fuels are represented.

Spatial Patterns. It is difficult to see spatial trends in hearth use because so few areas of hearths were analyzed. It is apparent that the hearth context from Area G3 (G101) is the result of a specialized activity involving seaweed, with possibly small admixtures of turf and/or peat fuels. The other hearths are all from the same general area of the site, and do not provide much information about spatial trends.

Changes over Time. There is a trend towards greater diversity of remains (more ecological groups represented, and a more even distribution of groups as a percentage of total seeds) in later hearth contexts when compared with earlier hearth samples. It is possible that this has to do with a wider range of gathering activities or changes in the environment around the site. However, it is perhaps more likely that this is a result of changing fuel types, with more turf (which burns more slowly and tends to lead to better charred preservation) being used in preference to peat. This could be due to peat scarcity, or to increasing demand for turf ash to use as a component of field fertilizer.

House Floors

House floors from Phase 2 Structure 5 (F1129), Phase 3 Structure 1 (F543), and Phase 4 Structures 1 (F423) and 2 (F221) were analyzed. Plant remains are present in all house floor samples, ranging in density from 85 seeds/10 liters (F221) to 266.7 seeds/10 liters (F423). Phase 2 floors contained more barley than oats whereas Phase 3 and 4 contained more oats than barley. Two seeds of flax were present in the Phase 2 sample. Seaweed was present only in the Phase 2 sample. Small concentrations of centrospermae seeds, *Stellaria media*, undifferentiated centrospermae (possibly damaged Caryophyllaceae or Chenopodiaceae) or *Atriplex* sp., are found in house floors from all phases. Moss stem is also present in low amounts, and underground plant parts and wood are present in all floor samples, with higher concentrations in the Phase 2 floor sample. The macrobotanical contents of the house floor samples in general are very similar to those of the hearth samples, but with higher seed density than found in the hearths. Presumably, the carbonized botanical remains from the house floors come from the use of redeposited hearth ash as flooring material.

Spatial Trends. As with the hearths, it is difficult to determine trends from such a limited number of samples. However, it does seem that the house floors vary quite a bit across space, as the two contexts from Phase 4 have the highest (F423, Structure 1: 266.67 seeds/10 liters) and lowest (F221, Structure 2: 85 seeds/10 liters) densities of remains of all house floors. These two contexts are quite different from one another; F423 is described as a brown silt clay floor layer that built up against a fire-cracked sandstone slab that functioned as a hearth, whereas F221 is a ‘packed earth’ floor made of ash spreads from Structure 2, a presumed sleeping room that does not have a hearth. The amount of plant related activity was presumably higher around the hearth in Structure 1 than in the sleeping area of Structure 2, which may be reflected by the higher seed density of floor layers in Structure 1. It is also possible that the ash selected for use as flooring in the sleeping room was of a finer grade, meaning it had been burned at a higher temperature and contained less uncombusted material.

Changes over Time. The earliest floor layers, from Phase 2 contain the only flax and seaweed from the floors. This suggests that household activities may have been more centralized indoors during this phase, and in later phases activities involving seaweed and flax were moved elsewhere at the site. Alternatively, ash from fires across the site could have been used for house floors in the early phases, whereas in later phases, ash from the central hearths was used exclusively (with other ash being discarded into the middens). There is a diverse representation of plant groups throughout the house floor assemblage, which suggests turf or dung fuels (which tend to preserve seeds) were used to produce ash incorporated into the house floors. The oat-to-barley ratios for Phases 2, 3, and 4 are interestingly opposite of the trends seen in the midden samples, with more barley in the Phase 2 house floors, and more oat in the Phase 3 and 4 house floors. Phase 1 samples from house floor contexts were unfortunately not available for analysis. It would have been very interesting to see if any changes in oat to barley ratios in house floor contexts were the same as or different from the changes observed in oat-to-barley ratios between Phase 1 and Phase 2 middens. Trends in oat and barley ratios for the later phases (2-4) will be discussed at greater length in a discussion of barley and oat cultivation.

Pit Fill/Dump Contexts

Individual contexts from pit fills and dumps represent what are most likely to be single depositional episodes, although none of these contexts appears to have been burned *in situ*. The botanical contents of these contexts are varied, but all include a mixture of plants from many environments. The density of plant remains in these contexts is very high. Pit fill and dump contexts from Phases 2 and 3 were analyzed and the results are as follows.

The last discernable act occurring in Structure 5 (Phase 2) was the deposition of context F1115, a dump of charcoal and ash. This context is the most seed-dense context at the site, containing 814 seeds (1,628 seeds/10 liters). The context included many oat caryopses (n = 322) and oat chaff, especially oat awns (n = 257). There were a very few barley and Cerealia caryopses, and a single six-row barley rachis fragment. The oats from this sample are likely to be *Avena strigosa*, because floret bases are all of the narrow type and the awns include some that have broken in a way to reveal the geniculate shape of the awn base. They are also somewhat small and a number of caryopses have exuded material at the distal ends, which is characteristic of unripe (milk or dough-ripe) grain (Hubbard and al Azm 1990).

The context also contains numerous weed seeds, including small grasses (n = 42), *Stellaria media* (n = 33) and moderate amounts of *Carex* sp., *Cerastium* sp., and *Chenopodium* sp. These weeds are all common species found in animal manure (Griffen 1988). An oily arable weed seed, *Capsella bursa-pastoris*, was also found in abundance in this sample (n = 28). This context has the highest density of seed remains associated with machair soils. Contributions from floor coverings, animal bedding, or turf or peat fuels may be indicated by a large amount of moss stem (n = 107), as well as by *Calluna vulgaris* and *Ericaceae* leaves. Underground plant parts and wood/stem are abundant, and small amounts of seaweed and fungus are included. This context also contains a number of carbonized insect remains, including a fragment of silphid (carrion beetle) pronotum (cf. *Thanatophilus* sp.) and fragments of fly puparium that have been distorted by heating (H. Kenward, personal communication: August 17, 2007).

The combination of remains from this context - including possibly unripe, unthreshed oats along with a mixture of crop weeds, machair plant taxa, animal bedding material (heather, moss, turf) and insect remains - seems to indicate byre flooring and/or fodder rather than crop processing waste or fuels. This context is similar in composition to a waterlogged pit found at Tuquoy, Westray, which was determined likely to contain an intact accumulation of byre-manure (Owen 1993). According to ethnohistorical accounts of the Orkneys and Shetland, byre manure mixed with byre flooring material (often turf and straw) was sometimes used as fuel, or tinder for fires, which would account for the carbonization of an assemblage of this type (Fenton 1978). Because of the large amount of oat awns and chaff in this sample, an alternate explanation is that this is the result of "graddaning", which Dickson and Dickson (2000: 186) describe as "an ancient method of separating oat grain from chaff, in which the heads of oats were set on fire. When the grain dropped out the remaining chaff was extinguished or the chaff thrown on the fire."

The means by which the weed seeds, heather leaves and moss stem entered the sample remain unexplained in the second case, although these are likely to have been common as flooring and bedding materials throughout a house interior.

Four contexts were analyzed from Phase 3 at the site. One context (F1051) is a dump found in Structure 3. The remaining contexts (F548, F550, F564) are pit fills from Structure 1. The Structure 3 context (F1051) contains more barley (n = 60) than oats (n = 28). The context contains some chaff, including a six-row barley internode, some oat awns (n = 28), and narrow (*A. sativa/strigosa*) oat floret bases. A wide range of wild seeds indicative of well-manured or nutrient-rich soils are present, including *Capsella bursa-pastoris* (n = 8), *Polygonum aviculare* (n = 19), *Stellaria media* (n = 186), Poaceae (n = 105), *Atriplex* sp. (n = 87), *Tripleurospermum maritimum* (n = 13), *Carex* sp. (n = 16), Centrospermae (n = 199), Chenopodiaceae (n = 71), Polygonaceae (n = 24) and *Rumex* sp. (n = 21). Heather leaves (n = 134) and Ericaceae leaves (n = 116) are abundant. There is some moss stem, moderate amounts of underground plant parts, and a moderate amount of vitrified fuel ash. There are also insect remains in this context, including probable segments of insect larvae, a probable staphylinid (rove beetle) abdomen and a metathorax and abdomen of a beetle, probably a cryptophagid (silken fungus beetle) (H. Kenward, personal communication, August 17, 2007). This context is most likely to represent uncleaned cereals or crop-processing waste (cereals, chaff, and arable weeds) mixed with turf or peat fuels (grassland, heathland, and underground plant parts). The carbonized insect and moss components suggest that the turf fuels may have been used as flooring in the byre before being burned.

From Structure 1, context F550 contains many cereal remains, with more oat (n = 112) than barley (n = 50). Oat awns are present as well as the narrow type of floret bases. There is a concentration of *Stellaria media* (n = 293), some small grasses (n = 31), cf. *Atriplex* sp. (n = 105) and *Tripleurospermum* sp. (n = 10). The context contained moderate amounts of underground plant parts, moderate amounts of wood, a little moss stem and a little vitrified fuel ash. In this context, mineralized seeds were found which were identified as *Atriplex* sp., *Stellaria media* and an unidentified seed type. No heather or Ericaceae leaves were found in this context, although it contains two seeds of *Empetrum nigrum*. A single carbonized possible cryptophagid (silken fungus beetle) metathorax was found in this context (H. Kenward, personal communication, August 17, 2007). This context appears to be another example of uncleaned grain or crop-processing waste (including many weed seeds and chaff) perhaps used as fodder or animal bedding (accounting for the moss and carbonized insects), with admixtures of turf fuels.

Context F548, also from Structure 1, has a much lower density of seeds. There are few cereals, with equal amounts of oat and barley (n = 7). Two oat awns are the only chaff present. Centrospermae seeds (n = 10) are well represented. There is a range of other seeds, making this context similar in content to the previous context but containing fewer seeds. The moss, vitrified fuel ash, underground plant part, and wood are all similar to context F550. This context may represent a more dispersed version of the other contexts, with a mixture of uncleaned grain, crop-processing waste or fodder (cereals and arable weeds) and turf.

The final Phase 3 context, F564 from Structure 1, contains even fewer cereals. There is more barley (n = 4) than oats (n = 2). A few oat awns are the only chaff. There are a few heather (n = 11) and Ericaceae leaves (n = 15) and a small assemblage of *Rumex* sp. seeds (n = 35). There is slightly more moss stem than in the other two contents, but otherwise the vegetative remains are similar. There are also mineralized seeds in this context, including some unidentified seeds and some Centrospermae seeds. The mineralization that occurred to the seeds in these samples coated the surface structure more completely and it is harder to make identifications on these seeds. This context may represent turf fuel waste with some small input from crop wastes or animal byre material.

S*patial Trends / Changes over Time.* It is difficult to make spatial and chronological comparisons among these contexts since they are all quite different. All of the pit fill/dump contexts appear to contain plant taxa from many different environments and probably indicate mixtures of remains including fuel remains, as opposed to unmixed deposits representing the results of a single activity such as crop processing or cereal drying. It is worthy of note that carbonized insect remains and mineralized seeds are present mostly in the pit fill and dump contexts of the site, with a few mineralized seeds in Phase 2 house floor contexts. This is most likely due to their position in low areas of the site that may have retained water for long periods of time. The insect remains may also indicate that the plant materials were sitting for awhile before they were burned, as in byre or bedding materials; however, the insect groups represented are not particularly specialized in their preferred habitat, and may have been present in many areas of the house interior, in bedding, flooring, roofing, stored cereals or other contexts.

Chapter Summary

The plant remains from Quoygrew are fairly typical of other Viking Age and medieval Orcadian farm sites in the species of plants that were identified, with the exception of gold-of-pleasure (*Camelina sativa*) and woad (*Isatis tinctoria*). Based upon the seed remains and the non-seed plant remains and matrix materials, it is likely that the samples of plant remains from midden contexts were derived in part from a combination of crop processing waste, grain stores at various stages of processing, household waste, house and byre floor materials, and turf and peat fuel sources. It is possible that other sources of carbonized seeds were responsible for part of the assemblage represented as well.

Particularly unusual contexts included a dump (F1115) from Phase 2 containing the remains of unthreshed oats and weed seeds, and a hearth context from Phase 2-3 (G101) which contained a high concentration of seaweed.

Quoygrew has proved very rich in carbonized botanical remains, including some very fragile remains that often do not survive carbonization, and some unusual seeds such as *Isatis tinctoria* and *Camelina sativa* that have not previously been identified in Viking- Age sites from Orkney. The extensive sampling and flotation regime provided a broad base to study the distribution of plant remains across a variety of contexts as well as over time. This study of plant remains from middens in different areas of the site highlights the importance of broad sampling, since the assemblage of seeds varied widely depending on the area of the site as well as the broader context.

The goal of this chapter has been to present data on the carbonized plant record at Quoygrew. It is clear from the botanical data that the inhabitants of Quoygrew used surrounding lands to cultivate cereals, including barley, common oat, and bristle oat. Flax was also a likely crop. The most prominent gathered wild resources that appear in the carbonized seed record are turf and peat fuels, and seaweed. Remains from turf fuel ash are found in most contexts at Quoygrew.

In the following chapter, I provide further discussion of the plant taxa found at Quoygrew, and place the plant data reported in this chapter within the context of a wider view of political and social change occurring in the North Atlantic region during the Viking/Medieval transition. In this way it is possible to provide insight into relationships among the economy of Quoygrew, the landscape surrounding the site, household dynamics, and regional politics of the period.

Figure 5.1 Count and Density of Economic Taxa from Midden Contexts by Area and Phase

GROUP	SCIENTIFIC NAME	PHASE 1		PHASE 2		PHASE 2-3				PHASE 3		PHASE 3-4		PHASE 4		TOTAL	
		(G)		(F)		(A,B,C)		(G)		(F)		(J)		(F)			
		count	#/10L	count	#/10L	count	#/10L	count	#/10L	count	#/10L	count	#/10L	count	#/10L	count	#/10L
Volume		212.6		45		796.4		202		8		8		18		1290	
Cereals	*Avena* sp.	879	41.35	93	20.67	941	11.82	145	7.18	2	2.50	11	13.75	29	16.11	2100	16.28
	Cerealia	373	17.54	24	5.33	784	9.84	66	3.27	3	3.75	1	1.25	5	2.78	1256	9.74
	Hordeum sp.	599	28.17	148	32.89	1975	24.80	252	12.48	7	8.75			25	13.89	3006	23.30
	cf. *Triticum* sp.					1	0.01									1	0.01
Cereal Chaff and Straw	*Avena* sp. awn	27	1.27	5	1.11	35	0.44	4	0.20							71	0.55
	Avena sp. floret base	3	0.14			21	0.26	2	0.10			1	1.25			27	0.21
	Avena sativa /*A.strigosa* floret base	8	0.38	2	0.44											10	0.08
	Avena sativa floret base	6	0.28													6	0.05
	Hordeum sp. rachis internode															0	0.00
	Hordeum cf. *distichon* 2-row rachis internode							1	0.05							1	0.01
	Hordeum cf. *vulgare* 6-row rachis internode	7	0.33	2	0.44	34	0.43									43	0.33
	Hordeum sp. awn					11	0.14									11	0.09
	Triticum sp. rachis internode					1	0.01									1	0.01
	indeterminate rachis internode	1	0.05											1	0.56	2	0.02
	Culm nodes	1	0.05													1	0.01
	Lemma	51	2.40	4	0.89			1	0.05							56	0.43
	embryo/scuttella	14	0.66	7	1.56											21	0.16
	chaff indeterminate	6	0.28			57	0.72									63	0.49
Economic	*Linum usitatissimum*	74	3.48	4	0.89	293	3.68	78	3.86	2	2.50			5	2.78	456	3.53
	cf. *Linum usitatissimum*	11	0.52	1	0.22	11	0.14	3	0.15	1	1.25					27	0.21
	Isatis tinctoria	2	0.09													2	0.02
	cf. *Isatis tinctoria*																

Figure 5.2 Count and Density of Economic Taxa from Hearth, Fill/Dump, and Floor Layer Contexts by Phase and Area

GROUP	SCIENTIFIC NAME	HEARTH						FILL/DUMP				FLOOR LAYER						TOTAL			
		PHASE 2-3 (G3)		PHASE 3 (F)		PHASE 4 (F)		PHASE 2 (F)		PHASE 3 (F)		PHASE 2 (F)		PHASE 3 (F)		PHASE 4 (F)		TOTAL		TOTAL SITE	
		count	#/10L	count	#/10L	count	#/10L	count	#/10L	count	#/10L	count	#/10L	count	#/10L	count	#/10L	count	#/10L	count	#/10L
Volume		9		23		23		5		41		10		7		5		123		1413	
Cereals	*Avena sp.*	3	3.33	3	1.30	10	4.35	322	644.00	161	39.27	10	10.00	19	27.14	19	38.00	547	50.65	2647	18.73
	Cerealia	1	1.11			6	2.61	4	8.00	49	11.95	7	7.00	3	4.29			70	6.48	1326	9.38
	Hordeum sp.	5	5.56			7	3.04	3	6.00	121	29.51	19	19.00	4	5.71	6	12.00	165	15.28	3171	22.44
	cf. *Triticum sp.*																			1	0.01
Cereal Chaff and Straw	*Avena sp.* awn							257	514.00	51	12.44			1	1.43	1	2.00	310	28.70	381	2.70
	Avena sp. floret base							1	2.00	11	2.68	1	1.00					13	1.20	40	0.28
	Avena sativa/A.strigosa floret base							5	10.00	6	1.46							11	1.02	21	0.15
	Avena sativa floret base																			6	0.04
	Hordeum sp. rachis internode									1	0.24	4	4.00					5	0.46	5	0.04
	Hordeum cf. *distichon* 2-row rachis internode							1	2.00									1	0.09	2	0.01
	Hordeum cf. *vulgare* 6-row rachis internode									4	0.98							4	0.37	47	0.33
	Hordeum sp. awn																			11	0.08
	Triticum sp. rachis internode																			1	0.01
	indeterminate rachis internode																			2	0.01
	Culm nodes									2	0.49							2	0.19	3	0.02
	Lemma							38	76.00	1	0.24							39	3.61	95	0.67
	embryo/scuttella							1	2.00	3	0.73	2	2.00					6	0.56	27	0.19
	chaff indeterminate																			63	0.45
Economic	*Linum usitatissimum*	1	1.11			1	0.43			1	0.24	2	2.00					5	0.46	461	3.26
	cf. *Linum usitatissimum*																			27	0.19
	Isatis tinctoria									1	0.24							1	0.09	3	0.02
	cf. *Isatis tinctoria*									1	0.24							1	0.09	1	0.01

Figure 5.3. Count and Density of Arable and Grassland Taxa from Midden Contexts by Area and Phase

