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Microscopic identification of feathers from 7th century boat burials at Valsgärde in Central Sweden: Specialized long-distance feather trade or local bird use?

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ABSTRACT

The warriors in the well-equipped, high-rank 7th–8th century boat burials at Valsgärde in Central Sweden were lying in feather stuffed beds. Feathers, especially from Common Eider, are known as trade commodities from the coast of North Norway from the 15th century onwards, but written sources indicate that it started much earlier. The main goal of this investigation was thus to see if the feathers from two of the boat burials, Valsgärde 7 and 8, showed any indications of such specialized long-distance trade of certain bird species. Various levels of bird identifications were obtained through microscopic analysis of the ancient feathers. Some of these identifications were corroborated with avian bones in the two burials and from a contemporary farm close to the burials. In this way a remarkably large variety of birds, among them Eagle Owl, was identified. The birds are likely to have been present in the surrounding areas including the nearby coast of the Baltic Sea. Therefore, the feathers do not suggest long-distance trade, but appear as a new source of knowledge of local bird fauna in archaeological sites. Scandinavian folklore and Icelandic Sagas indicated that the feathers had a special meaning, in connection with death and shamanism. The investigations could not confirm long-distance trade with feathers, but gave new perspectives on the use and cultural significance of birds in the Late Iron Age in Scandinavia.

1. Introduction

Feathers have been used by man as far back as we know to e.g. make clothing and pillows, to help arrows fly, and in decorations. Neanderthals have been found to intentionally harvest feathers (Peresani et al., 2011; Finlayson et al., 2012), and bird wings have been found in several Stone Age graves (Albrethsen and Brinch Petersen, 1976; Mannermaa, 2008; Grünberg, 2013). Alpine ice patches have revealed over 5000 years old feather fletchings (Dove et al., 2005) and goose down pillows are known from at least Roman times (Albarella, 2005). Here we investigate the use of feathers in pagan burials, which in Northern Europe are mostly known from high-rank boat burials from the Late Iron Age (AD 570–1030) (Berglund, 2009).

Feathers, especially from Common Eider (*Somateria mollissima*), are mentioned as trade commodities in North-European written sources from the 15th century onwards, for example from the Faroe Islands (Kolsrud, 1959). In Helgeland, the southern part of North-Norway,

Common Eider was almost domesticated. People built nesting houses (and still do), and in return they collected eider down from the nests (Berglund, 2009). Land registers from the 15th century show that nesting sites in this area were highly evaluated (Berglund, 2009). *Ohthere*, the North-Norwegian chieftain and seafarer, told King *Ælfrède* of England around AD 890 that the Sami paid him taxes in feathers, and some paid as much as *tyn ambra feðra*¹ (Bately, 1980). Substantial amounts of feathers were thus probably used as a trade commodity several centuries before it was mentioned in the land- and tax-registers.

Feathers used to stuff bedclothes in the two 7th century boat-burials Valsgärde 7 and 8, in Central Sweden, are here investigated through microscope analysis of downy feather types. Thus far, we know of only a handful of such studies on archaeological material (Hargrave, 1965; Messinger, 1965; Sibley et al., 1992; Dove and Peurach, 2002; Robertson, 2002; Rogers et al., 2002; Dove et al., 2005; Hardy and Moncel, 2011; Dove and Wickler, 2016) and as far as we know, the burials at Valsgärde are the oldest among the Late Iron Age burials with feathers

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¹ Ten ambers with feathers. Ambar is a type of bucket made of lags of wood. The size of the ambers is not constant but varies in different areas. (Stigum, 1956).

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mentioned in Scandinavian publications. We examined the fragile, but relatively well-preserved feather fragments from the two grave sites to identify the bird taxa. These investigations were corroborated with avian bones from the same sites and a contemporary, nearby farm. From this we discuss indications of specialized long-distance trade from Northern Europe of certain species versus the use of local birds, and the potential cultural significance of certain findings.

1.1. Valsgärde cemetery and two 7th century boat-burials

The pagan cemetery of Valsgärde is situated on both sides of a passageway over a hillside close to the river Fyrisån, where there is a ford (Herschend, 2008) where travellers could be controlled and taxed. The river connects Valsgärde to Old Uppsala, about 3 km to the south (Fig. 1). Two monumental barrows at Old Uppsala, usually considered royal mounds from the Migration Period, were newly dated to around AD 600 (Ljungkvist, 2008a) and may be contemporary with Valsgärde 7 and 8. The latter ones resemble those from the pagan cemetery at the church of Vendel (Stolpe and Arne, 1912), about 30 km to the north of Valsgärde. Waterways connected Valsgärde to both Vendel and the big lake Mälaren, which used to be a bay in the Baltic Sea.

The boat burials at Valsgärde have much in common not only with those at Vendel, but also with the 7th century aristocratic ship burial at Sutton Hoo in England, which also contained a pillow stuffed with feathers among the equipment (Bruce-Mitford, 1983).

The cemetery at Valsgärde (Fig. 2) was excavated in the 20th century, starting in 1928 (Lindkvist, 1929, 1931; Eriksson et al., 2013) by today's Gustavianum, Uppsala University Museum. The cemetery is known for its fifteen boat-burials with well-equipped, inhumated warriors from the Late Iron Age (AD 570–1030). There are burials from at least the 3rd century BC to perhaps the 12th century AD (Ljungkvist, 2008b). Arwidsson (1954, 1977) published the burials Valsgärde 7 and 8, and dated both archaeologically to the 7th century. She published three radiocarbon dates from number 7 (Arwidsson, 1977), and new radiocarbon calibrations confirm that Valsgärde 7 is from the 7th

century, most likely from the early or mid-7th century (Norr, 2008).

The graves consist of richly equipped boats orientated NE-SV, with the stem facing the river Fyrisån, ready for a long voyage, as Arwidsson (1977) claims, implicit to the kingdom of the dead. However, Larsson (2013) reports that the directions of the boats in the cemetery varied. The warriors had richly decorated helmets and weapons, some with metal sheets with stylized birds of prey (Fig. 2), like the helmet and shield II in Valsgärde 7 (Arwidsson, 1977). There were many other types of equipment like hunting gear and kitchen tools, as well as proviant; mostly meat from domestic animals and birds preserved as bones. Bones of horses and other animals were found outside the boat, close to the stem.

The warriors rested on pillows and bolsters stuffed with feathers, primarily preserved in connection with metal objects. Bolsters are long pillows used to support the pillows lying over them. It was probably not before the 16th century that one started to put a duvet over the body in the beds (Hoffmann, 1970). Textiles from Valsgärde 7 and 8, mostly suitable for covers for pillows and bolster, are investigated by Arwidsson (1954, 1977), Jørgensen (1992) and Malmius (2020). The quantity of feathers in the Valsgärde boats seems not to be so large that it is natural to call the featherbed a mattress, as Vedeler (2014) has done for the one found in the Oseberg ship.

Arwidsson (1954, 1977) supposes that the burials were not plundered, and that the warriors were buried with their heads in the stern and their feet in the direction of the stem. Because only a few bones of the human skeletons were preserved, she builds this interpretation mainly on how people were buried in other contemporary boat graves in the region (Arwidsson, 1942, 1954, 1977). In the poem Beowulf, likely composed between late 7th to early 9th century, the deceased ruler of the Danes, Scyld Scefing, is buried lying at the mast, richly equipped with treasures (Wrenn, 1958; Lee and Stevick, 2010). The ship was then set out into the ocean. The 7th century Valsgärde boats are row boats and have no mast according to Blomberg (1954, 1977); compare Larsson (2013), but the warriors were anyway laying amid ships ready for the voyage. It is also remarked that the Valsgärde boats are designed as

