# Ravens, crows, and jackdaws

A zooarchaeological study of Corvidae faunal remains from Medieval Norway, as well as Skuggi in Northwest Iceland.

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# Abstrakt

Denne avhandlingen tar for seg beinmateriale fra ravn (*Corvus corax*), kråke (*Corvus corone*) og kaie (*Coloeus monedula*) fra norsk middelalder (ca.1030 - 1537 e.Kr.) såvel som beinmateriale av ravn fra Island (aktiv fra ca. 10. - 12. århundre e.Kr.). Det er et samlet materiale på 176 elementer. 132 av dem er kråkefugl-elementer som stammer fra åtte utgravninger fra de fire eldste byene i Norge (Bergen, Oslo, Tønsberg og Trondheim), samt 44 ravne-elementer fra det islandske stedet Skuggi, en gårdsplass nordvest på øya.

Forskningsspørsmålene for denne avhandlingen er todelt: Hvordan kan en studie av Corvidae-materiale fra flere bosetninger i middelalderen i Norge og Island tilføre ytterligere kunnskap til den nåværende informasjonen om dette emnet?
Er antallet kråkeben fra middelalderen i Norge representativt for mengden vi forventer å finne? Eller er de over- eller underrepresentert som materiale fra nevnte utgravninger?

# 1 Introduction

Through this study, I will be working with 176 elements from three corvid species; common raven (*Corvus corax*), hooded/carrion crow (*Corvus corone corone/cornix*), and jackdaw (*Coloeus monedula*). 132 of these elements originate from eight excavations in Norway, and 44 raven elements are from the Icelandic site of Skuggi, a farmstead located in the Northwest of the island (active from. ca. 10th - 12th centuries, AD)(Harrison and Roberts, 2022). All contexts are of the Norwegian Middle Ages (AD1030 - 1537)(Sawyer & Sawyer 2010). All the Norwegian excavation areas of origin are located within the four earliest towns of Norway; Oslo (Schia & Griffin 1988, Molaug undated), Tønsberg (Molaug 2002, Ulriksen 2008 ), Bergen (Hansen 2008, Blackmore & Vince 1994, Wiig 1981), and Trondheim (Lie 1989, Marthinussen 1992, Nordeide 2003). The Icelandic material consists of one excavation; Skuggi is located in Hörgardalur in the Northwest of Iceland (Harrison 2010).

## Material access and analysis

As mentioned, this is a zooarchaeological study of Corvidae bones retrieved from archeological contexts of Norway and Iceland, which have all been dated to the medieval period. The Norwegian material studied is curated at the Natural History Department of the University of Bergen (UiB). Access to the university museum's comparative collection aided in analyzing the material. Specifically, having access to modern and professionally conserved Corvidae elements has been of great help and has provided the necessary guidance. This author is not a zooarchaeologist. However, this is a zooarchaeological study.

## Research questions

This study aims to see whether it is possible to better understand some of Medieval Norway and Iceland's practical and societal norms by analyzing the Corvidae bone remains from nine locations. Therefore, my research questions are divided into the following:

- How can a study of Corvidae material from multiple settlements in Medieval Norway and Iceland add further knowledge to the current information on this subject?
- Is the number of corvid bones from medieval Norway representative of the amount we would expect to find? Or are they over or under-represented as material from said excavations?

To address this, I will ask the following questions:

1. **How can modern ecology and zooarchaeological analysis be used to understand previous cultures' relationship with the Corvidae species?**
   In order to address this, I will include ecological reports regarding the current interrelations humans have with corvids as well as previous interpretations from archaeologists.

2. **If Corvidae materials are underrepresented, how can this be detected with the current material?**
   By quantifying my own material I will compare it to previous research and their documented methodology. In order to do this I will look at the avian representation in the archaeological record as a whole.

## Geographical and chronological range

The chronological range for this study is within the Norwegian Medieval period, or Middle Ages (NMA). This is the period following the Viking Age, generally accepted as the time between 1030 - 1537 AD, from the Christianisation of Norway until the Reformation (Walker et al. 2019).

The material I will work with for this study consists of corvid bones found during archeological excavations dated to the medieval period in Norway and Iceland. The eight

Norwegian excavations included in this study are cataloged under their own *J.S* registration numbers. *J.S* is short for *Jord Skjellet,* which roughly translates to *soil skeletons*, meaning that these materials were excavated from a cultural layer and thus provide the context to the archaeological excavation. The Norwegian towns and the respective J.S. registration numbers: Oslo (J.S.537, J.S.702), Tønsberg (J.S.563), Bergen (J.S.397, J.S.613), and Trondheim (J.S.632, J.S.765, J.S.845). These towns are considered to have been urban places or places of power during the NMA (Molaug 2007).

The Icelandic material stems from a single location: Skuggi (Harrison & Roberts 2014), located in a rural area in Hörgárdalur Valley (North-west of Iceland). The excavated site lies roughly 20 km from the shore of Eyjafjörður and the medieval trading site of Gasir (Harrison, Adderley & Roberts 2008).

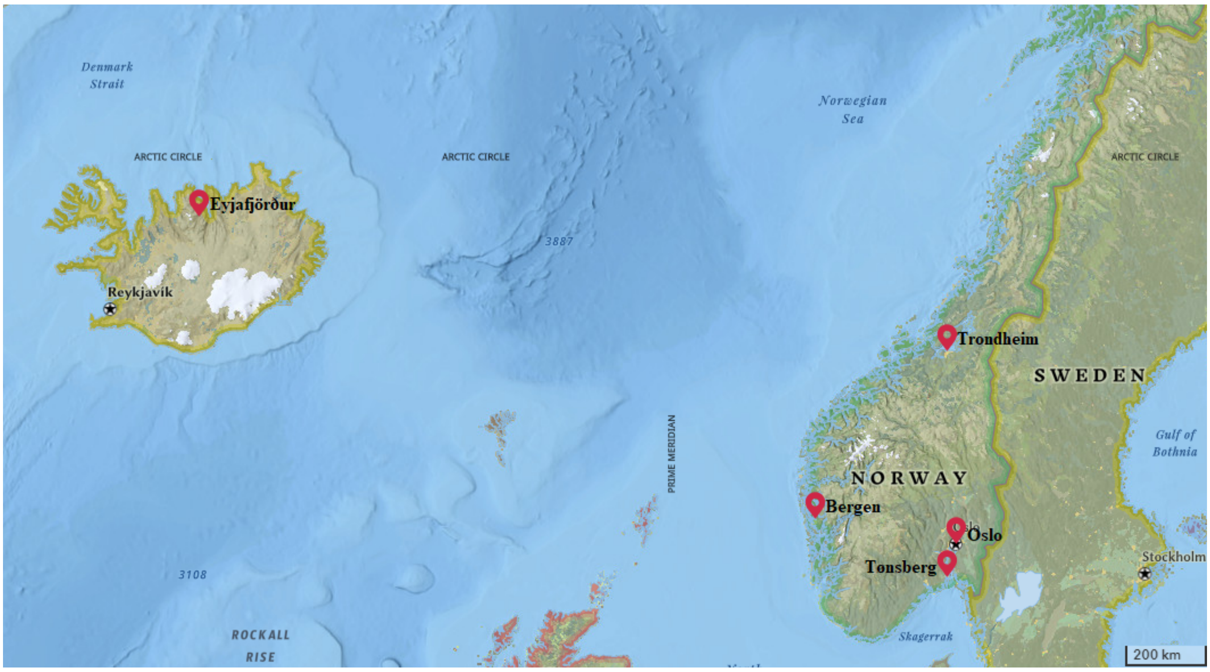


Figure 1: Map showing the five areas of focus in this study. Iceland with one location; Eyjafjörður. And Norway with four locations; Bergen, Oslo, Tønsberg, and Trondheim. (map by the author).

Archaeological sources have given a good framework for understanding when urban activities started in these areas. According to archeological sources indicating town activity, Trondheim is the oldest, with the first traces of activity being dated to the late 10th century. Oslo is dated to the first half of the 11th century, probably around 1030. In Bergen, it has been found activity from possibly as early as around the year 1020 or 1030, at the latest to its official founding date of 1070. And Tønsberg is dated to some time during the 11th century, perhaps the first part (Molaug 2007:5). However, when we include written historical sources, such as Snorre Sturlason's *Heimskringla,* Tønsberg is mentioned in a town-context as early as 871 AD.

What we can say for certain is that these settlements were all founded as towns before the 12th century (Molaug 2007). This aspect differs from Iceland, as their first town did not emerge until the 18th century (Reykjavik).

## The Corvidae family

In trying to understand why the remains of Corvidae are present in the assemblages from the nine medieval excavations in this study, I will first present some general knowledge of these birds' classifications, biology, as well as their behavior. Their prevalence in modern times is also included, as Walker et al. 2019 found no evidence to suggest that the avifauna in Medieval Norway would be different from the one we see today (Walker et al. 2019:24).

In Europe, the Corvidae family consists of four species. These are the common raven (*Corvus corax*), the crow (*Corvus corone*) with its two subspecies; the hooded crow (*C. corone cornix*), and carrion crow (*C. corone corone*), the jackdaw (*Coloeus monedula*), and the rook (*Corvus frugilegus)*. Only the three species first mentioned are included in this study, as these are the ones represented in the selected material.

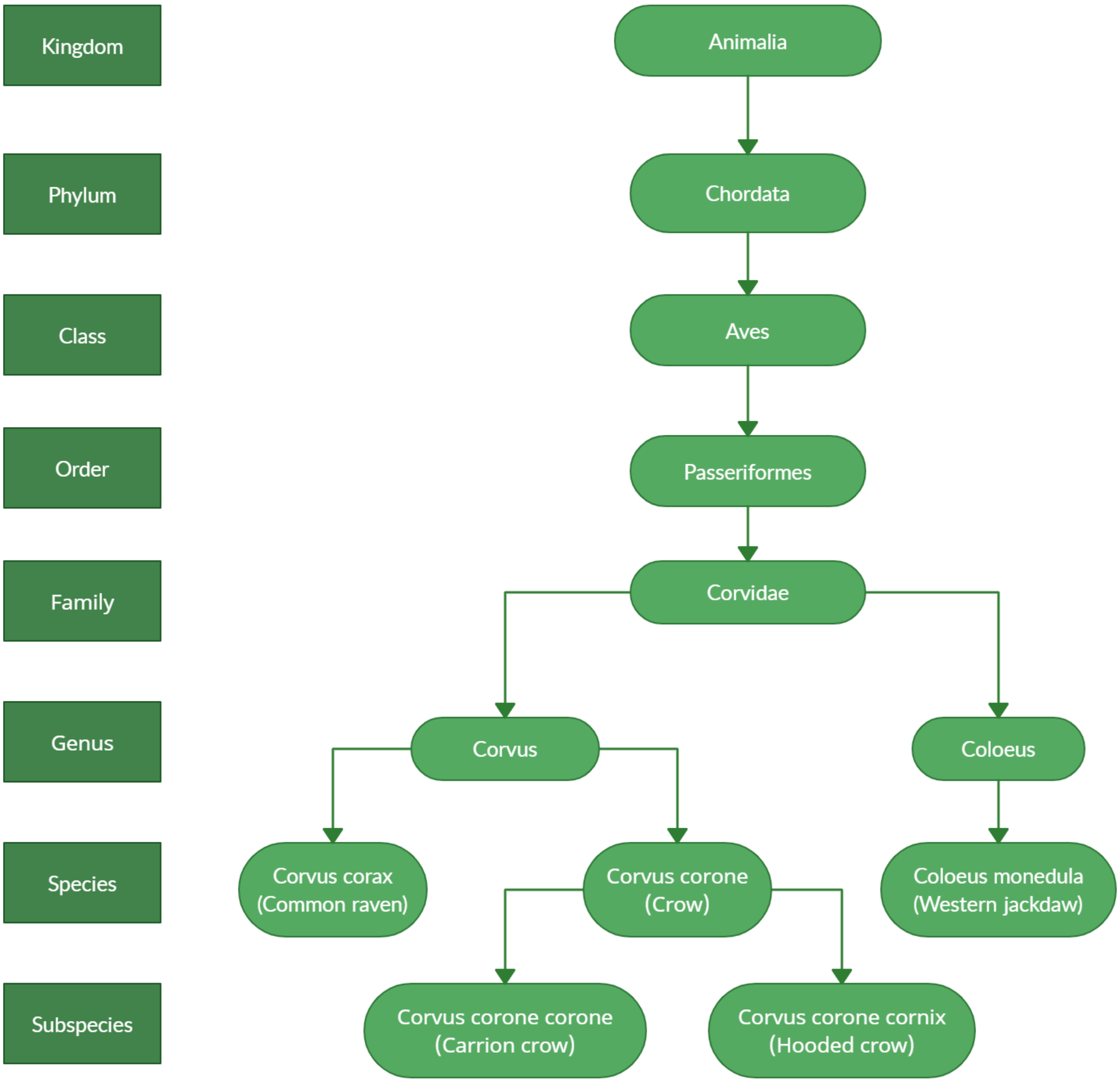


Figure 2: The scientific classification for each Corvidae species in this study (Information from Hogstad et al. 1992 and Nielsen 2013).

All the Corvidae relevant to this thesis were first named and classified by the Swedish botanist Carl von Linnè in the 10th edition of *Systema Naturae* (1758). Including an "L" for Linnè is common when mentioning these species. However, for this study, it should be sufficient to mention it only once here. This is because they all were academically documented by the same person in the same publication.

## Common raven (*Corvus corax)*

Figure 3: A common raven from Kløfta in Ullensaker, ready to make its signature sound: “korp.” (Photo by Bjørn Strømberg 2022).

**Appearance:** The common raven is the largest all-black bird in Norway and the biggest species of the Passeriformes order (commonly known as *perching birds*). Their feather coats are all glossy black, and their size and coloring make them easily recognizable (Nielsen 2013:33).

**Habitat:** Common ravens are prevalent in most of Europe, Asia, North America, and parts of North Africa (see fig. 4). In Norway, they have habitats in every municipality. They commonly spend their whole life in one area. In the wild, they can have a life expectancy of 10-20 years; however, the oldest raven, who was raised in captivity, lived for as long as 69 years (Hogstad et al. 1992:158-161).

Figure 4: Global prevalence of Common raven (*Corvus corax*)(source: Nielsen 2013:33).

**Diet:** The common raven prefers a carnivorous diet but will eat plants if it is easily accessible. Their diet comprises small mammals, amphibians, insects, carrion, afterbirth, young or injured birds, eggs, and other critters (Hogsatd et al. 1992:157). They can sometimes be spotted in urban environments, where they take advantage of food that people have discarded.

**Species-specific behavior: Breeding season**

Ravens start their breeding season in March, earlier than most other bird species. This allows the ravens to feed their young with eggs from other birds (Hogstad et al. 1992:159-161), something that has been viewed as problematic by other interest groups, like fowl hunters (Hogstad et al. 1992:160).

## Crow (*Corvus corone*)

As is shown in Figure 2, the species crow (*Corvus corone*) is further divided into two subspecies; Carrion crow (*Corvus corone corone*) and Hooded crow (*Corvus corone cornix*). These two subspecies mainly differ in the coloring of their feathers and their prevalence in the world. However, their skeletal features are considered to be identical.

Figure 5: A hooded crow in Øygarden, northwest of Bergen (Photo by Roald Hatten 2021).

Today only one of them is considered common in Norway; the hooded crow (*C. corone cornix*), while the other one, the all-black carrion crow (*C. corone coron*e), is only observed in Norway sporadically (Hogsatd et al. 1992:153-155, Nielsen 2013:31-32).

Figure 6: The two *C. corone* subspecies; The all-black carrion crow (*Corvus corone corone*) standing next to the gray and black hooded crow (*Corvus corone cornix*). The photo was taken by the shore in the South of Jæren, Norway (Photo: Stein Henning Olsen 2020).

**Appearance:** Hooded crows and Carrion crows differ in the color of their plumage. As seen in Figure 6 above, the carrion crow is all black, while the hooded crow has gray coloring on the body. Both subspecies have glossy black feathers covering their head, chest, wings, and tail. Their beak is thick and sturdy, with a slight curve. Their eyes are black, and so are their legs and feet (Nielsen 2013:31-32).

**Habitat:** The hooded crow (*Corvus corone cornix*) is common in Northern and Eastern Europe (except for Iceland). In Norway, they are common in every county except for areas with high mountains, and Svalbard (Hogsatd et al. 1992:155, see figure 5). The carrion crow (*Corvus corone corone*) is common in most of Western Europe but is only sporadically seen in Norway (Hogsatd et al. 1992:155, see figure 7).

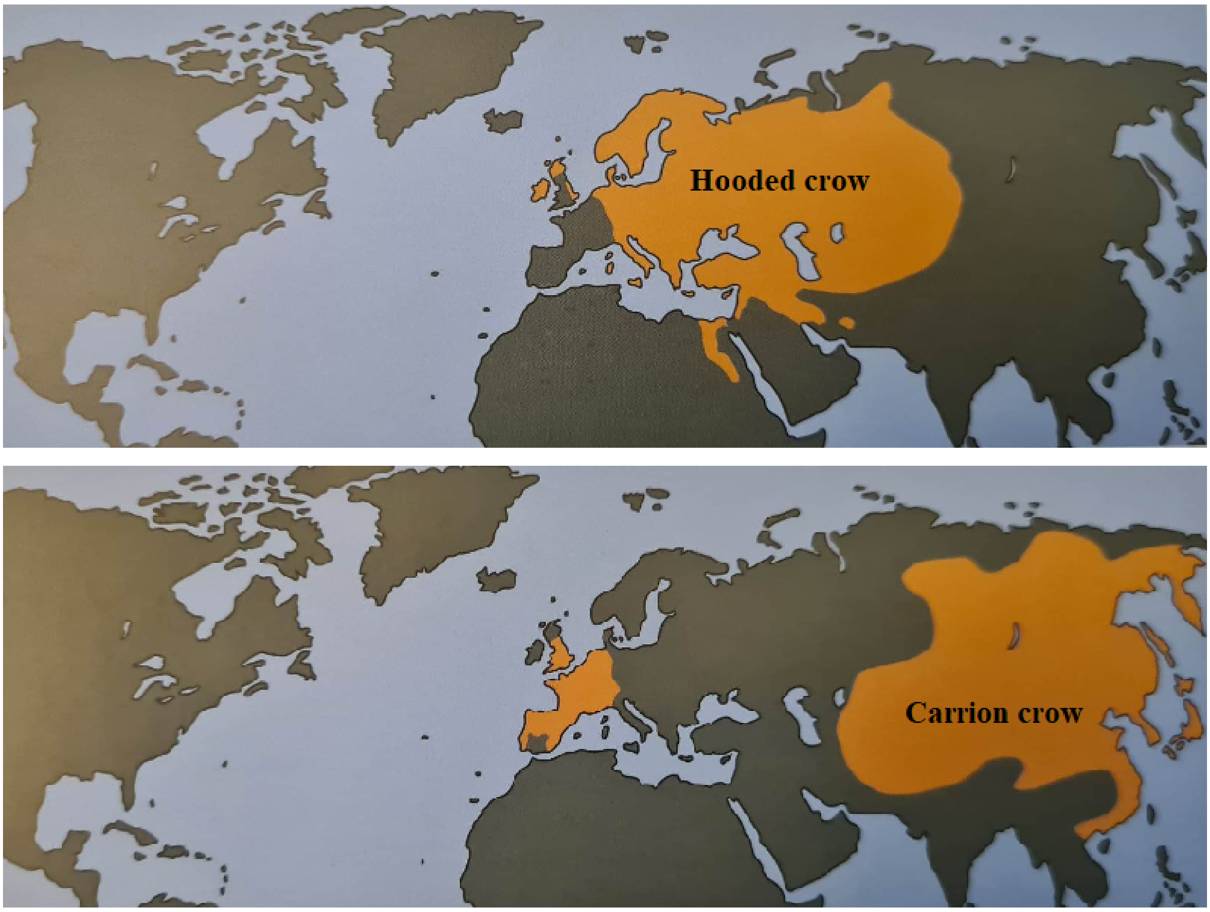

Figure 7: Global prevalence of hooded crow and carrion crow. Source: Nielsen 2013:31-32. Edited by author.

