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Male-biased operational sex ratios and the Viking phenomenon: an evolutionary anthropological perspective on Late Iron Age Scandinavian raiding☆

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ABSTRACT

In this paper, we use a combination of evolutionary theory, ethnographic data, written sources, and archaeological evidence to develop a new explanation for the origins of Viking raiding. Our argument focuses on the operational sex ratio, which is the ratio of males to females in a society who are ready to mate at a given time. We propose that a combination of two practices – polygyny and concubinage – and the increase in social inequality that occurred in Scandinavia during the Late Iron Age resulted in a male-biased operational sex ratio. This would have created a pool of unmarried men motivated to engage in risky behaviours that had the potential to increase their wealth and status, and therefore their probability of entering the marriage market. With high-status men looking to instigate expeditions to acquire plunder and develop their reputations as war leaders, raiding represented a mutually beneficial means of achieving social advancement and success.

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1. Introduction

Shipborne raiding by Scandinavian groups is central to our understanding of the Viking Age (c.750–1050), but the causes of this phenomenon remain uncertain. A wide range of explanatory factors has been put forward, including environmental change, overpopulation, and innovations in sailing technology. However, as Barrett (2008) has argued, these suggestions are not especially convincing because they lack supporting data and/or only consider short-term triggers. In this paper, we use evolutionary theory and ethnographic evidence in combination with archaeological data and textual sources to develop a new explanation for the early raids, which began in the late 8th century. Specifically, we explore the possibility that they may have been prompted in part by the existence of certain forms of male–female

relationship that motivated men to obtain status, wealth, and captives, and to engage in risky behaviour such as raiding in order to do so.

Conceptually, our hypothesis is related to what is perhaps the oldest explanation for Viking raiding, which was put forward by Dudo of St. Quentin (c. 965–1043). In *History of the Normans* (1, ch.1), he argued that the raids were caused by an excess of unmarried young men. Early modern scholars revived this notion several centuries later. For example, in Camden's (1610) volume *Britannia*, he suggested that the “Wikings” were selected by lot from among the young men of an overpopulated area and sent abroad to avoid civil strife, after they had “multiply'd themselves to a burdensom community” (p. 194). In time, the idea that raiding was a result of a surplus of single men became something of a cliché among scholars of the Viking Age, though Barrett (2008) has recently suggested that it deserves more careful consideration.

Our hypothesis focuses on the practices of polygyny and concubinage. Polygyny is a type of polygamous marriage in which a man has several wives (Henrich, Boyd, & Richerson, 2012). Concubinage entails a man and woman having sexual relations and often cohabiting without being legally recognised as husband and wife (Zeitzen, 2008). These practices can be linked to raiding via the operational sex ratio (OSR; Emlen & Oring, 1977; Kvarnemo & Ahnesjö, 1996). One of several sex ratios recognised by evolutionary biologists, the OSR is the ratio of males to females who are ready to mate in a population at a given time. Biases in the OSR are expected to determine which sex competes for access to mates and also the intensity of this competition.

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Specifically, as the OSR deviates from 50:50, mating competition will become more intense in the sex that is in excess. Our contention is that, during the Late Iron Age (c.400–1050), Scandinavian OSRs were biased towards males by polygyny and concubinage and that this bias was magnified by an increase in social stratification that occurred during the period. The bias increased male–male competition, and this in turn led to a volatile socio-political environment in which men sought to distinguish themselves by obtaining wealth, status, and female slaves. The surge in raiding that is associated with the start of the Viking Age was one of the consequences of this.

In developing our argument, we draw on archaeological data and written sources. The challenges of interpreting the former are well known, but the texts have limitations too. This is especially the case for the Sagas of Icelanders, which relate events in the 9th–11th centuries, when many Scandinavians were still pagans, but were first written down in the 12th–14th centuries, by which time Christianity was entrenched in the North. These texts have to be interpreted cautiously, as it is possible that Viking Age customs, especially those that conflicted with Christian ideals, may have been ignored or misrepresented by the scribes who committed the stories to writing (Clunies Ross, 1994, 1998; McTurk, 2005). Among the other sources we employ are insular annals, including the *Anglo-Saxon Chronicle* and the *Annals of Ulster*, and reports by travellers such as the 10th-century Arab envoy Ahmad Ibn Fadlān. These too have potential biases (Coupland, 2003; Montgomery, 2008). To counter these problems, we look for agreement among texts and between texts and archaeological data. In principle, consilience among multiple lines of evidence should allow more reliable insights into the beliefs and practices of Viking Age Scandinavians to be obtained.

The paper is structured as follows. We begin by providing a brief overview of Viking raiding. We then outline evidence for the existence of polygyny and concubinage in Viking Age Scandinavia. Next, we explain why there is reason to think that the origins of raiding may lie in the impact of polygyny and concubinage on the OSR. Thereafter, we discuss how the effects of polygyny and concubinage on the OSRs of Scandinavian societies would have been magnified by the increase in social stratification that occurred during the late 1st millennium. Having shown that the conditions in Late Iron Age Scandinavia were precisely those in which low-status men are predicted to engage in raiding, in the *sixth* section of the paper, we evaluate some specific predictions of the hypothesis with respect to low-status men. In the *seventh* section, we consider how the male-biased OSRs would have influenced the behaviour of elite men. In the *eighth* section of the paper, we explore a potential proximate trigger for the raids and discuss the end of the initial period of raiding. We close with some caveats and conclusions.

Before we proceed to the next section, we need to clarify the way we will use the terms “Viking Age” and “Vikings.” Following Price (2002) and Brink (2008), we consider the Viking Age to represent the final phase of the Late Iron Age in Scandinavia. When we use the term “Viking Age,” we are specifically referring to the period c. 750–1050. The term “Vikings” has become freighted with assumptions and biases (Brink, 2008). Throughout this paper, we will use it to refer to individuals who engaged in maritime robbery with violence rather than as an ethnonym.