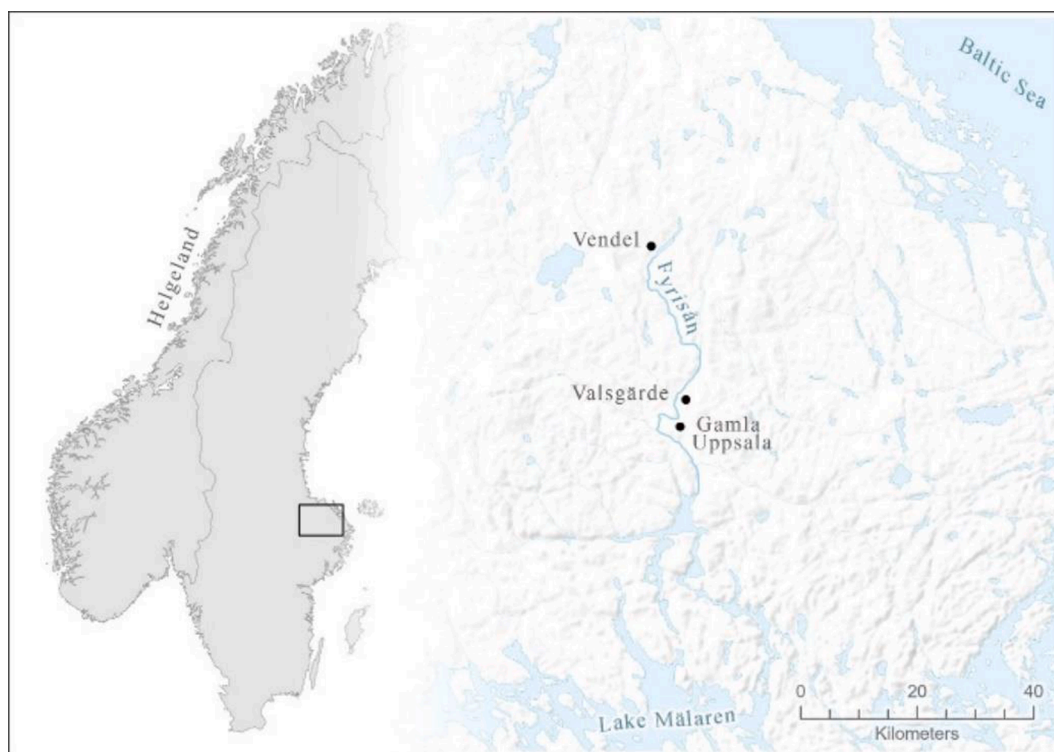


Fig. 1. Scandinavia with the position of Vendel, Valsgärde and Old (Gamla) Uppsala in Uppland, Central Sweden. The three sites are connected by the river Fyrisån that flows into lake Mälaren. Valsgärde is situated at 59,9°N, 17° E. (Illustration: Magnar Mojaren Gran, NTNU University Museum).



Fig. 2. Top: The Valsgärde hillside with the pagan cemetery seen from south-east. Hollows after excavated boat burials are visible. Photo: B. Berglund. Bottom left: Map of the Valsgärde hillside with numbered burials. The investigated sites are marked in red. From Arwidsson (1977). Bottom right: Warriors on a metal sheet from the helmet at Valsgärde 7, with birds of prey on their helmets. Drawing from Arwidsson (1977).

halls, i.e. buildings for feasts (Herschend, 2001).

Valsgärde 7 was excavated in 1933 and is the best equipped of the two boat burials (Fig. 3). Arwidsson assumes that the bed originally covered an area of 1×2 m, orientated in the direction of the boat. The bed seemed to be situated in a cist or in a cart basket like the one in the Oseberg ship burial (Arwidsson, 1977; Blomberg and Arwidsson, 1977). Three shields were lying over the warrior and a helmet was placed close to the feet.

The excavation of Valsgärde 8 was carried out 1936 (Fig. 4). The bed was suitable for a 165–170 cm tall man. The equipment resembles that found in Valsgärde 7, although not as plentiful in terms of items. The head is assumed to have been immediately behind the upper end of the scramasaxes (long single-edged knives). The sword was situated on the left side of the body and two shields were lying over where the legs and feet should have been. There were large quantities of birchbark in the boat, mostly sheets sewn together, used to cover the stern and some of

the equipment (Arwidsson, 1954).

2. Materials and methods for microscopic investigation of the feathers

2.1. Within-site samples and contexts

Eleven samples of feathers were collected from the two sites. Among these, eight samples were collected from three locations in Valsgärde 7, while three samples were taken from one location in Valsgärde 8.

2.1.1. Valsgärde 7

Feathers under Shield I: sample 1–2 (Vgde 672) & sample 3–6 (Vgde 925)

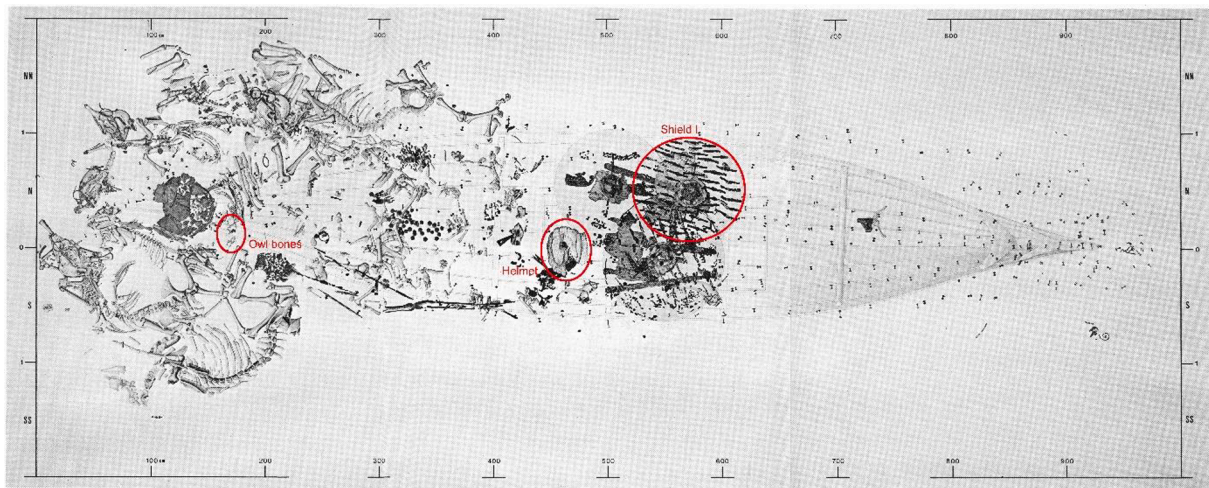


Fig. 3. Excavation plan of Valsgärde 7. Tafel 45 from Arwidsson (1977). Red circles mark the position of certain contexts mentioned in the text. Left: Owl bones. Middle: Helmet. Right: Shield I.

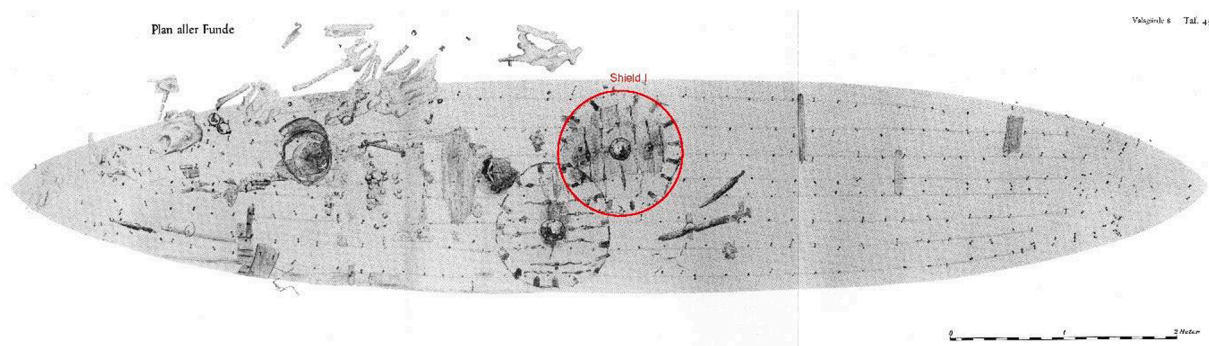


Fig. 4. Excavation plan, Valsgärde 8. Tafel 43 from Arwidsson (1954). The red circle in the center of the boat shows the position of Shield I.

The six samples are all from the part of the bed that was preserved under Shield I (Fig. 3). The feather layer was thickest under the shield boss, where it was up to 3,5 cm thick. There were textiles (patterned fabric and twill), hair and untanned fur directly over or under the feathers, probably pillowcases, bolster covers and pelts (Arwidsson, 1977).