**Diet:** Crows are omnivores who eat almost anything they can catch or find. Their prey can be small forest critters such as bugs, amphibians, rodents, other birds, and their eggs. Plant-based food sources of interest are grains, berries, and nuts. They are perhaps most commonly associated with eating carrion and are also known as skilled foragers in urban settings (Hogsatd et al. 1992:153). Today the crow is well known among sheep farmers as a threat to the well-being of their livestock (Houston 1977), and many modern fowl hunters view their egg-stealing ways as a threat to their hunting season (Hogstad et al. 1992:153).

**Species-specific behavior: Bullying**

Crows are well known for harassing other animals. This aggression is often played out as air attacks aimed at predatory birds who routinely attack crows, but they are also seen harassing other birds of prey that pose no threat to them. Land mammals also get their share of the harassment. This is harassment and not hunting because the end goal can be described as social bonding within the flock rather than a way to get food. However, if an animal is carrying or guarding food, then the goal of the harassment is often to steal the food from them (Hogstad et al. 1992:154).

## Western jackdaw (*Coloeus monedula*)

Figure 8: An adult western jackdaw living close to urban areas at Tveitevannet in Bergen (Photo: Ragnhild Lo 2019).

The western jackdaw is considered a social bird commonly observed in small groups, either with others of its kind or with crows (Hogsatd et al. 1992:145). During breeding seasons, they commonly flock together in larger groups of several hundred.

**Appearance:** The western jackdaw has a distinct color pattern that makes them easily recognizable. Their wings, tail, and the top of their head are black, their neck is light gray, and the rest of their body is dark gray (Nielsen 2013:29). This color pattern is similar to the hooded crows, but western jackdaws are significantly smaller and have inverted colors (Hogsatd et al. 1992:146).

**Habitat:** Their preferred habitat is open areas in lowlands, like cultivated fields or parks. They are considered common in most of Europe, apart from the most northern reaches (Nielsen 2013:29). In Norway, they mainly inhabit the lowlands of Southern Norway. However, they are also common in the farmed districts along Trondheimsfjorden of Mid Norway (Hogsatd et al. 1992:146).

Figure 9: Global prevalence of the western jackdaw (*Coloneus monedula*) (source: Nielsen 2013:29. Edited by author).

**Diet:** Western jackdaws mainly forage for food on the ground. Their main diet consists of insects and small critters, but they can also eat grains and occasionally berries, fruits, and eggs when these are in season (Hogsatd et al. 1992:146).

**Species-specific behavior:** In modern ecology, the western jackdaw is considered to be a bio-indicator for the environmental health in the farmlands where they reside (Blanco et al. 2022:81). However, by dwelling in the farmland and the high numbers of their flocks, they are also considered to be a field-pest by farmers (Blanco et al. 2022).

# 2 Theoretical frameworks

"Archaeologists deal primarily with two sets of phenomena: past human behavior and its material consequences"

- Bird & O'Connell 2006:2

In this chapter, I will establish the theoretical framework that will be used to interpret the material in this study.
When choosing theory in a zooarchaeological study, a processual approach is often the way to go to quantify these elements by extracting their objective data (in the likes of tables, diagrams, percentages, and measurements), as most of the research with methods common to the natural sciences. However, it is important also to remember the human agency of those who created the faunal remains (Hedeager 2017:118-120, Lucas 2012:156). The theoretical framework shapes what kind of questions we can ask of the material, and the nucleus of this study is to try to understand how these medieval Corvidae bones should be interpreted as part of the medieval archaeological record. In other words, this is a study where both processual and post-processual frameworks will occur, as with most current archaeological studies. The human agency of the past is an essential factor in understanding the archaeological records (Hedeager 2017:118-120).

## Behavioral ecology

As a subset of evolutionary ecology, Behavioral Ecology (BE) analyzes how different environments cause behavioral trade-offs for different organisms (Bird & O'Connell 2006:2). For this study, the environment will be Medieval urban settlements of Norway (Bergen, Oslo, Tønsberg, and Trondheim) as well as rural North-West Iceland (Hörgárdalur Valley), and the organisms in question will be three species from the Corvidae family (Raven, crows, and Jackdaws). BE will be used as the framework used in order to examine ecological explanations based on different behavioral patterns of Corvidae and how their behavioral traits are shaped by their functional or adaptive purposes (Bird & O'Connell 2006:3).

The framework for BE was slowly established during the 1960s and the 1970s through multiple studies regarding animals' social, reproductive, and foraging patterns that multiple ecologists published. It is important to note that behavioral ecology is not synonymous with *optimal foraging theory*. This is a misconception that has been addressed by Bird & O'Connell (2006) as well as Sciffer (1999). Further, it is noted that BE, by default, downplays the importance of cultural factors from humans (Bird & O'Connell 2006:29), this is a valid concern, and it is, therefore, necessary in this study for BE to be supported by other theories during the discussion, rather than the main focus.

## Actor-network theory

The actor-network theory (ANT) was introduced in the 1980s by sociologists Bruno Latour, Michael Callon, and John Law. The theory was first implemented to view scientific knowledge's cultural and social dimensions and technological developments (Lucas 2012:176). Collectives (/networks) are fluid entities that can be formed and dispersed by the actants that affect it (Lucas 2012:192). The actant (/actor) are non-human entities (Preucel Unpublished:4).
ANT will be implemented in this study as a way to analyze the role that corvids (actors) had in medieval society (network). The archeological aspect is that through this theory, we can analyze what role these three corvid species (C. corax, C. corone, and C. monedula) played in earlier societies and how this affected the people living in those societies.

## Zooarchaeological theories

Reitz and Wing (2008) describe that zooarchaeological research can have two related goals. The first is to understand, through time and space, the biology and ecology of animals. The second is to understand the structure and function of human behavior. Zooarchaeological research is often connected to natural processes, some practices are built around the biological and physical sciences. Anthropology is also used, especially the theories and methods regarding humans and their relationship with their social and natural environments (Ritz & Wing 2008:11).

## Taphonomy

Bones and fragments from animals can provide much information about people from past societies and cultures, but in order to interpret them, one must also have an understanding of the taphonomic processes that the bones have been through. Lyman (1994:39-40) and Schiffer, (1996) states that three factors shape taphonomic processes; objects (can be added, maintained, or subtracted), spatial (has been moved or not moved), and modification. Meanwhile, animal remains also undergo taphonomic processes; disarticulation, dispersal, fossilization, and mechanical alteration. Another framework used regarding taphonomy, first developed by geologists Clark & Kietzke (1967), conceptualizes seven subdivisions of taphonomic processes and factors that can happen to live organisms (animals and plants). This ranged from being alive to being documented for publication and was later adapted by Hesse & Wapnish for use in the study of archeological remains (1985:18-30). The seven processes are listed in Table 1, and put in the context of this study.

| **Subdivisions of the taphonomic processes (life to publication)** | |
|---|---|
| Process | Description and study-related context |
| *Biotic processes* | The processes that took place while the animal was alive and can often aid in explaining why the animal was there. This information can include the prevailing climate, local ecosystem, and the most common human activity in the area (O'Connor 2016:19-20). This can also provide information on the breeding of tame animals or the hunting of wild ones. In the case of the Corvidae materials, this tells us that Corvidae remains that are found in an archeological excavation probably lived in the surrounding area because corvids commonly stay their whole life in the same area (Hogsatd et al. 1992:156-159) since there is no previous indication that people in Medieval Norway ever bred or traded Corvidae. |
| *Thanatic processes* | The events that led to the animal's death and the deposition of its remains. When working with archeological remains, it is common that humans were the cause of the animal's death, but there can be other causes, in.e. other predators, disease, or old age. Also, the animal's death and |

| | |
|---|---|
| | processing can occur in different locations, especially when working with remains found in a bone assemblage in a garbage deposit (O'Connor 2016:19-20). Understanding the cause of the death can aid in understanding the motivation for the killing. Whether for the meat, getting rid of a pest, or sport. |
| *Perthortaxic processes* | The causes of motions and destruction the remains might go through before they end up underground. These causes can be scavengers, waterways, weather, conscious disposal by humans in a waste deposit, fire pits, rituals, or other causes (O'Connor 2016:19-20). These factors shape the taphonomic processes of the bones before burial. |
| *Taphic processes* | The first process after the bones are buried. It is for the chemical and physical effects the soil can have on the bones. These effects can cause the bones to be well-preserved or speed up their destruction. Almost all of the bones used in this study are well-preserved. However, just because most of the material in this study can be described as well-preserved does not mean it is the norm for buried bones in general. It is, however, necessary for bones to be preserved well enough to be identified to their species. |
| *Anataxic processes* | Physical factors can cause the bones to resurface and be re-exposed to chemical and physical factors above ground. This is not a repetition of the previous processes since the bones are now in a different chemical and physical state than before burial. All the Norwegian material used in this thesis are from locations that have had an increasing growth in population since they started as Medieval urban settlements up until now, where they all are in some of the largest cities in Norway (Oslo, Bergen, Trondheim, and Tønsberg). These areas can go through continuous development, meaning that the material could have been previously exposed to construction work, either from the Medieval or Modern Ages. As for the Skuggi material, its origin is from a more rural context, with fewer activities happening close to Skuggi. |
| *Sullicent processes* | During the recovery of the bones, the archeologist will make decisions based on their methodology. The animal's death and processes might not be found and collected. During the excavation, there will be different methods that can greatly increase the number of bones found, but it is not without penalty. For instance, sifting the soil will probably yield more small or fragmented bones. Sifting will, therefore, probably increase the representation of birds and fish remains. However, this method is also time-consuming, and excavations almost always run on a tight budget financially and time-wise. The choice is often between whether an excavation should recover as much as possible from a large area, make a |

| | |
|---|---|
| | detailed recovery from a smaller area, or do both by only making a detailed recovery with sifting on "points of interest" (like latrines or waste pits). This was the case during the excavation of Mindets Tomt (J.S.537), where only one-half of a grid was sifted (Schia & Griffin 1988:7). |
| *Trephic processes* | The final stage. When the researcher chooses from the collected material to decide how to sort, record, and publicize it. I am building my thesis through this previous work of identifying, researching, and publications. |

Table 1: Taphonomic processes divided into subdivisions, with contexts relevant to this study added (Original table by O'Connor 2016:20).

It might not always be as straightforward as implied by the seven subdivisions outlined in Table 1. Some of the processes can merge, while some parts might only take seconds, others can last for millennia, and lines can be blurred between what is caused directly or indirectly by humans and what is caused by nature (O'Connor 2016:20).

## Formation processes

Schiffer (1997) and Miksicek (1987) describe formation processes as the factors that play a part in creating the historical and archaeological records (Schiffer 1996:7). The processes can be implemented by forces that are either cultural or noncultural (Schiffer 1996:7). A cultural formation process is where the behavior of humans is the agency for the transformation. A noncultural formation process is where the agency comes from processes that originated from environmental factors (Schiffer 1996:7).

| **Examples of cultural and noncultural formation processes** |
|---|
| *Cultural formation processes:* |
| Items use and reuse, recycling, waste, discard, refuse, loss, abandonment, social stratification, symbolism, rituals, reclamation, reincorporation, salvage, scavenging, |
| *Noncultural formation processes:* |
| Earthmoving processes, trampling, plowing, construction/operation impacts, chemical/physical/biological deterioration, bacterial/fungal/insect/animal decay, weathering, |

| |
|---|
| soils/sediments, temperatures, erosion, vulcanic, glacial, lakes, marsh, coastal, vegetation, and fauna. |

Table 2: Examples of cultural and noncultural formation processes, sourced from Schiffer 1996:7.

Most matters dematerialize over time due to environmental processes, metals and stones can corrode, and biological matters decay. This means that the archaeological record is already built on a bias of items that have been kept in fortunate conditions long enough for them to be collected and analyzed. Whether the given conditions are good or not depends on the materials. For example, a peat bog provides excellent conditions for storing pollen and seeds, but is poor for storing osteological matter (Miksicek 1987:214).
The archaeological items that are retrieved and documented are often brought forth to be managed by conservators that will stabilize or slow down ongoing and potential processes to stop any further loss or damage to the item.

Cultural and noncultural processes affect each other and the archeological materials. There is variation in how and why each process is started, and the start of one process will determine which other processes can take place.

What we consider to be the material of our cultural past has gone through changes that were afflicted by both the cultural and noncultural formation processes. These processes can be viewed from two aspects: cause and consequence (Schiffer 1996:21), where the effects can be differing or ubiquitous, they are not something that should be studied in a vacuum. This introduces variability into the archaeological record. These variabilities can be viewed from four different aspects: *formal* (the properties of the item that can be measured, such as size, weight, chemical composition, coloration, shape, and hardness (schiffer 1996:15)), *spatial* (understanding where the item was recovered from, if it is during an excavation then it will probably be located within the grid-system, but spatial dimension can also refer to the behavioral significance, such as household or burial mound (Schiffer 1996:16-18), *frequency* (the number of times a specific item is found, this can help with understanding how common said item was, but it can also be an indication of how well or poorly said item reacts to cultural and noncultural formation processes (Schiffer 1996:18)), and *relational* (material that tends to co-occur with other materials or specific locations (Schiffer 1996:19)). An example of this would be grave goods from a Viking burial; if keys are found then glass beads are also probably there, since those are often found together, indicating that the person buried was a woman.

### Limitations in methodology through sampling and documentation bias

There is a low representation of birds and fish in the archaeological record. This is especially the case when compared to faunal remains from mammals. While we expect some of these losses to be caused by the agency of earlier humans and the natural processes in the soil, there is also a contemporary component in the chosen strategy for recovering bones during an excavation (O'Connor 2016:28-35). This study uses materials from nine different excavations from 1955 to 2008, meaning there have been several changes to the strategies used in collecting the material and the documentation added to them.

# 3 Methods

In this chapter, I will present the methods used for and otherwise considered in this study.

### Zooarchaeological Initial Identification

In order for this study to take place, several previous actions have had to occur. First is the excavation of the Corvidae materials. During each of the excavations, there were methodological choices and priorities in what and how bone material should be collected; was it sufficient to pick material by hand, and if sifting was used, should it be used in specific areas or all over? (Reitz & Wing 2008:147-151). Bones are commonly identified through morphological comparisons to modern specimens. For this study I used comparative material as a point of reference (all material was pre-identified to species), this was done through laboratory work with the University Museum of Bergen's comparative skeletal collection, which houses 4'000 bird skeletons representing 95% of the current avian fauna in Norway (Walker et al. 2019:7). As well as the comparative skeleton of a Common raven at the University of Bergen AHKR zooarchaeology laboratory.

## The avian skeleton

Birds as we know them today are winged, endothermic, bipedal, feathered, egg-laying vertebrates that are descended from theropod dinosaurs some 230 million years ago (Broughton & Miller 2016:127). Birds could technically be placed within the class Reptilia, and they have several bones that overlap with them (three digits, furcula, coracoid etc), while other bones are unique to birds (fused elements like carpometacarpus, tarsometatarsus).

There are a lot of overlapping skeletal elements when we compare the avian skeleton to those of other vertebrates (like mammals). However, most avian species are capable of flight. Their skeletal elements have gone through evolutionary adaptations such as fused bones (i.e. carpometacarpus and tarsometatarsus), enlarged breastbone (sternum), as well as the addition of some bones that are unique to avian species (i.e synsacrum and furcula). Their long bones are also hollow (this is not always the case for flightless birds that have evolved sheltered from land predators (Reitz & Wing 2008:325)).

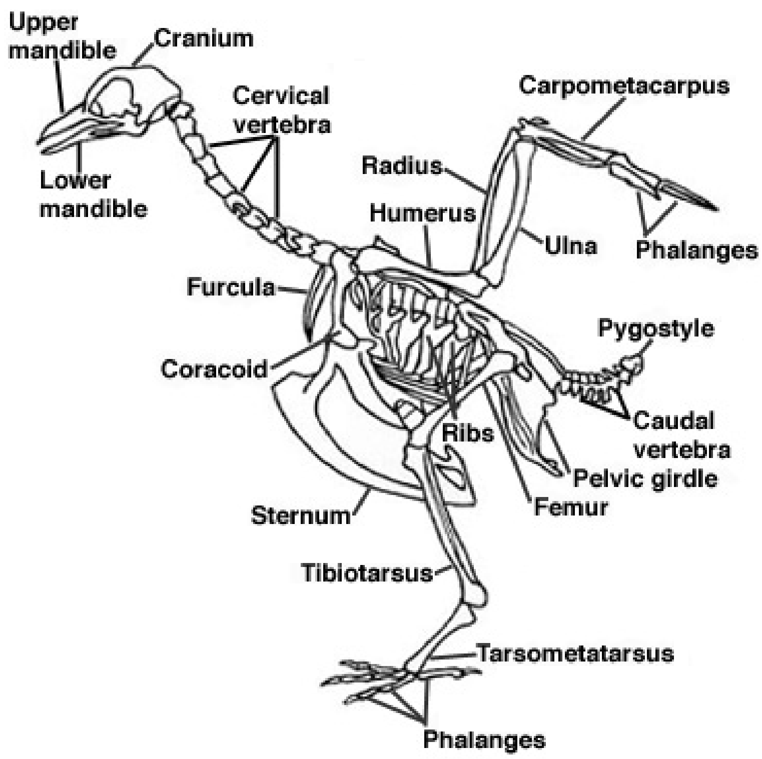


Figure 10: Avian skeleton with the main elements labeled by name.

The following table (tab.3) gives a brief overview of all the skeletal elements that appear in this study.

| The Avian Skeletal Elements | | |
|---|---|---|
| **Latin** | **Abbreviation** | **English** |
| Carpometacarpus | CMT | Avian hand/wrist bone (fused) |
| Coracoid | COR | hook-shaped shoulder bone |
| Femur | FEM | Thigh bone |
| Fibula | FIB | Leg bone (thinnest) |
| Furcula | FUR | Wishbone |
| Humerus | HUM | Upper arm bone |
| Mandible (lower) | MAN | Jawbone |
| Pelvis | PEL | Hip Bone |
| Phalanx fragment | PHA | avian toe bone |

| | | |
|---|---|---|
| Radius | RAD | A forearm bone |
| Rib | RIB | Rib |
| Scapula | SCP | Shoulder blade |
| Sternum | STE | Breastbone |
| Synsacrum | SYN | Avian fused vertebrae, lower back |
| Tarsometatarsus | TMT | Avian ankle/foot bone (fused) |
| Tibia | TIB | Shinbone |
| Tibiotarsus | TBT | Avian lower leg bone |
| Tracheal ring | RNG | Windpipe / trachea |
| Ulna | ULN | A forearm bone |
| Vertebral | VER | spine bone |

Table 3: The Avian Skeletal Elements that appear in this study, with description and abbreviations. The abbreviations are based on the recording system used in NABONE zooarchaeological database 9th edition (NABONE, 9th edition) (see **Appendix 2**). English names have been based on descriptors used by the author.

Some skeletal elements are not included in this list (table 3), as they do not appear in the material studied. Abbreviations of all elements from avian species are, however, available in **Appendix 2**. Also, some of the elements have been grouped together to simplify the material. This is the case for the vertebral elements. In birds, the vertebral column is divided into four groups: cervical, thoracic, synsacral, and caudal (Broughton & Miller 2016:128). However, for this study, they will all be documented under the general description of *vertebrae*.