2. Viking raiding: History, objectives, and participants

Although the Viking Age is usually defined by the onset of Scandinavian raiding into the North Sea in the late 8th century, both written sources and recent archaeological finds suggest that Scandinavians had already been active in the eastern Baltic for several decades. *The Saga of the Ynglings* (ch. 32), for example, tells us that a Swedish king called Yngvarr was killed while raiding in Estonia during the 7th century. More concretely, the recent excavation of two boat burials at Salme, Estonia, shows that Vikings were present in the eastern Baltic as early as the 750s. One of the vessels, Salme I, is a small, light, manoeuvrable craft, while the other, Salme II (Fig. 1), is a larger sailing ship. The remains of seven individuals were found in Salme I, while 34 skeletons were found

in Salme II (Konsa, Allmäe, Maldre, Oras, & Russow, 2008; Peets, Allmäe, & Maldre, 2012). Similarities between the Salme burials and contemporaneous finds in central Sweden suggest that the warriors came from there (T.D. Price, Peets, Allmäe, Maldre, & Oras, 2016). It appears, therefore, that Scandinavian raids into the Baltic preceded those into the North Sea by at least 40 years.

In western Europe, the monasteries of the British Isles bore the brunt of the initial Viking raids. The famous attack on Lindisfarne in 793 was followed by raids on Jarrow in 794 and Iona in 795, 802, and 806 (Hall, 2007). The end of the 8th century also saw the first raids on Frankia, with the *Royal Frankish Annals* (p. 78) recording that Charlemagne took measures to protect his kingdom’s coast from pirates. These raids appear to have taken place in the warmer months and involved a few boatloads of men employing hit-and-run tactics against weakly defended targets (Williams, 2008). In the first decades of the 9th century, the size of raiding fleets increased. To take just two examples, 13 ships raided up the Seine in 820 (*Royal Frankish Annals*, pp. 107–8), while 35 ships attacked Carhampton, England in 836 (*Anglo-Saxon Chronicle*, p. 62). By the mid-9th century, the nature of Scandinavian activity in western Europe had changed. Historical sources describe “armies,” sometimes comprising hundreds of ships, engaging in campaigns for years at a time. For example, the *micel here* or Great Army that is discussed by the *Anglo-Saxon Chronicle* campaigned in England from 865 to 878 before settling in the north and east of the country (McLeod, 2014; Williams, 2008). Other large Viking groups established enclaves in Ireland, Normandy, and Brittany in the 9th and early 10th centuries (Harrison, 2013; Renaud, 2000; Woolf, in press).

The available archaeological evidence indicates that most raiders were men. This is supported by several mass graves that appear to have resulted from raids gone wrong. These include the Salme burials discussed earlier (Konsa et al., 2008; Peets et al., 2012), some 50 male skeletons from a late 10th century mass grave at Ridgeway Hill, England (Loe, 2014), and 37 male skeletons in a mass grave from St. John’s College, Oxford (Falys, 2014; Pollard et al., 2012). However, there is evidence that women could also participate in raids (Raffield, Greenlow, Price, & Collard, 2016). The 12th century Irish *War of the Gaedhil with the Gaill* (p. 41), for example, records a “fleet of the Inghen Ruaidh” (the Red Girl, referencing her hair colour) operating in Munster during the 10th century. Two of her sons would later be slain at the Battle of Clontarf (*War of the Gaedhil with the Gaill*, p. 207). This may indicate that some Scandinavian women not only engaged in raiding but also led groups of warriors.

Acquiring portable wealth seems to have been a major objective of raiding groups. This is indicated by the large quantities of insular metalwork found in Norwegian graves from the early 9th century (Fig. 2; Abrams, 2012; Bakka, 1965; Glørstad, 2012). Undefended monasteries away from settled areas would have been ideal targets. In addition to containing ecclesiastical riches, religious foundations were foci for the exchange of imported goods and also seem to have been used by secular rulers as “safety deposit boxes” (Hall, 2007).

In addition to obtaining plunder, raiders also took captives for both ransom and enslavement. This practice appears to be depicted on the “Hostage Stone” from Inchmarnock, Scotland, which appears to show mail-clad figures leading a manacled individual to a ship (Fig. 3; Griffiths, 2010). The *Annals of Ulster* also record individuals being taken as prisoners during the 830s. High-ranking members of the clergy or royal families likely would have been ransomed rather than enslaved. Although sources shed little light on ransom negotiations, the reappearance of individuals after they had been taken as captives suggests that the negotiations were sometimes successful (Downham, 2014). For low-status individuals, enslavement was probably a more common fate. The *Annals of Ulster* record that numerous Irish women were taken as captives during a raid on Étar in 821 (p. 277) and that ten years later, several prisoners were taken from the community of Ard Macha (p. 289). The Arab chronicler Ibn Hayyān also recorded Viking groups taking slaves while operating in Spain during the mid-9th century (*Ibn Hayyān*, p. 106).



Fig. 1. The mass burial within the Salme II ship at Salme, Estonia, dating from ca. 750 AD. Photo by kind courtesy of Jüri Peets.

3. Polygyny and concubinage in Viking Age Scandinavia

The main sources of information about social relationships in pre-Christian Scandinavia, the Sagas of Icelanders, contain relatively little information about polygyny and concubinage. Jochens (1980) has convincingly argued that this is because most of them were composed after Iceland's conversion to Christianity and the Church's disapproval of polygyny and concubinage resulted in them being "written out" of the sagas. However, a few instances of both practices can be found in the Sagas of Icelanders. In *The Saga of the People of Laxardal* (ch. 12–13), for instance, Höskuldr Dala-Kollsson purchases an apparently mute slave woman called Melkorka while on a trading voyage to Norway. Höskuldr makes Melkorka his concubine and takes her back to Iceland with him. Similarly, in *The Saga of the People of Vatnsdal* (ch. 37), reference is made to concubinage when Þorgrímr's wife orders the exposure of his concubine's child.

Other sagas also provide evidence that Viking Age Scandinavians engaged in polygyny and concubinage. At least two of the "kings' sagas" make specific mention of Viking Age rulers engaging in these practices. For example, in *The Saga of Harald Fairhair*, Snorri Sturluson noted that the 9th century Norwegian king Haraldr Hárfagri had numerous wives and concubines. Snorri also indicated in *The Saga of Harald Hardrada* (ch. 33) that Haraldr Sigurðarson Harðráði, king of Norway 1046–1066, was married polygynously. The "contemporary sagas", which describe life in 12th- and 13th-century Iceland, contain numerous mentions of concubinage too (Jochens, 1980, 1995), which suggests

that this practice persisted for a long time after the Icelanders converted to Christianity.