Feathers in connection with the helmet: Sample 7–8 Vgde [1205]

There were textiles stuffed with feathers inside and by the side of the helmet. Sample 7 is from the area under the helmet and thereby surely from a pillow. Sample 8 is found between the two tight-jointed sides of the helmet. There were also several types of textiles, for example soumak weave. The feathers and textiles inside the helmet could be remains of a stuffed lining to make the helmet more convenient to wear. Arwidsson (1977) claims, however, that the different textiles do not indicate this, even if one of the textile types could have been suited for use in a lining. In such a case, more of this textile should have been preserved since the preservative conditions were so good inside the helmet. She (1977) supposes that mice and other animals may have disturbed the layers in the bedclothes if the material was used to build nests in the boat. Another opinion is that the textiles in the bedclothes and those from the helmet look similar (Arwidsson, 1977).

2.1.2. Valsgärde 8

Feathers under Shield I and under textiles: sample 9–11 (Vgde 414)

The best-preserved feathers and textiles at this site were found directly under Shield I (Fig. 4). It was possible to distinguish layers of feathers, textiles, alder twigs and hay. There were three to five different pillowcases and bolster covers of textile, lying on top of each other and stuffed with feathers. There was also a pillowcase of cattle hide. Quilt covers of hides are known from medieval documents (Hoffmann, 1970). Such covers did not demand a careful cleaning of the feathers (Kolsrud, 1959). Hay and twigs of alder served as a base for the bed (Arwidsson, 1954).

2.2. Sampling and microscopic analysis of feather fragments

Studies on variations in the microstructures of feathers have a relatively long history of research, starting with the studies of Nitzsch (1867), but with great improvements during the last part of the 20th century (e.g. Chandler, 1916; Day, 1966; Robertson et al., 1984; Brom, 1986; Dove, 1997, 2000; Dove and Agreda, 2007; Lee et al., 2016). Barbules on downy barbs have diagnostic characteristics of sizes, shapes and pigmentation patterns that are specific to various taxonomic levels of birds, and which can be used to identify at least the Order level, sometimes Family and in certain circumstances even species through microscopic examination (Chandler, 1916; Brom, 1986; Dove and Koch, 2010). These characters may vary in different parts of the feathers and among different feather types, so great care is needed to make taxonomic designations.

In order to identify the types of birds present among the feather samples from the two burials (e.g. Fig. 5), a varying number of downy barbs (Fig. 6) were sampled from each location and prepared for



Fig. 5. The excavated feathers from Valsgårde 7 (Sample 2) are very well preserved, but brittle, densely packed and entangled. Photos: J. Rosvold.

microscopic examination following the methods described in Dove and Koch (2010). Whenever possible, we sampled from known positions on contour feathers, but due to the fragile and intertwined nature of the material this was not possible in all cases. Some samples, however, were exceptionally well preserved and clearly contained both contour feathers and true down. Great efforts were taken in order to search through the material and locate feathers that could provide the most detailed identifications. The feathers in the samples were teased apart, but due to the minute size of the barbules, the sampling was minimally destructive.

In total, 29 microslides (each containing several barbules) were made from Valsgårde 7 and four microslides from Valsgårde 8. The microslides were investigated using a Leica light microscope at 100–400x magnification. Photos were taken with a Euromex CMEX-18Pro microscope camera using the ImageFocusAlpha software. Focus stacking was used to increase the depth of field, and images have been manually edited to remove lens dust.

The ancient feather fragments were compared to a large library of reference samples in the NTNU University Museum, as well as published literature (Chandler, 1916; Brom, 1986; Dove, 1997, 2000; Dove and Agreda, 2007; Dove and Koch, 2010). The fragments were compared to species known to occur in Northern Europe. In order to corroborate the identifications, the findings were compared to identified bird bones from Valsgårde 7 and 8 (Ericson and Tyrberg, 2004) and from two excavated houses (A2 pit house and A241 in or close to house 3A) of a nearby, contemporary farm (Bäckström, 1997).

The methodology for sampling and identification is qualitative rather than quantitative. Thus, we obtain a measure of the variety of taxa present in the samples and not a definite measure of their frequencies in the archaeological material. However, visual inspection of the material combined with microscope investigations enabled us to get

an impression of the dominant taxa.

3. Results of the microscopic analyses

In general, the feathers were very well preserved, but densely packed, brittle and entangled in such a way that teasing apart single feathers or barbules often resulted in increased micro-fragmentation. This, in combination with intermingled dirt, made viewing for identification purposes more difficult. Even so, the analysed material showed a remarkable high degree of heterogeneity and contained at least nine different taxa (Figs. 7–9, Table 1). At both sites, Anseriform (ducks and geese) feathers seemed to be the most frequent, but for Valsgårde 7 there was a large variation in taxa. The types of feathers present were varied and contained a mixture of contour feathers and true down in an unknown proportion. There seemed to be a much higher amount of distal pennaceous ends compared to proximal ends. This could indicate that the contour feathers had been deliberately cut in order to remove the hardest and pointiest parts of the rachis.

3.1. Valsgårde 7, 672 “Pillow under shield I”

Two samples were taken from this context, but only one (Sample 2) had feathers with identifiable characters. Sample 2 (Fig. 5) was the largest of the samples and highly heterogenic (Table 1).

Several of the subsamples from Sample 2 showed the typical characteristics of Anseriformes (geese, swans and ducks) with distinct triangular nodes (Fig. 7). Visual inspection of these showed the presence of at least two different species. Some had the distinct characteristics of geese (Fig. 7a,b) with relatively long barbules, with several (up to five) large and widely separated triangular nodes spread medially to distally. The characters fit best with Greylag Goose (*Anser anser*), but other