Following are some illustrations (fig. 11, 12, 13) of different regions in the avian body to give a clearer view of which elements that interact within the body.

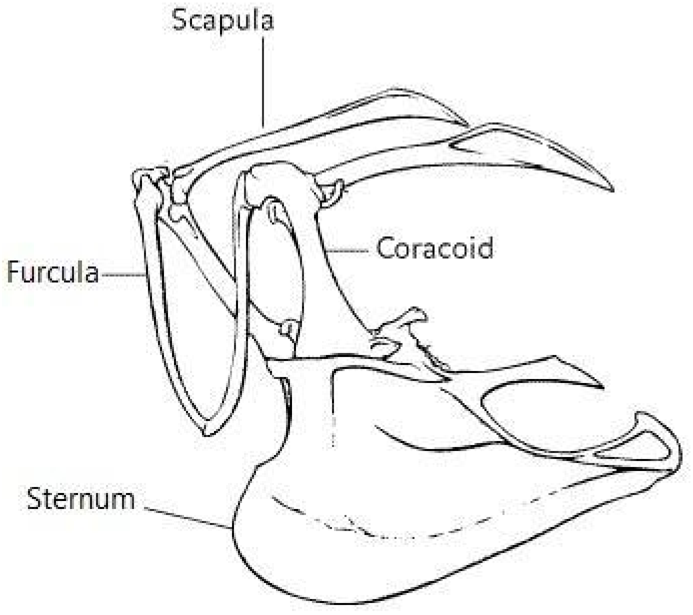


Figure 11: Skeleton parts from the avian thoracic region. Ribs and vertebrae are not shown (From: http://people.eku.edu/ritchisong/skeleton.html. Edited by author).

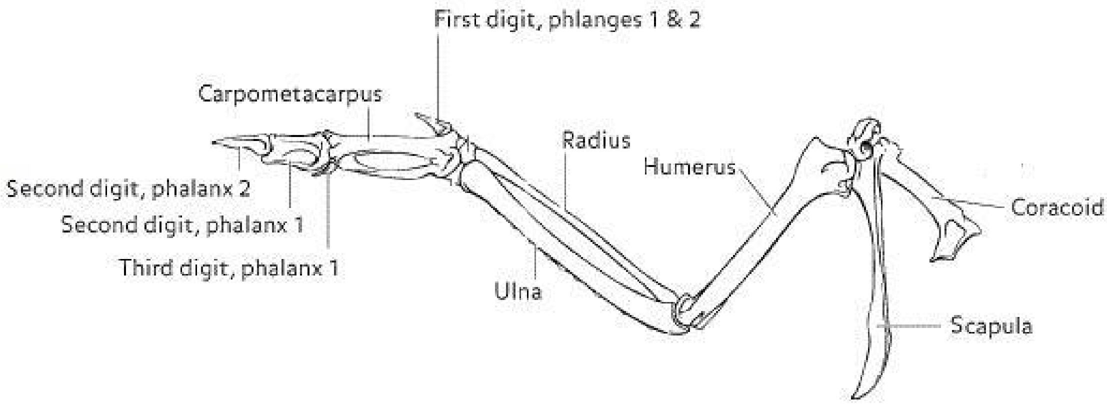


Figure 12: Skeleton elements from an avian forelimb (wing), (http://people.eku.edu/ritchisong/skeleton.html. Edited by author).

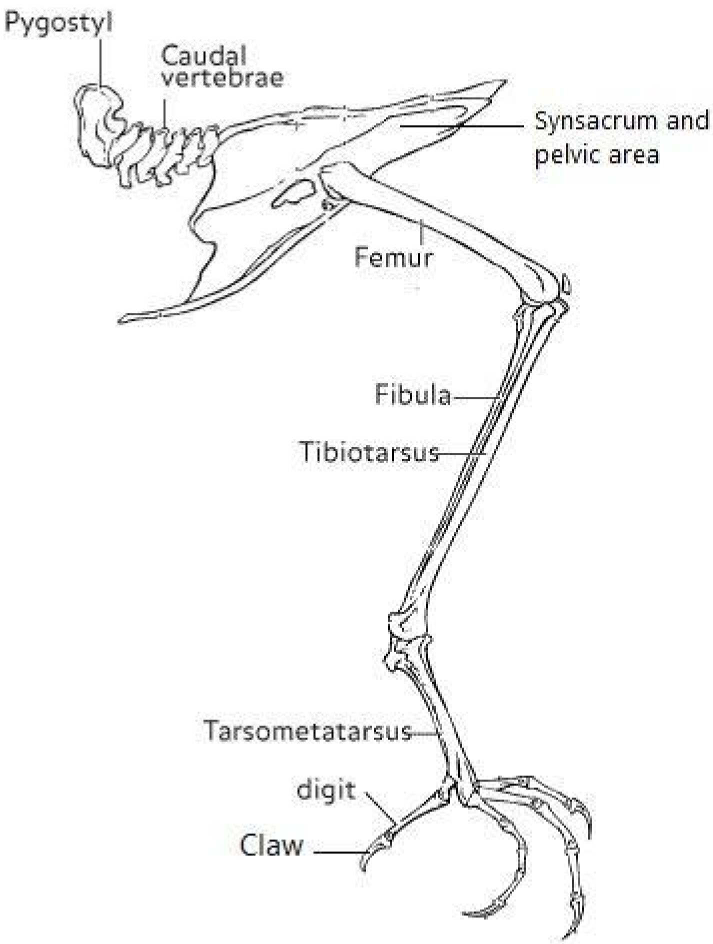


Figure 13: Skeletal elements from an avian hindlimb (leg). (From: http://people.eku.edu/ritchisong/skeleton.html. Edited by author).

## The selected material

All material analyzed in this study was selected and gathered by Anne Karin Hufthammer (Professor, University Museum of Bergen), Olaug Flatnes Bratbak (Chief engineer, University Museum of Bergen), and Ramona Harrison (Associate professor, University of Bergen). The complete list of the studied material can be found in the appendix (see **Appendix 1**) and contains data regarding the material's species, excavation identification number, element, right/left, whole/end, and measurements (with varying degrees of information). Each element was also examined for anthropogenic marks on the bones. Further information on element representation will be in the data chapter.

### Norwegian material selection

The Norwegian material is conserved by The University Museum of Bergen and was made available to the author at the osteology department's dry laboratory. Most of the materials were brought forward in their storage boxes, containing all the avian materials from that excavation, and the author sorted through them and located the relevant material. The material in the storage boxes is stored in smaller see-through plastic bags, with a label informing of its contents; J.S.-number, species, identification number, and, when possible, what layer and grid/square they were excavated from. All the relevant material was first sorted physically by removing them from their boxes, then digitally logged by the author, Photos were also taken of a selection of the material.

### Icelandic material selection

The Skuggi material discussed here was excavated by Harrison in 2008 and 2009 (Harrison 2010) and is currently on loan to the North Atlantic Biocultural Organization NABO, curated in the UiB AHKR zooarchaeology laboratorium (lab director: R. Harrison) until its return to Iceland.  The laboratory was equipped with a comparison skeleton of a common raven from Greenland. It was collected in 2009 by Konrad Smiarowski This specimen did not contain all elements, notably, it lacked its right foot (tarsometatarsus and below). All elements from its right foot were present, so when necessary, the comparative analyses still worked though mirrored comparison. All 44 elements were present, digitally logged by the author and photos were taken of all the material, including the comparative material (see Figure 14 below).


Figure 14: Comparative material of a common raven, gathered by Konrad Smiarowski from Greenland in 2009. This image contains all the available long bones, and some of its other elements, not present in this photo, are the vertebrates, neck rings, and ribs.

## Comparative material

The material for this thesis had already been identified to species or family, and most of it had spent decades in storage at UiB or been recently transported from New York (Skuggi material).


Figure 15: An example of the comparative work I did, showing the distal end of a modern coracoid, and a fragmented one from Skuggi (SKÖ09 layer 11).

My work was thus to firstly, familiarize myself with the material and with the important aspects that make the avian skeleton different from the mammals, This was done through being in the laboratory with the material and the comparative materials. The most used literary tool was the revised manual by Cohen and Serjantons (1996). This proved vital for an archaeologist unfamiliar with analyzing and identifying bird bones from archaeological deposits. secondly, to familiarize myself with material that has undergone taphonomic processes.
An example is the two coracoid (Figure 15 above), where the one on the right has been slightly dulled on its edges but is still clearly similar to the one on the left.

For the analysis of the material, I documented: species (*C. corax, C. corone, or C. monedula*), elements, fragmentation, left/right and its length, and other information that was specific to that element. All of this information is available in **Appendix 1.**

## Quantifying the material

Here, I will address some of the ways the material can be quantified, and why it is necessary. Quantifying the material in a zooarchaeological study can add a layer of objective information to the study that makes the material easier to work with.

### Total number of fragments (TNF)

TNF presents an overview of the amount of material from an assemblage or excavation (Reizt & Wing 2008:167). A researcher can use this to present the amount of material they collected during excavation. This quantification method can be informative or misleading; one femur from a cow can be fragmented into hundreds of pieces, which will increase the TNF, but it does not increase the number of cattle present in the material. This is also often the first time the material is counted, as it can be done before any species identification. All that is necessary is to confirm that it is an osteological specimen.

### Number of Identified Specimens (NISP)

NISP is one of the main parameters used for quantifying animal bones from excavation and one of the first analyses being done on the bones. The approach is to identify all the bones in the assemblage to a taxon to state all the species represented in that record (Reizt & Wing 2008:167). The number of bones is not important in this measurement, only the species-specific representation. This means that an assemblage of 100 dog bones and one whalebone still creates a NISP of one dog and one whale. By not focusing on the amount of material from each species, you get a condensed overview of all the species represented in the assemblage.

### Minimum number of individuals (MNI)

A way to calculate the minimum number of individuals (MNI) is to go through the data to look at what kind of bones are represented in the material. Each bone in the skeleton is represented a maximum number of times per individual (O'Connor 2016:54). For instance, a raven has two femurs but only one left-sided femur.

This method is used on the elements that have been identified. By adding up the element represented to see how many individual skeletons there could potentially be of each species (Reizt & Wing 2008:206). For instance, if you have an assemblage of remains, you separate them by species. If possible, you separate them by age/size as well, and then you look at the elements represented (Lyman 1994:100). If the material is four vertebrae, two pelves, and two right and one left femurs, then the lowest possible number of individuals would be two, however, if the represented elements consist on four vertebrae, two pelvis, and three left femurs then the minimum number of individuals would be three since no individual can have two left femurs. It is important to note that MNI is solely an analytical product to show us the lowest possible number of individuals. This does not mean that the MNI should be interpreted as fact. In an exaggerated theory, each element found could be from a different individual.

### Photo documentation

A selection of the Norwegian elements, and all the Icelandic elements were photographed. All photos follow the same standard of being on an even surface with a ruler (centimeter). Light editing has been done on all photos (adjusting contrast/brightness and cropping the frame). Pictures will be presented with the data (chapter 5).

### Measurements

In this study, some measurements were taken following the instructions in Cohen and Serjanton's (1996) *manual for identifying bird bones from archaeological sites* (1996:106-108). The measurements were done with a Cocraft Digital Caliper 0-150mm. However, for most elements, the only measurement taken was for the elements' greatest length (GL). This measure was also taken of fragmented elements, this was done in order to add data to those elements. For instance, when documenting a long bone that is only a shaft (fragmented), it is useful to document how long the shaft is. This provides context for the reader. The material from Erkebispegården has also been documented for fragment size, based on the guidelines of NABONE 9th edition (page 9). The varied measurements taken through this study will be readdressed in the discussion chapter.

Measurements can provide valuable information regarding the material, and it is important to follow the instructions thoroughly (Reizt & Wing 2008:179). Multiple measurements of the same element should be taken, such as its greatest length, smallest circumference, and other more specific measurements of its structure.
Stewart (2007), *An Evolutionary Study of Some Archaeologically Significant Avian Taxa in the Quaternary of the Western Palaearctic,* where he confirmed a strong geographical component to the size range of ravens. He documented patterns and variations in the osteological shape and size in a collection of common ravens (*C. corax*) from the Quaternary fossil record (with fossil species *C. antecorax*). Modern specimens were also included. Also, some measurements were taken of the smaller Corvidae, like the carrion crow (*C. corone corone*), hooded crow (*C. corone cornix*), and the rook (*C. frugilegus*). Measurements were taken from common ravens sourced from seven provinces (Greenland, Switzerland, Spain, Iceland, Britain, Scandinavia, and Poland). Very broadly speaking, the raven population in northern areas is larger (Stewart 2007:191), and there was variation in the size of modern material and fossil material. Ravens from Medieval Britain seem smaller than the ravens of Modern day Britain. In Walker's (2021) doctoral thesis, *Archaeological bird remains from Norway as a means to identify long-term patterns in a Northern European avifauna,* he presented the largest analysis of bird bones conducted in Norway, consisting of 11'023 elements that were (re-) analyzed. In one of his studies, he analyzed the skeletal remains of modern and archaeological Atlantic puffin (Fratercula arctica) to document the morphological and body size changes that the species had been through (Walker 2021:28).

### Fragmentation - Element Nomenclature for Describing (END)

Archaeological material has often gone through some sort of fragmentation (O'Connor 2016:41). Documenting whether the bones were found complete or fragmented provides a new layer of information (and statistics) regarding the processes that the bones have been through, and (when possible) it gives room for the analyst to speculate about the cause of why a bone was fragmented or if other markers that can provide further context. About the bones used in this study: most elements are close to or whole, with a few signs of their time in the soil. However, a good portion of the elements is broken/fragmented. Whether this was likely due to taphonomy, formation processes, or human/animal interaction has not been recorded by the author, but the part of the elements present has. Whether marks are taphonomic or anthropomorphic will be discussed later in this study (chapter 6).

The fragmentation of bones is often recorded by documenting the present parts as a whole (the element is intact), proximal epiphysis (the fragment is the part close to the body's center), distal epiphysis (the fragment is the part furthest from the bodies center).
Most of the elements analyzed in this study were recorded according to these descriptors (Table 4, below).

| **Descriptors for the fragmentation of individual bone elements** | | |
|---|---|---|
| Fragmentation | Description | Abbreviation |
| Proximal epiphysis | The part of the element that is closest to the point of origin, in this case, the center of the body | PRO |
| Shaft (diaphysis) | The column part of the long bones that are the middle part of the element. | S |
| Distal epiphysis | Distal - the part of the element that is furthest away from the point of origin. in this case, the center of the body. | DIS |
| Whole | The element is complete, meaning it contains all the parts it is expected to have. | W |
| Fragment | Elements that the author could not describe with the identification values listed above. (e.g. smaller pieces from vertebrae, sternum, and other oddly fragmented bones) | FRAG |

Table 4: The different categories of fragmentation, as well as explanation of them and the abbreviations used for them. Based on the guidelines of NABONE 9th edition.

## Anthropogenic marks

Remains from animals that have lived or died in human settlements can carry marks from human interactions. Of course, many natural conditions can alternate and distort bones through the formation and taphonomic processes. It is important to consider whether or not modifications to elements have been caused by nature or humans. When considering which traces were left by humans, we often look for the marks that would occur as a result of butchering, eating, or tool-making.

### Butcher marks

Marks left from dismembering animals are a way to record human behavior from said archeological remains. In recording butchering marks, one must look at the location and the type of marks. Different tools leave different marks (O'Connor 2016:45). three functions are commonly used to explain bone cut marks: dismembering, fileting, and skinning (Serjeantson 2009:132). These are all related to the butchering process. Well-placed cuts that are small and deep are often considered the telltale sign of an incision meant to cut tendons, muscles, and ligaments. Long and light marks can result from scraping necessary for fileting the muscles or preparing the bones for tool-making.

### Charred bone

Bones can show visible signs when exposed to high heat. The term *charred bone* can be broadly divided into three categories: black charring with no distortion, gray shade with minor cracking and distortion, and white calcining with shrinkage and distortion (O'Connor 2016:45). The degree of charring depends on how long the bone was exposed.

# 4 Research history

In this chapter, I will present some research history relevant to the selected material, locations, and topics.

## Corvidae in archaeology

There has been some archaeological research conducted that incorporates Corvidae material, some of that will be presented here, both from Norwegian material and British material.

## Corvidae in Medieval Norway

Walker, Hufthammer, and Meijer (Walker et al. 2019) have re-examined and amalgamated most avian remains found in Norwegian Medieval faunal assemblages. The material that could be identified consisted of 5'938 bird bones (54% of the study's TNF) from 55 different species of 16 different orders (Walker et al. 2019:8). Their record included 105 elements (1,8% of the study's TNF) from three species from the Corvidae family (*C. Corone, C. Corax,* and *C. Monedula*). It is important to note that the *Walker et al. 2019* study did not include ribs, vertebrates, and phalanges (to avoid over-representing species).

The Medieval archeological record showed that the Corvidae remains were exclusively located in assemblages from urban excavations (Bergen, Oslo, Tønsberg, and Trondheim) (Walker et al. 2019:22). Based on the modern geographical range, it is assumed that all 52 elements were identified as *Corvus corone* are part of the subspecies hooded crow (*Corvus corone cornix*). It is, however, possible for some of the elements to be from the carrion crow (*Corvus corone corone*), or the rook *(Corvus frugilegus*) (Walker et al. 2019:22).
If their ubiquitous presence today could be a reflection of their prevalence in urban environments in the NMA, then it would mean that they are poorly represented in the NMA archaeological record (Walker 2019:25). However, it could also mean that they were not as prevalent in urban areas previously. This could be due to the species not settling in the area during the development and expansion. Also, the archeological specimens do not necessarily mean that corvids did not live in or close to the urban centers. It could just mean they were

not commonly trapped or hunted, so humans rarely disposed of them. Sykes (2014) specifies that even though certain wild animals are not or are poorly represented in the assemblage, they still might have been present in the landscape of that society, well other wild animals might be found in the faunal remains in areas where they were they could not live or thrive in life (Sykes 2014:55-57). Alternatively, there could be a recovery bias due to most of these excavations before sieving became common practice (Walker et al. 2019:25, 29).

Walker et al. hypothesized that the lack of corvids and gulls in the urban faunal remains could indicate a taboo against eating those birds. Several Bible verses refer to 'unclean animals.' The Christian mindset in Medieval Norway could have affected whether or not Corvids were considered fit for eating (Walker et al. 2019:25).