GROUP	SCIENTIFIC NAME	PHASE 1 (G) count	PHASE 1 (G) #/10L	PHASE 2 (F) count	PHASE 2 (F) #/10L	PHASE 2-3 (A,B,C) count	PHASE 2-3 (A,B,C) #/10L	PHASE 2-3 (G) count	PHASE 2-3 (G) #/10L	PHASE 3 (F) count	PHASE 3 (F) #/10L	PHASE 3-4 (J) count	PHASE 3-4 (J) #/10L	PHASE 4 (F) count	PHASE 4 (F) #/10L	TOTAL count	TOTAL #/10L
Volume		212.6		45		796.4		202		8		8		18		1290	
Arable	*Aphanes arvensis*					1	0.01									1	0.01
	Camelina sativa	2	0.09					1	0.05							3	0.02
	cf. Camelina sativa	9	0.42													9	0.07
	Capsella bursa-pastoris	1	0.05	1	0.22					1	1.25			1	0.56	4	0.03
	Chenopodium album					2	0.03									2	0.02
	Chrysanthemum sp.					1	0.01									1	0.01
	Euphorbia helioscopa	3	0.14	1	0.22	2	0.03	1	0.05							7	0.05
	Papaver sp.															0	0.00
	Papaver rhoeas															0	0.00
	Polygonum aviculare	4	0.19	1	0.22	8	0.10	2	0.10							15	0.12
	Fallopia convolvulus					22	0.28									22	0.17
	cf. Fallopia convolvulus					2	0.03									2	0.02
	Polygonum maculosa (persicaria)			3	0.67	1	0.01									4	0.03
	Polygonum sp.	3	0.14					2	0.10							5	0.04
	Polygonaceae	27	1.27	1	0.22			17	0.84	2	2.50			2	1.11	49	0.38
	Spergula arvensis	21	0.99	1	0.22	38	0.48	55	2.72	1	1.25					116	0.90
	Stellaria media	54	2.54	32	7.11	461	5.79	47	2.33	2	2.50			20	11.11	616	4.78
	cf. Stellaria media					1	0.01	25	1.24							26	0.20
Grassland	*Danthonia decumbens*					45	0.57									45	0.35
	Danthonia sp.			1	0.22											1	0.01
	Poa annua	1	0.05	2	0.44											3	0.02
	Poaceae <1 mm	60	2.82	44	9.78			53	2.62	2	2.50	4	5.00	17	9.44	180	1.40
	Poaceae 1-2mm	46	2.16	2	0.44	314	3.94	10	0.50			1	1.25	3	1.67	376	2.91
	Poaceae 2-4mm	2	0.09			129	1.62									131	1.02
	Poaceae scutellae							1	0.05							1	0.01
	Leontodon sp.					1	0.01									1	0.01
	Linum catharticum	1	0.05													1	0.01
	Plantago lanceolata	11	0.52	1	0.22	24	0.30	9	0.45			1	1.25			46	0.36
	cf. Plantago lanceolata					1	0.01									1	0.01
	Plantago maritima (capsule)							1	0.05							1	0.01
	Potentilla erecta			9	2.00											9	0.07
	Potentilla cf. erecta	10	0.47									1	1.25			11	0.09
	Ranunculus acris type	1	0.05													1	0.01
	Ranunculus ficara tuber															0	0.00
	cf. Rhinanthus minor							1	0.05							1	0.01
	Rumex acetosa					2	0.03									2	0.02

Figure 5.4 Count and Density of Arable and Grassland Taxa from Hearth, Fill/Dump, and Floor Layer Contexts by Phase and Area

GROUP	SCIENTIFIC NAME	HEARTH PHASE 2-3 (G3) count	HEARTH PHASE 2-3 (G3) #/10L	HEARTH PHASE 3 (F) count	HEARTH PHASE 3 (F) #/10L	HEARTH PHASE 4 (F) count	HEARTH PHASE 4 (F) #/10L	FILL/DUMP PHASE 2 (F) count	FILL/DUMP PHASE 2 (F) #/10L	FILL/DUMP PHASE 3 (F) count	FILL/DUMP PHASE 3 (F) #/10L	FLOOR LAYER PHASE 2 (F) count	FLOOR LAYER PHASE 2 (F) #/10L	FLOOR LAYER PHASE 3 (F) count	FLOOR LAYER PHASE 3 (F) #/10L	FLOOR LAYER PHASE 4 (F) count	FLOOR LAYER PHASE 4 (F) #/10L	TOTAL count	TOTAL #/10L	TOTAL SITE count	TOTAL SITE #/10L
Volume		9		23		23		5		41		10		7		5		123		1413	
Arable	*Aphanes arvensis*																			1	0.01
	Camelina sativa																			3	0.02
	cf. *Camelina sativa*																			9	0.06
	Capsella bursa-pastoris					4	1.74	28	56.00	11	2.68			1	1.43			44	4.07	48	0.34
	Chenopodium album																			2	0.01
	Chrysanthemum sp.																			1	0.01
	Euphorbia helioscopa									2	0.49	1	1.00					3	0.28	10	0.07
	Papaver sp.									2	0.49							2	0.19	2	0.01
	Papaver rhoeas									1	0.24							1	0.09	1	0.01
	Polygonum aviculare									19	4.63							19	1.76	34	0.24
	Fallopia convolvulus																			22	0.16
	cf. *Fallopia convolvulus*																			2	0.01
	Polygonum maculosa (persicaria)	1	1.11							6	1.46							7	0.65	11	0.08
	Polygonum sp.																			5	0.04
	Polygonaceae	3	3.33			1	0.43	4	8.00	37	9.02			1	1.43	4	8.00	50	4.63	99	0.70
	Spergula arvensis									13	3.17					1	2.00	14	1.30	130	0.92
	Stellaria media					51	22.17	33	66.00	483	117.80	61	61.00	3	4.29	5	10.00	636	58.89	1252	8.86
	cf. *Stellaria media*			9	3.91					7	1.71							16	1.48	42	0.30
Grassland	*Danthonia decumbens*																			45	0.32
	Danthonia sp.																			1	0.01
	Poa annua																			3	0.02
	Poaceae <1 mm	5	5.56	12	5.22	8	3.48	42	84.00	144	35.12			4	5.71	6	12.00	221	20.46	401	2.84
	Poaceae 1-2mm	1	1.11			1	0.43			9	2.20	14	14.00			1	2.00	26	2.41	402	2.85
	Poaceae 2-4mm											1	1.00					1		132	0.93
	Poaceae scutellae																			1	0.01
	Leontodon sp.																			1	0.01
	Linum catharticum																			1	0.01
	Plantago lanceolata	1	1.11			1	0.43	2	4.00	7	1.71							11	1.02	57	0.40
	cf. *Plantago lanceolata*																			1	0.01
	Plantago maritima (capsule)																			1	0.01
	Potentilla erecta							3	6.00	5	1.22	1	1.00					9	0.83	18	0.13
	Potentilla cf. *erecta*									2	0.49							2	0.19	13	0.09
	Ranunculus acris type																			1	0.01
	Ranunculus ficara tuber									2	0.49							2	0.19	2	0.01
	cf. *Rhinanthus minor*																			1	0.01
	Rumex acetosa																			2	0.01

Figure 5.5 Count and Density of Heathland and Ruderal Taxa from Midden Contexts by Area and Phase

GROUP	SCIENTIFIC NAME	PHASE 1		PHASE 2		PHASE 2-3				PHASE 3		PHASE 3-4		PHASE 4		TOTAL	
		(G)		(F)		(A,B,C)		(G)		(F)		(J)		(F)			
		count	#/10L	count	#/10L	count	#/10L	count	#/10L	count	#/10L	count	#/10L	count	#/10L	count	#/10L
Volume		212.6		45		796.4		202		8		8		18		1290	
Heathland	*Calluna vulgaris* leaves	47	2.21	43	9.56			39	1.93			10	12.50			139	1.08
	Calluna vulgaris flowers/buds	1	0.05			39	0.49					3	3.75			43	0.33
	Empetrum nigrum	8	0.38			13	0.16	1	0.05					2	1.11	24	0.19
	Empetrum nigrum leaves	21	0.99			475	5.96	35	1.73			13	16.25			544	4.22
	Ericaceae leaves	82	3.86	54	12.00			16	0.79					5	2.78	157	1.22
	Ericaceae seed	1	0.05			6	0.08									7	0.05
	Erica sp.	1	0.05			1	0.01									2	0.02
	Erica cinerea	3	0.14													3	0.02
	Erica cf. *cinerea*	1	0.05													1	0.01
	Juncus squarrosus	4	0.19													4	0.03
	Juncus sp.					49	0.62									49	0.38
	Juncus sp. capsule							1	0.05			2	2.50			3	0.02
	Luzula sp					34	0.43									34	0.26
	cf. *Luzula sp.*	5	0.24													5	0.04
	Vaccinium myrtillus					1	0.01									1	0.01
Ruderal	*Atriplex sp.*	7	0.33	7	1.56	2	0.03	23	1.14			1	1.25			40	0.31
	cf. *Atriplex sp.*							2	0.10							2	0.02
	Brassica sp.					6	0.08	2	0.10							8	0.06
	Euphorbia peplus							1	0.05							1	0.01
	Fumaria sp.															1	0.01
	Galium aparine													1	0.56	1	0.01
	Hypericum sp.	3	0.14			1	0.01									4	0.03
	cf. *Hypericum sp.*	1	0.05			15	0.19	1	0.05							17	0.13
	Lapsana communis					2	0.03									2	0.02
	cf. *Lapsana communis*					3	0.04									3	0.02
	Myosotis sp.	1	0.05					3	0.15							4	0.03
	Odontites sp. / *Euphrasia sp.*	1	0.05													1	0.01
	Plantago major	2	0.09													2	0.02
	Plantago media							1	0.05							1	0.01
	Potentilla anserina	1	0.05													1	0.01
	Raphanus raphanistrum							1	0.05							1	0.01
	Raphanus raphanistrum pod					1	0.01									1	0.01
	Rumex acetosella					11	0.14									11	0.09
	Rumex obustifolius type	1	0.05													1	0.01
	Tripleurospermum inodorum					23	0.29									23	0.18
	Tripleurospermum maritimum	6	0.28													6	0.05
	cf. *Tripleurospermum maritimum*	3	0.14	1	0.22	21	0.26									25	0.19
	Tripleurospermum sp.					3	0.04									3	0.02
	Urtica dioica			2	0.44			1	0.05							3	0.02
	Viola subgenus *Melanium*	2	0.09													2	0.02

Figure 5.6 Count and Density of Heathland and Ruderal Taxa from Hearth, Fill/Dump, and Floor Layer Contexts by Phase and Area

GROUP	SCIENTIFIC NAME	HEARTH						FILL/DUMP				FLOOR LAYER						TOTAL			
		PHASE 2-3 (G3)		PHASE 3 (F)		PHASE 4 (F)		PHASE 2 (F)		PHASE 3 (F)		PHASE 2 (F)		PHASE 3 (F)		PHASE 4 (F)		TOTAL		TOTAL SITE	
		count	#/10L	count	#/10L	count	#/10L	count	#/10L	count	#/10L	count	#/10L	count	#/10L	count	#/10L	count	#/10L	count	#/10L
Volume		9		23		23		5		41		10		7		5		123		1413	
Heathland	*Calluna vulgaris* leaves					2	0.87	57	114.00	147	35.85	11	11.00	4	5.71	3	6.00	224	20.74	363	2.57
	Calluna vulgaris flowers/buds																			43	0.30
	Empetrum nigrum									4	0.98							4	0.37	28	0.20
	Empetrum nigrum leaves			1	0.43					15	3.66							16	1.48	560	3.96
	Ericaceae leaves	2	2.22			1	0.43	12	24.00	116	28.29	4	4.00	3	4.29	10	20.00	148	13.70	305	2.16
	Ericaceae seed																			7	0.05
	Erica sp.																			2	0.01
	Erica cinerea																			3	0.02
	Erica cf. cinerea																			1	0.01
	Juncus squarrosus																			4	0.03
	Juncus sp.							3	6.00									3	0.28	52	0.37
	Juncus sp. capsule									3	0.73							3	0.28	6	0.04
	Luzula sp.			1	0.43													1	0.09	35	0.25
	cf. *Luzula sp.*																			5	0.04
	Vaccinium myrtillus																			1	0.01
Ruderal	*Atriplex sp.*					4	1.74			99	24.15	6	6.00	3	4.29	20	40.00	132	12.22	172	1.22
	cf. *Atriplex sp.*			4	1.74					105	25.61							109	10.09	111	0.79
	Brassica sp.																			8	0.06
	Euphorbia peplus																			1	0.01
	Fumaria sp.									1	0.24							1	0.09	2	0.01
	Galium aparine																			4	0.03
	Hypericum sp.																			17	0.12
	cf. *Hypericum sp.*																			2	0.01
	Lapsana communis									14	3.41							14	1.30	17	0.12
	cf. *Lapsana communis*							1	2.00									1	0.09	5	0.04
	Myosotis sp.					2	0.87	6	12.00	1	0.24							9	0.83	10	0.07
	Odontites sp. / Euphrasia sp																			2	0.01
	Plantago major							2	4.00					1	1.43			3	0.28	4	0.03
	Plantago media																			1	0.01
	Potentilla anserina																			1	0.01
	Raphanus raphanistrum																			1	0.01
	Raphanus raphanistrum pod																			11	0.08
	Rumex acetosella																			1	0.01
	Rumex obustifolius type																			23	0.16
	Tripleurospermum inodorum																			6	0.04
	Tripleurospermum maritimum							3	6.00	14	3.41							17	1.57	42	0.30
	cf. *Tripleurospermum maritimum*																			3	0.02
	Tripleurospermum sp.									14	3.41	2	2.00					16	1.48	19	0.13
	Urtica dioica																			2	0.01
	Viola subgenus *Melanium*									1	0.24							1	0.09	1	0.01

Figure 5.7 Count and Density of Wetland Taxa from Midden Contexts by Area and Phase

GROUP	SCIENTIFIC NAME	PHASE 1 (G) count	PHASE 1 (G) #/10L	PHASE 2 (F) count	PHASE 2 (F) #/10L	PHASE 2-3 (A,B,C) count	PHASE 2-3 (A,B,C) #/10L	PHASE 2-3 (G) count	PHASE 2-3 (G) #/10L	PHASE 3 (F) count	PHASE 3 (F) #/10L	PHASE 3-4 (J) count	PHASE 3-4 (J) #/10L	PHASE 4 (F) count	PHASE 4 (F) #/10L	TOTAL count	TOTAL #/10L
Volume		212.6		45		796.4		202		8		8		18		1290	
Wetland	*Ajuga sp.*					4	0.05									4	0.03
	Carex hostiana					1	0.01									1	0.01
	Carex hostiana type					1	0.01									1	0.01
	Carex sp.	52	2.45	93	20.67	7	0.09	97	4.80	17	21.25	26	32.50	9	5.00	301	2.33
	Carex sp. lenticular type					5	0.06									5	0.04
	Carex sp. trigonous type			165	36.67	835	10.48									1000	7.75
	Carex sp. utricle					2	0.03									2	0.02
	Cyperaceae	31	1.46	1	0.22			4	0.20							36	0.28
	Eleocharis pallustris	47	2.21	2	0.44	31	0.39	5	0.25							85	0.66
	cf. *Eleocharis pallustris*					2	0.03									2	0.02
	Eriophorum angustifolium					3	0.04									3	0.02
	cf. *Eriophorum angustifolium*					1	0.01									1	0.01
	Eriophorum latifolium / vaginatum					45	0.57									45	0.35
	cf. Eriophorum sp.					2	0.03									2	0.02
	Littorella uniflora	2	0.09	5	1.11			5	0.25							12	0.09
	cf. *Littorella uniflora*	1	0.05													1	0.01
	Lychnis flos-cuculi																
	Montia fontana	12	0.56	17	3.78	165	2.07	27	1.34			1	1.25			222	1.72
	cf. *Montia fontana*		.			6	0.08									6	0.05
	Potamogeton sp.																0.00
	Potentilla palustris					1	0.01									1	0.01
	Potentilla cf. palustris							1	0.05							1	0.01
	Ranunculus flammula	3	0.14	4	0.89	27	0.34									34	0.26
	Ranunculus cf. flammula					2	0.03									2	0.02
	Schoenoplectus lacustris	1	0.05													1	0.01

Figure 5.8 Count and Density of Wetland Taxa from Hearth, Fill/Dump, and Floor Layer Contexts by Phase and Area

		HEARTH						FILL/DUMP				FLOOR LAYER						TOTAL			
		PHASE 2-3 (G3)		PHASE 3 (F)		PHASE 4 (F)		PHASE 2 (F)		PHASE 3 (F)		PHASE 2 (F)		PHASE 3 (F)		PHASE 4 (F)		TOTAL		TOTAL SITE	
GROUP	SCIENTIFIC NAME	count	#/10L	count	#/10L	count	#/10L	count	#/10L	count	#/10L	count	#/10L	count	#/10L	count	#/10L	count	#/10L	count	#/10L
Volume		9		23		23		5		41		10		7		5		123		1413	
Wet ground	*Ajuga sp.*																			4	0.03
	Carex hostiana																			1	0.01
	Carex hostiana type																			1	0.01
	Carex sp. lenticular type					4	1.74	12	24.00	28	6.83	24	24.00	1	1.43	4	8.00	73	6.76	374	2.65
	Carex sp. trigonous type																			5	0.04
	Carex sp. utricle																			1000	7.08
	Cyperaceae																			2	0.01
	Eleocharis palustris																			36	0.25
	cf. *Eleocharis palustris*	1	1.11					2	4.00	7	1.71			1	1.43			11	1.02	96	0.68
	Eriophorum angustifolium																			2	0.01
	cf. *Eriophorum angustifolium*																			3	0.02
	Eriophorum latifolium / vaginatum																			1	0.01
	cf. Eriophorum sp.																			45	0.32
	Littorella uniflora																			2	0.01
	cf. *Littorella uniflora*	1	1.11							3	0.73	1	1.00	1	1.43			6	0.56	18	0.13
	Lychnis flos-cuculi																			1	0.01
	Montia fontana									1	0.24							1	0.09	1	0.01
	cf. *Montia fontana*	3	3.33	1	0.43	1	0.43	1	2.00	8	1.95	3	3.00	1	1.43	3	6.00	21	1.94	243	1.72
	Potamogeton sp.																			6	0.04
	Potentilla palustris													2	2.86	1	2.00	3	0.28	3	0.02
	Potentilla cf. palustris																			1	0.01
	Ranunculus flammula																			1	0.01
	Ranunculus cf. flammula											1	1.00							34	0.24
	Schoenoplectus lacustris																			2	0.01
																				1	0.01

Figure 5.9 Count and Density of Environmentally Unclassified Taxa and non-seed remains from Midden Contexts by Area and Phase

GROUP	SCIENTIFIC NAME	PHASE 1 (G) count	PHASE 1 (G) #/10L	PHASE 2 (F) count	PHASE 2 (F) #/10L	PHASE 2-3 (A,B,C) count	PHASE 2-3 (A,B,C) #/10L	PHASE 2-3 (G) count	PHASE 2-3 (G) #/10L	PHASE 3 (F) count	PHASE 3 (F) #/10L	PHASE 3-4 (J) count	PHASE 3-4 (J) #/10L	PHASE 4 (F) count	PHASE 4 (F) #/10L	TOTAL count	TOTAL #/10L
Volume		212.6		45		796.4		202		8		8		18		1290	
Unclassified	cf. *Anthemis cotula*			1	0.22											1	0.01
	Arenaria sp.							1	0.05							1	0.01
	Arenaria sp./Stellaria sp.			1	0.22							3	3.75			4	0.03
	Asteraceae	4	0.19	1	0.22	1	0.01	4	0.20							10	0.08
	cf. Asteraceae	5	0.24													5	0.04
	Asteraceae / Apiaceae							1	0.05							1	0.01
	Brassicaceae					18	0.23									18	0.14
	Brassica oleraca																
	Brassica sp. / Sinapsis sp.	4	0.19	1	0.22			2	0.10					1	0.56	8	0.06
	Brassica sp. / Cannabis sp.	2	0.09													2	0.02
	Carex sp. / Rumex sp.	1	0.05			1	0.01									2	0.02
	Caryophyllaceae	23	1.08	1	0.22	9	0.11	10	0.50							43	0.33
	Centrospermae	3	0.14	4	0.89			23	1.14					40	22.22	70	0.54
	Cerastium sp.	2	0.09			2	0.03	1	0.05							5	0.04
	Cerastium sp. / Stellaria sp.	2	0.09					2	0.10							4	0.03
	Chenopodiaceae					115	1.44			1	1.25			35	19.44	151	1.17
	cf. Chenopodiaceae					2	0.03									2	0.02
	Chenopodium sp.					15	0.19									15	0.12
	Clusiaceae (was Hypericaceae)	1	0.05													1	0.01
	cf. Descurainia sp.					1	0.01									1	0.01
	Euphorbia sp.					3	0.04									3	0.02
	Fabaceae					9	0.11	1	0.05							10	0.08
	cf. Fabaceae					0	0.00	1	0.05							1	0.01
	Fabaceae pod					1	0.01									1	0.01
	Galium sp.	1	0.05											1	0.56	2	0.02
	Lamiaceae	1	0.05													1	0.01
	Potentilla sp.	16	0.75	1	0.22	75	0.94	5	0.25							97	0.75
	Ranunculus sp.					1	0.01									1	0.01
	cf. Ranunculus sp.					1	0.01									1	0.01
	Ranunculus repens					5	0.06									5	0.04
	Ranunculus repens type					9	0.11									9	0.07
	Rumex sp.	43	2.02	1	0.22	71	0.89	21	1.04			5	6.25	2	1.11	143	1.11
	Rumex sp. Fruit (w/perianth)																
	cf. Salvia sp.					1	0.01									1	0.01
	Scleranthus annuus			1	0.22											1	0.01
	Silene dioica					5	0.06									5	0.04
	Stellaria sp.							3	0.15							3	0.02
	Stellaria nemorum	1	0.05													1	0.01
	Veronica sp.			1	0.22											1	0.01
	Unidentifiable seed fragments*	513	24.13	4	0.89			272	13.47	25	31.25	9	11.25	30	16.67	853	6.61
	Unidentified seeds	13	0.61					7	0.35			7	8.75			27	0.21
TOTAL SEEDS (excluding unidentifiable seed fragments and leaves)		2597	122.15	689	153.11	6717	84.34	999	49.46	41	51.25	62	77.50	198	110.00	11303	87.62
Non-seed	Seaweed	47	2.21	4	0.89	2039	25.60	42	2.08							2132	16.53
	Moss stem	1	0.05	5	1.11	-				1	1.25	32	40.00	1	0.56	40	0.31
	Underground Plant Part	77	3.62	103	22.89	-		141	6.98	116	145.00	274	342.50	54	30.00	765	5.93
	Vitrified Fuel Ash	14	0.66			-		14	0.69			3	3.75	3	1.67	34	0.26