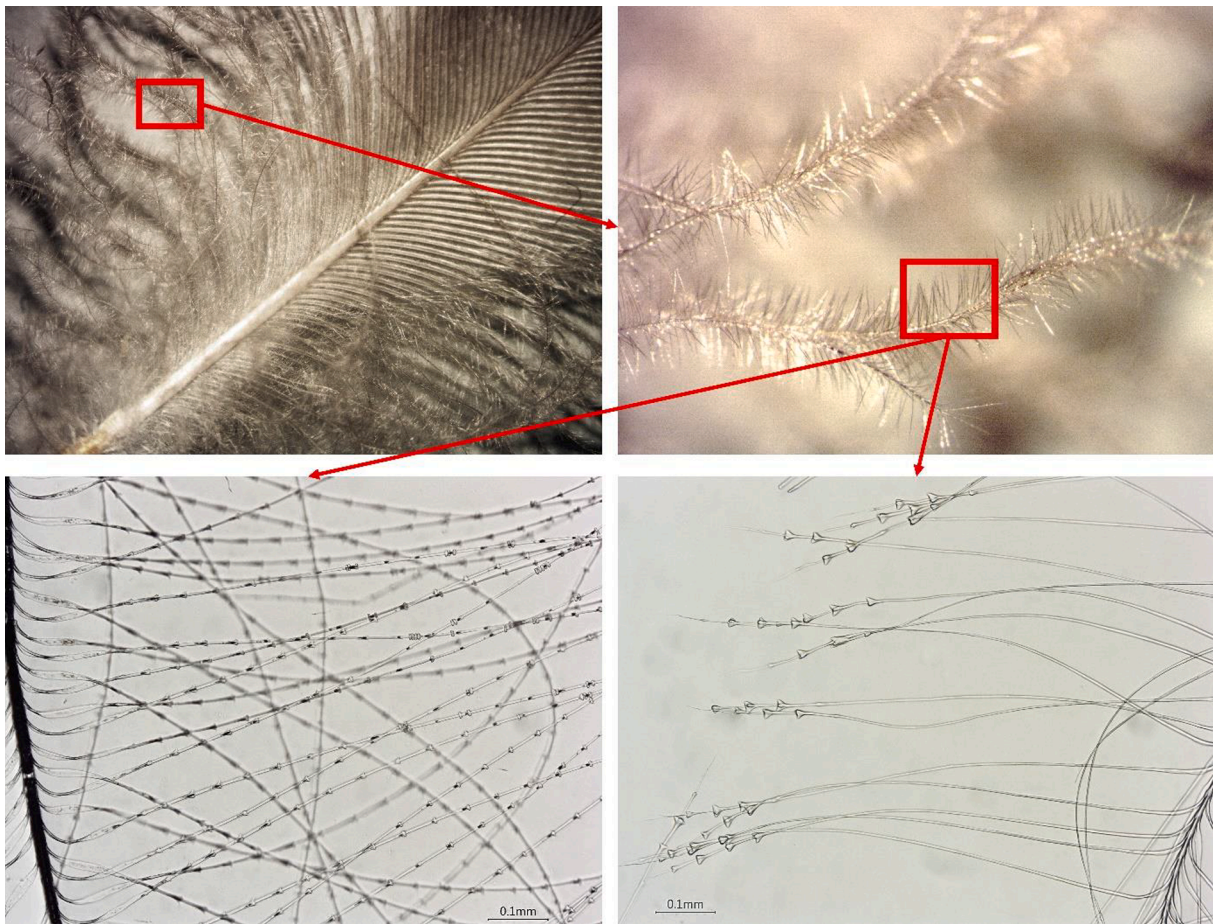


Fig. 6. Various parts of a modern contour feather. Top left: the basal part of the feather with the central stem (rachis) and the branching barbs that are downy (plumulaceous) at the proximal end and pennaceous towards the distal end of the feather. Top right: Close-up of downy barbs with branching barbules from the rachilla of the barb. Bottom: Microscope images of branching barbules from the rachilla of the barb, showing examples of differences between two species; Rock Ptarmigan (*Lagopus muta*) left and Mallard (*Anas platyrhynchos*) right. Scale bars are 0.1 mm. Illustration: J. Rosvold.

closely related goose species cannot be ruled out due to the general variability of these characters. Other subsamples were clearly of a species of dabbling duck. Ducks are characterized by having expanded nodes on the distal ends and ducks within the dabbling group can be differentiated from other ducks by e.g. longer barbules, a larger number of expanded nodes per barbule and shorter distance between the nodes (Dove and Agreda, 2007). In this sample, the duck feather barbules had three to five nodes placed distally and close together (e.g. Fig. 7c). Among the species naturally occurring within Northern Europe, the length of the barbules and relatively large numbers of barbules fits best with Mallard (*Anas platyrhynchos*) or Widgeon (*Anas penelope*) (Fig. 7d). One subsample, consisting of a loose tangle of barbules, differed from the others by having a very large number (up to seven) of broad, triangular nodes that were spaced relatively close together. Among the species that occur naturally in Northern Europe, only Common Shelducks (*Tadorna tadorna*) show these characteristics in our reference material. However, this species was not found in any samples apart from this highly fragmented subsample and the result should be interpreted with caution.

Feathers of Galliformes were also frequently found in Sample 2. These are characterized by very long barbules with expanded, spiny proximal nodes that change to medial and distal ring-shaped nodes, which may detach and slide along the barbules (Fig. 8b). Most of the galliform finds in this sample had relatively large and wide proximal nodes, long distance between the nodes and heavy nodal and prenodal pigmentation (Fig. 8a). Among the species occurring in Northern Europe, these characters were highly consistent with tetraonids, i.e.

Black grouse (*Tetrao tetrix*) or Capercaillie (*Tetrao urogallus*). One subsample differed by having distinctly smaller and more spiny proximal nodes, and a diffuse pigmentation pattern. This subsample was more similar to Domestic Chicken (*Gallus gallus*). This identification is uncertain, but is corroborated by bone finds of Domestic Chicken at the same site (Table 2 below).

A third set of subsamples from Sample 2 showed the characteristic features of Passeriformes (Dove and Koch, 2010), with a large number of flared, pigmented nodes along the barbules, as well as the presence of knobbed villi on the proximal part (Fig. 8c–f). Most of these had features characteristic of corvids (Fig. 8c,d), with long barbules containing up to c. 50 nodes spread relatively wide apart compared to other passerines. Furthermore, the nodes were only slightly flared with diminishing projections towards the distal ends, and the nodes had distinct pigmentation throughout the entire barbules. These samples were cut from relatively large feather fragments, with long well-preserved barbs. The other set of passerine feather fragments from this sample were more fragmented, but had more uniform and tightly spaced nodes, with more apparent transparent projections (Fig. 8e). These were clearly from a smaller, non-corvid passerine, but it was not possible to perform a more precise identification.

An interesting find in Sample 2 (as well as Sample 4 and 6, see below) was the presence of feather fragments of owl (Strigiformes) (Fig. 9). Owls have very long, thin barbules, with large, expanded proximal nodes that become indistinct towards the distal ends, and have uniform pigmentation pattern throughout. The overall node shapes and distances between nodes in this sample were consistent with owls in the subfamily

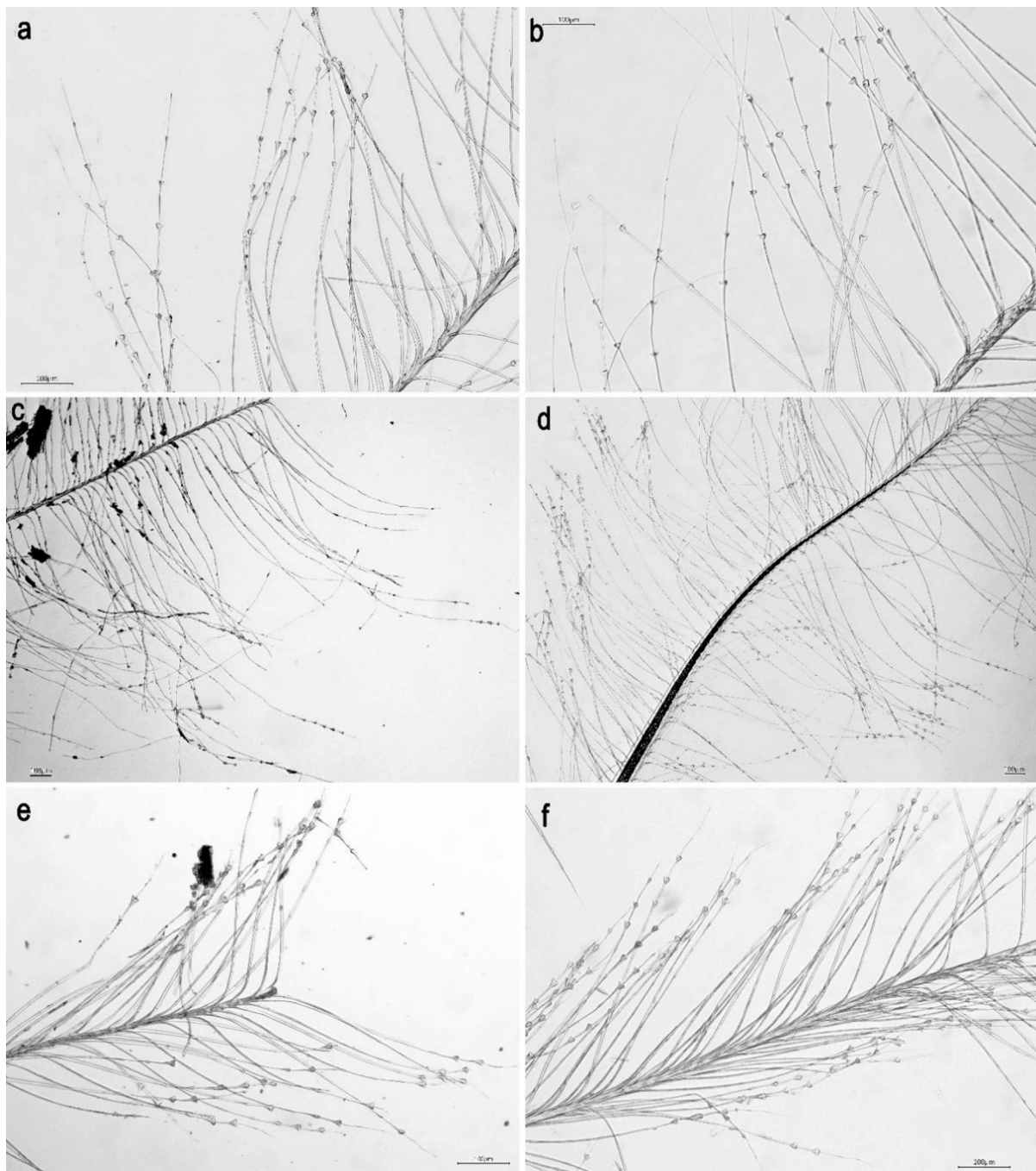


Fig. 7. Microscope images of downy feather barbs and barbules from Valsgårde (a, c, & e) compared with examples of similar anseriform reference material of b) goose (Greylag Goose [*Anser anser*]), d) dabbling duck (Mallard [*Anas platyrhynchos*]) and f) diving duck (Common Eider [*Somateria mollissima*]). Scale bars are 100 μ m. Photos: J. Rosvold.