## Other studies of Corvidae in archaeology

Serjeantson and Morris (2011) re-examined skeletal remains of ravens and crows from the older excavation of the Danebury hillfort. These finds were not considered typical during the excavation. Approximately one from each fiftieth pit dug contained corvid remains. Taphonomy, context, and associated finds were briefly discussed. This re-examination is due to earlier research concluding that corvid finds in such sites mainly had natural explanations. In contrast, Serjeantson and Morris aimed to show that most, if not all, the corvid's bones were deliberately buried due to the Iron Age and Roman beliefs and rituals. The bones were found in the base layer of pits, and most had been placed there intentionally. Their conclusion challenged earlier archaeological interpretation, which often prefers functional explanations of animal remains rather than cultural ones (Serjeantson & Morris 2011:96-97).

| **Different interpretations of Corvidae remains in British Archaeology** | | |
|---|---|---|
| **Interpretation** | **Original argument** | **Support or argument against** |
| **Natural deaths** | Ravens are known to frequent human waste disposal sites, and their being common should also mean that they could occasionally die there (Coy 1984) | The remains from the British study showed no signs of being gnawed on by other scavengers, which is to be expected by remains that are left uncovered (Serjantons & Morris |

| | | |
|---|---|---|
| | | 2011:98). |
| **Killed because they were scavengers of carrion** | Corvids would live close to settlements to eat carrion or food scraps. | Waste and carrion are plentiful in and near human settlements. Scavengers will therefore seek out humans.<br>In Norway today, they is culturally considered a pest (Hufthammer 1999:12). |
| **Killed for food** | It was suggested that some raven bones perhaps were the remains of a 'raven-stew' (Richardson 1951), and they are meat-bearing animals that like to live close to human settlements. | Corvids were believed to be consistently avoided in Celtic societies (Ross 1979:329). Further, humans tend to avoid eating animals that feed on carrion, and Corvids have also been given a symbolic status connected to evil omens and death (Serjeantson & Morris 2011:98). |
| **Killed for feathers** | The flight feathers on corvids are large and glossy black. They could serve as an ornament or embellishment (Serjeantson 1991) | There are some discussions if whole wings or feathers could have been used on the helmets during battle during the Roman period (Green 1992:88). This would explain the broken humerus (Serjantons & Morris 2011:98-99). |
| **Spiritual reasons** | Ravens have had different spiritual status in different cultures as deliverers of messages and prophecies. Ravens have been connected to many gods; The Greek god Apollo, the Celtic god Luhg (Serjeantson & Morris 2011:99), and the Norse god Odin. | Ravens seem to have held a spiritual symbolism in Iron Age Scandinavia, Through the Norse god Odin, who is often depicted together with his two ravens; Hugin (Thought) and Munin (Memory/Mind) (Headeager 2011:88). |
| **Companion animals** | Ravens and crows have been kept as pets due to their long history of commensalism with humans as referred to by Pliny and Macrobius in ancient Rome, with the tradition continuing today at the Tower of London. The ravens' findings during Silchester excavations led some to suggest they were pets or even "semi-domesticated" due to the Roman tradition. | Ravens in the wild live for 10-20 years; however, when raised in captivity, they have been documented to live for as long as 69 years (Hogstad et al. 1992:158-161). In those cases, we could expect signs of old age on the bones (Reitz & Wing 2008). |

Table 5: Serjantons & Morris 2011, their results from their re-examination compared with sources included by this author.

O'Connor (2004) noted that the importance of organic refuse in urban environments coincides with the frequency and occasional abundance of corvid taxa in the faunal remains of Anglo-Scandinavian York (O'Connor 2004:436-437).
Urban environments can provide ample opportunities for scavengers.
Refuse accumulations can quickly form into large organic deposits, attracting creatures typical for the urban biota (O'Connor 2004:436-437), from flies and beetles to scavenging rats and Corvidae.

## Literary sources concerning the Medieval food culture

Nordeide (2003) documented the social aspect of dining in the middle ages. At Erkebispegården, meals would commonly be consumed twice a day in the dining hall between 8 - 10 am and 6 - 8 pm. Eating food was the purpose, but there was social importance in controlling how the meal was prepared, who prepared it, what was in it, and who could partake. As well as controlling the seating and order of the dining hall. Everyone in the dining hall would know their place in the social hierarchy, and sitting down at the assigned seat was a way to consent to one's placement within the hierarchy (Nordeide 2003:295). The quality of the meal also varied based on the consumer's importance. While the higher strata dined on imported foods and meats, the lower-strata worker might have only been fed porridge.

## Wildlife management - When corvids are viewed as pests

This study looks into what medieval societies would want with corvids. However, it is also necessary to view it from the opposite side; could corvids have been unwanted in medieval societies? To address this, I will include modern ecological studies and rulings that show how corvids are viewed today, focusing on modern farming and hunting societies and Norwegian regulations.

Wildlife management is the idea that humans should intervene in wild ecosystems to maintain balance and protect endangered species. Further, this can be used to form human interests by decreasing the population of species that are “not wanted”, especially if those species threaten the viability of species deemed preferable to humans. One way this is achieved in Norway today is when municipalities issue hunting bounties (Viltloven 1999 §51) to control populations of wild species that are believed to be causing damage or are otherwise overpopulated. The approval process involves consultation and authorization from relevant government bodies (the relevant municipality and the Norwegian Environment Agency (Miljødirektoratet)) to ensure that the management strategies are consistent with conservation and sustainability goals. Several hunting bounties are (at the time of writing) active, and the bounty for ravens and crows is set between 40-75 NOK per bird (Viltloven 1999 §51. *Forskrift om skuddpremie på mink, rødrev, kråke mv., Tysfjord* §1. *Forskrift om skuddpremie på rødrev, kråke og mink, Lurøy* §4, *Forskrift om skuddpremie på kråke og mink, Dønna kommune, Nordland* §4). Crows are culturally considered a pest, especially on farmed land (Hufthammer 1999:12). Further reasoning that bounties are necessary in order to decrease the nest predation of other birds that might be more sought after by hunters, as nest predation is part of the crows' natural behavior. There is discourse and disagreement on whether or not municipality-sanctioned hunting bounties can be an effective solution. Experts such as Dr. Lislevand (Associated Professor and Senior Curator of birds and mammals at the University Museum of Bergen) point out that this is a wrongful interpretation of ecology (Dr. Lislevand per e-mail 19.03.23).

In 2013, an in-field ecological study was conducted in Australia regarding how even temporary carrion disposed of by fishing activities along the Australian shore would increase the prevalence of scavengers and further the effect of nest predation of nesting shorebirds (Rees et al. 2013). The study showed that the native (Australian) raven (Corvus coronides) would quickly increase their presence in areas where even small amounts of carrion had been sparsely distributed. This would also increase the ravens’ predation on the eggs within the area (Rees et. al., 2013). Nest predation is considered a natural process, and there is an expectation that prey animals need to adapt to their environment (Dr. Lislevand per e-mail 19.03.23). The study of Rees et al. (2013) argues that if human activity increases the amount of available carrion, which further causes the increased predatory impact of Australian ravens, then it should not be considered a natural process. Humans should make the adaptations (Rees et al 2013: 48).

In 1973 - 1974, David Houston (1977) conducted a large-scale study on how the hooded crows affected hill sheep farming in Oban near Argyll, Scotland. This research was in response to an unpublished questionnaire for the county of Argyll in 1962, which showed that farmers estimated that hooded crows were responsible for causing over £60.000 of damage to their herds each year. Hooded crows are omnivores and generalists when it comes to finding food, and they operate as predators, scavengers, and foragers (Hogstad 1992:153). They feed extensively on carrion during the winter months. Pregnancy and labor can be fatal for some ewes and lambs, and as a result, there is commonly no shortage of carrion during the lambing season, which can last from December till June.

Most of the farmers that participated in Houston's study viewed hooded crows as a pest and would argue that their numbers should be radically diminished (Houston 1977:26). However, this study also took several clinical measurements of the killed lambs, where the main focus was on the lamb's fat reserves and lung development, which gives clear estimates of the lamb's overall viability. This showed that among the lambs killed by hooded crows, only about 1 - 4% (Houston 1977:27) of them were considered viable lambs that could have grown up without assistance from the farmer. Moreover,  many of them indicated that they had died before any hooded crow started pecking (Houston 1997:27). It is difficult to argue that food is why hooded crows are attacking lambs. Carrion is abundant during the lambing season, cattle feed is openly available in the same landscape, and during their nesting season, they prefer to feed predominantly on insects. The analysis of the killed lambs has shown that feeding on them has not been optimal, but the birds have always consumed certain parts, mainly their eyes, tongues, and umbilical cord. This leads Hudson to suggest that these parts are perhaps considered to be extra nutritious or tasty for the crows. Further, it is suggested that killing weak or dying lambs is an innate part of their instinct, as if their predatory behavior needs an outlet, even though other food might be available and more desirable (Houston 1977:27-28).

In the report, hooded crows were not killing ewes, but there were cases of ewes suffering non-lethal but dreadful injuries, mainly eye loss due to pecking. Houston points out that finding a dead ewe or lamb that crows are pecking apart is a grisly sight, which might make many sheep farmers might think that the crows are the main cause in their livestock death, even though the damage caused by the crow is actually slight (Houston 1977:20). Houston’s study indicated that there was not a reasonable justification to reduce the hooded crow population in Argyll, as they had concluded that the loss of lambs and sheep each season was not increased by the crow, but rather something that would occur whether or not the crows were there to take advantage of the situation. This conclusion differed vastly from most farmers' interpretations (Houston 1977.28-29). Viewing corvids as a pest and a threat to livestock and game is not a modern perception. It has appeared in writing going back to medieval Europe (see example below, Fig.16).

Figure 16: An opportunistic raven being a nuisance to an annoyed sheep. This depiction is from the well-decorated Medieval manuscript *Breviarium; Bréviaire dit de Louis de Male; Brevier van Lodewijk van Male.* Dated to 1360-70 AD.

## The locations of the material in question

The following part of the research history will focus on the previous archaeological research conducted on each of the nine locations included in this study. This is to get a clearer image of the contexts the bird remains to derive from.

## The Norwegian locations

Here, I will present the eight locations included in this study that are in Norway.

Figure 17: An overview of all the Norwegian excavations shown by their location in their respective city, as well as the cities' location in Norway (made using https://mapmaker.nationalgeographic.org/, pinpoints added by author).

### Bergen

Snorre Sturlason wrote *Heimskringla* (around 1230 AD) where he stated that King Olav Kyrre "placed" a town in Bergen around 1070 AD. There has been some discussion around interpreting the Norse word "setja" (placed) due to its multiple meanings. It could either mean that Olav Kyrre decided that the city of Bergen should be constructed or that there was already some kind of trading or settlement activity in that area that Olva Kyrre decided should be expanded to town status (Hansen 2008:15).

Bergen's expansion as a town seems to have been developed from *Vågen*; a natural harbor South-East of the Byfjorden fjord. This elongated bay has been gradually expanded throughout the Medieval period, and the organic waste that has become the foundation is a valuable tool for dating the expansion (Hansen 2008). This is alongside the layers that document Bergen's long history of town fires (Hansen 1998, Helle 1998, Dunlop 1998). Wiig (1981:34) describes Bergen as one of the best-known Medieval societies in Scandinavia.

By the twelfth century, Bergen was a town with a plethora of essential roles, nationally as well as internationally; it was the court of the king, had a well-established religious and financial center, and it held a demographic of men, women, and children (Hansen 2008:35). During the High Medieval Period the Bryggen area in Bergen became Norway's largest center for trade, gradually leading to foreign influences; Hanseatics and later the Dutch (Bisgaard, 2011) establishing themself in the town to trade alongside the rule of the Norwegian kings.

## Bryggen

| | |
|---|---|
| Site name | Bryggen |

| | |
|---|---|
| J.S number | J.S.397 |
| Location synonyms | Hansabryggen, The German Wharf, The Hanseatic Wharf |
| Area | Bergen |
| Excavation period | 1955-1968 |
| Size in m² | c. 4000m² |
| faunal remains | 200'000 TNF < |

Table 6: Information on the Bryggen site.

## Excavation

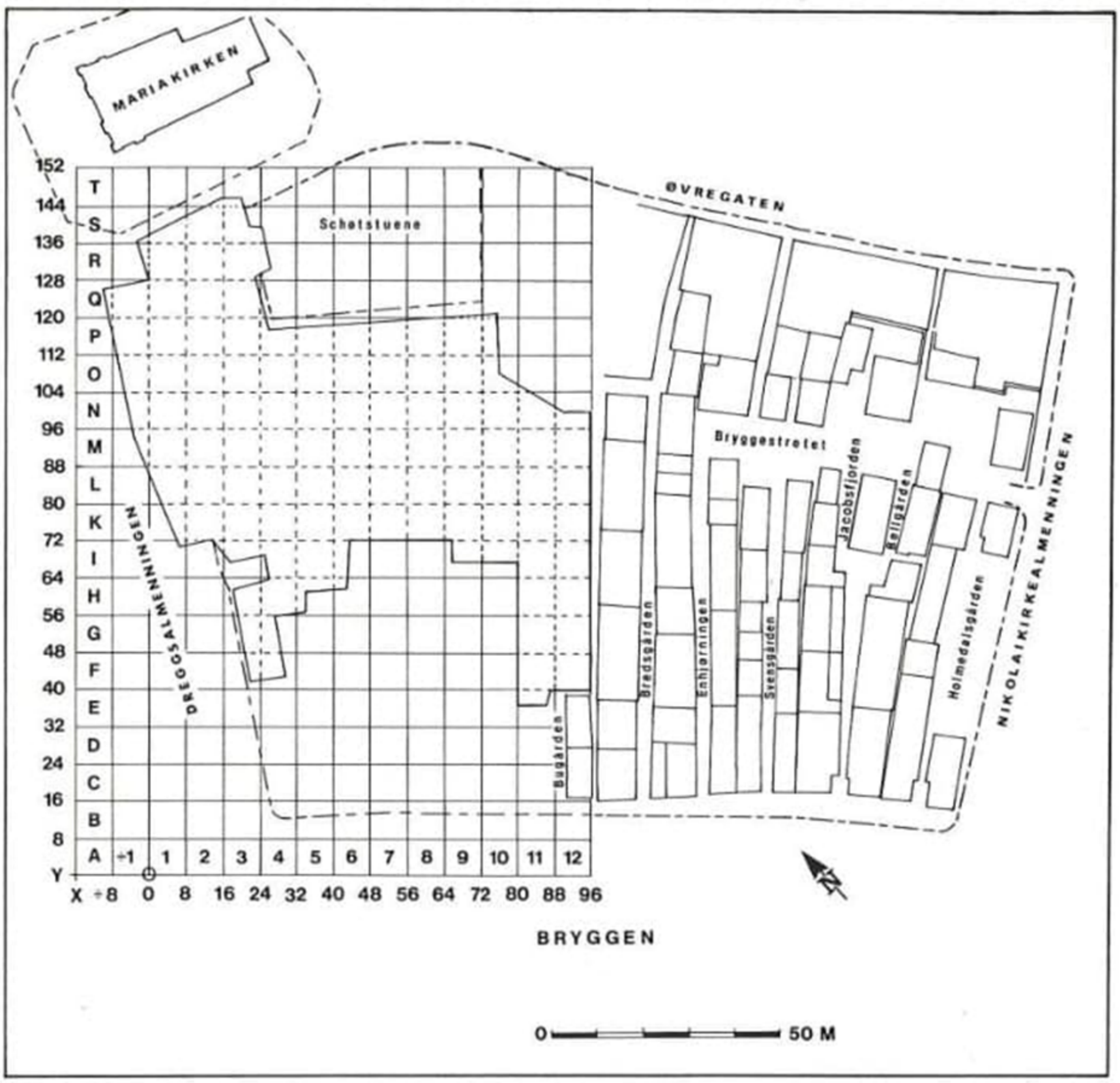

Figure 18: The excavation of Bryggen shows the layout of the grid square (Bryggen papers no 5, p.18).

The excavation of Bryggen started due to a town fire in 1955, and the project was completed in 1968. The excavation area was roughly 4'000 square meters and the findings from this excavation are still being documented and published in the series *Bryggen Papers (*Blackmore, L. & Vince, A. 1994:21-24). The chronology of found items was based on the placements of the object in relation to its nearest fire layer (e.g.over/in/under Fire VI). Location records followed a traditional grid system (Blackmore, L. & Vince, A. 1994:24). Sieving and other techniques that increase the chances of small bones being retrieved were not used during this project, which would have greatly affected the total bird material. This is something to keep in mind when analyzing and discussing the amount of bird bones present.

### Material

The excavation of Bryggen has resulted in the collection of several hundred thousand bones (Hufthammer 1994). Among these were bones of corvids. A lot of the material from Bryggen has not been analyzed.

### Research/conclusion

The Bryggen project is the earliest excavation in this study and while there are several publications on its findings (the Bryggen Papers), none of them have touched on the subject of Corvidae remains.

## Rosenkrantzgate 4 (Bergen)

| | |
|---|---|
| Site name | Rosenkrantzgate 4 |
| J.S number | 613 |
| Location synonyms | n/a |
| Area | Bergen |
| Excavation period | 1978 - 1979 |

| | |
|---|---|
| Size in m² | n/a |
| faunal remains | 2'298 fragments (Wiig 1981) |

Table 7: Information on the Rosenkrantzgate 4 site.

Location

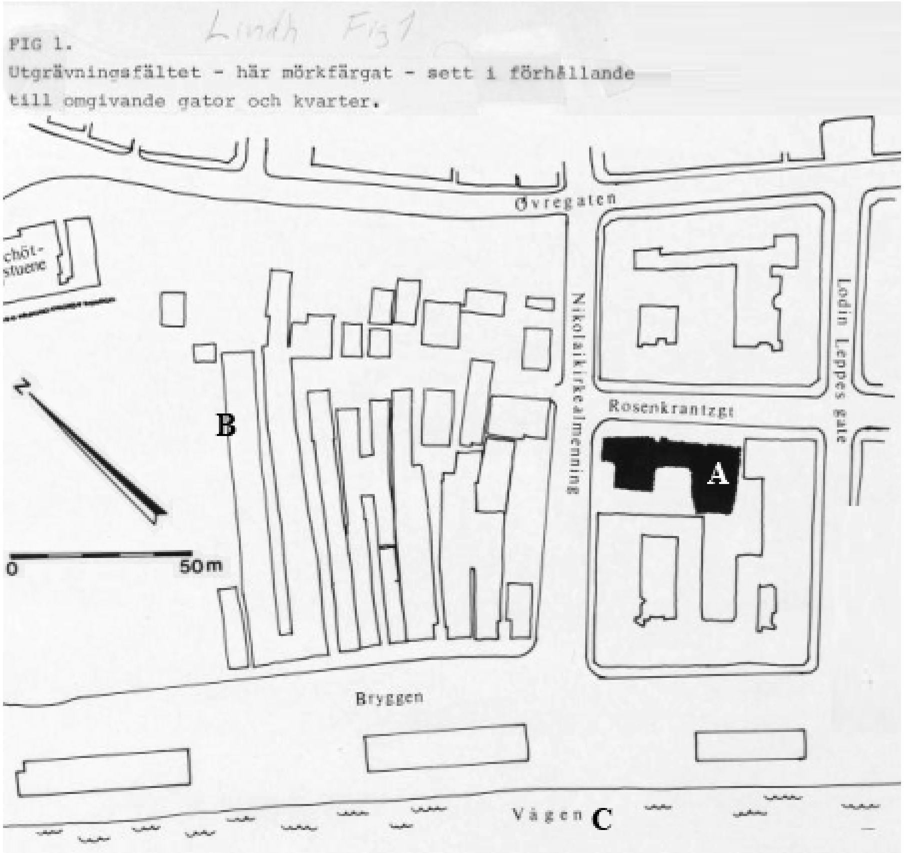


Figure 19: The area that was excavated in Rosenkratzgate 4 (A) is highlighted in black, also in the map is the Bryggen / the German Wharf (B) and Vågen / The waterfront (C). Lindh, J. (1980 unpublished) Edited by the author.

Rosenkrantzgate 4 is the plot located right behind today's Hanseatic Museum, in the city center of Bergen. The plot the excavated area lies within is on the waterfront. In the c. 400 meters between Rosenkrantzgate 4 and Håkonshall, lies a good portion of Bergen's Medieval sites.

### Excavation

The excavation project of Rosenkrantzgate 4 lasted 13 months, from May 1978 to May 1979. The stratigraphy included five fire layers, and the material was dated based on whether they were over or under the layer of a certain fire (as seen in dating the Bryggen finds). This study was focused on material from the strata of two of the fire layers. These are described as "under fire layer C" being from before the fire of 1431 AD, and "over fire layer A" that is after the fire in 1476 AD (Wiig 1981:35). Medieval fires are well-documented in Bergen both historically and archaeologically, and are often used as a reference point for the chronology of archeological excavations in the city center (Hansen 1998, Helle 1998, Dunlop 1998).