Figure 5.10 Count and Density of Ecologically Unclassified Taxa and Non-Seed Remains from Hearth, Fill/Dump, and Floor Layer Contexts by Phase and Area

		HEARTH						FILL/DUMP				FLOOR LAYER						TOTAL			
		PHASE 2-3 (G3)		PHASE 3 (F)		PHASE 4 (F)		PHASE 2 (F)		PHASE 3 (F)		PHASE 2 (F)		PHASE 3 (F)		PHASE 4 (F)		TOTAL		TOTAL SITE	
GROUP	SCIENTIFIC NAME	count	#/10L	count	#/10L	count	#/10L	count	#/10L	count	#/10L	count	#/10L	count	#/10L	count	#/10L	count	#/10L	count	#/10L
Volume		9		23		23		5		41		10		7		5		123		1413	
Unclassified	cf. *Anthemis cotula*																			1	0.01
	Arenaria sp.									5	1.22							5	0.46	6	0.04
	Arenaria sp./Stellaria sp.									1	0.24							1	0.09	5	0.04
	Asteraceae																			10	0.07
	cf. Asteraceae									1	0.24							1	0.09	8	0.04
	Asteraceae / Apiaceae																			1	0.01
	Brassicaceae											1	1.00							18	0.13
	Brassica oleraca									1	0.24							1	0.09	1	0.01
	Brassica sp. / Sinapsis sp.							1	2.00									1	0.09	9	0.06
	Brassica sp. / Cannabis sp.																			2	0.01
	Carex sp. / Rumex sp.																			2	0.01
	Caryophyllaceae	11	12.22	4	1.74	2	0.87			1	0.24			13	18.57	9	18.00	40	3.70	83	0.59
	Centrospermae	1	1.11	18	7.83	67	29.13	6	12.00	220	53.66			54	77.14	14	28.00	380	35.19	450	3.18
	Cerastium sp.					1	0.43	11	22.00	2	0.49	3	3.00	4	5.71			21	1.94	26	0.18
	Cerastium sp. / Stellaria sp.																			4	0.03
	Chenopodiaceae			5	2.17					71	17.32							76	7.04	227	1.61
	cf. Chenopodiaceae																			2	0.01
	Chenopodium sp.	2	2.22			32	13.91	10	20.00					3	4.29			47	4.35	62	0.44
	Clusiaceae (was Hypericaceae)																			1	0.01
	cf. Descurainia sp.																			1	0.01
	Euphorbia sp.																			3	0.02
	Fabaceae									2	0.49							2	0.19	12	0.08
	cf. Fabaceae																			1	0.01
	Fabaceae pod																			1	0.01
	Galium sp.									1	0.24							1	0.09	3	0.02
	Lamiaceae																			1	0.01
	Potentilla sp.									1	0.24							1	0.09	98	0.69
	Ranunculus sp.					1	0.43											1	0.09	2	0.01
	cf. Ranunculus sp.																			1	0.01
	Ranunculus repens																			5	0.04
	Ranunculus repens type									1	0.24							1	0.09	10	0.07
	Rumex sp.	10	11.11							68	16.59	2	2.00					80	7.41	223	1.58
	Rumex sp. Fruit (w/perianth)									1	0.24							1	0.09	1	0.01
	cf. Salvia sp.																			1	0.01
	Scleranthus annuus			1	0.43													1	0.09	2	0.01
	Silene dioica																			5	0.04
	Stellaria sp																			3	0.02
	Stellaria nemorum																			1	0.01
	Veronica sp																			1	0.01
	Unidentifiable seed fragments*			11	4.78	23	10.00	50	100.00	199	48.54	28	28.00	16	22.86	2	4.00	329	30.46	1182	8.37
	Unidentified seeds									2	0.49							2	0.19	29	0.21
TOTAL SEEDS (* excluding unidentifiable seed fragments and leaves)		50	55.56	53	23.04	198	86.09	787	1574.00	1592	388.29	158	158.00	116	165.71	74	148.00	3028	280.37	14331	101.42
Non-seed	Seaweed	1306	1451.11	1	0.43			2	4.00	4	0.98	46	46.00					1359	125.83	3491	24.71
	Moss stem			3	1.30			107	214.00	41	10.00	10	10.00	2	2.86	8	16.00	171	15.83	211	1.49
	Underground Plant Part	12	13.33	6	2.61	12	5.22	179	358.00	142	34.63	71	71.00	8	11.43	17	34.00	447	41.39	1212	8.58
	Vitrified Fuel Ash	3	3.33	5	2.17	5	2.17	9	18.00	12	2.93			1	1.43			35	3.24	69	0.49

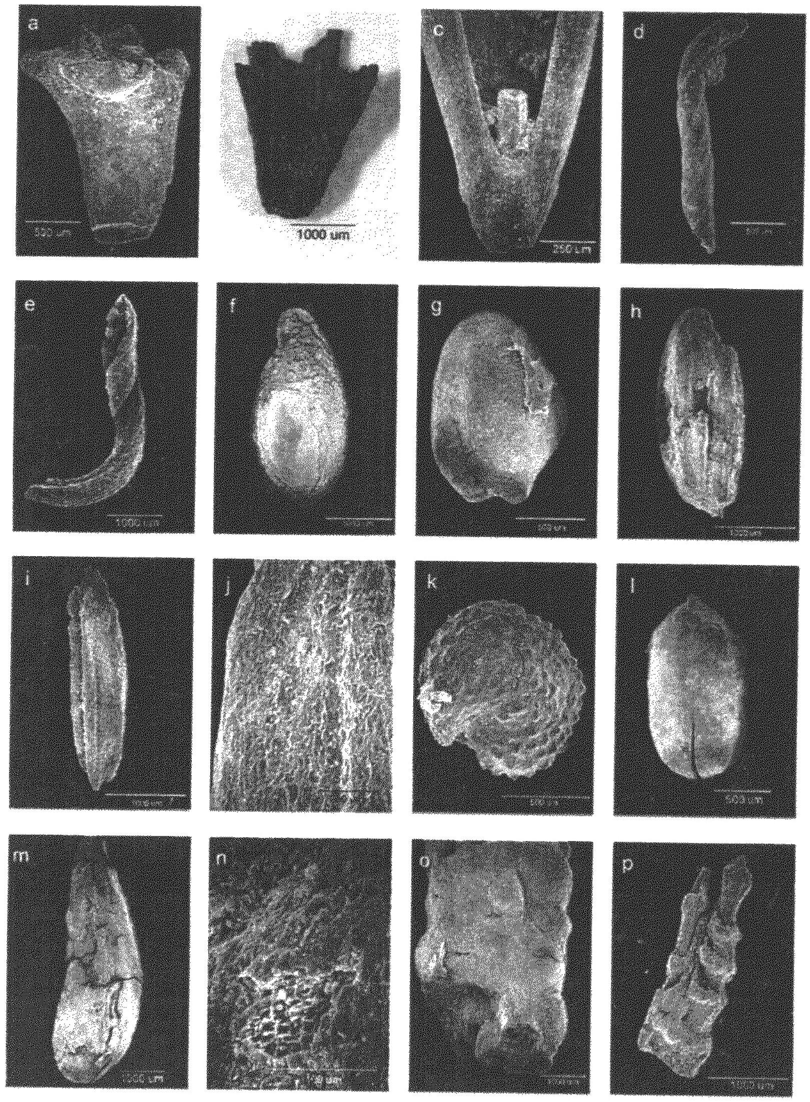


Figure 5.11 Images of recovered botanical remains: a) Hordeum vulgare 6-row rachis internode (context F1051, sample 60654); b) Avena sativa floret base (G022, 7497); c) A. sativa/strigosa floret base (F1051, 60625); d) geniculate Avena sp. awn (F1115, 60707); e) geniculate Avena sp. awn (F1115, 60707); f) Linum usitatissimum (G020, 7156); g) Camelina sativa (G022, 7252); h) Isatis tinctoria (G059,7451); i) Isatis tinctoria (F1051, 60625); j) Isatis tinctoria (F1051, 60625); k) Stellaria media (F1051,60654); l) unknown seed (G013/015, 7119); m) Ranunculus ficaria tuber (G056, 7388); n) Ranunculus ficaria tuber (G056, 7388); o) fucoid seaweed (G101, 7529); p) underground plant part (F671, 60208)

Figure 5.12 Density (#/10L) of Macrobotanical Remains by Ecological Group: Middens by Area and Phase

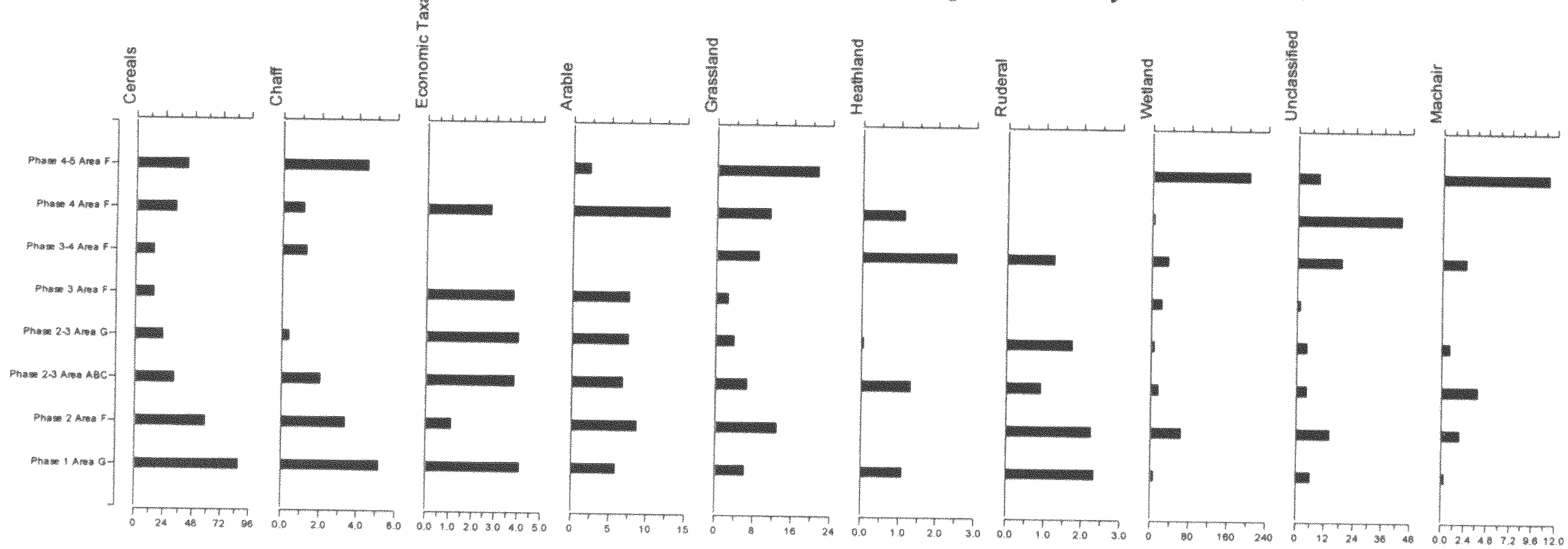
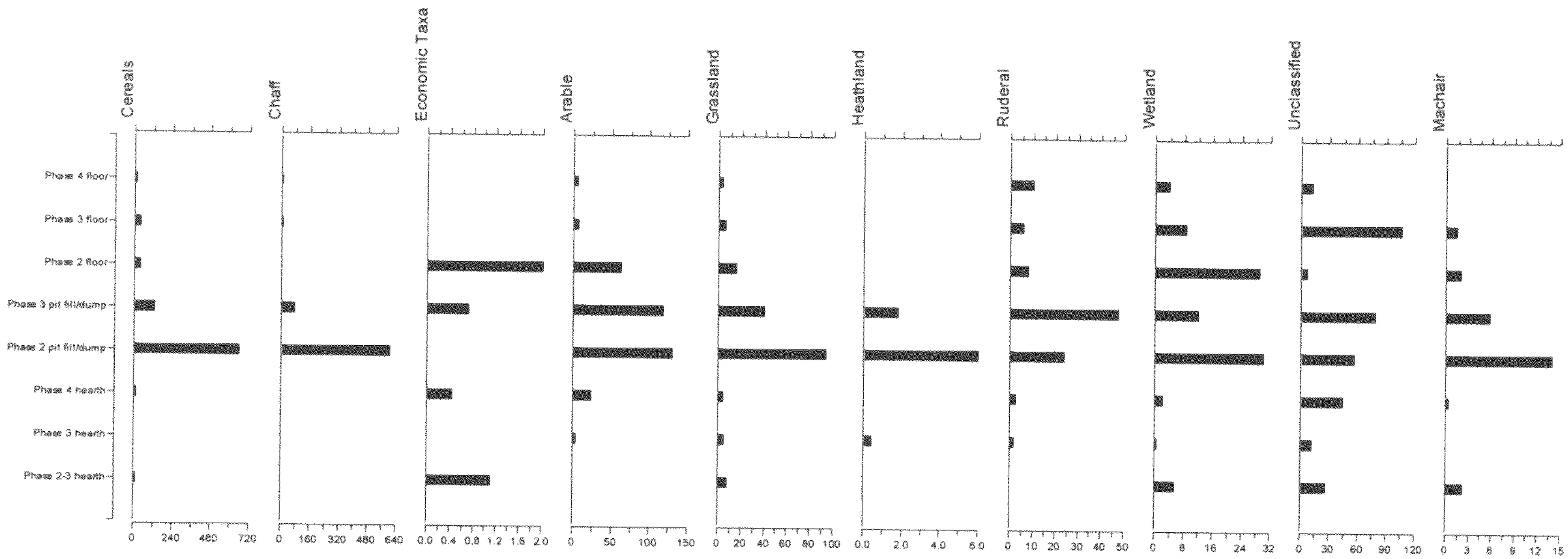


Figure 5.13 Density (#/10L) of Macrobotanical Remains by Ecological Group: Hearth, Pit Fill/Dump and Floor Layer Contexts by Phase



CHAPTER 6: DISCUSSION

It is possible to use the botanical data presented in the last chapter to obtain a more complete understanding of life at Quoygrew during the Viking/Medieval transition by providing context to the plant remains using published data from other specialists working at the site. It is also helpful to compare interpretations of farm activity at Quoygrew with evidence about what other farms in the North Atlantic experienced during this transition. Here I compare Quoygrew to other North Atlantic farms, in terms of plant data, but also based upon other archaeological and documentary data.

This chapter is the beginning of a discussion of how plant remains at Quoygrew can be interpreted to explain change at Quoygrew during this important transition. In this chapter, questions about what plants Quoygrew farmers were growing, how they were using the land available to them, and how the aspects of farm production like plant agriculture, pastoralism, fishing, fuel gathering, and textile working were related to each other are considered.

In Chapter 7, this discussion is taken a step further to consider how this information about life at Quoygrew can be used to discover how changes at Quoygrew in the realm of production are related to increasing state administration, changes in household organization, social stratification, and to the regulation of natural resources. I begin the current chapter by considering the agricultural system at Quoygrew and the relationship between farming and livestock management at the site.

Agriculture

Cereals

Cereal chaff and caryopses were common throughout the site, with especially large concentrations in several of the midden contexts and pit fill/dump contexts. The two main crops were barley, probably primarily hulled six-row barley, *Hordeum vulgare* ssp. *vulgare*, and oat, probably both common oat *Avena sativa* and bristle oat *A. strigosa*.

Lumping all of the analyzed contexts at Quoygrew together, there is altogether more barley (n = 3183) than oats (n = 2666). However, considering the oat/barley relationship by phase reveals some interesting patterns. Figure 6.1 shows the density of oat and barley by Phase for midden contexts. Non-midden contexts are presented similarly in Figure 6.2.

During Phase 1 in the farm mound midden (G1), oat is clearly dominant over barley (barley dominance = 22.22 percent, n = 9 contexts), and oat has a higher density (41.35 seeds/10 liters) than barley (28.17). This is in marked contrast to the situation during Phases 2, 2-3, and 3, where middens across the site show that barley is the dominant cereal in 79.63 percent (Phase 2-3 fish midden, Columns ABC: n = 12 contexts), 91.67 percent (Phase 2-3 farm mound Area G1: n = 54 contexts), and 100 percent (Phase 2 area F midden: n = 4 contexts) of samples (see Figures 6.3

and 6.4). Barley densities in the midden samples are also markedly higher in Phases 2, 2-3, and 3 (Figure 6.1). In contrast, pit fill and dump contexts from Phases 2 and 3 show higher densities of oat than barley (Figure 6.2). In the few midden contexts from Phases 3-4 and 4, oat density is higher than barley. This is also true of the Phase 4 hearth and the Phase 4 house floor contexts.

Hulled barley and oat are both commonly found at Viking and Early Medieval sites in the Orkneys. The ratio of the two crops varies between sites, although usually dominance of one or the other grain is relatively consistent across the site (Dickson and Dickson 2000:175).

When compared to the Pictish period, the land used for growing oats increased during the Viking period. This has been interpreted as evidence that new, more marginal land was brought into cultivation (Bond 1998). Many sites show that this increase was maintained throughout the Late Norse period (Dickson and Dickson 2000).

The inconsistency of barley dominance between context types at Quoygrew means that something more complicated than basic trends toward extensification and the claiming of new land for agriculture is going on at this site. We see a decrease in the amount of cereals and chaff (especially oat) present in midden samples from Phase 1 to Phase 2-3. Because this is the period during which fishing is likely to have increased at the site, it is tempting to see the decrease as a contraction of agricultural activities as labor was diverted towards fishing. However, along with the decrease in cereals and chaff, there is an increase in the number of arable weed seeds present in these middens from Phase 1 to Phase 2-3, which suggests that cereal production may have increased, rather than decreased. This is unlikely to be solely a result of unequal preservation due to fuel types, because cereal grains are more likely to survive intense heat than the more fragile arable weed seeds. If a switch to hotter-burning fuels were responsible for the decline in cereals and chaff in later phases, arable weed seeds should also decline as a result of poor preservation. It is also not a result of differences in sorting procedures. Because the smallest size fractions were not included in analysis for Columns A and B, and especially C, it is possible that some of the arable weed seeds are underrepresented in this area. However, if this is the case, it only strengthens the observation that arable weeds increase at the site between Phase 1 and Phase 2-3.

The fact that oat shows up as the predominant cereal in house floor, pit fill and dump contexts from Phases 2 and 3 also supports the idea that production of this crop did not necessarily decrease. Rather, it is likely that the deposition of these cereals across the site changed in response to new demands, such as the beginning of dairy production or the use of horses as work animals, which require better quality fodder for animals. If oat became the preferred fodder material during Phase 2-3, we might expect that less carbonized oat would end up in middens, because the grain would not be processed to the same degree (remaining chaff and weed seeds would not need to be removed as thoroughly for animal consumption, and the grain would not need to be dried as thoroughly or roasted). The total volume of oat produced may also be underrepresented by counting caryopses, as oat used as fodder may have been less frequently dried and thus had a lower chance of appearing in the archaeobotanical record. Pit fill and dump contexts from Phases 2 and 3 are consistent with this explanation. These contexts show large quantities of unthreshed or incompletely threshed oats (including chaff and weed seeds) amidst other botanical remains suggesting byre flooring or byre manure. This is the way we would expect to find oat, if it were being used as fodder.