Striginae and, among the species that naturally occur in Northern Europe, the pigmentation pattern was only identical to Eagle Owl (*Bubo bubo*). The species level identification is uncertain, but is corroborated by bone finds of this species in the same grave (Table 2 below).

3.2. Valsgårde 7, 925 "Pillow under shield I"

Four samples were taken from this context, all of which provided feather fragments with identifiable characters and which proved heterogenous in taxa (Table 1). Overall, the identified taxa were similar to context 672 (above) and consisted mainly of anseriform and galliform feathers. The identified feather fragments of goose, Eagle Owl, corvid

and Black Grouse/Capercaillie were similar to those found in context 672.

On the other hand, the identified duck feathers differed. Duck feathers were found in Sample 4, 5 and 6. Sample 5 was too fragmented to give a more precise identification, but the feather fragments found in Sample 4 and 6 were consistent with seaducks (*Merginae*, e.g. scooters (*Melanitta* sp.) and mergansers (*Mergus* sp.)) based on the short length of the barbules, shape of the nodes and the relatively low number of nodes (0–3) per barbule.

Small fragments of feathers from a wader (*Charadriiformes*) were found in Sample 6. This group of birds is highly varied in barbule characteristics (Dove, 1997). The fragments had medium length

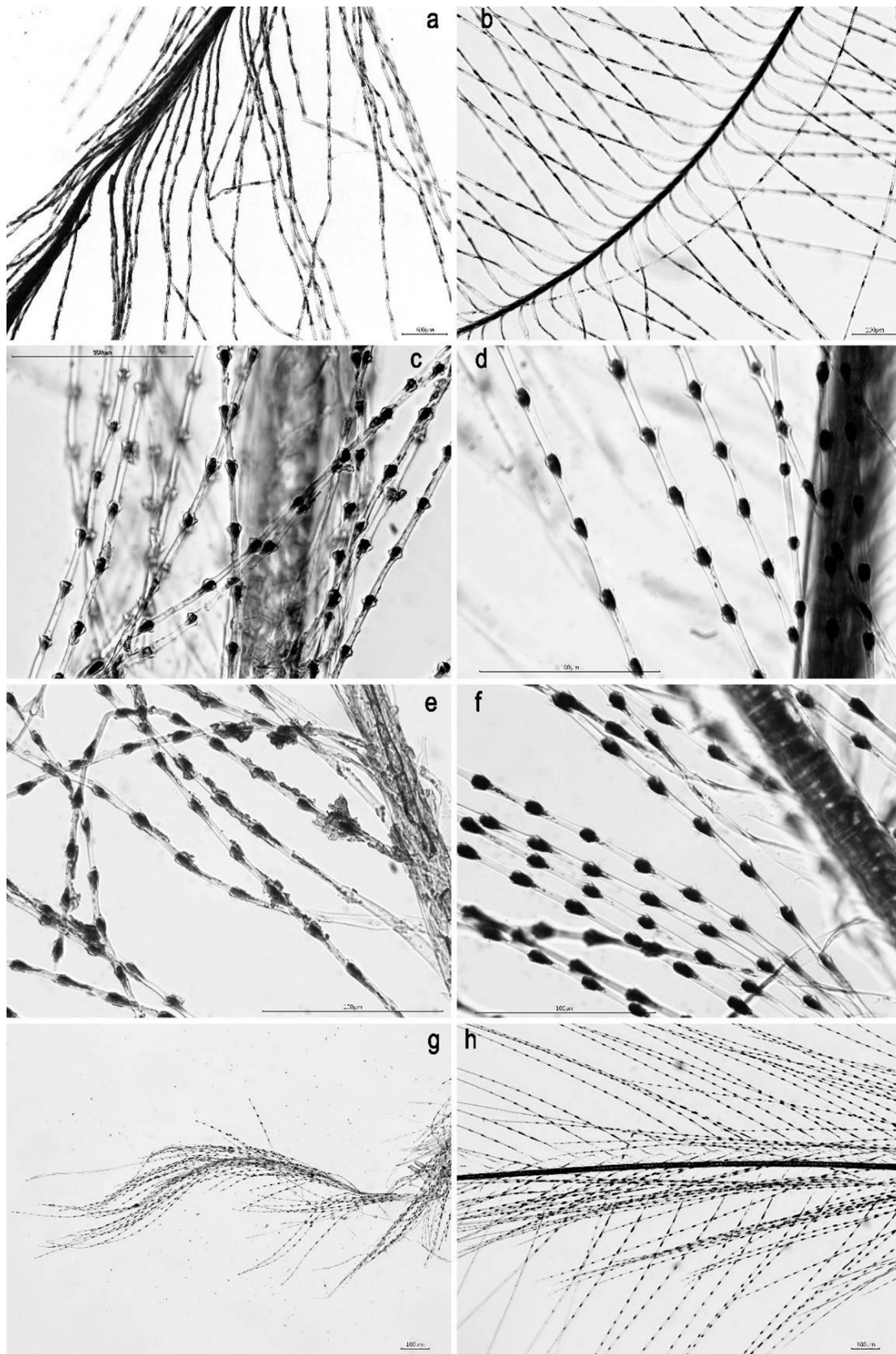


Fig. 8. Microscope images of various downy feather barbs and barbules from Valsgärde 7 (a,c,e & g) compared with examples of similar reference material from various bird groups: b) Galliformes (Black Grouse [*Tetrao tetrix*]), d) Passeriormes (Eurasian Jay [*Garrulus glandarius*]), f) Passeriformes (Yellowhammer [*Emberiza citronella*]) and h) Charadriiformes (Dunlin [*Calidris alpina*]). Scale bars are 100 µm. Photos: J. Rosvold.