As for the collection method, it is described as "all visible bones being collected by hand during the recovery of the site" (Wiig 1981:35). Again, this most likely greatly affects the number and kinds of species retrieved.

### Material

The faunal remains that Wiig analyzed consisted of 2'298 fragments, whereas 40,1% were unidentified to a specific species but still placed in their main category of mammal, bird, or fish.

| **Rosenkrantzgt 4 faunal remains (Aves)** | | |
|---|---|---|
| Species (aves) | Layer 1 | Layer 2 |
| Gannet (*Sula bossana*) | 1 | 0 |
| Goose (*Anser anser/ anser* (domestic)) | 0 | 1 |
| White-tailed eagle (*Haliaetus albicilla*) | 3 | 0 |
| Fowl (Gallus (domestic)) | 2 | 2 |
| Common gull (*Larus canus*) | 1 | 0 |
| Raven (*Corvus corax*) | 0 | 2 |
| Number identified | 7 | 5 |
| Number not identified | 0 | 1 |
| Total number of bones | 7 | 6 |

Table 8: Rosenkrantsgt 4 Faunal remains (Aves) (Source: Wiig 1981).

| Rosenkrantsgt 4 faunal remains (TNF) | | | |
|---|---|---|---|
| Class | Layer 1 | Layer 2 | Layer 1 & 2 |
| Mammal | 1'118 | 1'151 | 2'269 |
| Aves | 7 | 6 | 13 |
| Mammal & aves | 1'125 | 1'157 | 2'282 |

Table 9: Rosenkrantsgt 4 Faunal remains (TNF) (Source: Wiig 1981).

The 1364 fragments that had been identified to a species showed that up to 95% of this material was from either cattle (Bos domestic) or sheep/goat (Ovis/Capra domestic). By including the other mammals from both domestic; cats (Felis domestic), dogs (Canis domestic), and horses (Equus domestic) and wild fauna; reindeer (Rangifer tarandus), moose (Alces alces), and red deer (Cervus elaphus) (Wiig 1981:34-35) the percentage rises to 98,2%. The remaining faunal material is 0,43% from fish and 0,87% from birds.
These statistics are similar to what has been found in other medieval excavations (Table 8).

The identified bird material of the site consists of 12 bones from six species. Two domestic species are fowl (Gallus gallus) and goose (Anser anser), and three species are coastal birds; common gull (Larus canus), gannet (Sula bassana), and white-tailed eagle (Haliaetus albicilla), the last species is the raven (Corvid corax). The Corvid material consists of two humeri and amounts to 0,14% of the species-identified material.

## Oslo Gamlebyen

Oslo is the capital of Norway and celebrated its 900th anniversary in 1950 based on the historical sources of Snorre Sturlason. There it is stated that King Harald III of Norway founded Oslo around the year 1050 (Heimskringla: Harald hardrådes saga). However, archeological findings moved the likely founding date to the year 1000 AD, which caused Oslo to celebrate its 1000th anniversary in the year 2000 (Molaug 2008:73).

Gamlebyen is the Old Town part of Oslo, located just south of Oslo's modern city center. The excavation there started in 1860, with the main focus being to uncover the remains of monumental buildings in that part of the city, leading to some of this area becoming *Middelalderparken* (the Medieval Park).

## Mindets Tomt (Oslo)

| | |
|---|---|
| Site name | Mindets Tomt |
| J.S number | J.S.537 |
| Location synonyms | n/a |
| Area | Oslo |
| Excavation period | 1970 - 1976 |
| Size in m² | n/a |
| faunal remains | n/a |

Table 10: Information on the Mindets Tomt site.

### Location

Mindets Tomt is located in Old Oslo (Gamle Oslo), is the district on the east side of the current city center of Oslo. It is connected to the Søndre Felt and on the other side of Clemens Street is the Nordre field. Like many Norwegian towns during the medieval era, this area of Oslo has a long and unfortunate history of town fires, which became an essential marker for dating the material and gave name to the layers found (for instance, one of the layers was described as *Fire 3 and under, possibly over fire 5).*

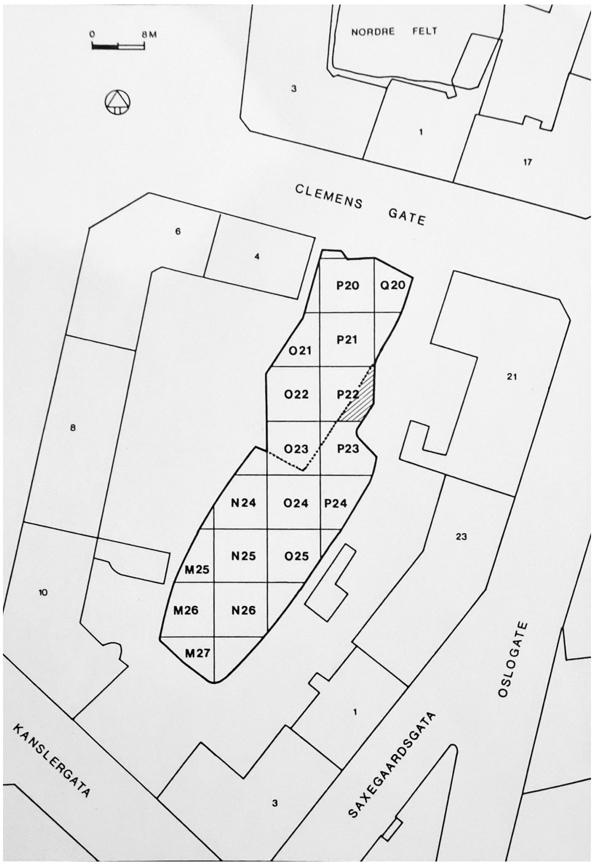


Figure 20: The map shows the *Mindets Tomt* (the northern part) and *Søndre Felt* (the southern part) (Schia & Griffin 1988:8).

## Excavation

The excavation of Mindets Tomt was started by Hans-Emil Lidèn in 1970-72. Petter B. Moland and Erik Schia took over the project in 1973 and completed it by 1976. The number of animal bones was recorded by grid-square and burnt layer (Schia & Griffin 1988:7-10). Sifting was mostly not included as a method apart from c. 9.5 sq m of the P22 grid (Schia & Griffin 1988:7). Choosing to sift P22 probably increased the number of small bones found there. However, smaller bones were considered more challenging to identify than larger ones, due to the fragmentation and taphonomic processes.

All information on this site was originally written in Norwegian but has been translated by the author. Secondly, none of the material has been given any new identification numbers by this author.

### Material

Information of the other materials found at Mindets Tomt was not acquired by this author. Corvidea material consists of 25 elements, including all three species in this study.

### Research/conclusion

The burnt layers in the stratigraphy were used to date the excavated objects. These were also used as descriptive names for the layers.

| **Layer dating of Mindets Tomt** | | |
|---|---|---|
| RELATIVE DATING | ABSOLUTE DATING (AD) | POSSIBLE TOWN-FIRE (AD) |
| Burnt layer 3 | 1450 - 1525 | 1523 |
| Burnt layer 4 | 1350 - 1450 | 1456 |
| Burnt layer 5 | 1300 - 1350 | 1352 |
| Burnt layer 6 | 1275 - 1300 | c.1300 |
| Burnt layer 7 | 1250 - 1300 | 1287 |
| Burnt layer 8 | 1200 - 1250 | 1254 |
| Burnt layer 9 | 1175 - 1225 | 1223 |
| Burnt layer 10 | 1150 - 1200 | c.1200 |

Table 11: The cultural layers of Mindets Tomt, based on fire layers (Based on Schia & Griffins 1988:11 table. Absolute dating has been rounded off to the nearest 25 years).

Schia found it more probable that these were the remains of the Hooded Crow (Corvid corone corone). He (Schia) further concludes that crow meat might have been a significant food source in the early days of Medieval Oslo and that their meat is pleasant to eat (Schia & Griffin 1988:183). This differs from his opinion about the ravens found on sight; they might still have been a source of food, but he describes their meat as not being *highly regarded*, and might also have been hunted simply for the joy of the hunt (Schia & Griffin 1988:183).

## Oslo Area. Gamlebyen, Grønnengen and Nordre Felt II

| | |
|---|---|
| Site name | Gamlebyen, Grønnengen og Nordre Felt II |
| J.S number | J.S.702 |
| Location synonyms | Gamlebyen, middelalderparken, |
| Area | Oslo |
| Excavation period | 1976 - 1984 |
| Size in m² | N/A |
| faunal remains | N/A |

Table 12: Information on Grønnengen and Nordre Felt II.

On the website of The University of Oslo's DUO research archive, there is a series of ten books published that are discussing most of the archaeological research that was conducted in Gamlebyen, with a focus on work from 1960 until the publishing date (1977 - 1991). Unfortunately, two of these books (number 4 and 9) have been announced but never published. Book 4 would have been about Nordre felt, and due to this not being published, there is a lack of information from this site.

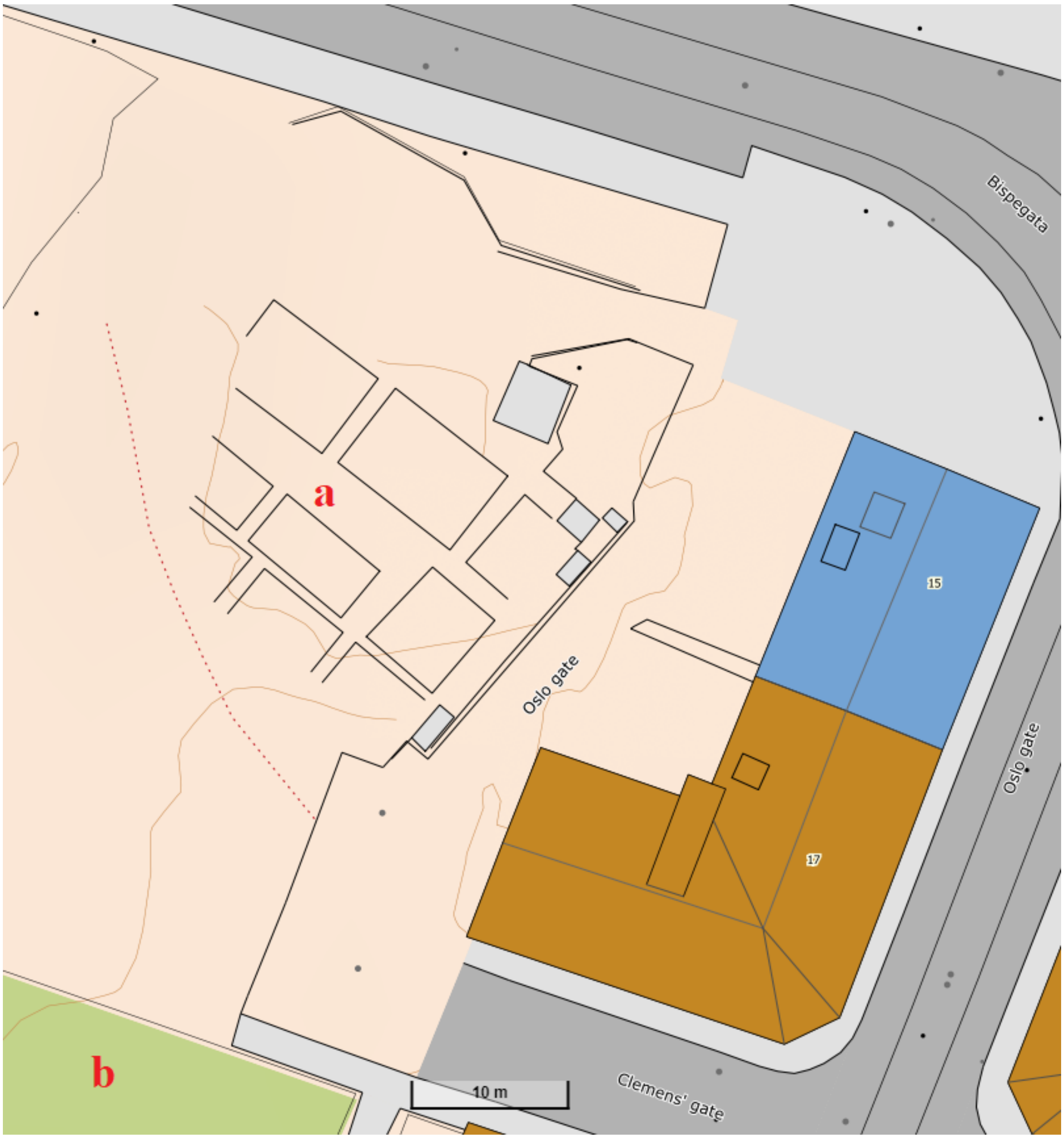


Figure 21: The location for the Nordre Felt  II excavation. There is no information published that shows the exact borders, but the outlined structures in the center of the photo are the foundation of the structures excavated.

## Location and historical significance

Nordre Felt (1, 2, and 3) as an area is a cross-section that spans over five modern addresses (Bispegaten 4 & 6, Kanslergaten 2, and Clementsgate 1 & 3) (Molaug undated:2). This area has been divided into smaller sections, where the first excavation started in 1972. The section relevant to this thesis is referred to as Nordre Felt II and Grønnengen. This author has not found any map of the excavated site that could point to where ‘Grønnengen’ (“the green field”) is located, but since all the corvid bones have the same J.S. number it is reasonable to assume that it is a field within the same area. Perhaps it is the open area southwest of the structures (see Figure 19, area marked “b”).

### Excavation

The excavation of Nordre Felt 2 began in 1976, and the main focus was in the areas within Clemensgate 1 & 3 (Molaug n.d.:3). The next year, in 1977, the project was put on hold indefinitely due to lack of funding (Molaug n.d.:3 & 55). The excavation of Nordre Felt 2 started up again six years later, in 1982, and continued until 1984. Petter B. Molaug led the project (Molaug n.d.:4).

The methodologies were similar to those used at Mindets Tomt, and there was a conscious effort to match the plot grids between the two excavation sites (8 x 8 sq.m grids). The stratigraphy was registered based on the burnt layers from Oslo’s many town fires (Molaug n.d.:9).
During previous work on Nordre Felt it was noted that most of the material was in a very poor condition, and through consultations with Bergen Museum (now Universitetsmuseet i Bergen) it was decided that recovering faunal remains should not be a priority (Molaug n.d.:8). However, this was reprioritized at Nordre Felt II, and faunal remains were collected. Further, the sifting test that was conducted on Mindets Tomt led to sifting being a big part of this excavation from 1982-84 (Molaug n.d.:8).

## A rough overview of the cultural layers

The first excavation campaign in 1976-77 dug down to layers that could confidently be dated to the fourteenth and thirteenth century. During the second campaign wood structures were uncovered that connected Nordre Felt 1 with Nordre Felt 2 (Molaug n.d.:57). However, due to modern structures, it was not possible to connect the two sites stratigraphically (Molaug n.d.:56). The stratigraphy is described, but since this written record is based on an unpublished manuscript it is without any figures or tables. This makes it challenging to understand (Molaug n.d.:57-59).

The stratigraphy in Nordre Felt (1, 2, and 3) was divided into 23 phases based on structures and pits and contained 8 burnt layers. Phases 1 - 4 were dated to the 16th to 19th century, the remaining phases 5 - 23 had all the documented burnt layers and spanned over the 10th - 12th century (Molaug n.d.:13-15).

#### Research/Conclusion

This author has not found any sources that deal with the research and conclusion of the excavation of Grønnengen and Nordre Felt II or its faunal remains. The layers on this site were also given numeral names, making it difficult to know were to place them chronologically.

## Tønsberg

Tønsberg is located on a peninsula on the west side of the entrance to the Oslo fjord. By boat, there is approximately an 80 kilometers distance between Tønsberg and Oslo.
Tønsberg is widely considered to be the oldest town in Norway, and the date when the city was founded is thought to be 871 AD. This is based on Snorre Sturlason's writings, saying that Harald Hårfagre traveled through Tønsberg on his way to the battle of Hafrsfjord (Molaug 2002:23). Most of NIKU's research in Tønsberg has been done in the harbor-area, and the oldest remains of 'town-activities' are dated to the 10th century (Molaug 2002:23).

Figure 22: A general view of Tønsberg showing the location of the relevant excavation plot, Storgaten 35, and its location compared to the town square (*Torget)*, Saint Olav Monastery, and the coastline. (Map made by Leon Gundersen, at the request of the author).

## Hvistedahl Plot, Storgaten 35 - (Tønsberg)

| | |
|---|---|
| Site name | Storgaten 35 |
| J.S number | J.S.563 |
| Location synonyms | Hvistedahl Tomt, Storgt. 35 |
| Area | Tønsberg |
| Excavation period | 1974 |
| Size in m² | 200 sq.m |
| faunal remains | c. 350 liters |

Table 13: Information and data on the Hvistedahl Plot in Tønsberg.


Figure 23: Streetmap of Storgaten in Tønsberg. A) St. Olavsklosteret/the monastery, B) Storgaten 23-25, C) Storgaten 33, D) Storgaten 35-37, and E) Torget/the town square.
(Edited by the author. Original from Wienberg 1992:76).

### Location and historical significance

Hvistedahl Tomt (Storgaten 35) is located 200 meters from the harbor of Tønsberg, between the town square and St.Olavs monastery (Eriksson 1975:1).

### Excavation

The excavation of Hvistendahl Tomt was conducted in 1974, and roughly 200 square meters were uncovered in the research (Wienberg 1992:75). The lead excavator was Jan E. G. Eriksson. The excavation of Storgaten 35 was conducted in 1974 and was implemented for the plots Storgaten 35 and 37 to be approved for construction. This author has found limited documentation regarding this excavation's methods and materials. The majority of information mainly relies on a preliminary report written by Eriksson (1975) the subsequent year, and some later work done by Tjeldvoll (1990) and Wienberg (1992).

The excavation was conducted in 1974, running for 17 weeks, from early May until early September (Eriksson 1975:1). Minimal excavation work was done on Storgaten 37. The modern structures on that plot consisted of a building with a deep basement, so all cultural layers had been removed. This was not the case in Storgaten 35, some areas were without structures, and the areas with modern structures had caused limited disturbance to a few cultural layers (Eriksson 1975:1). The cultural layers extended to 1,2 meters in depth (Eriksson 1975:2). The exception was the east side, which had been left relatively undisturbed. Roughly 350 liters of bones were retrieved from this area (Eriksson 1975:3), but the preliminary report presents no further data or photos regarding the bones. Later work was published in Tjeldvoll (1990).

The preliminary phases were determined by structures, some only appeared during one phase, and others, like the well, lasted for several phases (Eriksson 1975:4). The structures indicated that parts of the plot might have always been "open terrain", possibly part of the town square.

| **Storgaten 35 cultural layers** | |
|---|---|
| Phase | preliminary dates |
| 1 | N/A |
| 2 | 1300 - 1400 AD |
| 3 | 1200 AD |
| 4 | N/A |
| 5 | < 1200 AD |

Table 14: Preliminary dating for the five phases of the cultural layers in Storgaten 35 (Eriksson 1975:3-5).