At the medieval site of Perth in Scotland, common oat (*A. sativa*) and wild oat (*A. fatua*) were found in the carbonized record along with barley. However, in the latrines, which provide more direct information on human diet, the overwhelming majority of remains were of barley, with only a small proportion of oat (Greig 1991). It is evidence like this that leads the author to conclude that “Avena may have been used more generally for animal feed than for human consumption … where Avena was used mainly for animal fodder, it is under-represented in charred remains” (Greig 1991:323, 328). Hjelmqvist (1992) records that in Southern Scania oat is historically known as “horse corn” (Hjelmqvist 1992: 364), further evidence that oat might have been preferentially used as animal fodder in Scandinavian-influenced areas. Langdon (1986:251) reports that high energy fodder like oat is necessary for work animals, especially for horses but also for oxen. Such animals were probably kept at Quoygrew, based upon zooarchaeological evidence that will be discussed later (Harland 2006). It is also likely that higher quality fodder would be necessary or at least helpful to allow milking cows to produce sufficient milk surpluses.

Two cereal types found elsewhere in the Orkney Islands are rare or absent at Quoygrew. These are wheats, *Triticum spp*. and rye *Secale cereale*. One wheat (*Triticum* sp.) caryopsis and one wheat rachis internode were identified from Phase 2-3 of Quoygrew's fish midden. Wheat is never a common find in the Orkneys, but small amounts have been identified at other sites in the North Atlantic (Dickson and Dickson 2000; Huntley 2000b; Huntley and Turner 1995; Poaps and Huntley 2001b). Because of the low number of wheat caryopses found, it is unlikely that wheat was a major crop grown at Quoygrew.

Another grain grown rarely in Orkney, but that is common elsewhere in Scandinavia, England and Ireland is rye, *Secale cereale*. In Norway, rye is present in medieval contexts, as are peas and beans (Griffin 1981). In the Jutland region of Denmark, rye is the most common grain at two large sites, the Fyrkat fortress and Øster Ålum (Jensen 1991). In Southern England, grains from the early medieval period (600 – 1066 A.D.) include wheat, oat, barley and rye. In Ireland during the Early Christian Period (500 - 1100 A.D.), hulled six-row barley, oat, rye, and a small amount of wheat have been found (Greig 1991). In South Scania, a shift took place during the Viking age from barley cultivation to cultivation of barley, rye and flax (Engelmark 1992). In the Ystad area of southern Scania, hulled barley and rye were the two most common crops during the medieval period (Hjelmqvist 1992).

However, in Scotland, barley and oat were the main crops, with some likely imported wheat, but rye is rare (Greig 1991). The earliest record of rye from the Orkney Islands comes from the Viking settlement of Westness on the island of

Rousay (Dickson and Dickson 2000; Kaland 1993). There are few details published from this site regarding the amount of rye found here, but pollen analysis confirms that oat, barley and rye were grown in the vicinity of the site. Rye is not often reported from Viking Age/Medieval sites in the Orkneys. Rye is important because it is a winter crop, which could be grown after a harvest of spring wheat or barley. Along with legumes like broad beans and horse beans, rye was the foundation of a field rotation system known as the three-field system common in Northern Europe during the medieval period. This topic will be discussed further in the context of land use, but the absence of rye at many sites in the Orkneys may have been related to the absence of this system in the Orkney earldom.

Cereals were likely to have been traded within the Orkney earldom, especially from Orkney to Shetland. Also, malt and barley grains were likely shipped to Iceland and perhaps northern Norway as well, where cereal agriculture was much more limited. In these areas agriculture was mainly focused on growing hay for foddering animals (Durrenberger 1991). Some evidence for Orkney trade in barley with Iceland is contained in documentary sources (Simpson et al. 2005). In *Bandamanna* Saga (Porter 1994) Odd Ofeigsson is recorded as having brought malt and grain from Orkney to Thorgeirsfjord. Again, in *Islendinga* saga (McGrew 1970), Thorkel Rostung, a relative of Orkney's bishop, captained a ship transporting meal from Orkney to Hvíta. Thus Orkney was most likely an exporter of barley grain and malt to the rest of the North Atlantic islands, given the historical records and the greater suitability of Orkney for cereal agriculture in comparison to the other islands.

The excess grain exported from Orkney was likely to have been obtained through taxes and rents.

In summary, the two major crops grown at Quoygrew were barley and oat. The barley was likely used for bread, other food dishes, and malted for beer, as well as used to pay taxes. The oat was likely used as fodder primarily, with occasional use as human food. Wheat was present in very small amounts and is unlikely to have been grown as a separate crop, and rye was entirely absent from the Quoygrew samples.

Flax

Flax is present in Scotland since the Neolithic, but it appears very rarely in Pre-Norse contexts from the Northern Isles. At Crosskirk Broch, an Iron Age site on Mainland, Orkney, one flax seed was found (Dickson and Dickson 1984:152). Small amounts of flax were also found in Pictish layers at Howe, Mainland Orkney (Dickson and Dickson 2000:254). Few sites show continuous occupation between the Pictish and Viking periods, but in two that do have continuous occupation (Pool in Orkney and Old Scatness in Shetland), flax occurs only in the Viking period samples (Bond et al. 2004). Because of the low frequency of flax in pre-Norse sites from the islands, it is possible that the use of flax shifted, perhaps from use as a medicinal herb (laxative) to use for oil or fiber where a larger crop would become necessary.

Flax can be used for its fiber (linen), for its seeds as oil, as an addition to bread, as a medicinal plant, and/or as a nutritious addition to fodder. It is possible that flax seeds became carbonized as a result of fiber processing, because in a wet climate such as Orkney, the plants would need to be dried after retting (soaking to decompose the stems and make separating the fibers easier). Historically, in Ireland, flax straw was often dried on a rack over fire to make it more brittle, and to facilitate separation of the bast fibers from the straw. An accident during this process could result in carbonized seeds. Under ordinary circumstances, the dried straw could be beaten over a stone with a wooden mallet or beetle to break up the woody outer layer (Geraghty 1996:47). If done indoors, this process may also have led to carbonization of flax seeds in the fire. Flax seed as used as a component of the diet is most likely to be found in waterlogged latrine deposits, none of which exist at Quoygrew.

Evidence for flax cultivation at Cleat, Westray, was found in the form of adhering capsule fragments (Poaps and Huntley 2001b). At Mindets Tomt and Søndre Felt sites in Medieval Oslo, Norway, flax pollen and capsule fragments showed flax production took place, and there was some evidence for hemp production as well. At the urban sites, flax was interpreted as a garden crop, grown in fertilized areas within the town (Griffin 1988).

No capsule fragments came from Quoygrew, but *Camelina sativa* presence is a strong indicator of local production. Quoygrew has a higher density of flax than most other contemporary sites in the region, which may indicate that flax played a larger role at this site (Poaps and Huntley 2001a). This is especially true since oily seeds like flax seeds do not tend to be preserved well by carbonization, and so may be underrepresented (Viklund 1998:106). The consistency of flax remains in midden samples from Quoygrew is also worth noting. Economic taxa appear at a similar density (approximately 4 seeds/10 liters) throughout the farm mound midden, Phase 3 Area F middens, and Phase 2-3 fish middens. There are no clear trends of flax increases or decreases over time at Quoygrew. Presence of flax in the fish midden at similar densities to other middens at the site is especially interesting when considering the area's potential activities and marine specialization and will be discussed at greater length in Chapter 7. Further interpretation of the flax at Quoygrew is included in the discussion of textile production later in this chapter as well. Because flax is a potential fiber crop and textile working was a strongly female-dominated activity, flax is also important in discussions of household organization and gender roles covered in Chapter 7.

Woad

It is very unusual to have found woad (*Isatis tinctoria*) represented at Quoygrew. Woad is a demanding crop that has a tendency to strip soils of nutrients and requires multiple weeding steps. In addition, production of woad pigment from the leaves is a complicated process requiring more steps than required for dyeing with other plant materials (Hurry 1973). Woad is not native to the British Isles or to Scandinavia, and is a very unusual find for Orkney (Dickson and Dickson 2000; Stace 1997; van der Veen et al. 1993).

Both woad and indigo (*Indigofera tinctoria*) leaves are a source of the rare nitrogen-containing plant pigment indigotin, which produces a lightfast blue color.

Woad was the major source of blue dye for dyeing cloth in Europe before the introduction of indigo (Davies 2004). The pigment is not present in the whole, undamaged leaves, but rather develops from deglycosylation of precursor molecules stored in the plant vacuole when cells are damaged and the compounds exposed to chlorophastic enzymes and air (Davies 2004). The pigment indogotin has been found on many Viking-age textiles, especially from Scandinavia (Walton 1988).

Woad has been grown commercially in England (Wills 1970), but when semi-industrial production of woad-dyed fabric took place during the medieval period, the pigment was often imported in the form of fermented balls from France. The quality of pigment was better in leaves grown in that area (Edmonds 1998). There are records of woad being traded to York, England, from Europe in 1251 (Walton 1989). Modern studies show that the quality of light is important in the plant's production of indigotin, and more of the pigment is produced during periods of dry, sunny weather (Stoker et al. 1998). In addition, the woad must be processed into balls and dried as rapidly as possible, which is difficult in the damp, rainy, and windy climate of the British Isles, and Orkney in particular (Edmonds 1998).

Vegetative remains of the woad plant from waterlogged samples have been found on a few sites of Viking age, notably in the Coppergate area of York, England (Walton 1989). Woad seeds were found in a box or bowl accompanying the high status female interred in the Oseberg ship burial in Norway (Hald 1980). Also, woad was identified at the Iron Age sites of Dragonby in England, and Ginderup, Denmark, at the Anglo-Saxon site of Somersham, Suffolk, and an early Christian site of Deer Park Farm in northern Ireland (van der Veen et al. 1993).

Young leaves of the woad plant are the part used for dyeing, and it is unlikely (although possible) that woad would grow to produce quality pigment in the Northern Isles. Thus the presence of woad seeds in a midden context in the Northern Isles is somewhat difficult to explain. It is possible that settlers may have obtained woad seed from Europe and tried to grow woad locally for dyeing linen or wool, but found the environment unsuitable and discarded the seeds. Alternatively, it is possible that the climate at the time was favorable enough to allow cultivated woad to produce pigment sufficient for local use. Woad is another plant that is strongly associated with textile production, and thus with women, and discussion of this find is also included in discussions of gender roles in Chapter 7.

Agricultural Activity

There are many activities involved in agricultural production at a farm the size of Quoygrew. Not only must crops be planted and harvested, but soil must be properly prepared by fertilization and plowing, sowing must take place at the proper time, harvest must be made at the right time, and seed corn must be stored in a way that preserves it through the winter. Sheaves must be processed to remove grain from the weeds and chaff, and dried to facilitate grinding. Grains can then be ground or otherwise prepared and meals prepared using them.

All of these processes are related in some way to other facets of the farm's production. Each of these activities must be scheduled, taking into account other priorities and tasks that divert labor from agricultural production. Each of these activities requires input from other aspects of farm production, whether that is human or animal labor or products from animals or gathered plants or fuels. These activities are also to a greater or lesser extent seasonal, and the timing of the planting or the harvest is a decision that can have important consequences for the year's production or even for the farm's survival.

In this section I provide a brief description of the various aspects of cereal production at Quoygrew, with a focus on: 1) the interaction between cereal production and other aspects of the farm's economy; and 2) the degree to which scheduling resources including human and animal labor were important.

Manuring. At the heart of the infield system is an area of land kept in continuous agricultural use by the generous application of fertilizer. Simpson (1997:375) describes the process:

> Turfs were stripped from the hill land, causing significant damage to summer grazings, and applied to the infield area together with varying proportions of animal manure. Minor amounts of seaweed were also applied, but there is no evidence to support exploitation of other resources for use in these infield arable areas. Intensity of organic material application was greater with proximity to the farmstead and became greater as the deep top soil developed, perhaps reflecting greater demand for arable produce.

The main manure used for this practice would have been cow manure, with likely some admixture from sheep. Most of the manure was likely to have come from animals byred, or stalled indoors during the winter. Interestingly Simpson et al. (1999) have discovered lipid biomarkers including those of pigs in infield samples from West Mainland, Orkney. This unexpected result may suggest that pigs were stalled at least at some point in the seasonal round, allowing dung to be collected for use on the fields.

Adderley et al. (2000) argue that when a similar system was applied in Shetland, that the intensity of manuring increased or stayed the same over time, despite the biological reality that the deeper the enriched topsoil became, the less new material was required to maintain or enhance fertility. It appears that in the Shetland farms studied, the intensity of fertilization increased over time, rather than leveling out or decreasing as the plaggen soils grew. The end result of this inefficiency was overexploitation of potential grazing areas where turf was stripped. At a certain point, more fertilizer no longer produced measurable gains in soil fertility, and the labor and turf input to the system became wasteful from an ecological point of view. From the farm managers' point of view, however, the practice of manuring may have seemed necessary and the extra effort may have been psychologically a way to ensure a good crop. As I discussed earlier, tenants were in a precarious position, where failing to meet their rent obligations or worse, requiring spring aid from their landlord could have devastating consequences on the household. In such a system, "… with short-term observations suggesting higher rates of manure application than were actually required, there would have been an incentive to continue manuring intensively" (Adderley et al. 2000:428-429).

At Quoygrew, two areas of raised fertilized soils were identified. According to soil-chemistry analyses conducted by Simpson et al. (2005), total phosphorus levels in the enriched soil area are comparable to values found in anthropogenic soils elsewhere in the Orkney Islands, confirming that the areas were fertilized. Thin-section analysis suggests that grassy turves and organic matter (probably animal manure and peat ash residues) were used to create the thickened soils as they were elsewhere in the Orkney Earldom. The original soil underlying the anthropomorphic soil is of poor agricultural quality, since it has poor drainage and is relatively shallow compared to machair soils just south of the site. This fits with the pattern of manuring practiced elsewhere in the Northern Isles where farmers stripped turf from nearby hills, used it as byre bedding, then raked out the mixture in spring, composting it with ruminant and pig manure and seaweed, and then spreading it on the fields. This is only the first of many uses of cut turf in the islands that will be discussed in this Chapter. As turf is an important resource that is only renewable to a certain degree, farmers intensifying production must have been concerned about management of grassland in their landscape, and probably had regulations related to the collection of turf. The effects of turf use on the environment, and potential resource management agreements and regulations are considered in Chapter 7.

Plowing and Sowing. Two different sorts of plows were in use during the Viking and Medieval periods in Northern Europe, including Orkney. The *ard* or scratch plow was the simpler sort, used to prepare the soil before sowing, and was usually drawn by horses or oxen. This sort of plow cuts the sod but does not turn the soil or throw the sod. Instead, it basically rakes the soil in a single furrow, leaving the vegetation on either side intact. Seeds can then be planted within the disturbed soil (Kaland and Martens 2000).

The second type of plow was known as a moldboard plow, and does turn the soil over. This type of plow was only workable when the area to be plowed was relatively flat and free of rocks (Kaland and Martens 2000). Iron plowshares are rarely preserved, but are occasionally found, especially in Viking Age pagan burials where they are sometimes used as grave goods (Hamerow 2002). At Westness on the Island of Rousay in the Orkneys, one of the graves contained an iron ploughshare (Dickson and Dickson 2000). Another indirect source of evidence for plows of this type comes from wear-pebbles that were used on the axles of plow fore-carriages. The purpose of the quartz pebbles and the unique wear patterns were identified based on plows found intact in Danish bogs with the pebbles in place. However, apparently the pebbles sometimes worked themselves loose and were lost. Pebbles of this type were found in the fill of an abandoned Viking outhouse at the site of Jarlshof, a high status site in the Shetland Islands. The fill dates to before the end of the fourteenth century, and is the earliest evidence for the moldboard-type plow in the Orkney earldom (Fenton 1978:292). This plow type did not entirely replace the ard or scratch plow, since there is later evidence for the continuing use of the simpler plow (Fenton 1978:292).

One key link between agricultural production and pastoralism lies in the use of animal labor for plowing. Oxen were used from the Iron Age to pull plows and were eventually supplemented with horse labor, although horses never completely replaced oxen for traction in the Orkneys. Zooarchaeological evidence from Quoygrew indicates that some cattle had joint pathologies consistent with traction work, as did some horse remains (Harland 2006).

Scheduling plowing is likely to have been an important community decision, since plow teams were expensive to operate and were likely either shared by a community (where oxen or horses were provided by more than one tenant or landowner) or else plow teams owned by one landowner were contracted by others for use during the planting season. Quoygrew farm managers probably owned work animals, based upon bones found in the middens. However, it is hard to determine how many of these animals were alive at the same time, which could tell us if Quoygrew's managers had control of their own plow team. Owning work animals was likely to have given Quoygrew's farmers some say in scheduling decisions. The use of plows would have been affected by changes in household organization that took place during the Viking/Medieval transition and is further considered in Chapter 7.

Seed Corn and Sowing. Proper ripening, drying and storage of seed corn was hugely important to the next year's successful crop. The return on sowed grain was not high, and often a third or more of the harvest needed to be saved and resown in order to achieve an equal harvest the next year. In eighteenth century Scotland, the annual supply of grain was usually only sufficient to be divided into three parts by tenant farmers, a division expressed in the following saying "Ane to gnaw, and ane to saw, and ane to pay the laird witha'" (Drury 1984:46). It is easy to see how one bad harvest could adversely affect future harvests, or place tenant farmers or even small landholding farmers in increasing debt cycles since the means to sow the next year's harvest depends on saving sufficient seed corn from the previous year.

Harvesting Grain. Harvesting grain can be done with a scythe or by plucking the grain. At The Biggings site on Papa Stour Shetland, archaeobotanical remains including low-growing arable weeds suggested that the cereal crops were either being cut very low on the stalks using scythes or were uprooted. Both practices would maximize the amount of straw that would be available for fodder, but would reduce the amount of nutrients remaining in the soil for the next year's crop (Dickson and Dickson 2000). In areas where all of the straw is removed from the field, additional organic matter must be returned to the soil, usually in the form of animal dung, or the land quickly becomes unproductive.

At Quoygrew, arable weeds are also of multiple heights, including some plants such as *Aphanes arvensis* (10 cm), *Polygonum aviculare* (30 cm), and *Spergula arvensis* (30 cm) that are quite low growing. For a chart showing the plant heights of arable weeds found at Quoygrew, see Figure 6.5. The presence of these low growing crop weeds suggest that cereals were also cut low or plucked at Quoygrew, and nutrients lost in this way were returned to the soil via manuring.

Harvest was another time when labor demands were high, and there is evidence ethnographically that communal labor was employed to achieve a quick harvest. Again, timing was very important. The earlier the grain was harvested, the more likely it was to be green and thus harder to dry and store properly. However, the fall brought devastating gales to the region and crops left in the fields too long were subject to destruction from saltwater spray and gale-force winds. Negotiating this risk must have been difficult, and mistakes made here may have put stress on decision-makers as those affected by the poor decision dealt with the effects of poor harvests.

Communal harvesting did put some pressures on farmers because of individual field ownership. In historic Orkney, a complicated system of straw marking was employed to identify bundled sheaves in the fields as belonging to a certain farmer, especially since high winds could easily shift or substantially relocate drying sheaves of grain. Old women and orphans were set to watch the fields during the first stages of drying so that no farmer would remove or alter the straw markings on his/her neighbor's bundles or surreptitiously cut grain from the furrows between fields. These watchers were called *mullyos* and were paid for their service by being allowed to collect harvest gleanings (Fenton 1978:349).

Early harvest at Quoygrew is indicated by the presence of carbonized green grains and extensive damage to some caryopses. The most parsimonious explanation for early harvest is as a risk-reduction strategy, especially as a response to early poor weather. Another explanation for green grain in the archaeobotanical record include harvest of some grain for use as fodder, where green grain would not cause problems with storage. A third potential explanation is that collection of green grain could have been a subtle way of evading full taxation or rents, by underestimating the size of the harvest, or a way of making use of grain growing in common areas (like furrows between fields) before they were under close scrutiny when ripe. It is possible that the more green grain a household could use before the harvest, less one was assessed at harvest time.

Crop processing: Lashing, Flailing, Flinging and Sieving. Crop processing involved a number of steps and was labor intensive. Information about these steps is available from ethnographic information gathered by Fenton (1978) as well as from archaeological correlates discussed by Viklund (1998).