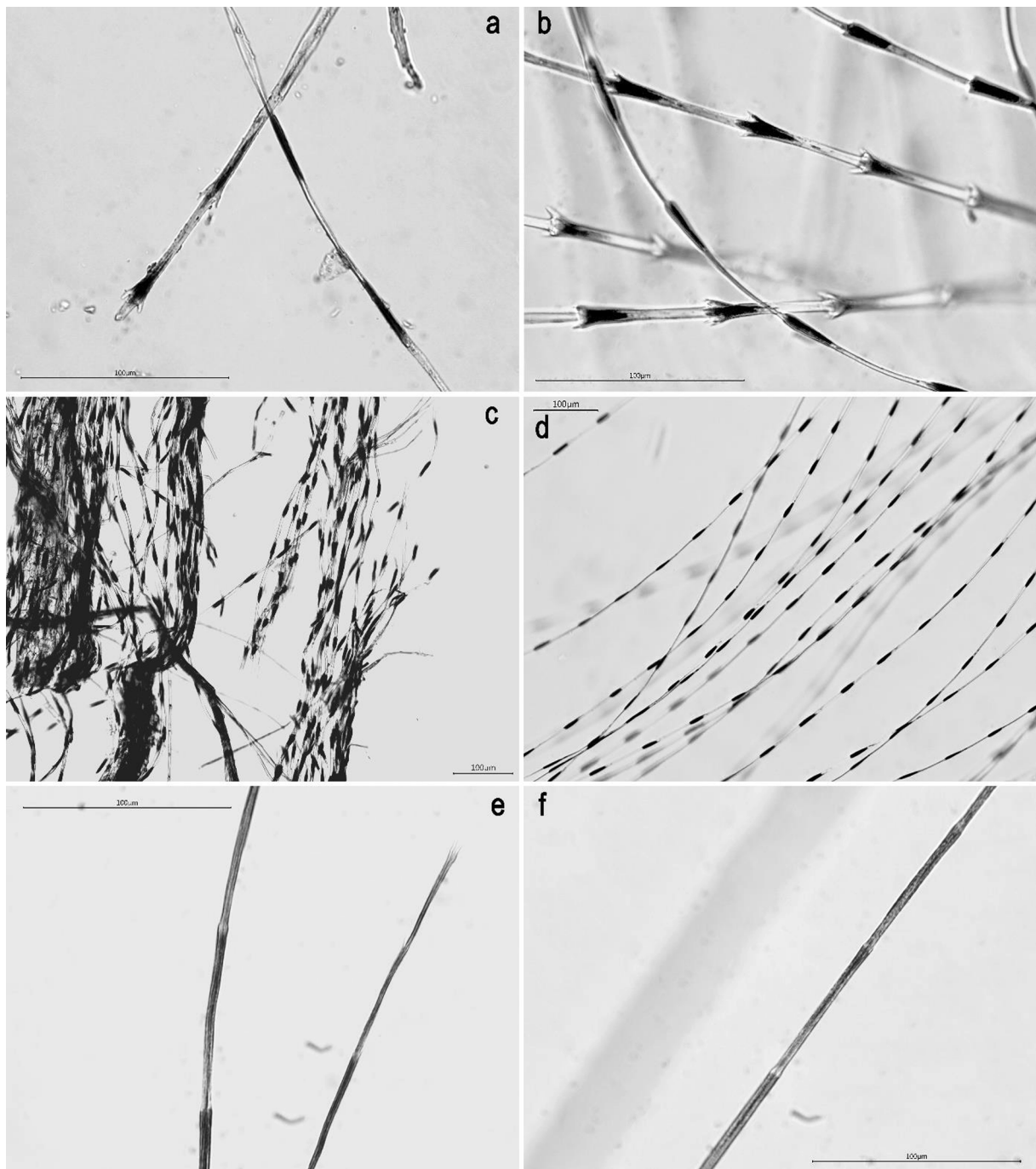


Fig. 9. Microscope images of downy feather barbules from Valsgårde 7 (a, c & e) compared with reference material of Eagle Owl (*Bubo bubo*) proximal (b), medial (d) and distal (f) barbule sections. Scale bars are 100 µm. Photos: J. Rosvold.

barbules with many expanded, spiny nodes and diamond shaped nodal pigmentation, but no pigmentation in the distal nodes and no villi (Fig. 9g). These could be determined to either Charadriidae or Scolopacidae (e.g. Dunlin *Calidris alpina*).

3.3. Valsgårde 7, [1205] “Pillow under helmet”

One small sample was taken from this context, but it contained feather fragments from at least three taxa (Table 1). Well preserved, goose feather fragments with the same characteristics as the above samples were found, as well as from a species of wader similar to Sample 6 (see above). In addition, we found well preserved fragments of a sea duck, with characteristically short barbules and few (0–3) expanded

nodes (Fig. 7f). These features, along with the distance between the nodes and the heavy pigmentation throughout the barbule were consistent with eiders, but other species of sea ducks cannot be ruled out entirely.

3.4. Valsgårde 7, [1205] “Inside the helmet”

One small sample was taken from this context, which contained poorly preserved feather fragments of swan or more likely goose (Table 1). Swans can be differentiated from geese by e.g. generally more proximally located nodes, but these feathers were too fragmented and indistinct to be entirely sure.

Table 1

Avian taxa identified in different samples from Valsgärde 7 and Valsgärde 8. The samples differ largely in size and several microslides of subsamples were made from each.

Context	Sample	Order	Family	Subfamily	Species	ID*
Valsgärde 7						
672 Pillow under Shield I	1	N/A	N/A	N/A	N/A	N/A
	2	Anseriformes	Anatidae	Anserinae	<i>Anser</i> sp.	Goose [#]
		Anseriformes	Anatidae	Anatinae	<i>Anas</i> sp.	Dabbling duck [#]
		Anseriformes	Anatidae	Tadorninae?	<i>Tadorna</i> sp.	Shelduck?
		Galliformes	Phasianidae	Tetraoninae	<i>Tetrao</i> sp.	Black Grouse or Western Capercaillie
		Galliformes	Phasianidae	Phasianidae?	<i>Gallus gallus</i> ?	Domestic Chicken? [#]
		Passeriformes	Corvidae	Corvinae		Corvid
Passeriformes					Small passerine [#]	
925 Pillow under Shield I	3	Strigiformes	Strigidae	Striginae	<i>Bubo bubo</i>	Eagle Owl [#]
		Anseriformes	Anatidae	Anserinae	<i>Anser</i> sp.	Goose [#]
	4	Galliformes	Phasianidae	Tetraoninae	<i>Tetrao</i> sp.	Black Grouse or Western Capercaillie
		Anseriformes	Anatida	Merginae		Sea duck
		Passeriformes	Corvidae	Corvinae		Corvid
	5	Strigiformes	Strigidae	Striginae	<i>Strix/Bubo</i> sp.	Owl [#]
		Anseriformes	Anatidae			Duck or goose
	6	Galliformes	Phasianidae	Tetraoninae	<i>Tetrao</i> sp.	Black Grouse or Western Capercaillie
		Anseriformes	Anatidae	Merginae		Sea duck
		Charadriiformes	Charadriidae/Scolopacidae			Wader
		Strigiformes	Strigidae	Striginae	<i>Bubo bubo</i>	Eagle Owl [#]
[1205] Pillow under helmet	7	Anseriformes	Anatidae	Anserinae	<i>Anser</i> sp.	Goose [#]
		Anseriformes	Anatidae	Merginae	<i>Somateria</i> sp.	Eider
	Charadriiformes	Charadriidae/Scolopacidae			Wader	
[1205] Inside the helmet	8	Anseriformes	Anatidae	Anserinae		Likely goose
Valsgärde 8						
414 Under textiles and Shield I	9	Anseriformes	Anatidae	Anserinae	<i>Anser/Branta</i> sp.	Goose [#]
	10	Anseriformes	Anatidae	Anserinae	<i>Anser/Branta</i> sp.	Goose [#]
	11	Anseriformes	Anatidae	Anserinae	<i>Anser/Branta</i> sp.	Goose [#]

*Species designations are based on the most likely species among those naturally occurring in Northern Europe. [#] Species designations corroborated by bone finds at Valsgärde or the nearby excavated farm houses (see below).

Table 2

Microscopic feather analyses corroborated with identified bird bones that appear in Valsgärde 7 and 8 and a nearby, contemporary farm.

Species	Feathers Valsgärde 7	Feathers Valsgärde 8	Bird bones Valsgärde 7	Bird bones Valsgärde 8	Bird bones Farm: A2 Pit house	Bird bones Farm: A241
Goose	X	X	X	X		
Mallard	X?		X		X	
Eagle Owl	X		X			
Domestic Chicken	X?		X			X
Passerine	X		X			

3.5. Valsgärde 8, 414 “Under textiles”

Three small samples were taken from this context (Table 1), but the material was highly brittle and contained few downy, identifiable barbules. A few barbule fragments could be determined to goose.

4. Discussion

Although feather microstructure alone is not enough to allow secure identifications all the way down to species level in most cases, nevertheless a surprisingly large variety of different birds were identified among the feathers excavated from the two Valsgärde burials (Table 1). Some of the identifications can be corroborated with bone finds (Table 2) of birds found within the same two boat burials (Ericson and Tyrberg, 2004), as well as in a partly excavated contemporary farm (Fig. 10) close to and north of the burial hillside (Norrr and Sundkvist,

1997). Even if there are few identified bird bones from these sites, there are some striking similarities which support the feather analyses.

The bones from the farm were excavated from two houses (A2 pit house and A241 in or close to house 3A), and out of a total of 11 bird bones only three of the bones could be identified to species (Bäckström, 1997). Two of these bones were identified to Domestic Chicken (one hen and one cock), both from a pit probably used for storing of food in or outside a longhouse (House 3A). The other fragment was from a Mallard and was found inside the pit house. Both houses are ¹⁴C-dated to the first half of the 7th century (Norrr and Sundkvist, 1995, 1997; Herschend, 1997) and should thereby be contemporary with the boat burials Valsgärde 7 and 8. The storing pit is not ¹⁴C-dated, but all the culture layers seem to be from about AD 600–650 (Norrr and Sundkvist, 1997).