### Material

The deposit (layer 31) where the faunal remains were uncovered was labeled as a *waste deposit*. When discussing game meat from Storgaten 35, the named animals included are reindeer (Rangifer tarandus), hare (Lepus timidus), grouse (Lagopus lagopus), and hazel grouse (Tetrastes bonasia). They note that the representation of game meat is minuscule compared to the bones from domesticated animals. Similarly to Bergen, Oslo, and Trondheim, it was concluded that birds and game meat are surmised to have played an inferior role in the dietary choices of people living in the urban settings of Medieval Tønsberg (Tjeldvoll 1990 Bilag 2:1). Interestingly, when ravens are discussed it is paired with the discovery of rat bones in the faunal remains. Neither ravens nor rats are discussed any further. However, it is mentioned that "If one considers the occurrence of bones in medieval waste as meal remains and an expression of aspects of the diet of the time, it seems that animal food obtained through hunting/trapping has played a vanishingly small role compared to the importance meat from domestic animals has had" (Tjeldvoll 1990 Bilag 2:1).
Other materials found were mainly the kind of material that can keep well in poor conditions, such as ceramics, some metals, and worked soapstone (Eriksson 1975:5). Biodegradable matters were scarce in the recovered material, except for the material from the eastside. The earliest material dated was ceramics from 1100 - 1200 AD (Ulriksen 2008:99).

### Research/Conclusion

Wienberg (1992) stated that the excavation of Storgaten 35, and the neighboring excavations got limited attention. It is speculated that this was due to the uncovered data being fragmented and complex to determine (Wienberg 1992:75). This Author has found no further research relevant to this study.

# Trondheim

## Televerkstomten (Trondheim)

| | |
|---|---|
| Site name | Televerkstomten |
| J.S number | J.S.632 |
| Location synonyms | TVT, Televerket, Nordre gate 1 |
| Area | Trondheim |
| Excavation period | 1977 |
| Size in m² | 485m² |
| faunal remains | 28'094 TNF |

Table 15: Information and data on the Televerkstomten site in Trondheim.

### Location

Televerkstomten is located in the city center of Trondheim (both currently and likely historically) and was excavated in 1977. The faunal material was first examined in 1992 by Karin Lykkemeier Marthinussen, and two elements from c. corax were recorded.

### Excavation

The faunal remains were analyzed at the Zoological Museum in Bergen (now part of the University Museum of Bergen) by Marthinussen (1992) for her master's thesis in Systematic zoology.

The excavation yielded 18'883 pieces of faunal remains dated to seven phases, from 900 AD to 1600 AD. Marthinussen's studies focused on 10'288 pieces, where 54,5% had been identified as a specific taxon (Marthinussen 1992:92). 98,8% of this material is from domesticated animals. The bird bones represent 0,99% of the total faunal assemblage excavated at Televerkstomten (Marthinussen 1992:67). If this is narrowed down to only the material dated to between 900 AD - 1600 AD, it decreases to 0,86% out of the assemblage that has been identified to a taxon (Marthinussen 1992:67). Marthinussen points out that this statistic is in line with similar excavations with faunal remains from medieval contexts (Marthinussen 1992:67).

| Bird remains from the different NMA locations studied | | | | |
|---|---|---|---|---|
| J.S number | Excavation | Researcher and publishing year | % of the total number of fragments | % of total species-identified fragments |
| J.S.632 | Televerkstomten | Marthinussen 1992 | 0,6 | 0,86 |
| J.S.765 | Bibliotekstomten | Lie 1989 | 0,4 | 0,5 |
| J.S.613 | Rosenkrantzgt 4 | Wiig 1981 | 0,6 | 0,9 |
| J.S.630 | Dreggen | Undheim 1985 | 0,3 | 0,6 |
| J.S.599 | Oslogt. 7 | Lie 1979 | 1,4 | 2,2 |
| J.S.537 | Mindets Tomt | Lie 1988 | 1,3 | 2,2 |

Table 16: The percentage of birds in Medieval faunal remains based on the total number of fragments and the total number of species-identified fragments (based on a table from Marthinussen's thesis 1992:67).

### Research/Conclusion

Regarding bird bones, Marthinussen has divided her bird material into four categories: domesticated, aquatic, forest/mountain, and birds of prey (Marthinussen 1992:67-70). The data shows that out of the fragments from birds considered meat-producing fowl, 46,3% are from domesticated birds (Marthinussen 1992:79). Fragments from meat-producing wild birds are categorized as 75% aquatic birds. The remaining 25% are from land birds (Marthinussen 1992:82). Only one corvid species is mentioned in Marthinussen's thesis, the Common Raven. It is, however, mentioned regarding bones from a mesolithic excavation from Blomvåg (Marthinusse 1992:90). Two corvid elements are present from that excavation. These (the FTB elements) were from a common raven (*Corvid corax*), Understandably, this material has not been considered as a factor in Marthinussen's analysis, considering that the corvid material from this excavation only consists of two elements.  The representation of wild species found at Televerkstomten is an accurate representation of the wildlife in the natural landscape around Medieval Trondheim (Marthinussen 1992:93 & 1992:88-89).

| FBT phases (AD) | |
|---|---|
| Phase 1 | > Late 900th c |
| Phase 2 | Late 900th c - 1025 |
| Phase 3 | 1025 - 1050 |
| Phase 6 | 1150 - 1175 |
| Phase 8 | 1225 - 1275 |
| Phase 9 | 1275 - 1325 |
| Phase 10 | 1325 - 1500 |

Tabel 17: Folkebibliotekstomtens Phases with dating (Source: Chistophersen & Nordeide, 1994:35).

## Erkebispegården (Trondheim)

| | |
|---|---|
| Site name | Erkebispegården |
| J.S number | J.S.845 |
| Location synonyms | *EBG, The Archbishop's Palace,* ABP |
| Area | Trondheim |
| Excavation period | 1991 - 1995 |
| Size in m² | 2200m² |
| faunal remains | 35'303 TNF |

Table 18: Information on the Erkebispegården site of Trondheim.

### Location and historical significance

The Archbishop's Palace is located on the south side of the Nidaros Cathedral and is considered to be one of the greatest centers of power throughout the medieval era in Norway.

The site is best described as of high status characterized by its documented ecclesiastical practices (Walker et al. 2019:23).

### Excavation & material

The excavation of the Archbishop's Palace took place from 1991 to 1995, and the excavated area was divided into sections to reflect the different productions and periods that each section contained. The faunal remains that were collected from sections A & B in 1991 have been noted as the weakest research materials from this excavation (Nordeide 2003:302). This is partly because the faunal remains were excavated early in the project before adequate methods had been put in place. An amount of the material has not been sifted, and there are great gaps in time spans between some of the datings. Out of the 80 corvid elements from this location, all were excavated in 1991. 60 of the elements were from sections A or B. At the same time, the remaining 24 were from section I or G.

### Research/Conclusion

| TNF of mammal, birds, and fish from period 4 - 11, at Erkebispegården | | | | | |
|---|---|---|---|---|---|
| | **4 - 6 period** | **7 - 9 period** | **10 - 11 period** | **Sum species** | **sum in %** |
| **Mammal** | **11086** | **7762** | **10408** | **29’256** | **86,3%** |
| **Fish** | **161** | **413** | **1289** | **1863** | **5,4%** |
| **Bird** | **1285** | **636** | **859** | **2780** | **8,2%** |
| Crow (*C. corone*) | 31 | 10 | 2 | 43 | 0,1% |
| Raven (*C. corax*) | 2 | 2 | 2 | 6 | 0,017% |

Table 19: TNF of mammals, birds, and fish from period 4 - 11, at Erkebispegården (Source: Nordeide 2003:302-305).

The avian faunal remains mainly consist of domesticated birds such as various large landfowl (Galliformes), domestic fowl (Gallus gallus), and birds that are typically considered common for game/hunting such as rock ptarmigan (Lagopus mutus), black grouse (Tetaro tetrix) and western capercaillie (Teatro urogallus). All these birds are considered to be a common source of meat. Finding 84 elements from Corvidaes (Corvus corone, Corvid monedula, and Corvus corax) does stand out among the faunal remains. Nordeide (2003:308) concluded that judging by the number of corvid bones, they might have been a common part of the diet for some of the residents at the Archbishop's palace from 1250 - 1532 AD.

| **Distribution of common raven and crow bones from section A of EBG** | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Period** | **5** | **6** | **7** | **9** | **10** | **11** | **12** |
| **Chronology (AD)** | c. 1475 - 1500 | 1500 - 1532 | 1532 - c.1590 | 1640 - 1672 | 1672 - c. 1700 | c. 1700 - c. 1780 | c. 1780 - 1991 |
| Common raven (*C. corax*) | | | 1 | | | | 1 |
| Crow (*C. corone*) | | 30 | | 7 | 2 | | 1 |

Table 20: Distribution of common raven and crow bones from section A, EBG (source: Hufthammer 1999:12).

The distribution of crow (*C. corone*) was considered to be unexpectedly high in Period 6, notably even higher than the amount of chicken (G. gallus domest) (Hufthammer 1999:12).

| **Distribution of common raven and crow bones from section B of EBG** | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Period** | **6** | **7** | **8** | **9** | **10** | **11** | **12** |
| **Chronology (AD)** | 1500 - 1532 | 1532 - c. 1590 | c. 1590 - 1640 | 1640 - 1672 | 1672 - c. 1700 | c. 1700 - c. 1780 | c. 1780 - 1991 |
| Common raven (*C. corax*) | 2 | | | 1 | | 1 | |
| Crow (*C. corone*) | 1 | 1 | | 2 | | | |

Table 21: Distribution of common raven and crow bones from section B, EBG (Hufthammer 1999:19).

## Folkebibliotekstomten (Trondheim)

| | |
|---|---|
| Site name | Folkebibliotekstomten |
| J.S number | J.S.765 |
| Location synonyms | FBT, Bibliotekstomten, Peter Egges Plass 1 |
| Area | Trondheim, Norway |
| Excavation period | 1973 - 1985 |
| Size in m² | 700m² (of 3200m²) |
| faunal remains | 26'301 TNF (Lie 1989), 10 - 15 Tons |

Table 22: Information on the Folkebibliotekstomten site of Trondheim.

### Location

Folkebibliotekstomten (Peter Egges plass 1) on the peninsula's east side is considered downtown Trondheim. The plot is right by the waterfront of the river Nidelva.

### Excavation

The excavation of Folkebibliotekstomten (under project leader Axel Christophersen) resulted in 10 - 15 tons of faunal remains. The sheer amount caused some of the material to be cut from the following research that Lie conducted.

The faunal remains were excavated from Bibliotekstomten in Trondheim from 1973 to 1985 (Lie 1989:8).

All the material was divided into ten phases from 900 AD to 1400 AD (Lie 1989:8). Due to the high amount of materials, it was decided that the middle part (phase 4 - 7) was removed from the study, leaving the earliest phase 1 - 3 (late 900 AD to c. 1125 AD) and the latest phase 8 - 10 (c. 1225 AD to c. 1475 AD) (Lie 1989:8).

| TNF species from phases 1-3 and 8-10 from FBT | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Phase** | **1** | **2** | **3** | **8** | **9** | **10** | **total** | **%** |
| **Mammalia** | 340 | 7'504 | 5'447 | 4'353 | 892 | 5'624 | 24'160 | 89,5% |
| **Aves** | 4 | 54 | 24 | 16 | 0 | 14 | 112 | 0,40% |
| **Pisces** | 15 | 851 | 717 | 314 | 0 | 129 | 2'026 | 7,50% |
| | | | | | | | 26'980 | 97,4% |

Table 23: All the identified material from the earliest (1-3) and latest (8-10) phases from Folkebibliotekstomten. Data based on Lie 1989 spreadsheet. Note. in Lie 1989 the total is 2011 fish elements. This seems to be due to the author not adding the 15 elements from phase 1, however, it is not specified why this is the case, so I am leaning towards it being unintentional). Percentile calculations added by this author.

The site was divided into sections FJ, FN, FW, FA, FT and FU (Table 1 in Lie 1989:9). The main method of gathering remains was by collecting "as much as possible" (Lie 1989:8). This expectantly prioritizes larger and thicker bones. During the last season, some areas within "delfelt" FU, FW, and FN were sifted. This was not done systematically. Since sifting was implemented during the last season, it was only done on the oldest layers. The effectiveness of sifting seems apparent when viewing the number of faunal remains from avian and pisces species found in the individual layers.

### Material

The total amount of material from these six phases is 26'298 elements, whose division was c. 92% mammal, 7,5% fish, and less than 2% from birds (Lie 1989:14).
The crow ulna at Televerkstomten was found to be from phase 2 (Lie 1989:Tabell 1B), which places it early in the settlement's history (up until -1025AD).

### Research/conclusion

Lie questions mammal bones are represented in much higher numbers than birds and fish during Medieval times in Norway (Lie 1989:14).

## Iceland

Following, I will present the research history of the Icelandic location included in this study.

## Skuggi

### Location

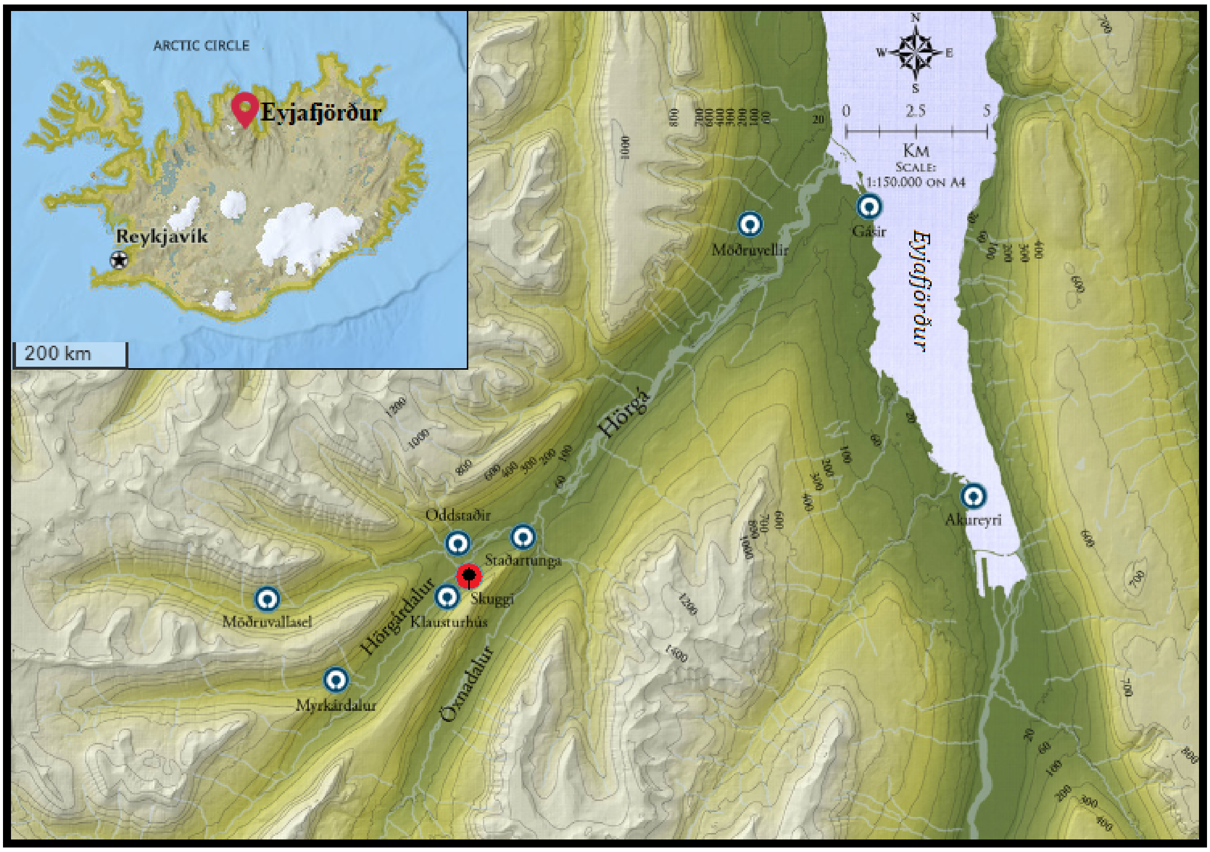


Figure 24: Map of the location of Skuggi (red pinpoint), as well as the other excavations is part of the research conducted in Hörgárdalur Valley and along the shore of Eyjafjörður (edited by the author, sourced from Harrison & Roberts 2022:66 and mapmaker.nationalgeographic.org/).

The Icelandic material consists of one excavation; Skuggi is located at an elevation of 170m asl in Hörgardalur in the North of Iceland (see fig, 23). It lies 20 km from Gasir (medieval trading site (Harrison et al. 2008)), next to the fjord Eyjafjörður.

## Excavation

The excavation of Skuggi began in 2008, with Ramona Harrison as the lead excavator. The first area (and the area of focus in this study) was Trench 1 (TR1).
All material from the midden was dry-sieved through 4 mm mesh. Whole-soil sampling was gathered for post-excavation analysis (Harrison 2010:3). The processing of the faunal remains took place in New York at the CUNY Northern Science & Education Center (NORSEC) laboratories (Harrison 2010:3).

| **All elements from Skuggi TR1 assigned to a species** | | | | | |
|---|---|---|---|---|---|
| Taxon | II, mid 10th - early 11th c | IV, mid 11th-mid 12th c | V, mid-late 12th c | Total NISP | % |
| All mammal domesticates | 889 | 291 | 151 | 1'331 | 60,8% |
| All wild mammals | 2 | 38 | 8 | 48 | 2,19% |
| **Total mammals** | **891** | **329** | **159** | **1'379** | **62,9%** |
| Common raven (*C. corax*) | 0 | 41 | 3 | 44 | 2% |
| **Total birds** | **2** | **383** | **26** | **411** | **18,7%** |
| **Total fish** | **21** | **290** | **70** | **381** | **17,4%** |
| **Total mollusca** | **13** | **5** | **0** | **18** | **0,8%** |
| **Total sum** | **927** | **1'007** | **255** | **2'189** | **100%** |

Table 24: All elements from Skuggi TR1 assigned to a species. The common raven, wild and domestic mammals are also included. (source: Harrison 2010).

The initial identification of the 44 elements from the common raven followed the research for avian skeletons at the AMNH Ornithology Department. Some of the elements were noted as possibly having butcher marks. However, they were severely fragmented and taphonomic processes could not be ruled out.

| The occupational phases at Skuggi | | |
|---|---|---|
| Phase | Occupation period | Dates (AD) |
| I | Settlements Phase | late 9th and early 10th c. |
| II | Later Viking Age | mid 10th - early 11th c. |
| III | Later Viking Age - Early medieval | mid 11th |
| IV | Early medieval | mid 11th - mid 12th c. |
| V | Terminal occupation | mid-late 12th c. |

Table 25: Breakdown of the occupational phases at Skuggi (source: Harrison 2010).

### Research/conclusion

Skuggi is believed to have been a tenant farm. Therefore, the site is considered relatively low status (Harrison & Roberts 2014:8). Its name and location also indicate that this is a low-status farm. Skuggi is Icelandic for shadow, and it is located on the shady side of the valley. The radiocarbon analysis in the midden from TR1 dates the midden deposits to roughly AD 970 -  1208 (tab. 25). This was further supported by tephra layers that are traced to well-documented volcanic eruptions (Harrison 2010:2).