The simplest way of separating grain from sheaves of grain was by lashing: a handful of sheaves were struck against a hard surface to remove most of the grains, and then the sheaves with some grains attached were fed to animals as fodder (Fenton 1978: 366). Flailing with an articulated flail, beating grain with a club, or trampling the grain by foot were more complete but more labor-intensive means of separating grains from straw (Fenton 1978:358-359; Viklund 1998:51). Once the grains were separated from the straw, the straw and chaff as well as arable weed seeds needed to be removed. This was done by a process called *bussing*. Straw was raked out from grain through the fingers, and tossed with a wrist flick about two feet away (Fenton 1978:366). This is similar to a process known as flinging described by Viklund (1998:61-62), which involved tossing the grain, chaff and seed mixture against a crosswind. Light chaff would blow away, and seeds would be arranged along a gradient that depended upon the seeds' weight and aerodynamic resistance (See Figure 6.6). The highest quality grain would end up in a relatively pure state at the far end of the gradient. Broad paddles have been found at Viking Age sites that may have been used for flinging grain (Viklund 1998:63). Sieving was accomplished using both coarse sieves (called riddles) or fine sieves. Baskets used as course sieves have been found with netting or mesh with approximately 1-1.5 cm openings (Viklund 1998:62-63). Fine sieves were either similar baskets with smaller openings (approximately 2 mm) or hoops two to three feet in diameter which were attached to hide or to perforated cow udders, which were called *wecht* and used by shaking and twirling the grain in a circular motion to separate the weed seeds and straw from the best grain. (Fenton 1978:374; Viklund 1998:62-62).

Paleoethnobotanists are often concerned with distinguishing producer sites from consumer sites based upon the ratios of cleaned grain to crop waste: cereal chaff and arable weeds. Several researchers have proposed models for determining whether cereal production or consumption was most important at a site, as a means to understand trade networks and site status (Hillman 1981, 1984; Jones 1985; van der Veen 1992). Although these sorts of models have been used at sites in the study region including on the fish midden material from Quoygrew (Poaps 2000), they are difficult to use at sites where the ratios are complicated by taphonomic issues such as seed-containing fuel ash deposited in middens, and in regions where cereal “waste” materials like straw and crop weeds have value for technological purposes or for fodder and can be traded in their own right.

Apart from taphonomic concerns, Stevens (2003) critiques producer/consumer site models and suggests that there are alternative explanations for differing ratios that have more to do with social and economic organization of the farm or village than they do with whether the farm or village as a whole was generally importing or exporting grain. In his model, the amount of grain stored in a clean state may simply be a reflection of the degree to which crop processing steps were taken by individual households as opposed to by community groups working together to process grains in bulk. In one situation, grain is processed communally and then parceled out in a cleaned state for individual storage. In the other case, grain is stored by individual households in an uncleaned state (haystacks, perhaps) and processed individually as necessary. Thus whether grain stored in bulk is cleaned or unprocessed is an important question that can be used to better understand social organization and communal labor.

Nowhere at Quoygrew has catastrophic burning preserved the quantity and sort of botanical evidence for crop processing that would be needed to determine whether crops were processed in bulk or individually. Although contexts exist at Quoygrew that resemble cleaned grain (Context G022 from Phase 1 midden) and uncleaned, unprocessed grain (context G020 from Phase 2 midden), midden contexts are too mixed to draw more conclusions.

Drying Malt and Grain. Kilns were often used for drying malt after it had been sprouted. In the wet climate of the Orkneys it was often necessary to dry the newly harvested cereal crop as well to prevent it from molding and spoiling. Kilns could be used for this task too, or by placing grains in a pot over the fire or rolling heated stones among the grains in a trough (Fenton 1978; Viklund 1998). Fenton describes the process of roasting grain using heated stones to produce a dish made of roasted grain and milk called burstin. He also mentions that "… any grains that got burnt were called ministers and were discarded because they left a sharp taste" (Fenton 1978:395). This process may have been the source for some of the carbonized grain deposited in middens at Quoygrew.

Grinding Grain. Grinding grain into flour for bread-making was a large job and could have been done in several ways. Rotary querns were in use throughout much of the Viking world and allowed for small quantities of grain to be ground as needed (Kaland and Martens 2000). This activity was likely to have occurred in the main living room of the house, near the hearth (Viklund 1998). Grain was likely roasted before being ground to thoroughly dry it and to improve the texture for grinding. Rotary querns were in use in Orkney and Shetland through the historical period. (Fenton 1978:389-392).

In addition to small-scale grinding at the household level, mills were also available. One interesting archaeological site that has been excavated on Mainland

Orkney is Earl's Bu, a horizontal water mill associated with the high-status Earl's hall that was occupied from the eleventh through fifteenth centuries (Dickson and Dickson 2000; Graham Campbell and Batey 1998). The association of the mill with the earl's hall indicates that at least this mill was likely under direct control of the Earl. Later historical records for Orkney describe efforts made in the late seventeenth century to force tenants to use mills for all of their grain grinding, and to break or confiscate the hand querns in general use to ensure that all grain went through the mills (Fenton 1978:389). This may have been both a way to generate revenue and a way to keep track of the amount of grain produced by each tenant household. Tenants resisted such decrees and kept using their rotary querns to a greater or lesser extent. Mills also had districts within which landowners and tenants were required to give service to the mill. According to Fenton (1978:398), during the seventeenth century each farm was assigned to a mill.

> To these, the people were astricted or 'mill-sookened', and were not only obliged to have their grain ground in them, but had also to take a share in the maintenance of the mill fabric and roof. When the mill of Bea in Sanday needed thatching, this intimation is said to have been made at the Cross Kirk: 'Ye sookeaners o'the Mill o'Bae Come tae her the morn wi' simmons [straw ropes] an' strae.'

Tensions over grain grinding in mills versus within the household are further discussed in Chapter 7.

Cooking/Brewing/Food Production. Food in Viking Age Scandinavia was usually eaten in two meals, according to sagas. The first meal, known as daymeal, was eaten in the early morning. Nightmeal was eaten in the early evening after returning from the day's work (Kaland and Martens 2000). Bread from Swedish graves includes barley and other grains (including wheat and rye), pea flour and linseed (Jensen 1991; Kaland and Martens 2000). In years with bad harvests, weed seeds and wild gathered seeds could be included in breads. Wild mustard and wild oats were often gathered and eaten during famines. In bad years, there are records from the 18th century that suggest that Shetlanders did not have access to bread for four months of the year. Conditions in Orkney were likely slightly better since Orkney has more arable land to farm (Drury 1984). Arable weeds common at Quoygrew including chickweed (*Stellaria media*) and corn spurrey (*Spergula arvensis*) were both edible and probably included as food when harvests were poor (Darwin 1996; Defelice 2004; Donaldson and Nye 1989; Fenton 1978).

Beer is another grain-based commodity well represented in the saga stories that played a large role in feasting and in building and maintenance of sociopolitical relationships. Beer tends to be underrepresented in archaeobotanical records because charred germinated grain is hard to identify: the sprouted embryos are often lost and the grains of malted barley are usually in poor condition when they can be identified at all. Brewing is typically identified by the presence not only of malted grain, but also of the known beer flavorings hops (*Humulus lupus*) and/or bog myrtle (*Myrica gale*). The remains of a brewery at the city of Bergen have been identified based on the remains of flavorings and malted barley grains (Jensen 1991). Danish examples of brewing based on bog myrtle and hops finds are also recorded in archaeobotanical surveys of plant use in Viking Age Denmark (Robinson 1994).

Some grains at Quoygrew were sprouted like malt and carbonized. However, grains in assemblages like this were not all sprouted, nor evenly sprouted as though all had begun germination at the same time. This suggests that it is more likely that they represent poorly stored grain that had begun to sprout rather than grain that was malted on purpose for brewing beer. Although evidence of malting is not indicated at Quoygrew, it is likely that malting and brewing did take place at most farms based on historical evidence. Malt and brewed beer were other commodities important to the Viking and Medieval economy that were most likely under the control of women. This is further discussed in Chapter 7.

Textile Production

Textile production has been covered to some degree in Chapter 3, and a greater discussion of textile production in terms of household organization and power relationships within the household is provided in Chapter 7. Artifacts such as spindle whorls and loom weights are ubiquitous at Viking/Medieval sites in the North Atlantic (Graham-Campbell and Batey 1988:213). Sheep parasites found at Viking sites provide evidence for wool processing (Owen 2005:207).

At Quoygrew, spindle whorls and a possible weaving batten indicate that textile production was taking place. Also, a possible lye pit discussed later in the chapter may have been associated with wool scouring. No pit house features have been found at Quoygrew, although these female weaving sheds are found elsewhere in the North Atlantic.

Livestock Management

The relative importance of pastoralism and cereal agriculture at Quoygrew or elsewhere in the North Atlantic is hard to estimate, since both are so tightly integrated. Livestock do not just have an economic value, but were also culturally significant. Scandinavian settlers in Greenland expended a lot of effort to maintain flocks and herds despite climatic unsuitability. It is argued that this had to do with the cultural importance of pastoralism to the Scandinavian way of life (McGovern 1988, 2000). Livestock had an important role in Viking Age gift exchange (Hamerow 2006). Livestock rearing certainly had something to do with climate variations and suitability of the landscape in certain areas where they were kept; however, the practice of livestock rearing also had definite elements of socially conditioned norms dictating the number of cattle a family ought to have to maintain their status vis à vis their peers (Hamerow 2006). Cattle, sheep and goats were the most common farm animals at Viking and Medieval sites in the North Atlantic region. Pigs were another element of livestock, and pork was considered particularly high status meat (Kaland and Martens 2000). In general, more pigs were kept in areas with surrounding forest, whereas more caprines were kept when the soils were sandy (Hamerow 2002).

At Quoygrew, cattle and caprines were dominant in the mammal bone assemblage. Pigs were present throughout the site occupation, and consistently represented about 10 percent of the domestic species at the site. Cow bone was usually dominant, with caprine bones exceeding cattle bone only late in Phase 1. Less than a quarter of the cows were allowed to grow to maturity. As Harland explains (2006), the emphasis on juveniles in the midden suggests a mixed economy where the emphasis was on dairying. Caprines were even more heavily weighted towards juveniles, with less than 10 percent reaching adulthood. This suggests management for meat and wool, while ethnographically there is evidence of caprines used for dairy production as well (Harland 206).

Dairying is confirmed by residue analysis of lipids from Iron Age British containers. Craig et al. (2005) and Copley et al. (2005) have conducted analyses that show that dairy product residues were common on containers during this period. Copley et al. (2005) have found dairy fats on 22 percent of the containers that they analyzed from Iron Age Britain. They also note that ruminant fats are more prevalent on the containers than pork fats. Craig et al. (2005) argue that dairying was likely taking place in the Hebrides from at least 1000 B.C.

Horses were high-status animals, present on many sites and valued for their work capacity. Used for riding, as pack animals, and for traction (plowing, pulling carts). Horses were used as food during the early Viking Age, but the Catholic church strongly discouraged eating horse meat and the practice declined (Kaland and Martens 2000). At Quoygrew, Harland has found evidence for butchery marks on a horse astragalus from late in Phase 1 at the site. However, it is possible that these marks, present mostly on the feet and legs, could have been the result of skinning a dead animal for hide rather than butchery for meat.

There is some evidence of joint pathologies in cattle bones that are consistent with the animals' use in traction, whether that was pulling a plow or pulling a cart cannot be determined. Horse bones were found at the site, although they are rare. Late in Phase 1, juvenile horse bones were found, while in Phase 2 both juvenile and adult horse bones were present. The adult horse bones showed a number of pathologies, although all the bones with pathology could be from a single old workhorse.

The Relationship between Cereal Agriculture and Pastoralism

In addition to the use of livestock in plowing, and as transport (riding horses, using horses or oxen to pull carts or as pack animals), livestock provided dairy foods including milk, cheese and butter, horsehair and wool for fishing lines, nets, and textiles for export, dung for manuring fields and for fueling fires, bone for working into tools, meat and hides. Two practices particularly show the close relationship between cereal agriculture and pastoralism include byreing and foddering.

Byreing. Byreing is the practice of stalling animals indoors, especially during the winter, but at other times of the year as well. This practice is often associated with manuring, since the animal dung is concentrated in a very small area and can be easily collected. In the Northern Isles, byres were usually in the same building as living quarters, but on the downhill side. There are some examples of doors in the

Northern Isles that have taken on distinctly cow-shaped openings from the daily pressing of cattle's shoulders against the uppermost stones making up the door. Deciding how many animals to byre in a given year was an important question, and one that was most directly related to the amount of fodder that could be procured in a given year (Amorosi et al. 1988).

Fodder. The importance of fodder to the success of a Viking/Medieval farm cannot be overestimated. Some of the complex decision-making involved in winter livestock management can be summarized in this way:

> At the start of each winter decisions had to be made as to how many animals could be kept on the volume of fodder collected. Farmers had to balance the winter fodder needs of currently mature stock, immature animals needed for replacement and herd expansion, human meat requirements and dairy provisioning needs, pasture productivity of the previous summer growing season, and the estimated, but still unknown duration of the winter feeding season. This risk assessment thus depended upon a complex of interacting variables, and not all farmers were equally capable and lucky in their closely calculated autumn choices … (Amorosi et al. 1998:42).

It is possible to identify potential fodder sources using characteristics of plants identified by their seeds in archaeological assemblages. Hodgson et al. (1999) describe three ways that grassland can be managed, and discuss ways that plants grown on each would differ. These grassland management types are pasture (grasslands which are regularly grazed), hay meadows (which have grasses gathered for storage as winter fodder) and derelict grasslands, which are unmanaged and revert to a more natural pattern or have begun the process of succession to other ecotypes where woody and shrub-like vegetation move in. One of the main differences between these three grassland strategies is in the canopy height each attains. Areas that are regularly grazed are unlikely to develop seeds of tall plants, while hay fields are likely to contain a range of heights. Derelict grasslands are likely to include more woody species and mostly tall species (Hodgson et al. 1999).

At Quoygrew, heights of grassland species identified are provided in Figure 6.7. Heights were determined using local floras and plant databases (Hill et al. 2004, Stace 1997). Eight of 10 of the grassland species identified at Quoygrew are from plants with a height of less than 50 cm. It can be inferred from this that the majority of the grassland species may have come from areas that were grazed. However, caution is necessary because at Quoygrew carbonized grassland seeds are likely not all from fodder remains. Turf fuels are also likely sources of grassland seeds. Turf for fuel may well have been taken from heavily grazed areas. Fenton (1978:425) mentions that before the nineteenth century, hay was a very small part of the economy in Orkney. This seems to fit with the archaeobotanical evidence from Quoygrew.

Information from the ratios of barley to oats and the distribution of these grains across the site discussed earlier in this chapter suggest that oat was likely to have been an important fodder crop at Quoygrew.

Marine resources also supplemented fodder. One pig skull dated to 779-981 at Quoygrew shows isotope ratios indicating that marine protein formed part of this pig's diet (Barrett 2005:269). According to Amorosi et al. (1998:47):

> Vegetable fodder was also supplemented with animal proteins and fats. Routinely, fish and fish offal were fed to cattle in Northern Iceland. Herring was carried inland and mixed with hay without pre-treatment, whilst cod waste needed to be boiled before feeding to stock…. Seal fat was also liquefied and poured over hay and it is also likely that any spoiled human food and its residues were recycled through the domestic animals.

In summary, not only did close connections exist between pastoralism and cereal agriculture, but livestock were linked to fishing through the use of animal by-products like horsehair for fishing lines, and also through the use of fishing by-products (including seaweed) as a supplement to animal fodder. Many such connections can be drawn to emphasize the integration between all areas of production at Quoygrew.

Land Use at Quoygrew

Infield/Outfield Systems

The following concise definition describes the land use system, which was most likely the system in use at Quoygrew: "The infield was a comparatively small area of arable close to the settlement which was divided up, probably into strips, and kept under permanent cultivation through intensive manuring. The outfield lay beyond this and consisted of common pasture, part of which was periodically cultivated, 'as the need arose'" (Definition from Hooke 1998:115-116, in Hamerow 2002:141). The system as described here is a less complicated system that preceded the infield/outfield system in use in eighteenth century Scotland, where animals were grazed in pens on limited areas of the outfields in a specific rotation to fertilize these soils in a managed way (Dodgshon 1973).

At Quoygrew, paleoethnobotany can be used to investigate land use by taking a close look at arable weeds and other taxa presented by each plant's ecological preferences. S*tellaria media* is very common at the site, and appears in midden contexts from all phases except Phase 3-4. This is an indication that well-fertilized soils were available during these periods. The crops most likely to have been grown on fertilized soils are common oats (*Avena sativa*), barley (*Hordeum vulgare* ssp. *vulgare*), and possibly flax (*Linum usitatissimum*) (Dickson and Dickson 2000). Arable weeds in general increase slightly from early phases to later phases of the middens, which may indicate increasing use of fertilized infields and plaggen soils. Interestingly, arable weeds that favor highly fertilized soil, such as *Stellaria media*, are present in some quantity from the earliest phase at the site. This is significant, since the area of plaggen soil identified at Quoygrew has been dated to the medieval period, indicating that it began to accumulate long after Phase 1. It is possible that this may not be the only plaggen soil developed at the site. Rather, fertilized infields could have been present on a small scale from the foundation of the farm, and expanded later to meet increasing demand for food, fodder, and to meet taxes. The expansion would account for increasing amounts of these seeds in later phases.

Small gardens also were common on medieval farms. Some medieval crops that could have been grown in small gardens near the farmstead include cabbage (*Brassica oleracea*), onions (*Allium cepa*), peas (*Pisum sativum*), beans (*Vicia faba*), and hops (*Humulus lupulus*) (Dickson and Dickson 2000; Kaland and Martens 2000). At Quoygrew, there is some evidence that one of the areas of amended soil at the site may have been used as a small garden: "A spade mark preserved by infilling with wind-blown sand suggests that the smaller area of anthropogenic soil north of the farm mound may have been spaded as a garden or to create the cultivation ridges indicated by a resistivity survey" (Simpson et al. 2005: 372). However, none of the common garden plants found at other sites from the region and period are represented in the archaeobotanical record at Quoygrew. Some of the flax grown at Quoygrew may have been grown in these small gardens, because flax is weed intolerant, and a garden close to the farm buildings would allow frequent tending. Peas and beans do not generally preserve well, and cabbage was probably used before seeding took place, so taphonomic issues may also have affected the presence of seeds from these plants among the carbonized remains represented at the site.

Outfields in Orkney are likely to have included machair soils, which are nutrient-rich enough to support agriculture, although they usually cannot support a continuous crop. The area of outfield used for agriculture would thus probably have shifted from season to season (Smith and Mulville 2004). *Avena strigosa* (bristle oat) can tolerate sandy, less well-fertilized soils and is a likely crop grown on the outfield (Dickson and Dickson 2000). Flax could also have been grown on a sandy machair outfield, although because it tends to use more nutrients than oats, it may have needed to be on a longer rotation to allow soil to regain fertility (Smith and Mulville 2004).

Machair seeds were found in abundance at Quoygrew from the earliest phase, and seem to be associated with oats (see Figure 6.8). Unfortunately it is not possible to separate common oat from bristle oat based on caryopsis, so bristle oat and common oat must remain mixed when looking at the association. However, oat is still associated with machair seeds despite containing a mixture of common and bristle oat. Whenever oat densities are high (as in pit fill/dump contexts of Phases 2 and 3), machair seed densities are higher than average. When oat densities are low (Phase 3 midden, Phase 3 hearth, Phase 2 house floor), machair seed densities are lower than average. The association is least strong in Phases 1, 2, and 2-3 middens, where oat densities fall dramatically after Phase 1, while machair seed densities rise slightly to peak in Phase 2, and then decline.

The correlation between machair seed densities and oat densities suggests that machair seeds may have come to the site along with bristle oat, as crop weeds. Alternatively, as machair areas may also have been used to pasture animals, or used as hay meadows, their seeds may have become carbonized as a result of the use of dung fuels. In this instance, oat could seem associated with machair if the oat was used primarily as fodder, and oat and machair seeds were both present in a context whenever dung or byre material was used as fuel. Flax density is less well associated with machair seed density, or with oat density. *Spergula arvensis*, an arable weed that prefers light, sandy, but nutrient-rich soils, is also not well associated with machair seed density, oat density, or flax density.