A large part of the feathers in the burials seems to be of goose, and most similar to Greylag Goose. Goose bones were not found among the few identified bones at the farm, but were found in both burials.

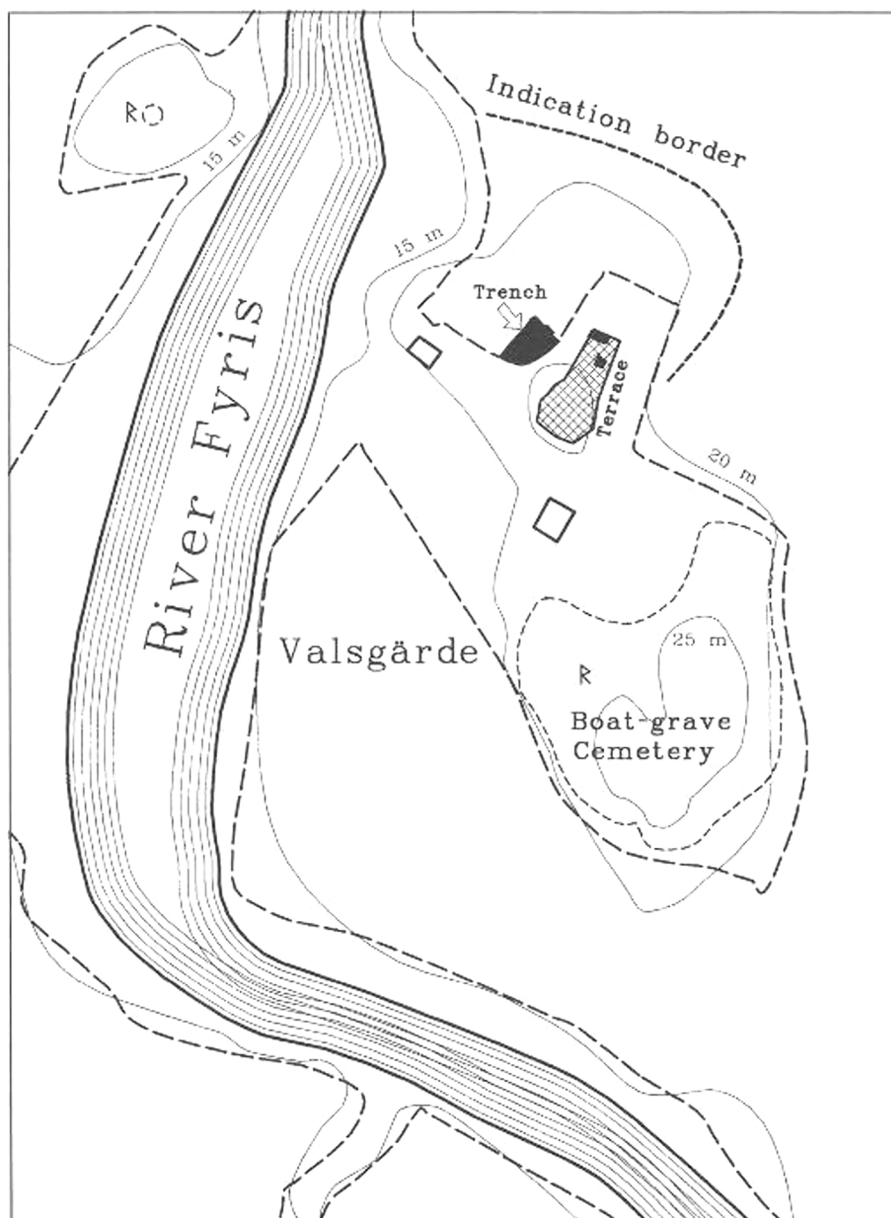


Fig. 10. Valsgårde with the pagan cemetery and the 7th century partly excavated farm in 1994–1996. The farm is situated 15–20 m over today's sea level. From [Norr and Sundkvist \(1995\)](#).

Domesticated Greylag Goose was introduced to Scandinavia during the Iron Age or even earlier ([Ericson and Tyrberg, 2004](#)). While it is difficult to differentiate bones of wild and domestic goose, most bones of Greylag Goose in archaeological contexts, from this and later periods, are identified to be of the domesticated type ([Ericson and Tyrberg, 2004](#)). Thus, it is not unlikely that there were feathers and bones of domestic goose in the burials at Valsgårde.

Mallard bones were found both at the farm and in Valsgårde 7, and feathers of dabbling duck (possibly Mallard) were found in Valsgårde 7. The Mallard from the farm shows that wild birds were consumed there, and that the farm used both domestic and wild animals. Mallard is the origin of the domestic duck and a burst of records from the Viking Age and forwards indicate that domestic ducks occurred in Sweden around that time ([Ericson and Tyrberg, 2004](#)). However, it is unsure if they occurred in Sweden earlier than this, and we suppose that the Mallard is a game animal. Mallard is the most common type of duck in Sweden today and seems to have been so earlier as well ([Ericson and Tyrberg, 2004](#)). Mallard bones were found in the burial and it is thus likely that

the feathers identified as dabbling ducks are of mallards.

Bones from domestic chickens were found at the farm and in Valsgårde 7, and support that there really are feathers of domestic chickens in the pillows and bolsters of Valsgårde 7. These feathers could thus come from the nearby farm. The oldest Swedish record of domestic chickens are from the 1st century BC ([Ericson and Tyrberg, 2004](#)).

Bones of an unidentified small passerine were found in Valsgårde 7. Similarly, feathers of at least one species of small passerine, as well as corvids, were found in Valsgårde 7. The bones support that there were feathers of passerine in the grave.

The Eagle Owl was represented with both feathers and bones in Valsgårde 7. An Eagle Owl was put in the burial, without its head but otherwise complete ([Arwidsson, 1977](#)), like two Goshawks in the 7th–8th century boat burials in Salme in Estonia ([Konsa et al., 2009](#); [Allmäe et al., 2011](#)). The Eagle Owl was originally determined as a Snowy Owl ([Arwidsson, 1977](#)). Although it is difficult to separate between bones from Eagle Owl and Snowy Owl, these were later re-determined as Eagle Owl ([Ericson and Tyrberg, 2004](#)). The

pigmentation pattern of the feather fragments is consistent with this being Eagle Owl and not Snowy Owl.

4.1. Were the feathers a specialized long-distance trade commodity or were they sourced locally?

The identified bird feathers do allow us to discuss further the potential for signs of long-distance specialized trade in bird feathers for use in e.g. bedclothes. Since all the feathers in Valsgärde 7 and 8 were from pillows and bolsters, there is no need to differ between feathers from different areas within the sites. Many contour feathers seem to have been cut, likely in order to prevent the larger and stiffer shafts to penetrate the textiles.

Some conditions to be accomplished for the feathers to be regarded as a long-distance trade commodity or as locally sourced will be investigated here:

1. The feathers of one species should dominate if they were a long-distance trade commodity, since we assume that such trade was specialized in one or few bird species.
2. If they were a long-distance trade commodity, the wild birds that the feathers originate from should not be expected to be common in the natural surroundings in the Late Iron Age. If they were common, it would be no point in bringing them in. Locally sourced feathers are expected to be common in the area.
3. Likewise, there should neither be bones of the same species as the feathers originate from in the burials or on the farm if the feathers were a long-distance trade commodity. Such bones indicate hunting or keeping of live birds, which is further proof of local sourcing.