Medieval Christian law codes from Scandinavia, which prescribe penalties for multiple-partner and extra-marital relationships, represent another line of evidence that Viking Age Scandinavians engaged in polygyny and concubinage. Given the Church's negative view of such behaviour, it is unlikely that they were innovations of the post-conversion period, and there is thus a strong implication that polygyny and concubinage were rooted in the customs of the Viking Age. Despite the Church's attempts to prohibit polygyny and informal sexual relationships, the practice of concubinage persisted for centuries. This was especially the case in Iceland (Jochens, 1995; Magnúsdóttir, 2001), where the clergy, who were unable to marry, adopted the practice (Price, 2005). The attitude of the Icelanders towards concubinage was so lax that in the 1170s and 1180s, Bishop Þorlákur asked the Archbishop of Niðarós, and later Pope Innocent III, to intervene (Jochens, 1995).

Further support for the occurrence of polygyny and concubinage among Viking Age Scandinavians is provided by the observations of outsiders. As early as the end of the 1st century CE, the Roman historian Tacitus recorded polygyny among the Germanic tribes of the north (*Germania*, ch. 18.1). A thousand years later, in c.1070, Adam of Bremen (bk. 4, ch. 21) observed that a Swedish man "according to his means has two or three wives at one time." Ibn Fadlān and Miskawayh, writing in the 10th century, also attest to the occurrence of polygyny and concubinage among the Rūs operating on the riverine trading routes between the Baltic and the Byzantine Empire, many of whom seem to have been Scandinavian or of Scandinavian heritage (Androshchuk, 2008; Montgomery, 2000).



Fig. 2. A reliquary recovered from a double burial at Melhus, Norway, ca. 800 AD. The remains of a number of reliquaries and other insular objects have been discovered in Viking Age graves in Scandinavia. They were likely taken as plunder from the British Isles. Photo: Per Fredriksen, NTNU University Museum.



Fig. 3. The 'Hostage Stone' from Inchmarnock, Scotland. The image appears to show an individual being led (possibly in chains) towards a Viking ship. Photo by kind courtesy of Headland Archaeology Ltd.

While there is good evidence that Viking Age Scandinavians engaged in polygyny and concubinage, it is important to acknowledge that some of the details of these practices are uncertain (Clover, 1988) and others are contested (Ebel, 1993; Reichert, 2006). For example, the relative social status of wives and concubines is unclear. It appears that for a woman to be recognised as a wife, a brideprice must have been paid to her family (*Grágás Laws* Vol. II, pp. 5, 270). The definition of a concubine is less clear-cut. The medieval Icelandic *Grágás* laws (Vol. I, p. 174, Vol. II, pp. 5, 180) suggest that a concubine was a female partner for whom brideprice had not been paid and who therefore possessed the same status as a slave (Karras, 1990). That concubines were of lower status than wives is supported by the fact that in *The Saga of the People of Vatnsdal* (ch. 37), Þorgrímr's wife orders his concubine's child to be exposed. However, the status of concubines may have been more variable than this episode suggests. Magnúsdóttir (2001) has shown that by the early Middle Ages, with probable antecedents in the Viking Age, the institution of concubinage in Iceland had taken several forms. Some such relationships were purely sexual; others were social in nature; still others were romantic liaisons. Concubinage could also involve ties of political and social advantage. Some concubines therefore may have wielded considerable power.

Another open question is the extent to which women exercised choice in relation to sex (Jochens, 1986). Curtailment of women's sexual freedom is a feature of some polygynous societies (Henrich et al., 2012), but the available evidence for Viking Age Scandinavia is difficult to interpret with respect to this issue. Jochens (1991, 1995) has argued that both *Örvar-Odds saga* and *Hallfreðar saga* indicate that there were female-only areas in houses. The existence of such areas, Jochens contends, indicates that men attempted to closet their female relatives to prevent access by other men. However, other evidence suggests that some women might have possessed considerable sexual freedom. In Viking Age Iceland, adultery was not grounds for divorce (Jacobsen, 1982), and several sagas mention affairs that go unpunished even after discovery, although a degree of social disapproval is evident. *The Saga of the People of Eyri* (ch. 47), *Grettir's saga* (chs. 88, 91) and perhaps *Gisli Sursson's saga* (ch. 9) describe married women taking lovers. Obviously, we cannot be certain that these stories convey real-world attitudes to women's sexual behaviour. Nonetheless, when combined with the lack of formal punishment for adultery, they do suggest that at least some women may have been able to freely engage in extra-marital sexual relationships.

4. The impact of male-biased OSRs on men's behaviour

Having outlined the basics of raiding by Viking Age Scandinavians and shown that there is evidence that they practiced polygyny and concubinage, we will now explain how raiding can be linked to polygyny and concubinage via the concept of the OSR.

A range of empirical evidence supports the idea that the OSR influences intensity of competition for mates. This evidence comes from a wide range of organisms, including insects, crustaceans, fish, snakes, birds, and mammals, and includes species in which the OSR is biased towards males and species in which it is biased towards females (e.g. Colwell & Oring, 1988; Debusse, Addison, & Reynolds, 1999; Forsgren, Amundsen, Borg, & Bjelvenmark, 2004; Höglund, Montgomerie, & Widemo, 1993; Kvarnemo, Forsgren, & Magnhagen, 1995; Madsen & Shine, 1993; Mitani, Gros-Louis, & Richards, 1996). Importantly, the empirical evidence indicates that the OSR does not affect all forms of competition in the same way. For example, in a recent meta-analysis, Weir, Grant, and Hutchings (2011) found that there was a significant effect of OSR on rate of aggression, courtship, and mate guarding but not on sperm competition. They also discovered that the impact of OSR on rate of aggression, courtship, and mate guarding differed. Weir et al.'s analyses indicated that rate of aggression increases as the OSR becomes increasingly biased towards one sex but then decreases once the bias exceeds a certain level. In contrast, the relationship between courtship

and OSR is a negative linear one, while the relationship between mate guarding and OSR is a positive linear one.