Based on the carbonized botanical remains, it seems likely that both infields (heavily fertilized, under continuous cultivation) and outfields (sandy, naturally fertile soils, under shifting agriculture) were in use from Phase 1 at Quoygrew. Both of these areas probably saw growth throughout the phases represented, because machair seeds and arable weed seeds both tend to increase in density over time. However, it is hard to rule out alternative scenarios where changes in the animal diet or the use of dung fuels mask patterns of land use

The Three-Field System

In Southern Scania, during the Medieval period, cultivation developed into a three-field system incorporating field peas and horse beans with an equal amount of barley and rye probably corresponding to a summer and fall crop (Engelmark 1992). Throughout Northern Europe, it appears as if rye begins to increase in importance over barley during the Medieval period, especially between the eighth and tenth centuries (Hamerow 2002). Hamerow suggests that annual turf manuring is associated with rye production in much of Northern Europe, and may have gotten its start sometime in the seventh century, although it was more widespread later, around the ninth to tenth centuries.

There is very little evidence for the three-field system ever having been popular in Orkney. Broad bean remains were found at the site of Freswick (Dickson and Dickson 2000), but are in general very rare in the Orkney Earldom. As mentioned above, rye was present at a few sites, but never in equal proportions to barley or to oats. There are several potential reasons for the unpopularity of rye in the Orkney earldom. First, the growing season may have been too short to support two crops successfully or with acceptable risk. Although temperature would not have been a problem for rye crops, the winter gales may been more of a problem, even for the hardy rye. However, as Viklund (1998:173) notes:

> Changes within the agrarian economy, e.g. changes of crops, are often discussed in terms of climatic or other environmental causes. The role of the individual and of cultural traditions are often underestimated, and it is frequently forgotten that agro-technical innovations have often been received as package solutions which brought about almost simultaneous changes in tools, crops and cultivation practices as well as in ideas and ends.

It is possible that rye simply did not fit the area's cultural expectations for a cereal grain. Beer and malt could have meant that the focus remained on barley, especially as its potential export market to Iceland and Shetland. In these Northern areas bread could be dispensed with, but the availability of beer for hosting feasts was a necessity for social advancement. Orkney may have been the first provider of the raw materials for the beer produced or drunk in Iceland and Shetland. Another potential reason that rye (but especially the three-field system that accompanied its production elsewhere) was not popular in Orkney could have been the labor demands. If Orcadian Svein Asleifarson's way of life described in Chapter 3 is a true reflection of the lifestyle of well-to-do Farmer/Vikings in Orkney in the twelfth century, then the seasonal round really only allowed for one planting and one harvest. If much of the potential labor force was off "viking" (raiding or warring) or engaged in maritime pursuits during a Spring and Fall trip, as Svein and his men allegedly were, this would make it very difficult to muster the labor needed to double the amount of communal labor devoted to agriculture.

Outland Use

Outland areas were very valuable to the North Atlantic farm. It was here that communal grazing was done, wild plants collected for food and technological uses, turf and peat cut and hauled back to the farm, and where shellfish bait was collected. In Scandinavian homelands, forests would have also been a much-used part of the outland. In Orkney, the sea became an extension of the outland as well, where seabirds and eggs could be collected along with fish, seals, and whales.

Many of the wild and weedy species identified from the archaeobotanical record are edible, or otherwise useful for medicines, textile dyeing, etc. Some of these uses have been mentioned or briefly discussed earlier. I have chosen not to place much emphasis on the uses of uncultivated plants, because the presence of these seeds in the contexts in which they are found at Quoygrew does not suggest that these plants were primarily gathered for these purposes. Quoygrew's contexts do not include latrines or preserved human feces that could give direct evidence of human diet. There are also no large concentrations of wild or weedy seeds that might suggest intentional gathering and storage of these seeds.

Based on ethnographic accounts, edible plants and seeds were probably frequently consumed, especially during certain times of the year, or in times of food shortages. Berries, including crowberry, were likely eaten, and the arable weeds harvested with grain were probably used for supplementing human or animal food supplies (Fenton 1978). However, we do not see evidence for or against this in the carbonized plant record at Quoygrew.

Absent from Quoygrew are some gathered remains commonly found at other Viking Age and Medieval sites from the period, including hazelnut, fruits and berries (with the exception of crowberry, *Empetrum nigrum*). Although it is possible that this relates to the status of Quoygrew and its location, it is just as likely that these remains were not identified because of the preservation conditions at Quoygrew (which did not include latrine contexts or any waterlogged materials) and/or because of the sampling strategy used, which did not consider heavy fractions, where more dense materials such as fruit stones and nutshell may well have ended up.

Wood was another valuable outland resource and a big difference between the North Atlantic Islands and Scandinavia was the lack of tree resources. Although wood is rarely used as fuel in the islands, wood artifacts are found when conditions are right to preserve them and show that wood was often imported, not only as finished pieces but also to supply local woodworkers. At the high-status site of

Tuquoy on Westray, excavation of waterlogged contexts has shown that pine flooring was used in the main building, and unfinished wood items like spoons and bowls show that woodworking was occurring at the site (Dickson and Dickson 2000). Imported birch bark, cork and wood tar were also found at The Biggings site on the island of Papa Stour in Shetland (Dickson and Dickson 2000). Non-native woods found at sites in the Orkney Earldom include pine, oak, ash, maple, and beech. These are likely to have been imported from Norway or from Scotland.

Wood analysis was not done at Quoygrew. Although some wood charcoal was present in the samples, the size of the pieces was in general very small, and included much that was likely to be woody twigs, heather and other small woody plants rather than larger pieces of wood. Driftwood would also have provided a source of wood fuel and may have provided a local source for workable wood.

Seaweed is common at sites in Orkney and Shetland, and was used for many things on the islands, including food, fodder, fuel, and fertilizer for the fields (Fenton 1978). Relatively robust fucoid seaweed (possibly *Fucus vesiculosus*) was found carbonized in low amounts in many areas and phases at Quoygrew, but was particularly dense in the fish midden, where it was probably carbonized due to activities related to fishing and processing of fish livers for oil. It may have been used as a fuel (Hallsson 1964) for fires used to boil livers for oil or to smoke and dry fish, or have been discarded as waste into the fire (perhaps while baiting or cleaning lines).

The other context that contains a very dense assemblage is context G101. This context may be comparable to similar, roughly contemporaneous contexts identified from The Biggings site on Papa Stour, Shetland, and at the Brough of Birsay, Orkney (Dickson 1999; Donaldson 1989). These contexts are shallow, unlined pits where large assemblages of carbonized fucoid seaweed have been identified. In later periods, similar sized stone-lined pits have been identified which relate to seaweed burning for the production of kelp ash, used in the industrial production of glass. However, these earlier charred-seaweed-filled pits have been interpreted by Dickson (1999) as lye pits, where water was leached through the carbonized seaweed to produce a caustic liquid, which could then be used for scouring wool in preparation for dyeing, or, in addition to slaked lime and fats or oils, turned into soap for washing or fulling cloth. Peat was the most likely fuel source used to help burn the seaweed, and heathy turf with sods from damp areas could have been used to damp down and prevent total combustion of the seaweed ashes. This combination accounts for the remains found at The Biggings (Dickson 1999), and would also account for the few seed remains seen in Context G101 at Quoygrew.

Sheep were certainly present at Quoygrew, and this interpretation would make sense as a source of lye for household soap and wool textile production. An alternative use for the lye that could have been produced using this pit would be for making *lutefisk*, a Scandinavian dish prepared by soaking stockfish in lye. Although direct evidence of this use is lacking, stockfish were certainly produced in abundance during Phase 2-3 at Quoygrew.

Some terrestrial hunting took place in the Orkneys, probably on larger islands or Mainland. A few red deer bones have been found in the middens at Quoygrew, only from late in Phase 1 (Harland 2006). Seal is more common in the middens, suggesting that seal was hunted regularly. Many of the seal bones in the middens at Quoygrew show signs of carnivore gnawing. Seal meat may have been used as dog food, while the hunting was primarily for the seal skin or for oil (Harland 2006). According to Amorosi et al. (1998), seal fat was also used to supplement livestock fodder. It seems that seal meat was not a preferred human food, and was eaten only during times of dearth.

Seabirds and egg shells are found at many Viking/Medieval sites in the Orkney Earldom, as well as in the Faroes, Iceland and Greenland (Dickson and Dickson 2000). Feather down (especially Eider down) would have been a luxury and potential trade item that could be collected from the outland regions during birding expeditions (Kaland and Martens 2000). At Quoygrew, bird bones are present throughout the middens of the site but are never common. Most of the bird bones are from wild birds that were most likely exploited seasonally during the breeding seaon. Gannets were common in the fish midden at Quoygrew only. The nearest place where these birds could likely be obtained is Sule Stack, approximately 86 kilometers from Quoygrew. The location of the gannet bones in the fish midden suggests that these birds were considered a marine resource and likely caught during deep water fishing excursions (Harland 2006).

Shellfish were also utilized at Quoygrew, and there is evidence of intensification of shellfish use in association with increases in fishing activity from Phase 1 to Phases 2 and 3 at the site (Milner et al. 2007). The most evidence for shellfish use is use of limpets (*Patella* sp.), which show size and age reductions consistent with increasing intensification of use during the eleventh and twelfth centuries. The most likely use of shellfish at the site is for baiting hooks to catch cod, or for ground-baiting, where shellfish are crushed and added to the water to attract saithe. Secondarily, the shellfish may have been used as human food (Milner et al. 2007). In ethnographic accounts, shellfish were used by the poor and by everyone in times when other food was hard to acquire. A saying for being reduced to poverty in Orkney is "to gang i' da wylk ebb," a reference to subsisting on gathered shellfish (Fenton 1978: 542).

Fishing at Quoygrew

Along with agriculture and pastoralism, fishing was a third aspect of economic production at Quoygrew that intensified over time. This mirrors changes taking place elsewhere in the North Atlantic, and especially in the Orkney Earldom during the Viking/Medieval transition. Fishing in Orkney first changed when Norse settlers arrived. Before this point, most all fishing was done from shore or close to shore. The Norse settlers brought with them techniques for catching deeper-water fish like cod and other gadid-family fish. Proportions of these fish increased in middens between Iron Age and Viking Age contexts. In Iceland, there is evidence for fish trade between coastal and inland settlements from the earliest periods (McGovern et al. 2006). During the Viking/Medieval transition, there is a second increase in the proportion of cod-family fish caught and reduction in saithe and other shallow-water fish that occurs around 1000 A.D. This has been termed the "Fish Event Horizon" and has been observed in many archaeological sites around the North Atlantic (Barrett 2003; Harland 2006; McGovern et al. 2006). In many areas of the North Atlantic, specialized or semi-specialized fish middens containing shell and bone appear during the transition (Barrett 1997; Barrett et al. 2004; Cerón-Carrasco 1998). Sizes of the fish caught also changes during the Viking/Medieval transition, with a new focus on fish between 800 mm and 1000 mm in length. This new size preference is thought to relate to requirements of processing the fish for drying (Harland 2006).

The increase in fishing at Quoygrew is likely tied to the intensification in fishing and the rise in fish trade taking place in Europe during the Early Medieval period (Barrett et al. 2004). This could have been related to the spread of Christianity and new fasting regulations that increased demand for storable fish. Dried fish was also an important resource for provisioning military expeditions (Perdikaris 1999).

Fish bone evidence from Mainland Orkney suggests that the site of Earl's Bu may have functioned as a center for dried fish distribution. Most of the fish bone found there suggests the site was a consumer of dried fish and not a producer, but it is likely that much more fish was coming into the site than was needed for consumption at the site. Much of the dried fish was likely being exported (Harland 2006). Perhaps Quoygrew's fish were being imported to Earl's Bu, perhaps via the Earl's farm at Rapness on Westray, and from Earl's Bu exported to Europe.

Strengthening market economies meant that specialization of production became more feasible during this period than it had been before. This strategy was used in northern Norway, where "it [became] possible for farmers to give up marginal agriculture and exchange the abundant cod for imported cereals." Seasonal fishing villages from this period in Northern Norway have been excavated (Perdikaris 1999:395). No such specialization seems to have occurred at Quogyrew. Fishing for deep water gadid species clearly increased between Phase 1 and Phase 2-3 (Harland 1996), but not at the expense of cereal agriculture or dairying.

Fishing is tied to other aspects of production at Quoygrew by both its inputs (fishing lines of linen or horsehair, sails made of textiles, fuel requirements of processing fish livers for oil, and generating salt for fish preservation, shellfish as bait) as well as by its outputs (fish waste used as fodder supplement, potentially included in soil amendment, certainly some ash produced by fires used as soil amendment). Although it is likely that linen textiles and fibers were needed to provision fishing boats and tackle, flax production (as measured using the imperfect indicator of flax seed presence in the carbonized plant record) seems to remain stable from Phase 1 through later phases.

Fuel Gathering

Fuel was arguably the most important terrestrial gathered resource needed at Quoygrew. Turf and peat were important fuel sources in the virtually treeless environment of the Orkney Islands, and would have needed to be gathered, processed, and stored for use (Fenton 1978). Peat is the more efficient of the two fuels, but turf burns more slowly and produces more ash, which can be an important component of fertilizer to increase soil fertility. In practice, the two fuel types often grade into each other environmentally, and could be used together in proportions that varied with the purpose of the fire (Church and Peters 2004; Lowe 1998)

In a midden context where remains from many fuel types are likely to be mixed, determining differences between varieties of fuel is very difficult. Allan Hall (2002) has published a list of "turf indicator" macroremains likely to occur when turf is being utilized, and many of these species are present in contexts from Quoygrew. Seeds in turf used for purposes other than as fuel are less likely to survive, because they are less likely to be carbonized, although it is possible that seeds in turf roofing material can fall into a fire, or be burned in place (Dickson 1998). It is also possible for heathland fires to contribute carbonized plant remains in instances where turf was not directly burned as fuel.

According to the carbonized plant remains alone, plant assemblages in hearth contexts appear to become more diverse in terms of the environments represented over time. This could indicate more turf fuels being used in these contexts over time.

However, only a few hearth contexts have been sampled, and trends may be different if more hearths or other controlled fires were included. The midden contexts, while perhaps providing a broader view of fuel use across the site, are difficult to interpret because each individual midden context is more likely to contain a mixture of fuel types. Not only can we be seeing several of fuel types in one fire, we could be seeing the combination of waste from several heaths resulting from different activities, and over a much longer time frame.

There are some possible environmental consequences to the harvesting of peat and turf at Quoygrew, and management strategies may have been used to preserve these resources, as were in place in later periods. More discussion of this topic will follow in Chapter 7.

Chapter Summary

In this chapter I have used the archaeobotanical material at Quoygrew in conjunction with other data from the site provided by other specialists to outline what sorts of activities and production was taking place at Quoygrew, and ways in which these activities might have been affected by the Viking to Medieval transition. I have outlined production at the site, and have established a context for Quoygrew's production in relation to other farms in Orkney and elsewhere in the North Atlantic and Northern Europe. In the final chapter of this dissertation I discuss the meaning of these changes in production in terms of larger socio-political and economic changes taking place in the region.

Figure 6.1. Barley and Oat Density by Phase (Midden Context

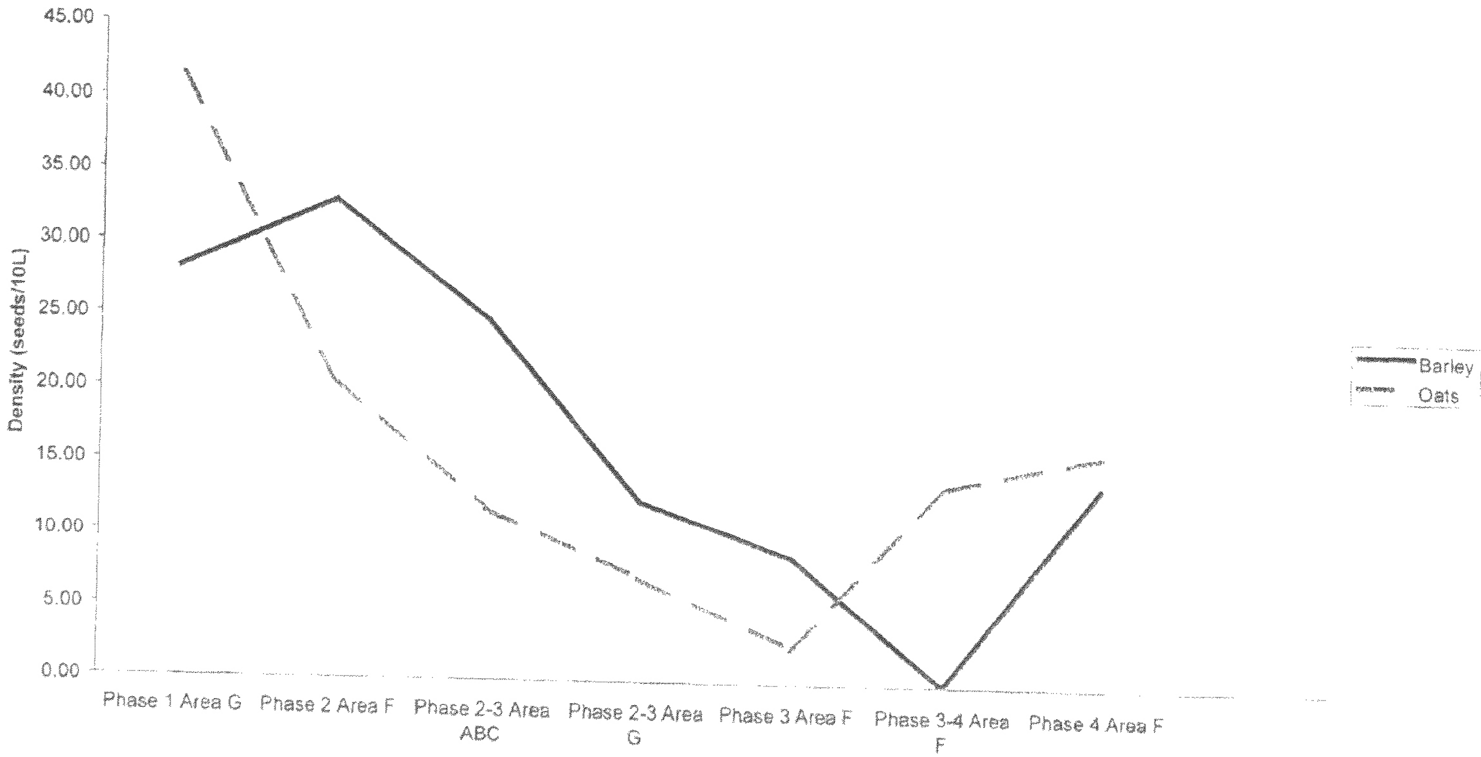


Figure 6.2 Density of Barley and Oats by Phase (Non-Midden Contexts)