While most of the feathers in the bedclothes in Valsgärde 7 seem to be of ducks and geese, the species content seems very varied and we can hardly say that one species dominates (Table 1). There are feathers from sea ducks and potentially eider ducks (Table 1), but they seem not to be common. If these feathers were a long-distance trade commodity from the coast of North Norway or other areas far north in Europe, they should have been more common in the bed and hardly mixed with feathers from local birds. It is more probable that the sea duck feathers came from the Baltic area. Short-distance trade with sea ducks is known from Central Sweden (Ericson, 1987) and is said to have long traditions in this part of the Baltic (Storå, 1968). The feathers from Eagle Owl can hardly be considered a game species, but owls are known to have been used as a lure during the hunting of other birds (Blome, 1686), and Eagle Owls are noted to be used like this until quite recently in Sweden (Stolpe and Arne, 1912; Ericson and Tyrberg, 2004). There were feathers in Valsgärde 7 that possibly originated from domestic chicken. Only a single feather fragment showed these characteristics, and the identity is uncertain, but bones of this species have been found in the same grave (Table 2). All in all, no feathers from one bird species dominated in the stuffed bedclothes of Valsgärde 7, and we suppose that most of the feathers originate from the wild birds caught in the surrounding environment of woods, rivers, lakes, fields and pasture grounds of Valsgärde and the nearby coast. Feathers were probably also collected from domestic birds at the nearby farm.

Few feathers from Valsgärde 8 were gathered during the excavation and the sampled material was not as well preserved as that of Valsgärde 7. All samples could be identified to some sort of goose (Table 1), but they might originate from more than one species. Thus, it is not possible to infer any further if these feathers were a long-distance trade commodity or if they were locally sourced, but both domestic and wild goose were likely present in the area.

The bird bones found in the burials and at the farm were of the same species as were found among the feathers in the burials. The investigation thereby does not support any of the conditions to regard that feathers from Valsgärde 7 and 8 are a long-distance trade commodity from the coast of Norway or other areas the far north in Europe. The sea

duck feathers could be sourced on the coast of the Baltic or be a short-distance trade commodity from there. This does not rule out potential trade in e.g. complete pillows from Southern Europe, but we deem it highly unlikely that there was trade in just feathers for stuffing from such remote areas.

Thus, the feathers may provide knowledge not only of domestic birds at the Valsgärde farm, but also of the bird fauna in the hunting ground and fields of Valsgärde. Many of the birds that the feathers came from, are normally not food for humans today and most of them are not expected at the high-status 7th century farm at Valsgärde. Their bones are therefore seldom found in excavated dwelling places and burials.

The feathers thus provide a new source of information of the bird faunal history and the use of birds at Valsgärde in the 7th century. Feathers are very rarely used as a source of information for archaeological and natural historical investigations but hold great potential and should be tried at other locations with bird feathers where this type of knowledge is demanded.

4.2. A deeper meaning behind the choice of feathers in the bedclothes?

Even if most of the feathers came from birds living in the hunting-grounds and the fields of the farm, it is not sure that all feathers were chosen accidentally. Could there also be a deeper meaning behind the choices, even if nobody could notice the feathers on the inside of pillowcases and bolster covers?

We have noted that there were feathers of Eagle Owl in Valsgärde 7 and that an Eagle Owl body was put in the grave with the head cut off, probably for ritual reasons like it is proposed for the decapitated birds of prey from one of the contemporary boat burials at Salme in Estonia (Allmäe et al., 2011). The keeping of predatory birds has long been a status symbol, something that the birds of prey on the metal sheets (Fig. 2) from Valsgärde 7 also confirm. Hunting with an Eagle Owl as a lure would likely provide high status. In Valsgärde 6, another of the high-status boat burials from the Vendel Period (AD 570–800), and in one or two of the royal grave mounds newly dated to around AD 600 (Ljungkvist, 2008a) at Old Uppsala (Fig. 1), there were bones of Goshawk (*Accipiter gentilis*), another bird species used for hunting (Ericson and Tyrberg, 2004). In Vendel III (Fig. 1), a boat burial from the Vendel Period, there were both a Gyrfalcon (*Falco rusticolus*) and an Eagle Owl (Ericson and Tyrberg, 2004). Both hawking and falconry seem to be introduced in Sweden in the 6th century among the aristocracy (Ericson and Tyrberg, 2004). The Eagle Owl in Valsgärde 7 was, according to Arwidsson (1977), old and female like the two Goshawks from Salme, probably because the females are larger than the male species and thereby able to catch larger game (Allmäe et al., 2011). The Eagle Owl bones were found on the northwestern side of a kettle, c. 2.5 m from the bed (Fig. 3). The other bird bones in the grave do not seem to originate from whole birds, but was cut up, ready for the kettle like the ones in the boat burial Valsgärde 6 (Arwidsson, 1942, 1977, 1980). The other bones were also situated in the kitchen-area, but according to the excavation plan (Fig. 3) further away from the kettle and closer to the bed. While the other birds were put in the grave as a proviant for the voyage to the kingdom of the dead, the Eagle Owl might have been part of the hunting equipment of the warrior. The Eagle Owl might be regarded as a domesticated bird, although not for food. The Eagle Owl in Valsgärde 7 had in this way a more practical meaning in connection with hunting and was at the same time a sign of high status. The fact that its head was cut off likely had a ritual meaning in connection with the funeral. Perhaps one, with the decapitation, wanted to prevent the owl coming back as a ghost? Eagle Owls are known in the Norse folklore as ghosts (Kostveit, 2000), and perhaps Eagle Owl feathers also had such a ritual or symbolic meaning?

Many birds have a special meaning in folklore (Kostveit, 2000; Hagberg, 2015) and in Norse mythology, as for example Odin's two ravens (Steinsland, 2005). There are feathers not only of Eagle Owl in Valsgärde 7 (Table 1), but also of corvids, hen and other mythological

birds that could have such a meaning. It feels at first far-fetched that feathers in pillows and bolsters could be put there for such reasons in addition to serving as stuffing. However, Fenno-Scandinavian and Danish folklore tells that there are situations where the species that the feathers came from, could be considered very important, for example which feathers a dying individual was lying on (Troels-Lund, 1969; Hagberg, 2015). The death-struggle was considered prolonged if wrong feathers were put in the pillows and bolsters, for example from domesticated hen, owls and other birds of prey, doves, crows and magpies. Many of these species are represented in Valsgårde 7. In some regions, goose feathers were considered the best to help free the soul from the body (Hagberg, 2015). Does this mean that they wanted to shorten the death-struggle for the deceased in Valsgårde 8, while this was not so important in Valsgårde 7 where there in addition to feathers from geese and ducks were feathers from birds that were considered to prolong the death struggle? The folklore was collected in the 18th century and later, about 1000 years after the two burials at Valsgårde. Nevertheless, the examples from Hagberg (2015) show that it was important which birds the feathers came from in the bedclothes at least from the 18th century, and this could have deep roots. In the Icelandic Eiríks saga Rauða, considered to be written in the 13th century but dealing with happenings around AD 1000, they put a cushion stuffed with feathers from domesticated hen on the seat of honor for a visiting female shaman to sit on at Heriölsnes in Greenland (Strömbäck, 1935; Erik den Rødes saga, 1961). It was obviously important which bird the feathers came from and it is then possible that the feathers in the pillows and bolsters in the Valsgårde burials also had a deeper meaning.

5. Conclusion

The microscopical identifications of which birds the c.1400 years old feathers in the burials Valsgårde 7 and 8 came from, corroborated with bones, showed a surprisingly large variety of birds. The feathers seem not to be a long-distance trade commodity from the far north of Europe, but reflect mainly the local bird fauna in the surroundings of Valsgårde and the nearby Baltic coast in the 7th century and are in this way a new source for such knowledge and of the use of local birds.

According to Fenno-Scandinavian folklore and Icelandic Sagas it is not always accidental which birds the feathers put in pillows and bolsters came from, especially in connection with death and shamanism. It was very important which bird species the feathers came from in bolsters, pillows and cushions when sitting or lying on them in such situations. Thus, it is possible that feathers in the Valsgårde burials were put there with a special meaning.

Feathers are rarely documented on archaeological sites, and this is as far as we know the oldest bird feathers from human burials examined in this way. The careful excavation and preservation of the feathers made it possible to carry out these investigations. Nevertheless, even minute ($\ll 1$ mm) feather fragments can be identified to at least particular groups of birds, and feather fragments are likely an ancient resource that have largely escaped archaeological attention. We are convinced that more feathers will be discovered when attention is given to the possibility of finding feathers during archaeological excavations. Thereby the feathers will bring forth new perspectives to the studies of ancient human life and nature and not least the relation between man and birds.

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