The presence of raven bones is noted as interesting, considering how they are rarely found in Icelandic midden deposits (Harrison 2010:11). Signs of possible consumption were noted and but not confirmed. More of this in Chapter 5

# 5 Data

In this chapter, I will present the elements used in this study and all the data I have collected. Most of this data has previously been collected through the work of the University Museum of Bergen and the NORSEC laboratories, I have chosen to redo the analysis that was previously done in order to ensure that the information I gather will be consistent with that which has already been documented.

| All Norwegian material | | | | |
|---|---|---|---|---|
| **J.S. number** | **City** | **Site name** | **Year** | **Total number of fragments (TNF)** |
| J.S.397 | Bergen | Bryggen | 1955 - 1972 | 1 Common raven (*C. corax*)<br>2 Crow (*C. corone*) |
| J.S.537 | Oslo | Mindets Tomt | 1970 | 10 Common raven (*C. corax*)<br>13 Crow (*C. corone*)<br>2 Western jackdaw (*C. monedula*) |
| J.S.563 | Tønsberg | Storgt.35 Hvistedahl Tomt | 1974 | 2 Common ravens (*C. corax*) |
| J.S.613 | Bergen | Rosenkrantz gate 4 | 1978 | 2 Common raven (*C. corax*) |
| J.S.632 | Trondheim | Televerkstomten | 1977 | 2 Common raven (*C. corax*) |
| J.S.702 | Oslo | Grønnengen og Nordre Felt II, Gamlebyen | 1976 | 9 Common raven (*C. corax*)<br>2 Crow (*C. corone*)<br>2 Western jackdaw (*C. monedula*) |
| J.S.765 | Trondheim | Folkebibliotekstomten | 1973 | 1 Crow (*C. corone*) |
| J.S.845 | Trondheim | Erkebispegården | 1992 | 27 Common raven (*C. corax*)<br>53 Crow (*C. corone*)<br>4 Western jackdaw (*C. monedula*) |
| | | | | 132 TNF |

Table 26: The information regarding the 132 TNF from the three Corvidae species from the eight Norwegian excavations.

| All Icelandic material | | | | |
|---|---|---|---|---|
| **I.D. number** | **Area** | **Site name** | **Year** | **Total number of fragments (TNF)** |
| SKÖ08, SKÖ09 | Hörgárdalur | Skuggi | 2008 - 2009 | 44 Common raven (*C. corax*) |

Table 27: The information for the 44 TNF on common raven from Skuggi, Iceland.

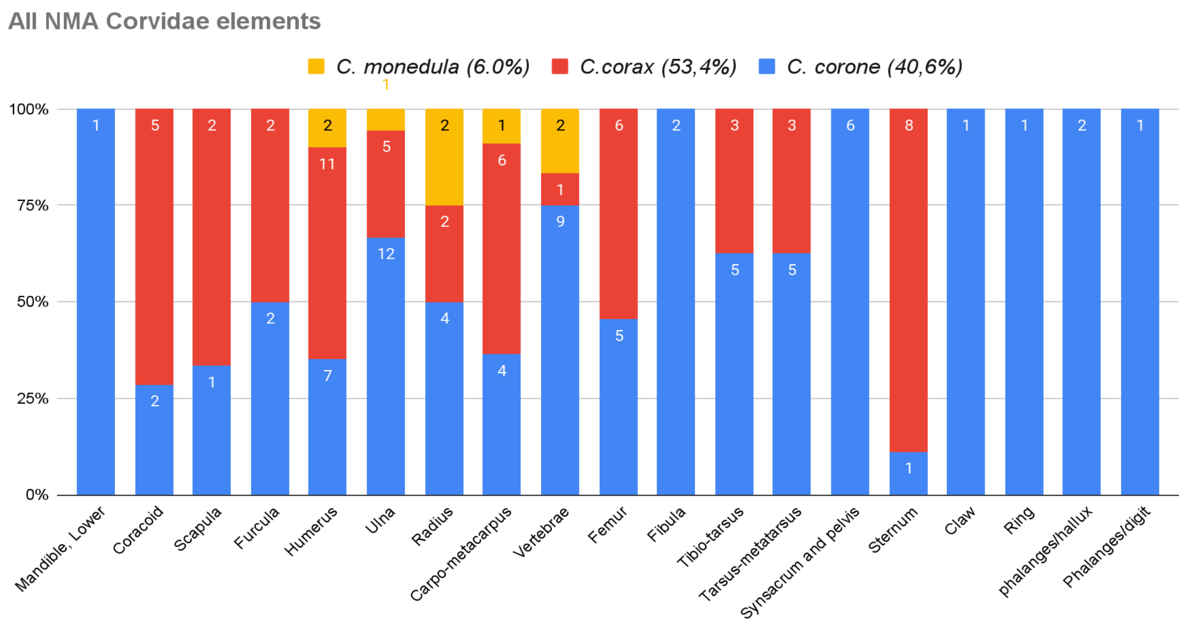


Figure 25: All NMA Corvidae elements divided into elements and percentages. For English terms, see Table 3.

## Data presentation

In this chapter, I will present the data retrieved from all the Corvidae bones I have analyzed through this study. It is important to note that there is inconsistency in the information that has been included, both by me and by the researchers who added the first bits of data to the material.

I have chosen to sort the Norwegian material first by the city (Bergen, Oslo, Tønsberg, Trondheim), and within them, it goes from lowest to highest J.S.-number.

The Icelandic material consists of one excavation and is therefore quite shorter than its Norwegian counterpart.

## Norwegian material

| Corvidae bone elements from NMA | | | | | | |
|---|---|---|---|---|---|---|
| **Elements** | **Common raven (*C.corax*)** | **Common raven %** | **Crow (*C. corone*)** | **Crow %** | **Western jackdaw (C. monedula)** | **Western jackdaw %** |
| Mandible, Lower | 0 | - | 1 | 1,40% | 0 | - |
| Coracoid | 5 | 9,25% | 2 | 2,81% | 0 | - |
| Scapula | 2 | 3,70% | 1 | 1,40% | 0 | - |
| Furcula | 2 | 3,70% | 2 | 2,81% | 0 | - |
| Humerus | 11 | 20,30% | 7 | 9,85% | 2 | 25% |
| Ulna | 5 | 9,25% | 12 | 16,90% | 1 | 12,50% |
| Radius | 2 | 3,70% | 4 | 5,63% | 2 | 25% |
| Carpo-metacarpus | 6 | 11,11% | 4 | 5,63% | 1 | 12,50% |
| Vertebrae | 1 | 1,85% | 9 | 10,40% | 2 | 25% |
| Femur | 6 | 11,11% | 5 | 7,04% | 0 | - |
| Fibula | 0 | - | 2 | 2,81% | 0 | - |
| Tibiotarsus | 3 | 5,55% | 5 | 7,04% | 0 | - |
| Tarsus-metatarsus | 3 | 5,55% | 5 | 7,04% | 0 | - |
| Synsacrum and pelvis | 0 | - | 6 | 8,45% | 0 | - |
| Sternum | 8 | 14,81% | 1 | 1,40% | 0 | - |
| Claw | 0 | - | 1 | 1,40% | 0 | - |
| Ring | 0 | - | 1 | 1,40% | 0 | - |
| phalanges/hallux | 0 | - | 2 | 2,81% | 0 | - |
| Phalanges/digit | 0 | - | 1 | 1,40% | 0 | - |
| **sum** | 54 | 100% | 71 | 98% | 8 | 100% |
| **TNF %** | 40,60% | | 53,40% | | 6% | |

Table 28: An overview of all Corvidae bone elements from NMA used in this study.

The majority of the material shows very good preservation. Most of the bones are either complete or have one epiphysis intact, with few taphonomic marks. This is very *on par* with the general bird bone assemblages from NMA (Walker et al. 2019:8).

## Bergen material

### Bryggen J.S.397

| Bryggen elements overview | | |
|---|---|---|
| Species | TNF | MNI |
| Common raven (*C. corax*) | 1 | 1 |
| Hooded crow (*C. corone cornix*) | 2 | 2 |

Table 29: Bryggen elements overview.

There are 3 elements from Corvidae from Bryggen. These are raven (1) and crow (2); however, this author has not located sufficient information as to what square or layer they were found in, and each bone has a unique identification number.

**Raven element from Bryggen**

Ulna (R) (no. 19351) from a common raven (*C. Corax*). Figure 27 shows that the outer layer has undergone considerable stress. The layer beneath is porous (almost chalk-like) to the touch. This bone is the only element in this study that has been noted as being in poor condition. However, its epiphyses are still intact enough for this to clearly be identified as a raven. As for giving causation for this ulna poor condition, this author suspects that the bone was exposed to some sort of stressor like the gnawing of a small animal or the grinding motions of hard objects (like rocks), which caused scratches in its other layer and made it more susceptible to taphonomic processes later on.

There are no deep cuts or definitive gnaw marks, so there is difficulty in stating a probable cause of events.

Figure 26: No. 19351 (J.S.397) C.corax. Ulna (R), shows a considerable amount of stress around its outer layer.

**Crow elements from Bryggen**

A pair of crow ulna; one right (no. 18258) and one left (no. 20004). They have been identified as *Corvus corone cornix*. At the moment of writing the author has yet to determine if the pair of ulnas were close enough for them to be from the same individual possibly. The measurements of the ulnas have different lengths of 6.9 mm. Further, they are numbered with a numeral difference of 1746 items, and the Bryggen excavation expanded c 4000 sq.m. However, with this limited information and their measurements (see **Appendix 1**), I have considered these ulnas to be from different birds.

Figure 27: Top: Hooded crow ulna (R) (n.18258). Bottom: Hooded crow ulna (L) (n.20004). These are likely from different individual birds, based on the almost 7-millimeter difference in their greatest length.

The potential MNI from Bryggen is two crows and one common raven.

## Rosenkrantzgate J.S.613

| Rosenkrantz gate 4 elements overview | | |
|---|---|---|
| Species | TNF | MNI |
| Common raven (*C. corax*) | 2 | 1 |

Table 30: Rosenkrantz gate 4 elements overview.

**Raven elements from Rosenkrantz gate 4**

The pair of raven humeri (one left and one right) from this location is most likely from the same individual. They are cataloged under the same number (76/11679) and they are from the same square and layer. Also, they are visibly (Figure 29) of equal size along their shaft (center). Both are missing parts of their epiphysis, however ulna (R), is slightly larger due to being better intact. Both were found in fire layer A and can be dated to sometime after the fire of 1476 AD.

The MNI from this excavation consists of one common raven.


Figure 28: Right and left humerus from a common raven (*C. corax*).

## Oslo material

## Mindets Tomt J.S.537

| Mindets Tomt element overview and MNI | | |
|---|---|---|
| Species | TNF | MNI |
| Common raven (*C. corax*) | 10 | 5 |
| Hooded crow (*C. corone cornix*) | 13 | 5 |
| Western jackdaw (*C. monedula*) | 2 | 1 |

Table 31: Mindets Tomt element overview and MNI.

None of the elements from Mindets Tomt (MT) has been given further identification numbers, however, each element is listed with multiple data points, like their square and layer (see **Appendix 1**). Estimate dating of the bones has been added by the author based on the fire layers listed in Table 11. There is little information regarding where the elements were found within their 8x8 meter square. As for MNI, I have chosen to view material from neighboring squares to be from different individuals.

| Dates (AD) for the Corvidae remains for Mindets Tomt | | | | | |
|---|---|---|---|---|---|
| | > 1223 | 1223 - 1254 | 1223 < | 1254 - 1287 | 1352-1523 |
| Common raven (*C. corax*) | 5 | | 3 | 1 | 1 |
| Hooded crow (*C. c. cornix*) | 11 | 1 | 1 | | |
| Western jackdaw (*C. coloeus*) | 2 | | | | |
| sum | 18 | 1 | 4 | 1 | 1 |

Table 32: Dates for the Covidae remains for Mindets Tomt.

### Raven elements from Mindets Tomt

The 10 raven elements were retrieved from five squares and they will be addressed in correlation with their square. The MNI of ravens is five.

**Square P20**

One femur (L) was found in layer *Fire 3 and under, possibly over fire 5,* placing this bone at some time between AD 1352-1523 (Table 11) (making this the most recent element from Mindets Tomt. The femur is documented as *whole* but there are signs of stress in the distal epiphysis (figure 31) This might be signs of it being lightly charred, possibly due to cooking. It would make sense to remove the meatless bones from the animal before skinning and preparing it, and by chopping off the legs at the tibiotarsus, those meatless parts are removed and it is easier to remove the bird skin, further, if the meat is cooked over fire it would expose the lower part of the femur to open flame. Causing the stress at the distal end.


Figure 29: Common raven (C. corax) femur (L) from fire layer 3 and under, possibly over fire 5.

**Square P22**

One raven carpometacarpus (L), from layer *fire 7 and under, over fire 8,* dating it to some time between AD 1254 - 1287. The element is fragmented (Figure 32), and shows signs of undergoing some taphonomic changes.


Figure 30: Common raven (C. corax) carpometatarsus (L). P22 Fire 7 and under, above fire 8.

**Square O21**

One raven coracoid (L) from *under fire 9*, placing it before AD 1223.

**Square O22**

Four elements from one raven; humerus (L), scapula (R), femur (L), and tarsometatarsus (R) (see figure 30). Located *under fire 9, down to sterile sand.* dating it to sometime before the fire of AD 1223.

Figure 31: Common raven (C. corax) from Firelayer 9 and under. Tarsumetatarsus (R), femur (L), scapula (R), and humerus (L).

**Square O23**

Three fragmented pieces from one sternum, from layer *under fire 9, top part*, dating it to after the fire of AD 1223. Largest piece is photographed (Figure 36), this author could not find any obvious signs of butchering.


Figure 32: Common raven sternum (frag), Under fire 9, down to sterile sand.

## Hooded crow elements form Mindets tomt

This material has previously been identified and specified to be the corvid subspecies hooded crow (*C. corone cornix*), and they will be referred to as such. There are 13 elements of hooded crows from Mindets Tomt.

### Square P21

Two fragmented pieces of one ulna (R), The pieces do not fit at the breaking point, but neither do they overlap, meaning that they are probably two pieces of the same element. Both are found in the same layer (*under fire 9*), dating them to before AD 1223.

**Square P22**

This square contains hooded crow elements from different layers. The first is a fragmented ulna (L) from layer *fire 7 and under, over fire 8,* dating it to some time between AD 1254 and 1287. The other element is also a ulna (L), from *fire 8 and under, over fire 9,* dated between AD 1223 and 1254. This one is however whole, and since both are from the left side they have to be from different individuals.

**Square O22**

One fragmented ulna (R), missing both epiphyses. From *Fire 9 and under,* placing it before AD 1223.

**Square O23**

This square contains hooded crow elements from different layers. The first layer (*under fire 9, down to sterile sand*, dated to before AD 1223) contained four elements (figure 33); one pair of humeri (L and R), a coracoid (L), scapula (R), and a fragment of a sternum.
The second layer (*under fire 9, top part,* also dated before AD 1223) contained originally three elements (now four due to a disarticulation of a loose piece during photographing). These are carpometacarpus (L), femur (R), and synsancrum (two frags). This Author finds it highly likely that these are all from the same hooded crow. The layers are within the same timespan and none of the elements overlap.

Figure 33: Hooded crow. humeri (L and R), a coracoid (L), scapula (R), and a fragment of a sternum. Under fire 9, down to sterile sand (J.S.537).

Figure 34: Hooded crow. Carpometatarsus (L), femur (R), and synsancrum (frag). O23 Under fire 9, upper part.

## Western jackdaw elements from Mindets Tomt

### Square O22

Two elements (figure 35), one radius (L) and one humerus (R), due to the elements being from different sides suggest that maybe two wings were disposed of here. These are from the same layer *Fire 9 and under,* dating these to prior to AD 1223.

Figure 35: Western jackdaw (*C. monedula*) humerus (R), and radius (L) from square O22, fire layer 9 and under.

## Gamlebyen, Grønnengen og Nordre Felt II J.S.702

| Grønnengen og Nordre Felt II element overview and MNI | | |
|---|---|---|
| Species | TNF | MNI |
| Common raven (*C. corax*) | 9 | 2 |
| Crow (*C. corone*) | 2 | 2 |
| Western jackdaw (*C. monedula*) | 2 | 1 |

Table 33: Grønnengen og Nordre Felt II element overview and MNI.

## Ravens from Grønnengen and Nordre Felt II

### Square P15 Grønnengen

There are five elements from Grønnengen square P15 all found in the same layer (5057); a pair of humeri (R and L), and two fragments of a sternum whose pieces fit together at the breaking point. One coracoid (L). None of these elements overlap.

**Square Q16 Grønnengen**

Three raven elements (figure 37)  were found in layer 5750; one Sternum (frag), vertebra, and ulna (L). It is reasonable to suggest that these are from the same individual.


Figure 36: Grønnengen, Common raven, Sternum (frag), vertebra, and ulna (L), (Q16/5750). (J.S.702).

**Square Q16 Nordre Felt II**

One tarsometatarsus (L) from layer 5753, this element is from the same square as the three elements from *Square Q16 Grønnengen*. Quite close in layers, so I assume that this element is from the same raven.

## Crow elements from Grønnengen and Nordre Felt II

**Square Q16 Grønnengen**

One raven humerus (L) from layer 5122.

**Square Q15 Nordre Felt II**

One raven humerus (R) from layer 5074.

### Western jackdaw elements from Grønnengen and Nordre Felt II

**Square Q16 Nordre Felt II**

Two vertebrate elements from western jackdaw, from layer 5026.

## Tønsberg material

### Hvistedahl Tomt (Storgt. 35) J.S.563

| Hvistendahl Tomt element overview and MNI | | |
|---|---|---|
| Species | TNF | MNI |
| Common raven (*C. corax*) | 1 | 1 |

Table 34: Hvistendahl Tomt element overview and MNI.


Figure 37: A carpometacarpus (R) from a common raven (J.S.563).

The material from Hvistendahl Tomt consists of two pieces of a carpometacarpus from the right wind of a common raven (C. Corax). The two pieces fit at the breaking point, meaning they are from the same element from the same bird. This means that the MNI from this material consists of one common raven.

## Trondheim material

### Televerkstomten J.S.632

| Televerkstomten element overview and MNI | | |
|---|---|---|
| Species | TNF | MNI |
| Common raven (*C. corax*) | 2 | 2 |

Table 35: Televerkstomten element overview and MNI.

There are two raven elements from Televerkstomten. The first one (Figure 38) is a tibiotarsus (L) (n.48119) from layer VC 201, and the second element (figure 39) is a left coracoid (n.43357) from layer VD 174. Although these two elements *could* be from the same raven, I was not able to find sources that explain the distance between these two elements, and I have therefore set the possible MNI to two ravens.

Figure 38: Common raven (n.48119) left tibiotarsus (48119) from layer VC 201. (J.S.632)

Figure 39: No.43357 Common raven coracoid (L) (J.S.632).

### Folkebibliotekstomten J.S.765

| **Folkebibliotekstomten element overview and MNI** | | |
|---|---|---|
| Species | TNF | MNI |
| Hooded crow (*C. corone cornix*) | 1 | 1 |

Table 36: Folkebibliotekstomten element overview and MNI.

The material from FBT consists of one ulna (R) of a crow, meaning that the MNI for a crow from this location is one. This specimen (figure 41) is in excellent condition and showed no signs of taphonomic effects.


Figure 40: No. 96715 crow ulna (R) from FBT (J.S.765).

### Erkebispegården J.S.845

| **Erkebispegården element overview and MNI** | | |
|---|---|---|
| Species | TNF | MNI |
| Common raven (*C. corax*) | 27 | 8 |
| Crow (*C. corone*) | 53 | 14 |
| Western jackdaw (*C. monedula*) | 4 | 2 |

Table 37: Erkebispegården element overview and MNI.

The Corvidae elements from EBG consist of 84 elements, making it 50% of the Norwegian material. These elements are divided first by species, then the sections (A, B, I, or G), in order by their number, and finally by their elements and location. The excavation of EBG is referred to as the "weakest material" from EBG (Nordeide 2003:302). However, there is much information added to each element, and this will be included here through this set-up: *ID number* (*layer/Y/X/Quadrate*). This information will also be used to determine the MNI for each of the species, where their placement in the layer and grid will be taken into account.