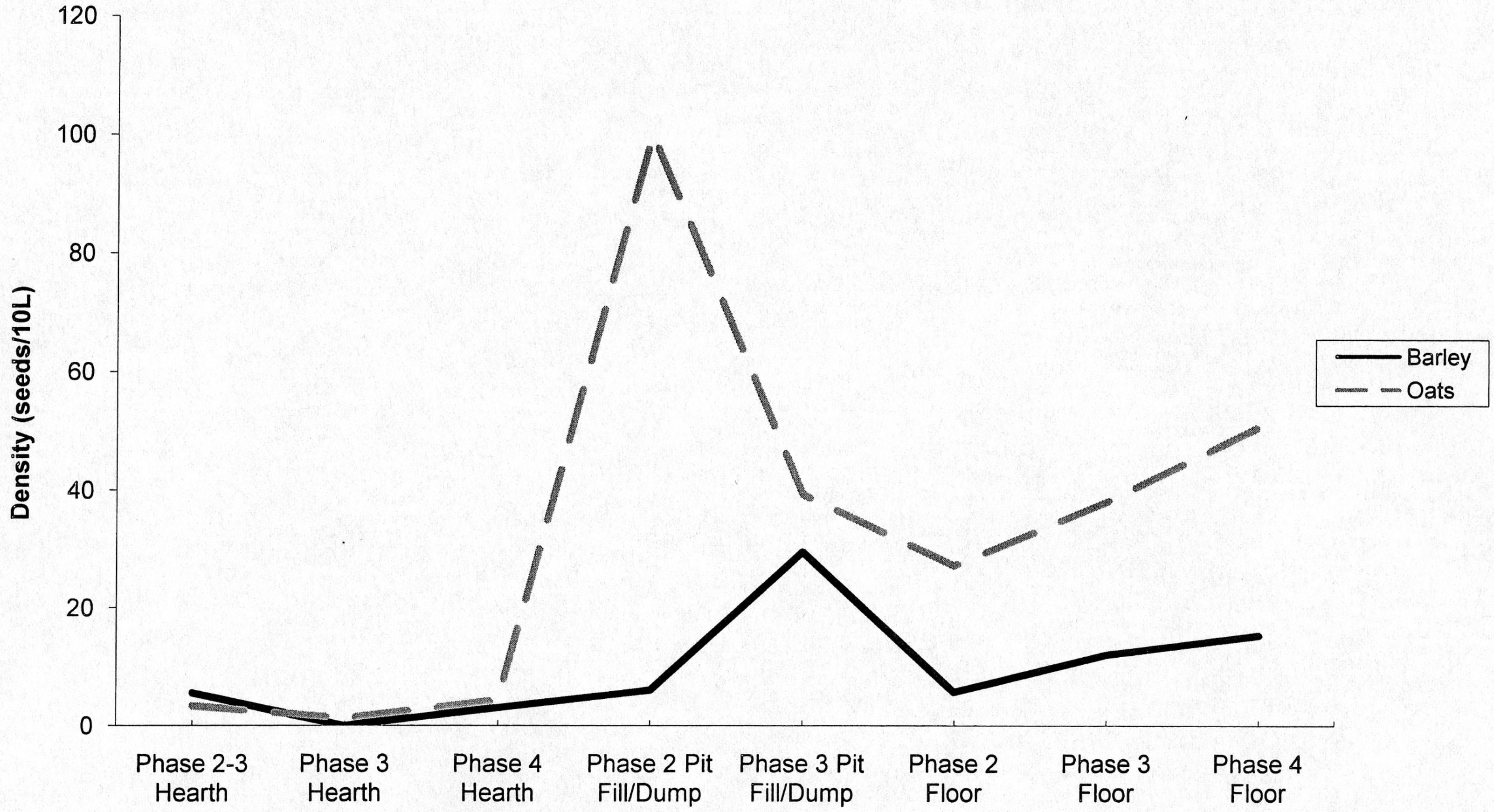


Figure 6.3 Barley % Dominance by Phase and Area (Midden Contexts)

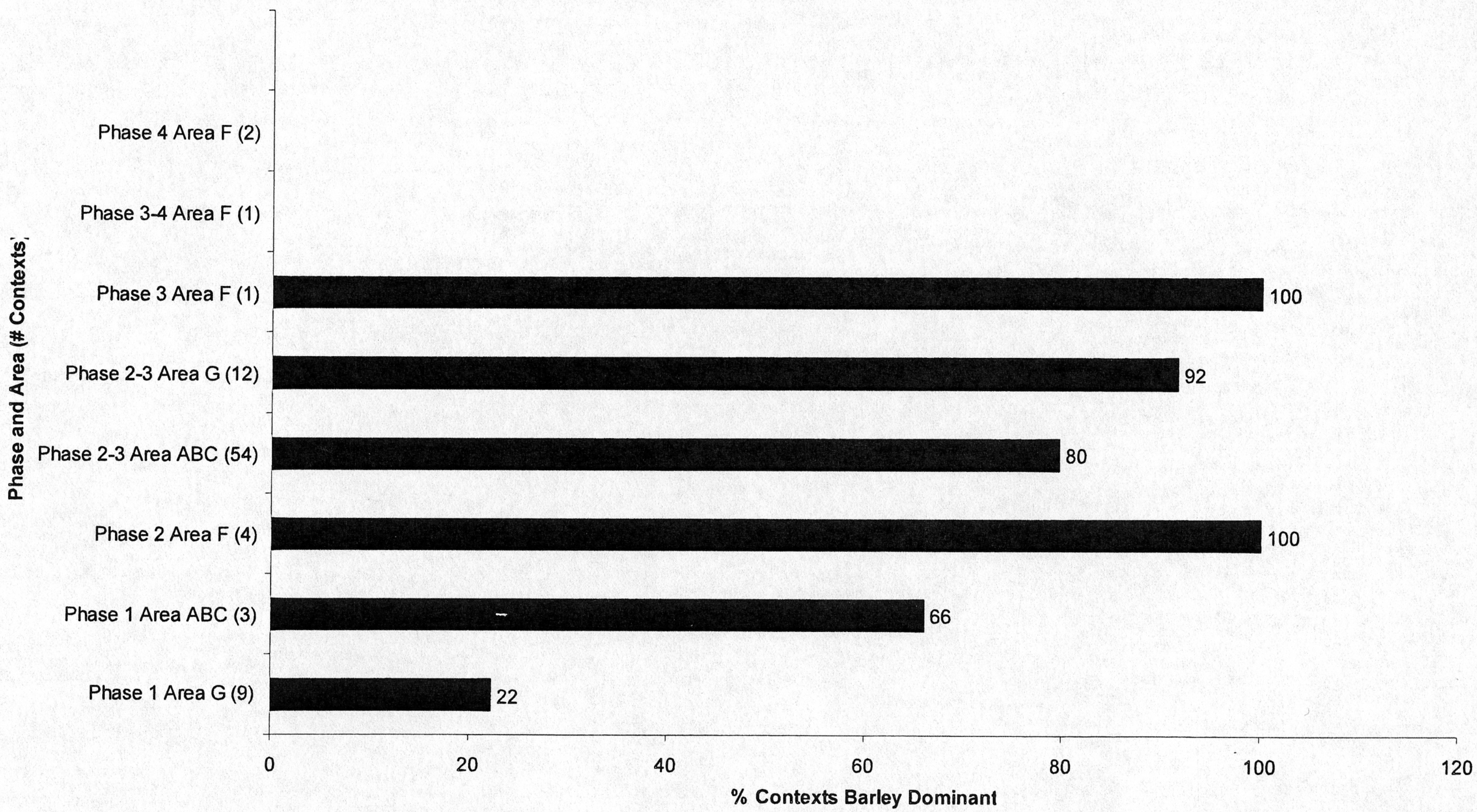


Figure 6.4. Barley % Dominance by Phase and Context Type (Non-Midden Contexts)

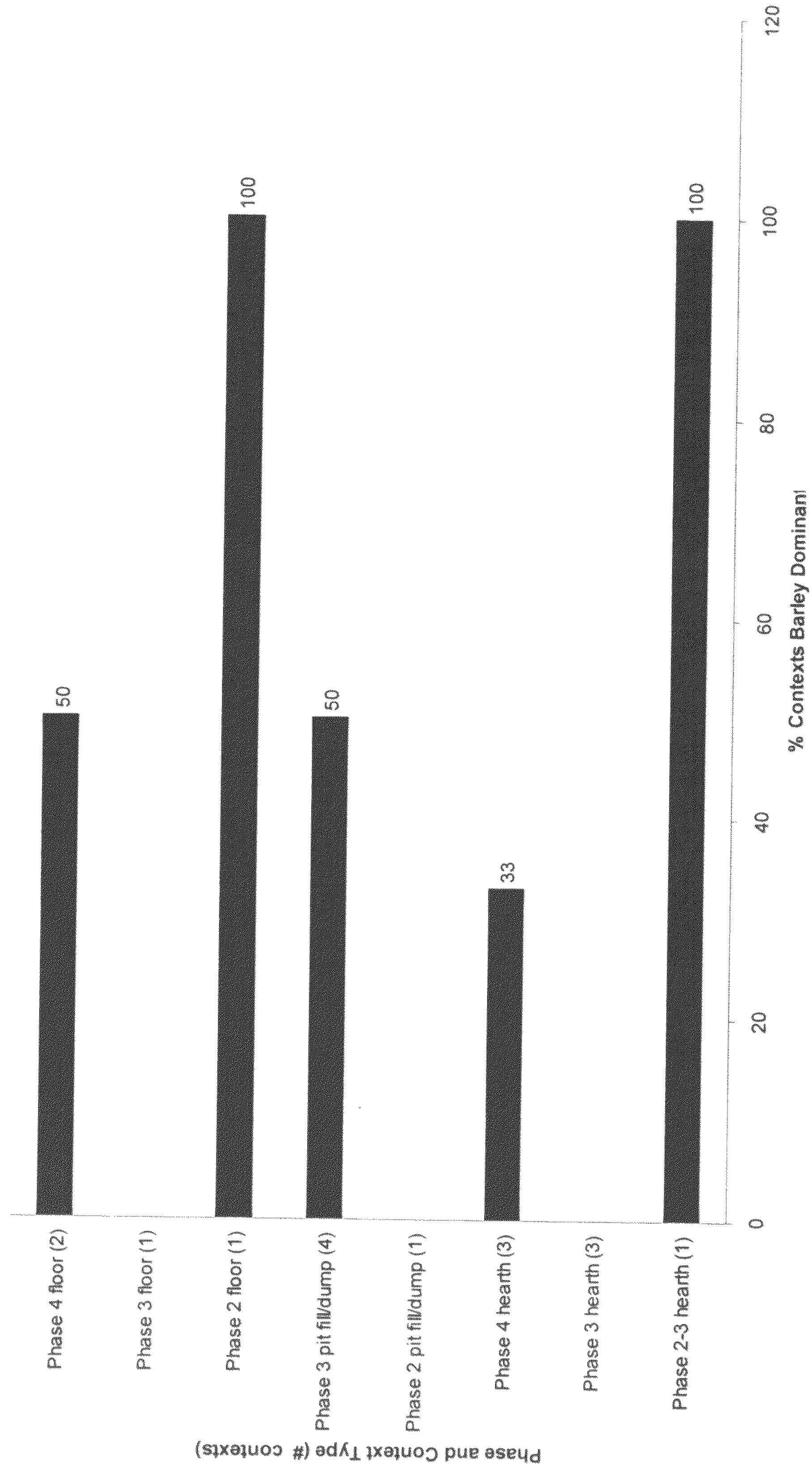


Figure 6.5 Arable Taxa Height in Centimeters

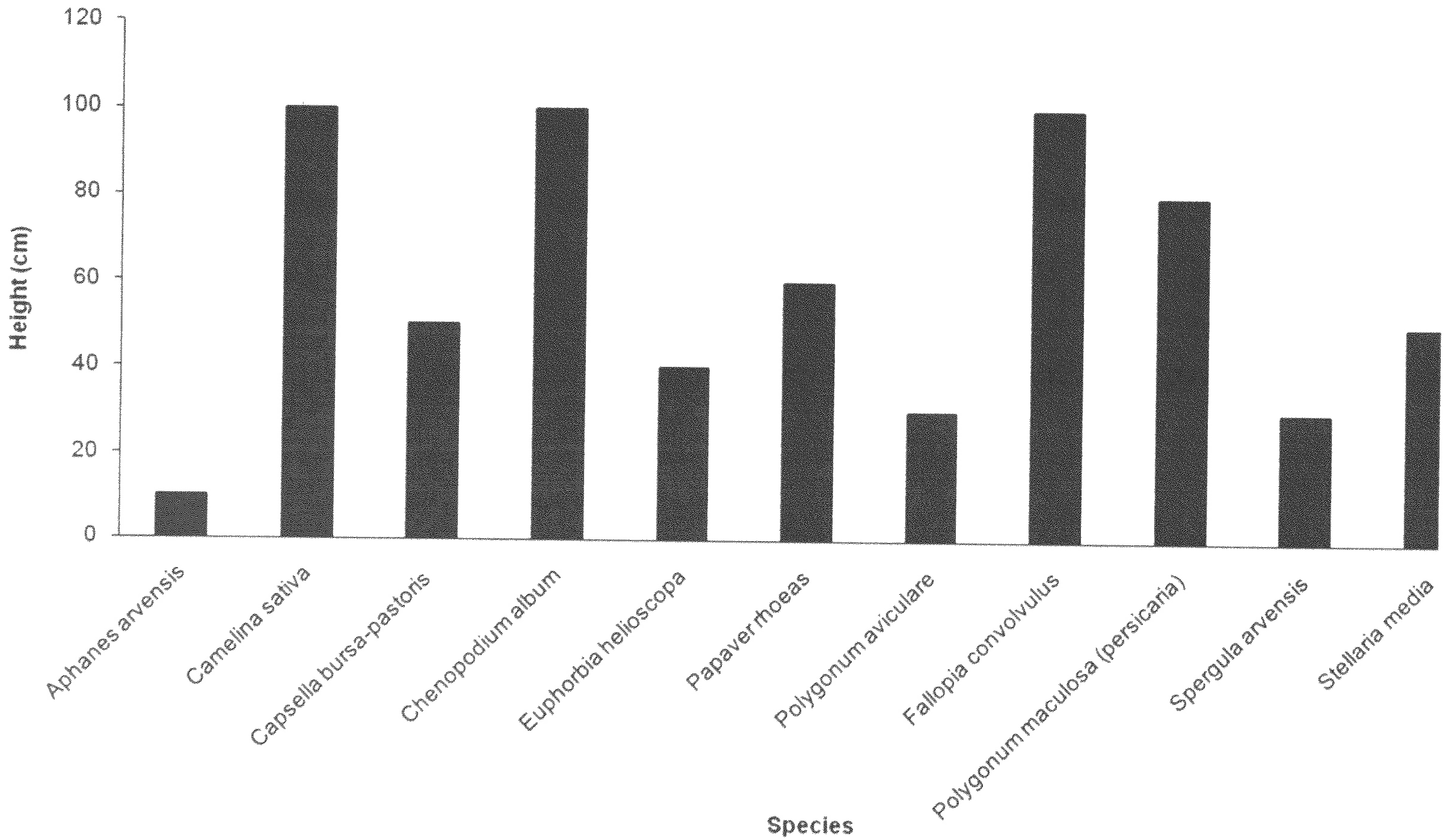


Figure 6.6 Diagram of Flinging (following Viklund 1998:63)

Figure 6.7 Grassland Species Height in Centimeters

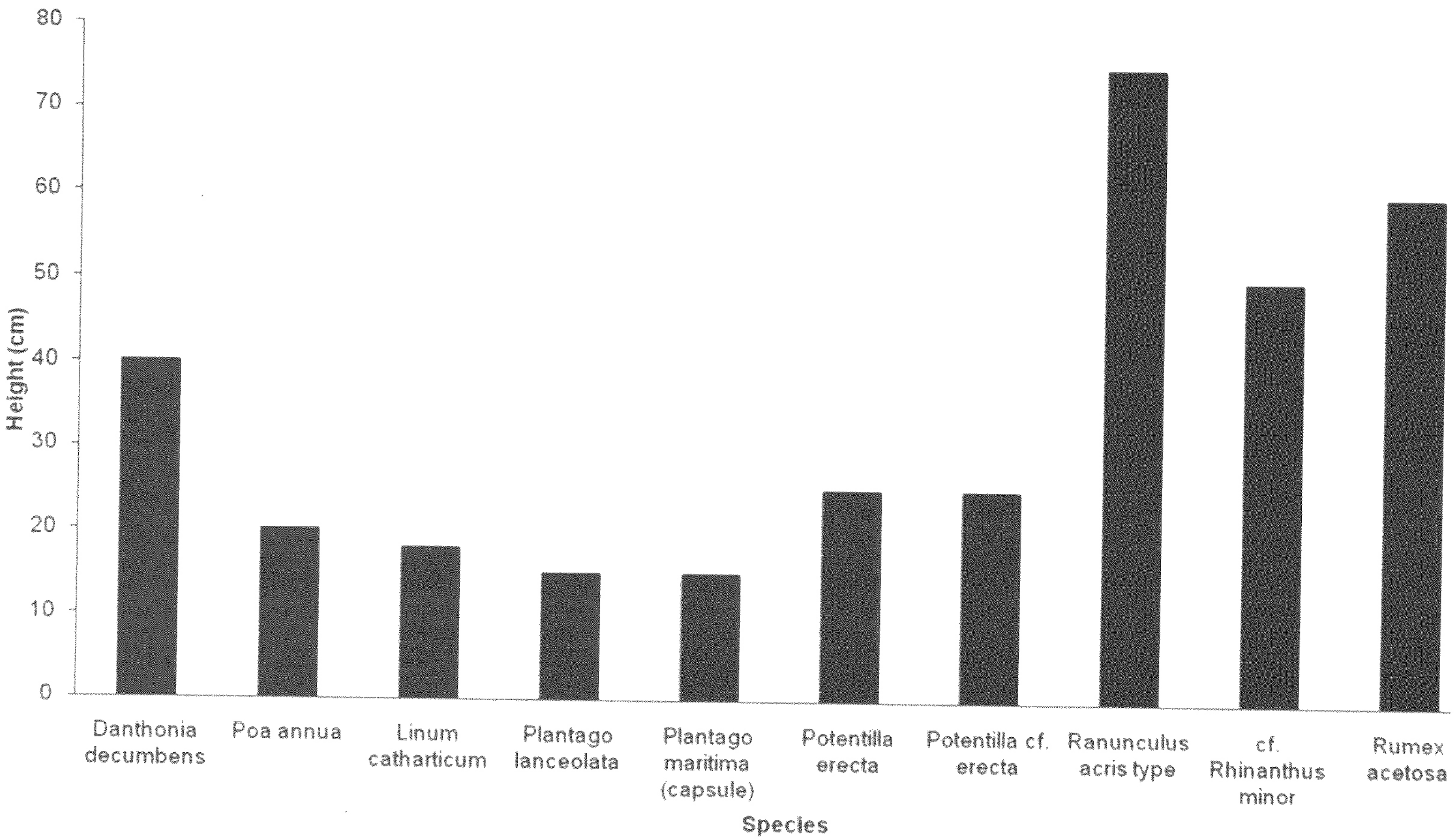
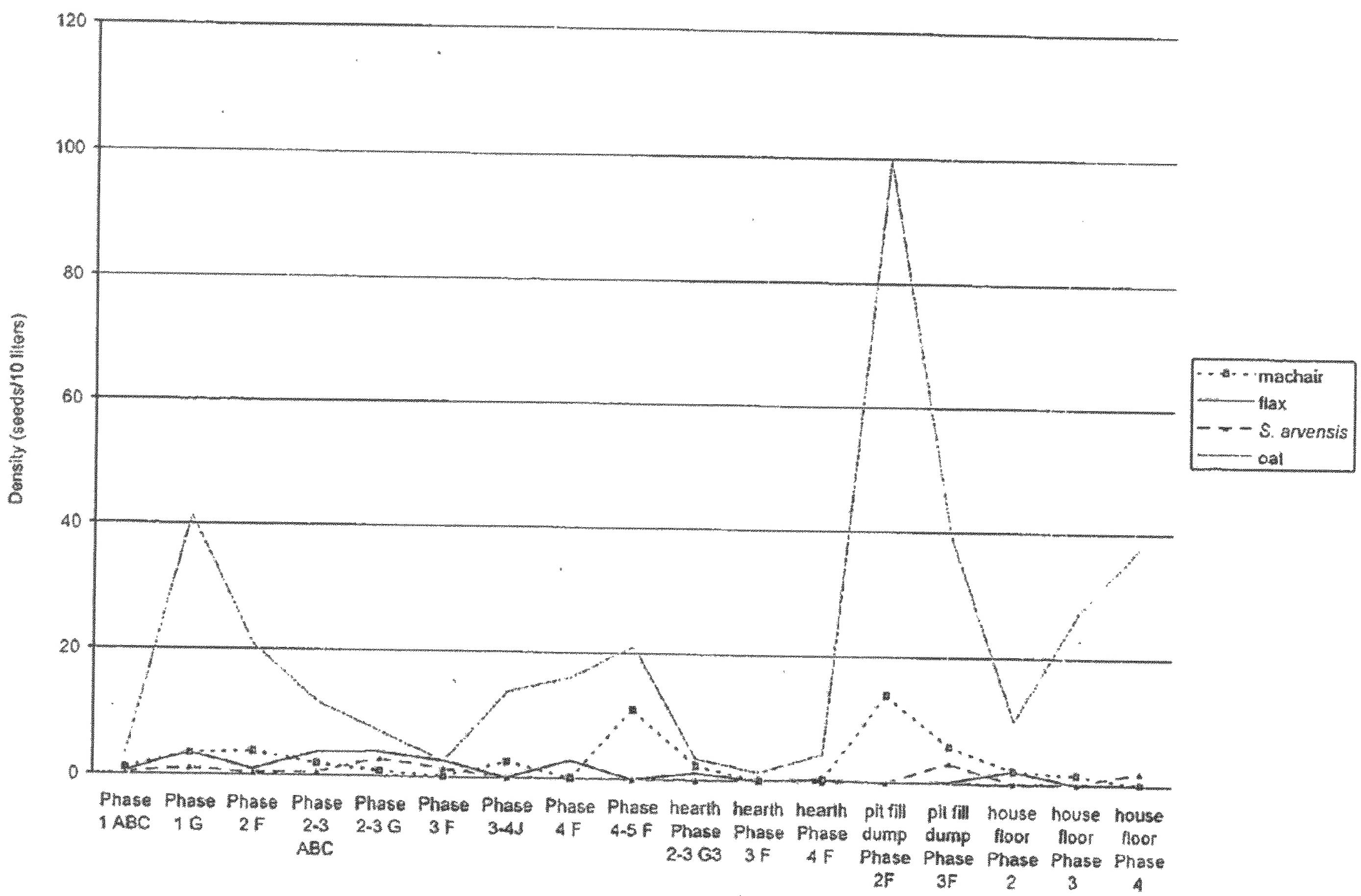


Figure 6.8 Machair Taxa and Associations with Oat, Flax, and *S. arvensis* Density by Area and Phase



CHAPTER 7:
SURPLUS PRODUCTION AND SOCIO-POLITICAL CHANGE DURING THE VIKING/MEDIEVAL TRANSITION

In this dissertation, I have analyzed carbonized plant remains from the Viking/Medieval farm of Quoygrew, and used archaeobotanical data to describe plant use at the site, as well as activity associated with all aspects of surplus production. I have also discussed the relationship between plant and other environmental resources used at the site and the farm's production of surpluses of cereal, dairy and fish products. My results emphasize interconnection between areas of production.