In human societies, the impact of the practice of polygyny on male-male competition can be appreciated with the aid of an example provided by Henrich et al. (2012). In this example, a society comprises 20 men and 20 women, and the men's status affects their marriageability. The 12 highest status men marry 12 of the women. The five most socially senior men then each take a second wife, and the top two take a third wife. Lastly, the most senior man of all takes a fourth wife. This degree of polygyny is towards the lower end of the range that has been documented cross-culturally, and yet it has substantial effects: fully 40 percent of the male population is precluded from marriage. To obtain a single wife, a man must be in the upper 60 percent of males as far as status is concerned, and moving from one wife to two requires a man to be in the top 25 percent of male status. It should be clear from this that even a small number of polygynous marriages in a society can impact the intensity of competition among men. This means that polygyny and concubinage could have been relatively rare in Viking Age Scandinavia and still have affected male behaviour.

Estimates of the ratio of opportunities for sexual selection on males (I_m) versus that on females (I_f) underscore the impact of polygyny on the intensity of competition among men. Moorad, Promislowa, Smith, and Wade (2011) examined data from 19th-century Mormons and calculated that in 1830, when Mormon communities practiced polygyny relatively freely, the I_m/I_f ratio was 2.4, which means that the intensity of selection on men was more than double that on women. This I_m/I_f ratio is close to the ratios that have been estimated for several other polygynous societies, including the Yanomamö of Venezuela (2.11), Arabs in Chad (2.28), and the Dogon of Mali (2.47) (Brown, Laland, & Bergerhof Mulder, 2009). Significantly, estimated I_m/I_f ratios for recent monogamous populations are closer to 1.0. The ratio for contemporary America, for example, is around 1.25 (Henrich et al., 2012). This indicates that at present, American men experience only slightly more competition for partners than American women. That I_m/I_f ratios are affected by marriage patterns is further supported by the decline in the Mormons' I_m/I_f ratio as the 19th century progressed and polygyny became less common among them. According to Moorad et al.'s (2011) calculations, by the time the Church of the Latter-day Saints renounced polygynous marriage in 1890, the I_m/I_f ratio for Mormon communities had dropped to 1.17.

Because polygynous marriage increases male-male competition by creating a pool of unmarried men, its occurrence within a society is predicted to increase risky status-elevating and sex-seeking behaviours among men, potentially leading to increased rates of murder, theft, rape, social disruption, kidnapping (especially of women), sexual slavery, prostitution, and – among high-status men – risky bids for political power. This prediction is borne out by a review of the impact of marriage status and type on criminal behaviour conducted recently by Henrich et al. (2012). These authors found that both cross-sectional and longitudinal studies indicate that unmarried men are significantly more likely to commit a property or violent crime than their married counterparts. The difference is marked. For example, one longitudinal study cited by Henrich et al. suggests that married men are 35 percent less likely to commit a crime of any type, and 50 percent less likely to commit a property or violent crime (Sampson, Laub, & Wimer, 2006). Henrich et al. went on to show that rates of crime are positively correlated with levels of polygyny in a large cross-national dataset. This relationship is independent of several potentially confounding factors, including economic development, economic inequality, population density, and degree of democracy. The key variable in the relationship between crime rate and degree of polygyny, Henrich et al.'s analysis suggests, is the percentage of unmarried men in the population. They found that the greater the percentage of unmarried men, the greater the rates of rape, murder, assault, theft, and fraud.

Significantly for present purposes, there is evidence that polygyny is sometimes associated with raiding and warfare due to its impact on

male–male competition. Ember (1974) carried out a cross-cultural analysis of the relationship between male mortality in warfare and marriage practices and found that male mortality in warfare is, on average, higher in polygynous societies than in monogamous ones. In the absence of differences between polygynous and monogamous societies with respect to the lethality of warfare, this indicates that polygynous societies engage in warfare more often than monogamous societies. Subsequently, White and Burton (1988) conducted a larger cross-cultural analysis and discovered that polygyny is most strongly associated with the capture of women for the purposes of marriage. That polygyny increases raiding and warfare (rather than vice versa, as Ember [1974] supposed) is supported by a number of ethnographic case studies. In perhaps the best-known example, Chagnon (1988) found that Yanomamö men engage in inter-village raiding to secure women for polygynous marriages. More successful warriors, Chagnon's data revealed, had more wives, providing a direct link between polygyny and raiding.

Recently, Schacht, Rauch, and Borgerhoff Mulder (2014) have argued that the notion that a male-biased sex ratio will lead to increased male–male competition is wrong. Instead, they suggest that we can expect men in male-biased populations to be more committed to providing parental care than their counterparts in female-biased populations and that this in turn can be expected to lead to reduced male–male competition. Schacht et al. then review the results of a sample of 20 studies that have examined the association between sex ratio and violence in human societies and find that the results are mixed: sex ratio and violence are positively associated in some of the studies, negatively associated in others, and not associated at all in still others. Based on this, they conclude that “we have a lot more thinking to do when attempting to use sexual selection to understand patterns of violence in humans” (p. 219).

At first glance, Schacht et al.'s study appears to cast doubt on the idea that polygyny and concubinage can be expected to lead to higher male–male competition and therefore to raiding. However, this is not in fact the case. To understand why, recall that the OSR is just one of several sex ratios recognised by biologists. The other sex ratios are the primary sex ratio (PSR), the secondary sex ratio (SSR), and the adult sex ratio (ASR). These are the ratio of males to females at conception, birth, and during adult life, respectively. Importantly, the PSR, SSR, ASR, and OSR are seldom the same (Székely, Weissing, & Komdeur, 2014). The reason for this is that the transition from the PSR to the ASR is mediated by a range of ecological, demographic, and life history processes, and the OSR is affected by factors that do not impact the ASR (Székely et al., 2014). The partial independence of the different sex ratios means that we need to be careful when testing hypotheses concerning them. Specifically, it means that data concerning one sex ratio should not be used to test hypotheses concerning the others. This is why Schacht et al.'s study does not cast doubt on the idea that polygyny and concubinage can be expected to lead to higher male–male competition and therefore to raiding. Their review included studies that focused on the ASR and studies that measured something closer to the OSR. This means that the fact that their results were mixed does *not* tell us anything about the relationship between the OSR and violence.