In addition to highlighting how production increases were obtained at Quoygrew, the results of this dissertation can also be used to show the close relationships between surplus production and the social and political changes taking place during the transition. As an ecobiography of Quoygrew, the strategies Quoygrew's farmers used to negotiate their way within the shifting social, political, and economic structures of the transitional Viking/Medieval world have been of prime concern.

This final chapter provides an examination of relationships between surplus production at the site and aspects of the changing socio-political landscape of the Viking/Medieval transition by addressing the five research questions posed in Chapter 1. These research questions relate to the reciprocal relationship between production changes and socio-political changes at Quoygrew.

How is Production at Quoygrew Related to Increasing State Administration Practices?

During the Viking/Medieval transition, state administration of production increased throughout the North Atlantic. This accompanied a shift toward internal financing, wherein leaders began to look to their subjects and the production of their subjects for support rather than basing their rulership on financing obtained by raiding or tribute from regions outside of their direct control.

Elsewhere in the North Atlantic, this shift took diverse forms. In Scania, state leaders relocated farmers on the landscape and established new villages to increase production and to make assessment and collection of taxes easier. In Iceland, empty landscapes filled in a less controlled way based upon farmer experimentation. In some regions, especially in the far north of Norway, communities specialized in the production of a single market commodity, usually dried fish in coastal regions and iron in forest regions.

In Orkney, external exploitation through loot from military campaigns and through wreckage salvage and profits made from provisioning and/or taxing foreign merchant ships probably continued for longer than it did elsewhere in the North Atlantic. The availability of much of this kind of financing was a consequence of the location of Orkney in relation to the rest of the North Atlantic world. Taxation was established, however, and was occasionally resisted as discussed in Chapter 2. There is no indication of forced relocation or state founded villages in Orkney. Quoygrew was occupied continuously from its establishment and throughout the Viking and Medieval Periods.

At Quoygrew, increases in arable seeds and machair (sandy naturally fertile lands) seeds over time indicate that agricultural production and land use increased at the site over time. This coincides with the introduction of areas of heavily fertilized and otherwise amended soils close to the site. Fishing and shellfish collection are shown to have increased, and it is likely that dairying increased at the site according to zooarchaeological analysis of mammal bones (Harland 2006; Milner et al. 2007). These increases are likely to have accompanied the introduction of taxes and tithes in Orkney, which made it necessary for many farmers to produce enough surplus to meet tax obligations from the state and the church.

The system of taxation established in the Orkney Earldom, which determined a level of taxation based upon a farmer's proportional share (pennylands) of a fixed portion of land (ounceland), may have provided incentive for farmers to reclaim lands for agriculture to increase the proportion of ounceland land that could be used for production. At Quoygrew seed remains suggest that both infield and outfield use increased from early phases to later phases.

Early harvesting at Quoygrew is evidenced by the presence of carbonized unripe (green) grain, which has a distinctive appearance. It is possible that this early harvest is a consequence of farmers' strategies for subtly resisting taxation or rents by taking advantage of crops before they are assessed. This could have been a reaction against taxation, or against rent required by tenant/landowner relationships.

However, there are other explanations for the presence of green grain in the record such as risk aversion (to avoid losses caused by late fall weather), a reflection of the preference for green grain in certain dishes, or for animal fodder.

Specialization of production does not seem to have been a strategy utilized at Quoygrew. Throughout the period of intensification, it seems that all areas of production are maintained and augmented. Fishing does not replace or overcome agricultural production or animal-based dairy and wool production. This maintenance and intensification of multiple lines of production was likely to have had the consequence of making Orkney more self-sufficient and autonomous, and may have been one reason why heterogeneous leadership could be maintained in Orkney in the face of increasing outside state control from Norway and Scotland.

How do Changes in Household Structure and Increases in Social Stratification Affect Production at Quoygrew?

During the Viking/Medieval transition the trend in both towns and rural areas was towards smaller households and greater stratification between landowners and tenant farmers. Whereas during the Viking Age, households were large and servants, slaves and members of extended family were subsumed within one productive unit, in the Medieval period each household was responsible for its own production (see Chapter 3).

There were also trends toward stratification of households, with kings, earls, landowners, tenants, cottagers, and migrant labor occupying different social strata.

Although archaeological evidence does suggest that there are differences between high status sites, like Tuquoy on Westray and Earl's Bu on Mainland, Orkney and sites of moderate status like Quoygrew, most of these differences are matters of quantity rather than quality. For example, high status sites tend to have more pigs, but pigs were kept at Quoygrew as well, just not in as great quantities (Harland 2006).

There are very few differences between sites of different status in plant remains. Wheat is sometimes considered a high-status grain that was likely imported to Orkney, yet it too is present at Quoygrew, but only in the fish midden, an unlikely place for a high status grain to be found. Some of the other imported plant materials exclusively found at high status sites may be overrepresented there and underrepresented elsewhere because of differences in building architecture and plant deposition between the sites. Conditions at many of the high status sites are better for preservation by waterlogging. Some high status sites and urban areas include excavated latrines and other areas where human waste was deposited, and where plants that would not have regularly been exposed to fire, like berry seeds, walnut shells, and fruit stones collected and were preserved (Dickson and Dickson 2000; Geraghty 1996; Griffin 1998; Krzywinski 1983).

At Quoygrew, one of the most interesting conclusions that can be drawn using plant data is that the shore midden, interpreted as a specialized fish midden where maritime waste was deposited, is in fact only semi-specialized. This midden, which begins to form in Phase 2 does contain fish bone, shells and seaweed in greater proportions than elsewhere at the site. It also contains crop processing waste, cereal grains (including the only examples of wheat at the site), and flax, which are unexpected if the area were being used solely for maritime activity. It is possible to suggest, based on analogy with saga evidence, that this fish midden may have been the locus of activity for a separate household, perhaps freed slaves, servants, or tenants who spent most of their energies pursuing production of fish oil and dried fish for the main household, but were also engaged in food production and possibly fiber production separately from the main household. Because of the close proximity of the two areas, substantial overlap in daily life was likely to occur. This would fit the pattern of labor organization known from sagas and late medieval documents, where cottagers living close to a major farm would be expected to provide service as well as rent to their landlords. The presence of crop processing waste, grains and especially flax in the "fish" midden is an extremely interesting find that at least complicates the conclusion of micromorphologists that the fish midden is "best interpreted as a specialized fish-processing area with intermittent but regular activity" (Simpson et al. 2005:368).

What Are Power Structures Like within Households? What are Gender Roles and How Does Gender and Labor Distribution Affect Production?

Managers of large farms are likely to have remained responsible for many decisions involving not only their own farms but also the landscape surrounding them. Before the Viking/Medieval transition, farms were managed as single large households with many laborers, both family members and servants and slaves under the direct control of the household heads, and supported year-round by the resources of the household (Byock 1988).

As the Viking/Medieval transition continued, tenant relationships developed and smaller households became more independent and self-supporting, while retaining ties based upon continuing labor requirements and the extension of credit by landowners to tenants (Byock 1988). Although it is possible that this increased the autonomy and agency of tenant farmers, who were perhaps able to exert more control over their means of subsistence, it also absolved the larger landowning households of responsibility for providing subsistence to their labor sources in times of dearth, a situation that hardly favored tenant farmers and cottagers (McGovern et al.1988). It is also uncertain how much control tenant farmers were able to maintain over their daily activities, and whether decisions about farm management were really theirs to make, or if rather major decisions like the amount of livestock to overwinter were made by their landlords. Although there is little conclusive evidence at Quoygrew for shifts of this kind, the fish midden evidence does suggest there may have been two household foci during Phase 2-3, with one having a greater maritime component.

Gender roles during the Viking period especially were quite flexible, and there is evidence from sagas and from grave goods in burials that farm managers were often female (Clover 1993; Dommasnes 1991; Jesch 1991; Stalsberg 1991). Some aspects of farm production, such as textile production, dairying, and malt production are nearly always associated with women, and fishing is nearly always associated with men. Elsewhere in the Medieval Northern Europe, textile production became more commercialized with the rise of urban centers, and in many areas fiber was processed to a certain point and then exported to towns to be finished into dyed and fulled cloth and returned as an imported item (Walton 1997). At Quoygrew, botanical evidence in the form of flax seeds and burned seaweed-containing features interpreted as lye pits suggest that linen and wool production occurred at the site. The presence of woad suggests a finishing process that would ordinarily be conducted in urban centers may have been at least attempted at Quoygrew. Finds of spindle whorls and a weaving batten are other evidence that suggest local production not just of raw fiber, but also of textiles at the site (Barrett in press). Although it is difficult to use flax seeds as a good estimate of flax production, the relative abundance of flax seeds at Quoygrew as compared to other sites in the Orkney Islands, and the presence of low but consistent levels of flax in most contexts and phases indicates that flax was likely an important crop at the site. Women were likely involved in managing this resource, and the consistency of flax throughout time implies that flax production was never superceded by other production concerns.

Although the introduction of Christianity was likely to have reduced the gender flexibility present in the Viking Age, and may have resulted in a reduction of the female sphere in the medieval Northern European world, at Quoygrew there is no evidence in the paleoethnobotany that indicates any relative reduction in production of those products traditionally associated with women. Although fishing, a traditionally male pursuit, does increase in importance at the site, it does not appear to do so at the expense of female-centered production areas, such as textiles, dairy products, or cereal production.

Increases in dairy production as evidenced in the archaeobotanical record by increases in the use of oat as fodder may have meant that women gained some additional power within the household via sale of surplus dairy produce. Women were more involved in management of this resource, as animals, especially cattle, were typically the responsibility of women according to saga descriptions. Women also would be involved in the production of staple goods like cheese and butter from dairy products. It is probable that additional female labor from slaves (early in the period) and tenants or cottagers (later in the period) was required for larger-scale textile production and dairying activities taking place on a landlord's farm, but that these activities were also pursued by females from tenant and cottager households using their own individual resources as well.

Children were also a valuable source of labor for most farms, and children were, according to ethnographic analogy, especially useful for making use of outland resources, by gathering wild plants for food or technological purposes, collecting shellfish for bait, and for cattle- and sheep-herding (Fenton 1978).

How is Production Influenced by Increasing Trade Networks and the Rise of Urban Centers?

The introduction of taxation had the effect of increasing surplus production at every farm large and small. A valid question to pursue is where all of this surplus went. At Quoygrew, fish bone evidence suggests that while fish were locally consumed at a higher rate in later phases, that some processing for export was taking place (Harland 2006). The fiber and textiles produced at Quoygrew, along with dairy products and cereals and possibly malt, were also likely traveling off of the site, and some imported items like steatite (soapstone) vessels, whetstones, iron implements, and some pottery (in later phases) were being imported to the site.

Because involvement in trade networks is so important to the development of local power relationships and to control of information about markets, prices, and demand, it is important to know whether Quoygrew managers had direct access to trade networks, or whether their produce was collected and distributed by others. Unfortunately, this information is not visible archaeologically. Based on the saga evidence about Westray during the middle of the twelfth century, it is possible that Quoygrew was sending the majority of their produce, at least the part claimed for tax, to the site of Rapness at the far south of the island, an area managed by a representative of the Earl.

It is also possible that trade was conducted and surpluses sold to one of the other large landowners at Quoygrew, perhaps to Helgi who owned a large farm near where the modern town of Pierowall stands today. However, it is not outside the realm of possibility that direct trade between Quoygrew managers and passing merchants took place, or that managers from Quoygrew were able to make their own trade contacts during visits to other areas of the North Atlantic. It is probable that, like so many other aspects of socio-political relationships, relative power of Quoygrew's managers and access to trade partnerships varied over time.

How is the Local Ecology Impacted by Increasing Surplus Production?

Increasing production at Quoygrew put increasing pressure on outland resources, especially grassland (used for turf fuels, amending agricultural soils, and for grazing), peat (used for fuel) and shellfish (used for bait). Analyses of shellfish have shown that intensified shellfish collection during later phases at Quoygrew effected the size of some limpets deposited in the site's fish middens (Milner et al. 2007). Paleoethnobotanical evidence shows an increasing diversity of plant remains preserved in later hearths when compared to hearths from earlier phases at the site. I suggest in Chapter 5 that this result may be related to a shift from hotter-burning peat towards less efficient turf fuels. In Iceland, control of peat is shown to have taken place. Early settlements that became high status farms were increasingly often able to control smaller farms' access to peat resources. On Westray, peat is localized in the southeastern portion of the island (Sharples 1984). It is unlikely coincidental that the major source of peat on the island is located in closest proximity to the high status farm of Rapness, and that this farm was claimed as Bordland by the Orkney Earls and run by administrators. It is likely that peat cutting on the island was managed by the Earl's administrator and may have been controlled, especially if managers could recognize negative effects of increasing demand on the island's (or perhaps especially, on Rapness farm's) limited peat resources. Management may explain why peat is still present on the island today despite evidence suggesting that Quoygrew's occupants switched to using less efficient fuels during later phases.

Access to outland resources was one source of constant dispute between tenants, landowners, and state officials. Farmers were very concerned with guarding their rights to outland resources, including the foreshore, which can be seen in the present retention of aspects of odal law related to ownership of the foreshore and its resources. Often farmers were willing to grant other concessions to Earls and kings in order to retain their rights in the outland.

Conclusion

This dissertation is an example of how paleoethnobotanical data can be used to better understand all aspects of surplus production at a site, and not merely agricultural production and gathered resources. Further, I have shown that processes of state formation are closely tied to farm production in the North Atlantic during the Viking/Medieval transition, and that paleoethnobotany, when integrated with other paleoecological information, can be used to further explore socio-political aspects of state formation in addition to the more traditionally studied economic aspects.

Management of the logistics of farm production, including decisions required to allocate labor and resources, are made based upon changing pressures from the outside world. During the Viking/Medieval transition, many of these pressures can be related to the shifts in power relationships accompanying the transition from chiefdom to state. It is helpful to do close study of the production relationships of a single farm in order to understand how large-scale changes like the shift towards state organization play out in everyday decision-making. By conducting farm-scale studies it is also possible to see the results of negotiation taking place between leaders and their would-be subjects. These negotiations shape the kind and amount of surpluses produced, the availability of production resources like fuel, the degree and form of taxation and method of tax collection, and the distribution of surpluses once they leave the farm.

Quoygrew farm has been discussed largely within the political arena of Westray and of the Orkney Earldom. Larger patterns of influence also shape how the Orkney Earldom itself developed over the course of the Viking/Medieval transition in relation to the rest of Europe. State formation in European context provides the opportunity to study interrelationships between centralizing cores and peripheral areas. People living in peripheral areas choose sometimes to accept and sometimes to reject centralizing ideas, philosophies, and methods for the generation and maintenance of power. The players who act in centralizing and peripheral roles can be quite fluid as well. As discussed in Chapter 3, at times the Orkney Earls can be seen as peripheral to changes taking place throughout Europe. Yet in other ways the Orkney Earls were a centralizing force in the North Atlantic, both to their own subjects and to neighboring polities.

This dissertation provides evidence of decisions made at Quoygrew which can be used to understand the socio-political arena of Viking/Medieval Orkney. As an ecobiography of a Quoygrew farm, this dissertation has provided a detailed look at farm life during the Viking/Medieval period. As further regional studies are done to fill in details about the Westray community, and that of other Orkney Islands, it will become easier to understand the relationship of Quoygrew farm to its local community. Understanding local power dynamics is an important step towards understanding larger scale political change.

The goal of this dissertation has been to integrate approaches from New Institutional Economics, agency theory, and historical ecology to show the value of exploring production-based decision-making at the household level for understanding shifts from chiefdom to state organization. Major contributions of this work include: 1) full description and analysis of a significant archaeobotanical assemblage, including description of the earliest find of woad, *Isatis tinctoria* in Scotland; 2) discussion of farm management practices at Quoygrew including interrelationships between areas of production (agriculture, dairying, fishing); and 3) thorough discussion of the implications of paleoeconomic data including archaeobotanical data for understanding socio-political aspects of state formation as they occurred at Quoygrew.

GLOSSARY

Ard – a scratch plow, drawn by horses or oxen and used to prepare the soil before sowing. This sort of plow cuts the sod but does not turn the soil or throw the sod. Instead, it basically rakes the soil in a single furrow, leaving the vegetation on either side intact.

Bondi – landowners

Bordlands – tax-free lands used to supply the Earl.

Budsetumadr – shack-men or cottagers.

Bussing – a method for removing the straw and chaff as well as arable weed seeds from grain. Straw was raked out from grain through the fingers, and tossed with a flick of the wrist.

Byreing – the practice of stalling animals indoors, especially during the winter, but at other times of the year as well.

Gälkare – a royal sheriff or "geld exactor."

Jarl – originally described independent rulers or tributary chiefs, later became "earl" a description for positions that functioned more as regional royal administrators.

Infield/Outfield – a system of farming common in Orkney. Infields are small areas of fertile land near settlements that were divided and kept under constant cultivation through heavy fertilization. The outfield lay further from the settlement and consisted of pasture that was occasionally cultivated.

Leiglendingr – tenant farmers

Machair – a stable grassland ecosystem unique to Scotland and Ireland that forms on sandy, lime-rich soils near the coastline.

Mill-sookened – restricted to use of a single assigned mill for grinding grain. In exchange for grinding, farmers were required to help with the mill's upkeep.

Mullyos – old women and orphans who were set to watch the fields during the first stages of drying so that no farmer would remove or alter the straw markings on his/her neighbor's bundles or surreptitiously cut grain from the furrows between fields.

Odal/Udal – form of inheritance and land ownership law practiced in Viking Scandinavia and Orkney. This law system has significant contrasts with the feudal law system.

Pennyland – unit of Orkney Earldom's taxation system. Each ounceland was divided into a specific number of shares, called pennylands.

Þing assembly – important meetings held periodically and attended by nearly every adult male. At these meetings political decisions were made, and disputes were resolved.

Three Field System – system of cultivation incorporating field peas and horse beans with an equal amount of barley and rye probably corresponding to a summer and fall crop.

Torp farms /villages – secondary farms or villages formed on the outskirts of established villages.

Turf – strips of earth cut and used for construction and fuel. Turf burns more slowly than peat and produces more ash, which can be an important component of fertilizer to increase soil fertility.

Urisland/Ounceland – unit of Orkney Earldom's taxation system. Each ounceland was divided into a specific number of shares, called pennylands.

Wadmal – a type of wool twill that was produced exclusively in the North Atlantic islands, often used to pay taxes.

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