5. Male-biased OSRs and increasing social stratification in Late Iron Age Scandinavia

The effects of polygyny and concubinage likely would have been greatly magnified by the increase in social stratification that occurred in Scandinavia during the Late Iron Age. Evolutionary theory predicts that, when given the choice, women will prefer men who have wealth and social status (Dickemann, 1979a, 1979b; Huber, Danaher, & Breedlove, 2011). This in turn predicts that when a socially stratified society allows polygyny and concubinage, women will seek to move up the social hierarchy. At the same time, it is likely that elite men will be able to coerce lower status women to become their wives or concubines more readily than lower status men, because of their greater resources

and power. Thus, when a stratified society allows polygyny and concubinage, it is expected that variance in male reproductive success will be correlated with social status such that elite men will have more partners than low-status men, and a percentage of low-status men will often not have a partner at all (Dickemann, 1979a).

Cross-cultural data are consistent with these predictions. In egalitarian societies, such as those that practice highly mobile hunting and gathering, levels of polygyny and the disruption it causes tend to be low (Henrich et al., 2012). Few men manage to obtain sufficient status to attract additional wives, and those that do usually acquire no more than three or four wives (Nielsen, 2004). In stratified societies, the disruptive effects of polygyny are much greater (Henrich et al., 2012). This is because increasing stratification is often accompanied by an intensification of polygyny among the most successful men who possess the wealth and power to attract or acquire numerous wives and concubines. This is illustrated by the pre-modern states of China, Aztec Mexico, and pharaonic Egypt. Rulers of these states often kept hundreds, or even thousands, of women in their personal harems (Betzig, 1982).

It is now generally agreed that Scandinavian societies became increasingly stratified during the Late Iron Age. In the early first millennium, communities appear to have centred on extended families that sought to maintain high social standing within tribal groups through marriage, the production of “good” heirs, and success on the battlefield (Hedeager, 2011). These families would not have been equal in status, but a lack of institutionalised social stratification likely prevented leadership stability for any length of time (Skre, 2001a, 2001b).

During the 5th and 6th centuries, Scandinavia, like much of Europe, experienced a period of political instability and turmoil, warfare, and large-scale human migration. The archaeological record has yielded evidence for depopulation and the widespread abandonment of settlements and land in many parts of Scandinavia at this time. The causes of these developments continue to be debated, but there is increasing acceptance that they may be, at least in part, a consequence of an extreme climatic event (Price & Gräslund, 2015).

This period of upheaval was followed by the consolidation of elite rule and the emergence of new power structures that focused on the ownership of land. It has been argued that this is associated with the emergence of odal rights, which allowed families to claim an ancestral link to land after a certain number of generations (Brink, 2002; Zachrisson, 1994). Odal land could not be disposed of without offering it to close kin, and in circumstances where land was unlawfully sold, odal men had the right to redeem it (Zachrisson, 1994). Odal rights, therefore, might have allowed certain kin groups to claim ownership of the best land and consolidate their economic and political power.

By the end of 8th century, a number of regional polities and petty kingdoms had developed in Scandinavia (Myhre, 2003, 2015; Näsman, 2000; Skre, 2007). This is indicated by several lines of evidence. The most striking of these is the appearance of monuments such as the royal mound cemetery at Borre, Norway and the substantial linear ditch and bank known as the Danevirke in what is now Schleswig-Holstein, Germany (Myhre, 2003). Such structures point to the existence of more centralised systems of overlordship that supported the large-scale management of resources and labour. However, it should be noted that we are not talking about the development of state-level societies at this time. While King Gudfred's reconstruction of the Danevirke in 808 (as recorded in the *Royal Frankish Annals*; p. 88) has been taken to indicate that a Danish kingdom existed by the end of the 8th century (Näsman, 2000), it is more likely that Gudfred was one of several kings and that power was not consolidated on a national scale until later in the Viking Age (Myhre, 2000; Simek, 2004). A similar situation prevailed in Norway and Sweden.

There is evidence that, as predicted, men needed to acquire wealth and social status in order to become eligible for marriage during the Viking Age. We mentioned earlier that the Icelandic *Grágás* laws make it clear that for a woman to be recognised as a wife, a brideprice must

have been paid to her family (*Grágás Laws* Vol. II, pp. 5, 270). An implication of the fact that Viking Age Scandinavian societies practiced marriage by purchase is that men would have needed to attain wealth to be viable as candidates for marriage (Jochens, 1995). It appears that status was also a prerequisite for a man to obtain a wife. This is illustrated by an episode in *The Saga of the Confederates* (ch. 9). When questioned as to why his daughters were unmarried, Gellir explained that no man had yet presented himself who was sufficiently rich in goods and estates, of a good family, and adequately accomplished.

That increasing social stratification led to large disparities in partner numbers among Late Iron Age Scandinavian men is supported by several sources. As we pointed out earlier, in *The Saga of Harald Fairhair*, Snorri Sturluson notes that the 9th-century Norwegian king Harald Hárfagri had numerous wives and concubines at the same time. At one point in the narrative (ch.21), Harald divorces nine women in order to marry the Danish princess Ragnhildr. The observations of Adam of Bremen and Ibn Fadlān also suggest that partner numbers varied greatly across social strata. We mentioned earlier that Adam of Bremen (bk. 4, ch. 21) explained that a Swedish man could, if his wealth allowed, have two or three wives at one time. Adam of Bremen went on to suggest that a Swedish prince might possess “an unlimited number” of wives. In his description of the Rūs court, Ibn Fadlān observed that the king was attended by 40 slave girls who were “destined for his bed,” while his 400 warriors were each provided with two slave girls (*Ibn Fadlān 921–922*, p. 55). This not only emphasises the disparity between elites and their followers with respect to mating opportunities but also suggests one of the mechanisms employed by elite men to maintain the loyalty of their followers – a point to which we will return later.

Some low-status families may not have had a choice as to whether or not to allow their daughters to become concubines. Jochens (1991) notes, for example, that in *Hávarðar saga Ísfirðings*, a chieftain named Þorbjörn essentially kidnapped the daughters and female relatives of other men, keeping them for a while before sending them home. However, for other low-status families, concubinage may have served as a means of social mobility, with parents gambling on the future formalisation of a relationship between their daughters and elite men. The production of elite offspring by a concubine may have provided a family with the means to increase their status. Jochens (1987) has argued that this explains why, in *Jómsvíkinga saga*, a father whose daughter conceives a child with King Harald of Denmark looked favourably on the pregnancy. In a society that practiced marriage by purchase, concubinage might have been particularly attractive to elite men as they would not have been obliged to pay a brideprice in order to acquire extra partners. A further benefit of a concubinal relationship over marriage for elite men is that they would have been able to choose whether or not to recognise any child resulting from the relationship as an heir.

6. Male-biased OSRs and the behaviour of low-status men during the Viking Age

To recap, our hypothesis is that the early Viking raids were a consequence of the intersection of two practices – polygyny and concubinage – with increasing social stratification. So far, we have shown that both evolutionary theory and ethnographic evidence support the link that is at the core of the hypothesis, i.e., the link between polygyny, concubinage, and raiding. Evolutionary theory suggests that polygyny and concubinage will increase the probability that low-status men will engage in raiding and other risky behaviours to obtain the wealth and status they need to enter the marriage market, and the available ethnographic evidence bears this out. We have also shown that there is evidence that both polygyny and concubinage were practiced in Late Iron Age Scandinavia and that the growing social stratification during that period led to very marked differences among men in terms of numbers of wives and concubines. In other words, we have shown that the conditions in Late Iron Age Scandinavia were precisely those in which low-status men

are predicted to engage in raiding and other risky behaviours. In this section, we outline evidence that increases the plausibility of the hypothesis still further.

Needless to say, the hypothesis requires raiding to have been a risky activity. Although contemporaneous observers often imply that Viking raiding parties were able to attack targets with impunity, it is undoubtedly the case that raiding was a dangerous undertaking. Ships would have been at the mercy of the elements while at sea, although seasonal summer raiding would have mitigated this danger to some extent. Even if a raiding party survived to reach its target, there would have always been the chance of reprisals by the locals. For example, it is reported that members of the Viking raiding party who attacked Jarrow monastery in 794 were massacred by the locals after coming ashore when their ships sank in bad weather (Swanton, 2000). Thus, there can be little doubt that raiding was risky and therefore was the type of activity predicted to be fostered by the polygyny- and concubinage-induced male-bias in the OSRs of Viking Age Scandinavian societies.

Another prediction of the hypothesis is that the majority of Viking raiders would have been young men. Several lines of evidence suggest that this prediction is also met. The mid-8th century Salme boat graves mentioned above contained the skeletons of men who were 18–45 when they died, with most at the lower end of the range. Of the 40 male skeletons capable of being aged in the Ridgeway Hill mass grave, eight were 13–17 years old, another ten were 18–25 and only a few individuals were over 45 (Loe & Webb, 2014). Of the 36 men in the mass burial at St. John's College, four were aged 16–20, and 16 were between 20 and 25, while none was older than 45 (Falys, 2014). Further evidence that raiding was primarily a young man's activity can be found in *Egils saga Skallagrímssonar* (ch. 1). Þórólfr, for example, is reported to have spent several years raiding with Kari of Berdla's sons after he turned 20, gaining both wealth and prestige. In *The Saga of the People of Vatnsdal* (ch. 2), a youth of 18 is criticised by his father for not having already engaged in raiding or other dangerous exploits in order to seek wealth and honour. In connection with this, it is worth drawing attention to the Old Norse term *drengr*. Although its meaning is debated, this term may refer to a young man who had not settled down and had yet to make his wealth and reputation, or to a follower of a military leader (Jesch, 2001). As such, the term *drengr* may have applied to a man at a certain stage in life – one in which he would take part in raiding expeditions or foreign ventures in order to secure the wealth and reputation he needed to progress socially. A contrast has been drawn between the terms *drengr* and *þegn*, with the latter being argued to refer to an older, mature man who had settled down and married (Goetting, 2006; Jesch, 2001). For some young men, serving in a retinue would have allowed them to secure the wealth and reputation they needed to marry and achieve social advancement. For others, raiding would have been an intermittent, opportunistic activity. In *Egils saga* (ch. 72), for example, we are told that a man named Arinbjörn furnished three ships for raiding, taking with him not only people from his own household but also many of the local farmers' sons.

A third prediction of the hypothesis concerns the nature of the captives taken during raids. Institutionalised systems of female capture and sale are a feature of some societies with male-biased OSRs (Dickemann, 1979b; Henrich et al., 2012). Consistent with this, the *Annals of Ulster* (p. 277) record Vikings enslaving numerous women during a raid in 821. Ibn Hayyān similarly records a Viking attack on Seville in 844 during which they spent seven days killing the men and capturing women and children (*Ibn Hayyān*, p. 106). In 859, the Viking leaders Hásteinn and Björn Járnsíða (Bjorn Ironside) assaulted Mazimma, Morocco, where they attacked the harem, ransoming two of the royal women to the emir of Córdoba (Price, 2008). Although slaving was a lucrative business, it is clear that such activities also provided opportunities for the sexual exploitation of captives. This is attested to by Miskawayh when describing the actions of the Rūs during a raid on Bardha'a in 943 (*Miskawayh*, p. 149), and the sexual exploitation of female slaves in general is remarked upon by several observers, including Ibn Fadlān. Taking

women as captives may have also functioned as a form of bride-capture, given that any resulting unions might have become permanent marriages (Jochens, 1995). In this respect, attention should be drawn to Wealhþēow, the wife of the Danish king Hroðgar in *Beowulf*. While Wealhþēow is clearly of high-status, her name has been argued to mean “foreign slave” (Hill, 1990), which may indicate that she had been a captive. Other women might have been taken or sold as concubines (Karras, 1990), as was the case with Höskuldr and the enslaved Irish princess Melkorka in *The Saga of the People of Laxardal* (ch. 12). The targeting of female captives may also be evidenced in Iceland, where DNA work carried out by Helgason, Sigurðadóttir, Gulcher, Ward, and Stefánsson (2000) suggests that the Viking Age female population was dominated by “Celtic” women, probably from the British Isles, while the male population was largely Norse. Although some of these relationships may have been consensual, it seems likely that many of the women enslaved during raids were transported to Iceland and other locations in Scandinavia and subsequently became wives or concubines.

As we explained earlier, raiding is not the only predicted outcome of male-biased OSRs. Among the other effects that are predicted are intense male–male competition, the development of hypersensitivity to insults, and positive attitudes towards risk-taking (Griskevicius et al., 2012; Henrich et al., 2012; Hudson & Den Boer, 2004). The first of these can be seen in *Eiríks saga rauða* (ch. 12, p. 672), which records the brief Norse settlement of Vinland at around the turn of the 11th century. During the third winter of the colony, “many quarrels arose, as the men who had no wives sought to take those of the married men”. The competition between Gunnlaugr Ormstunga and Hrafn Önundarson over Helga the Fair in *Gunnlaugs saga ormstungu* provides another example of male–male competition. Eddic poems and the sagas also provide evidence of hypersensitivity to insults, as well as a form of competitive insulting known as *flyting*, which often took place between male protagonists (as in *The first song of Helgi, the slayer of Hunding*; Orchard, 2011). One powerful form of insult, known as *nið*, was articulated in a complex, codified system that included impugning an adversary’s appearance, reminding him of previous failures, declaring him a breaker of taboos, and accusing him of cowardice and/or sexual deviance (Clover, 1993). Conflict was often associated with *nið*, as is demonstrated in both the Norwegian *Gulaping* and Icelandic *Grágás* law codes, which prescribed outlawry and even permitted killing in reprisal for certain insults (Almqvist, 1965, 1974; Clover, 1993; Meulengracht Sørensen, 1980). With regard to attitudes towards risk-taking, it has been argued that Norse ideologies encouraged the perception that dying in battle or while travelling abroad was a “good death” (Price, 2002). It seems likely that this would have encouraged men to view risk-taking positively. Thedéen (2009, p. 77) supports this argument, noting that rune-stone evidence suggests that death abroad was glorified and considered preferable to dying the “death of soot at home.” Thus, the behaviour of Viking Age Scandinavian men is consistent with several predictions of male-biased OSRs, not just with the prediction that they should engage in raiding.

7. Male-biased OSRs, elite male competition, and raiding

In the previous section, we focused on how male-biased OSRs likely would have driven low-status Scandinavian men to seek bridewealth, status, and captives through raiding. In this section, we consider the impacts of male-biased OSRs on the high-status men who were competing for power immediately prior to and following the initial raids of the late 8th century.

Male-biased OSRs can cause competition to intensify among elites as well as among low-status men (Henrich et al., 2012). This is because social tensions can alter both intra- and inter-group dynamics, and in the case of high-status men, this might render them more prone to engage in violence in order to secure the wealth and influence that were necessary to gain political power. During the Late Iron Age, we can see this

manifested in the behaviour of elite men, many of whom engaged in overseas raiding and conflict at home.

Elite men, including relatives of rulers, would have been motivated to increase their wealth and reputation in order to further their political ambitions and may also have been denied the inheritance of land or property by the Germanic inheritance laws of primogeniture and seniority (Opdahl, 2003; Simek, 2004). Organising successful overseas raids would have been one way in which these individuals could have achieved advancement (Barrett, 2008). Not least, the labour and resource requirements of ship-building in themselves imply the involvement of people of sufficient status to provide them (Bill, 2008). The same applies to the expense of equipping a raiding party in armaments and provisions. Thus, while raiding parties may have been largely composed of low-status men, it is likely that they were supported, funded, and led by elites.

Initially, the ability of high-status men to muster raiding parties would have been enhanced by the existence of a pool of low-status men seeking opportunities to obtain reputation, wealth and/or female partners due to the effects of male-biased OSRs. Over time, the growing reputation of a successful raiding leader would have drawn increasing numbers of followers. In addition, some of the wealth gained from raiding could have been used in the formation and maintenance of a military retinue or *lið*, which underpinned chiefly and royal power (Enright, 1996; Evans, 1997; Price, 2014; Raffield et al., 2016). For example, when composing a poem in honour of King Eirikr blóðøx in *Egil’s saga* (ch. 61), the warrior-poet Egill Skallagrímsson stated that the king “gives riches no rest, hands gold out like sand,” while the skaldic poem *The Lay of Harold* (v. 16) similarly states that King Haraldr Hárfagri rewarded his warriors with “gold from Hunland and with girls from the East-folks.”

While the foregoing arguments suggest that the early raids were instigated by elite men who wished to obtain the means to fuel their political ambitions, it is worth considering the possibility that rulers themselves might have encouraged low-status men to engage in raiding. Successful expeditions would have increased their instigators’ wealth and prestige, even if they did not themselves participate. Increasing tensions resulting from male-biased OSRs in Late Iron Age Scandinavia might also have led rulers to send young men on expeditions.

Just as we argued in connection with low-status men, the effects of male-biased OSRs on high-status men are unlikely have been limited to raiding. As Henrich et al. (2012) note, inequality can emerge even among elite groups due to the monopolisation of wealth and women by the most powerful men. This can precipitate conflict, driving elite men to engage in both direct and indirect competition. Investment in women’s clothing and jewellery could have also served to exhibit a man’s wealth and status. In a Scandinavian context, such behaviour was described by Ibn Fadlān, who observed that the personal ornamentation of Rūs women depended on their husband’s status, with one neck-ring being worn for every 10,000 dirhams the latter possessed (*Ibn Fadlān 921–922*, p. 46; see also Ashby, 2015). Similar customs among elites might explain the prevalence of well-furnished female graves around well-established farmsteads in the rich agricultural areas of Late Iron Age western Norway (but see Dommasnes (1982, 1991) for an alternative interpretation).

An intensification of male–male competition and resulting social tension may have had long-term implications for Scandinavian societies. It is possible, for example, that polygynous marriage systems and concubinage were partly responsible for what Vestergaard (1991) has argued was the fragmentation of society by the Viking Age. With elite men seeking to acquire increasing numbers of partners, and lower status families looking to improve their social standing, it is possible that cycles of competitive exchange emerged between rival kinship groups that were continuously striving to improve their own position (Vestergaard, 1991). As a result, an increasingly large pool of low-status men would have developed, increasing the likelihood of violence

and unrest. At the same time, it is possible that the desire of elite individuals to increase their wealth and status would have led to fragile political relationships and conflicts of loyalty. Relationships of this kind arguably undermined the stability of the Icelandic republic, as manifested in the saga narratives of seemingly endless internecine feuding (Byock, 2001; Miller, 1990).

8. Triggers and transformations

Two issues remain to be considered. The first is why the surge in raiding occurred in the final decades of the 8th century. It is possible that the combined effects of polygyny, concubinage, and social stratification simply reached a “tipping point” that led to the surge in raiding. However, it seems likely that other factors were involved (Ashby, 2015; Barrett, 2008). In relation to the timing of the early raids, we find one potential “trigger” particularly intriguing. Barrett (2008) has suggested that the catalyst for Scandinavian raiding was the sudden influx of Abbasid coinage into eastern Scandinavia via Russian and Baltic trade routes in the last decades of the 8th century. According to Barrett, this could have caused a shift in the balance of power, compounding social inequality as well as competition between increasingly powerful elites and driving efforts to seek comparable riches in Western Europe. We suggest that there might have been other effects too. The influx of coinage may have served to disenfranchise minor elite members who, along with exiles and pirates, might have begun to seek wealth abroad, either as part of elite-sponsored expeditions or in order to further their own political ambitions. An influx of wealth into the ruling classes would have also driven ever-increasing rates of polygyny and concubinage, exacerbating social stratification and denying access to women for a growing number of low-status men who had neither the social standing nor the bridewealth to enter the marriage market. In a society where the possession of land was a primary indicator of an individual’s worth (Zachrisson, 1994), the durability, divisibility, and portability of precious metals provided a new form of wealth that could be used in exchanges and marriage contracts (Sindbæk, 2011). Although political structures in Viking Age Scandinavia would have prevented the majority of lower-status men from advancing far up social hierarchies, this influx of wealth may have enabled them to improve their lot. The prospects of obtaining this material, we suggest, could have caused a step-shift in the number of young, unattached low-status men joining raiding parties.

The other issue that needs to be considered is how male-biased OSRs might have continued to influence Scandinavian activities beyond the initial raids of the 8th century, including later expansionist activities. With the spoils of initial raiding allowing marginalised elite men to become legitimate political contenders, this may have provided a context not only for the civil wars mentioned earlier but also for the formation of the large Viking “armies” that were operating in north-western Europe by the mid-9th century. Instead of returning home to make bids for political power in Scandinavia, some raiders may have instead desired to seek out their own lands to rule. This may explain why later armies were largely amalgamations of independent warbands and *lið* operating in temporary alliances led by individuals described as “kings” (Raffield, 2013). Cooperation between groups appears to have occurred only when it was mutually beneficial, and inter-group conflict was common (Raffield, 2016). It is possible that these relationships reflect an on-going volatile political situation in Scandinavia representing, in part, the continuing influence of male-biased OSRs.

9. Final remarks

In this paper, we have used a combination of evolutionary theory, ethnographic data, written sources, and archaeological evidence to develop a novel answer to a longstanding question in the historiography of Europe – namely what caused the initial Viking raids of the late 8th century? We have suggested that a combination of two practices –

polygyny and concubinage – and the increase in social inequality that occurred in Scandinavia during the Late Iron Age resulted in male-biased operational sex ratios. With elite men monopolising an increasing percentage of women, many low-status men would have found it difficult to marry unless they were willing to engage in risky activities to improve their wealth and status. At the same time, elite men were motivated to organise expeditions to acquire plunder and develop their reputations as war leaders. Raiding therefore represented a mutually beneficial means of achieving social advancement, success in the marriage market, and, for elite men, political power.

Before closing, we need to add three caveats to this argument in the context of Viking studies. First, we want to stress that we are arguing for a probabilistic rather than a deterministic approach to Viking Age Scandinavian societies in general, and raiding in particular. Obviously, not all polygynous cultures attempt to be universally controlling of women’s sexuality, while many monogamous ones certainly do. In addition, every society contains many shades of nuance in the adherence and resistance to its social norms.

Similarly, we are not making blanket claims about gendered behaviour in Late Iron Age Scandinavia. We are of the opinion that the overwhelming majority of raiders – as opposed to settlers in the wake of the raids – were men, and we would be very surprised to find much dissent from this view among scholars of the Viking Age. With this in mind, there is every reason to examine the possible motivations of these men, set against the wider background of Scandinavian society. However, to focus on these men is neither to marginalise women as active agents nor to ignore the broad spectrum of identity constructions and sexual preferences that were present in Viking Age Scandinavian society (Arwill-Nordbladh, 1998; Back Danielsson, 2007; Coleman & Løkka, 2015; Fuglestad, 2014; Meulengracht Sørensen, 1980; Price, 2002). That said, given the persistence of the dubious and romanticised cliché of the “heroic” Viking warrior, it is clear that the field would benefit from deeper studies of masculinity. Equally, it is important to stress that the Viking Age was *not* a utopia of female emancipation and empowered independence. For many women, it held bleak prospects. Consideration of the ways in which this might have been manifested – including sexual slavery and the treatment of women as social commodities – can make for unpleasant reading, but we believe that we should not shy away from exploring beliefs and practices of Viking Age Scandinavians that go against contemporary norms.

The third caveat concerns the perception of Late Iron Age Scandinavian societies. If Viking raiding groups emerge from our discussion as strongly predatory communities – in economic, territorial, sexual, and other terms – the obvious point can be made that this is exactly how they appear in the records of their victims, almost without exception. However, this is a partial viewpoint, and a focus on the violence of the Vikings should not be taken to imply that there were no other sides to Late Iron Age Scandinavian societies, though this is beyond the scope of our paper (Price, 2002).

To conclude, although many questions remain, we believe that the hypothesis we have presented represents an advance on previous attempts to explain the origins of Viking raiding, because it both provides a clear chain of causation and discloses its assumptions about the motivations and behaviour of the individuals involved. We hope that it not only prompts renewed interest in the causes of Viking raiding but also encourages our colleagues to seek other topics in Viking studies that can potentially be illuminated by the combination of evolutionary theory and cross-cultural data, which we think we have shown can be quite powerful.

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