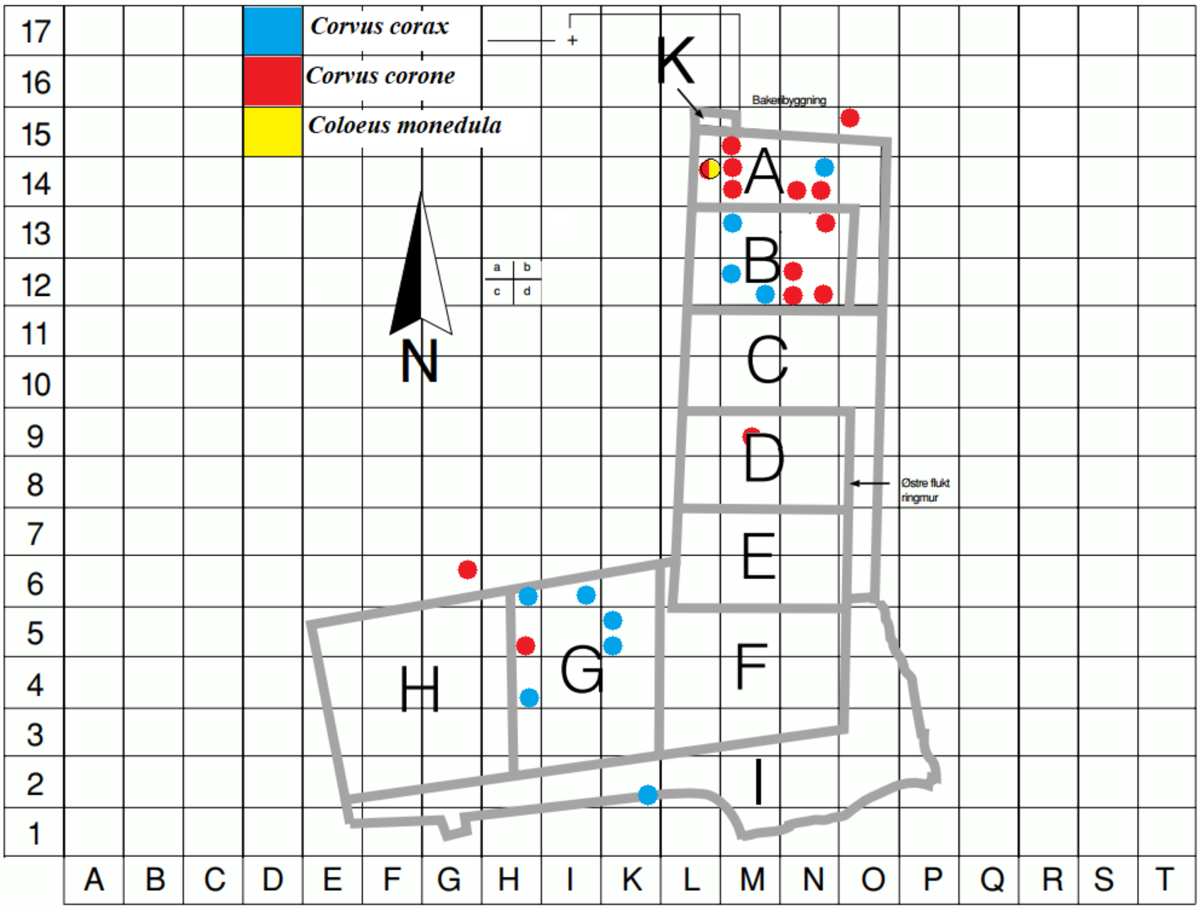


Figure 41: The location for Corvidae material used in this study from EBG (Source: Nordeide 2003:14. Edited by author).

## Ravens from Erkebispegården

There are 53 elements of ravens from Erkebispegården and they are presented based on their section (A, B, I, G).

## Ravens from section A

One element was located in section A.

**119988 (347/N/14/B):**

Coracoid (L).

## Ravens from section B

Three elements were located in section B. None of the elements overlap, but they are in different layers.

**118232 (319/M/13/A):**

Carpometacarpus (R).

**119794 (364/M/12/A):**

Humerus (L).

**121519 (494/M/12/D):**

Tibiotarsus (R).

## Ravens from section I

**162904 (87/K/2/D)**

These seven elements consist of coracoid (R), humerus (R), ulna (R), radius (R), femur (R), femur (L), tarsometatarsus (L). There is some variety in the bones (figure 42). Some of these (like the ulna, radius, and tarsometatarsus) contain little meat. The rest (femur, humerus, and coracoid) are closer to the body's center and therefore have more of the larger mussels connected to them.


Figure 42: No.162904 common raven coracoid (R), humerus (R), ulna (R), radius (R), femur (R), femur (L), and tarsometatarsus (L) from Erkebispegården (J.S.845).

## Ravens from section G

N.166875, n.166520, and n.166412 are possibly from the same individual; they were found in the same layer (925), and none of the elements overlap.

**166412 (925/K/5/A)**

Two elements, one scapula (R), and one femur (L). One side of the femur is showing signs of a clean chop.

Figure 43. Common Raven No.166412 femur (L) and scapula (R).

**166875 (925/H/6/D)**

Humerus (R), This element has been documented as complete (W), but there is a small piece missing from the proximal epiphysis. Whether this is due to taphonomy or the action of an individual is difficult to determine. There are no further markings on the humerus.


Figure 44: No. 166875 Common raven humerus (R) (J.S.845).

**166520 (925/K/5/C)**
Humerus (L), ulna (L), radius (R), carpometacarpus (L), and sternum (frag). Possibly from the same individual as n.166875 and n.166412, the same layer (925) and none of the elements overlap.

**167214 (978/I/6/D)**
Carpometacarpus (R).

**167796 (1002/H/4/D)**
Humerus (L), two pieces from one furcula, sternum (frag), femur (R), tibiotarsus (R).


Figure 45: No.167796 Common raven Humerus (L), two pieces from one furcula, sternum (frag), femur (R), tibiotarsus (R) (J.S.845).

## Crows from Erkebispegården

There are 71 crow elements grouped under 17 ID numbers. Based on their placement information (fig. 41), I find it likely that some of these groups consist of elements from the same individuals. My estimation of which ones that is is listed under each section (A, B, and G).

## Crows from section A

There are 45 crow elements divided into ten ID numbers from section A. Based on their placement, 120141 and 120176 are likely from the same crow. None of these elements overlap and they are from the same square and layer, but different quadrants in that square.

The same can be said for n.118870 and n.118865, neighboring squares but same layer, and no overlap, making the MNI of crows from section A eight.

**116365 (121/M/14/C)**
Humerus (R), ulna (R), radius (R), carpometacarpus (R).

**117029 (275/L/14/B)**
Tibiotarsus (R).

**117078 (263/M/14/A)**
Humerus (R).

**118865 (274/M/15/C)**
Synsacrum (frag), and pelvis (frag).

**118870 (274/M/14/A)**
Furcula (fragmented, right-side).

**119111 (135/O/15/A)**
Ulna (R), radius (R).

**120176 (504/N/14/C)**
Femur (R), radius (R).

Figure 46: No. 120176 Crow Femur (R), radius (R), (J.S.845).

**N.120141 (504/N/14/D)**

Tibiotarsus (R), tarsometatarsus (L), synsancrum (frag).

**N.121363 (503/M/15/C)**

Coracoid (R), pelvis (frag), synsancrum (frag), claw, trachea ring, femur (L), two pieces of one femur (R), tibiotarsus (L), two pieces of one tibitotarsus (R), furcula (frag left side), nine vertebrates (seven cervical, and two caudal), one phalange (digit from the wing), two phalanges (digit or hallux from the foot), fibula (R), fibula (L), tarsometatarsus (R), and tarsometatarsus (L). 121363 (fig 47) has 28 elements. The main parts missing are its wing bones and head parts. We can assume it was discarded with at least one wing, given that there is one digit present. If one is to argue that all crows caught were eaten then this specimen might be an outlier, it looks as if this bird was disposed of whole, we expect elements like phalanges and meatless long bones to be removed when animals are birds are prepared for consumption, this seems to not be the case here.


Figure 47: No.121363, the most complete skeleton in this study. Notably well enough preserved to include a complete neck ring, though missing the cranium, beak, and lower mandible (J.S.845).

**N.137485 (385/M/9/-)**

Humerus (L) with a puncher on the middle of the shaft. There is also a fair amount missing from the edges of both epiphyses.


Figure 48: No.137485 crow humerus (L) (J.S.845).

## Crows from section B

Six crow elements grouped under five ID numbers. 118204 and 118209 are probably from the same individual, as there is no overlap and they are only one layer apart (311/312). This makesaking the MNI 4 crows.

**N.118204 (311/N/12/A)**

Humerus (R), Carpometacarpu (R).

The humerus has a puncher and a superficial scratch on the proximal epiphysis (figure 55), and it is missing a piece on the side. The scratch looks to be modern (light in color) and might have happened during the excavation. The puncher is more difficult to determine.


Figure 49: No.118204 crow humerus (R), carpometacarpu (R) (J.S.845).

**N.118209 (312/N/12/C)**
Carpometacarpus (L).

**N.119400 (257/N/13/B)**
Mandible from a lower beek. Notably, there are no craniums or upper beaks documented from any of the Norwegian locations.

**N.119938 (478/-/-/-)**
Ulna (L), this element is missing a big part of its documentation, it was not available to the author during this study.

**121746 (556/N/12/D)**
Radius (L).

## Crows from section G

There are two elements under two ID numbers. Considering that there are two walls in between the elements (Fig. 41), I will consider them to be spatially too removed to be from the same crow. However, they are close (layer-wise). This makes the likely MNI two crows.

**166405 (925/G/6/B)**
Tarsometatarsus (R).

**167354 (970/H/5/D)**
Ulna (L).

### Western jackdaws from erkebispegården

There are four Western jackdaw elements from this location, they were all found in section A. The MNI is set to two, considering that there is some missing context for one of the elements (n.119769).

### Western jackdaw from section A

**119769 (302/-/-/-)**
Carpometacarpus (R). A part of the documentation was not available during this study.

**120090 (450/L/14/B)**
Humerus (L), ulna (R), radius (R)  Indicating that a set of jackdaw wings were discarded.

## Icelandic material

| **All Icelandic material** | | |
|---|---|---|
| **Common raven (*C. corax*)** | **Element** | **%** |
| Mandible, upper/lower | 5 | 11,30% |
| Coracoid | 3 | 6,80% |
| Ulna | 1 | 2,27% |
| Radius | 2 | 4,54% |
| Carpo-metacarpus | 1 | 2,27% |
| Femur | 8 | 18,18% |
| Tibio-tarsus | 3 | 6,80% |

| | | |
|---|---|---|
| Claw | 5 | 11,30% |
| phalanges/hallux | 16 | 36,36% |
| **sum** | 44 | 100% |

Table 38: All Icelandic elements (Skuggi).

## Skuggi

| **Skuggi element overview and MNI** | | |
|---|---|---|
| Species | TNF | MNI |
| Common raven (*C. corax*) | 44 | 4 |

Table 39: Skuggi element overview and MNI.

The phalanges and claws are not assigned to a specific joint or a right or left side. This was partly due to the author's inexperience, but this should not affect the interpretation of possible MNI, considering that phalanges and claws are not elements that are considered when determining possible MNI.

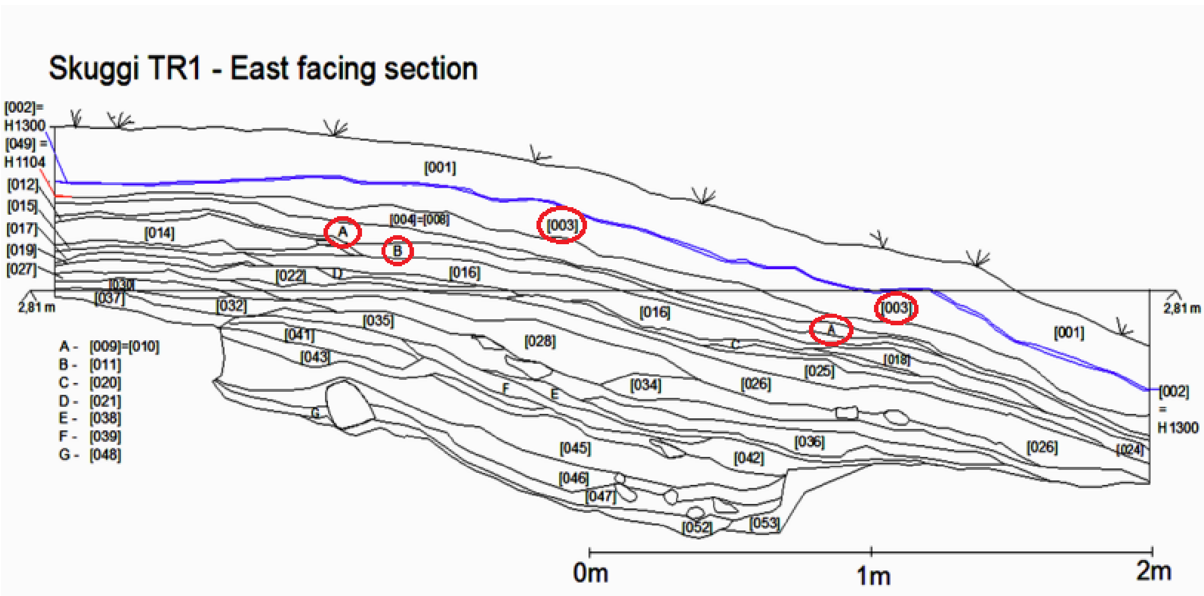


Figure 50: Skuggi trench 1. Red and blue lines are tephra layers (H1300 and H1104). Layers containing common raven are marked with red rings (Source: Harrison 2010:9, edited by the author).

## Ravens at Skuggi

The 44 raven elements were from three different layers and the elements have been dated based on earlier research (Harrison 2010:11 and fig. 25). The MNI is considered to be 4 ravens.

## Layer 3

This layer is the latest cultural layer from TR1, and is dated to the mid-late 12th century (the terminal occupation period). It contained three raven elements.
One mandible (fragmented beek, dorsal end), and the proximal end of a radius (fig 51), as well as one phalange (foot bone) (fig 52).

Figure 51: SKÖ08 common raven mandible, and radius (proximal).

Figure 52: SKÖ08 common raven phalange.

## Layer 10 - 9/10

This layer is dated to the mid 11th - mid 12th century (the early medieval period). It contained four raven elements, with a possible MNI of 1. The four elements are one claw noted as a talon, the distal part of a tibiotarsus (R), one distal part of a coracoid (R) that appears to have been snapped, and the distal part of a femur (R).


Figure 53: Common raven claw (SKÖ09).

Figure 54: Common raven tibiotarsus (SKÖ09).

Figure 55: Common raven coracoid (SKÖ09).


Figure 56: Common raven femur (SKÖ09).

### Layer 11

This layer is dated to the mid 11th - mid 12th century (the early medieval period), it contained seven raven elements. The elements here (fig. 57) are severely fragmented epiphysis, they consist of one distal femur (R), two connecting fragments from one proximal femur (L), the distal part of two tibiotarsus (R and L), another set of the proximal part of a pair of femurs (R and L), these two fragments are shown next to a modern raven femur.

Further in fig. 58 and fig. 59 we see 27 elements consisting of four mandible pieces (fragmented, two are from lower and overlap, meaning they are from different individuals), one ulna (R), one radius (R), two femurs (R and L), tarsometatarsus (L), fifteen phalanges, four claws, and one coracoid divided into two pieces.

The possible MNI for layer 11 is two ravens, based on the two pairs of femurs and lower mandible.

Figure 57: Seven fragmented elements of common raven, found at Skuggi (SKÖ09).


Figure 58: Common raven, 26 corvid elements (SKÖ09).

Figure 59: Common raven coracoid (L), photographed next to a coracoid from the modern material. (SKÖ09).

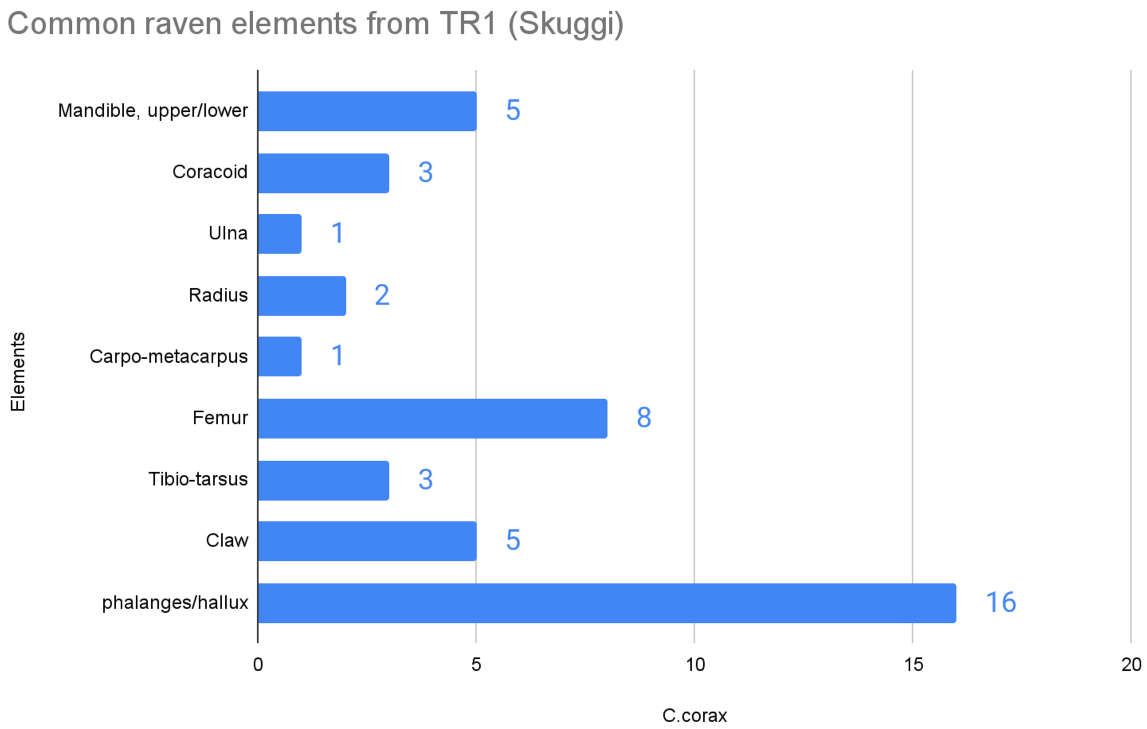


Figure 60: All Corvid material from Skuggi, sorted by element.

## Data Summarized

Here I will go through some of the points of data.

### Chronology of the material

The disposal of common ravens and crows are present in the NMA faunal remains throughout the NMA, with the earliest remains being dated before 1025 AD* (Lie 1989:Tabell 1B).

*note this is five years prior to the NMA.

Mindets Tomt is the only Norwegian site where all elements have been listed chronologically (by the author. Tab.23). It shows that Common ravens, hooded crows, and western jackdaws had been disposed of throughout the NMA (from before 1223 up to 1523 AD).

The IMA material has dates for all elements, placing them in the final phases of the Skuggi activities (from mid 11th - mid-late 12th century).

Not all the material in this study has been dated, and from some sites only pieces of chronology were available. This is the case with the material from Erkebispegården, which shows that at least 32 elements could be dated to the 6-7 period (tab. 20, 21), placing them at the end of the NMA.

### Elements with potential anthropogenic marks

Through the data analysis I have found some elements with markings that might be from human activities, but none of these marks have been what we can call *textbook,* and no hypotheses were presented regarding snapped bone, due to my inexperience with the subject. One element that I think stands out is the common raven Femur (L)(Fig. 29) where the distal part potentially is black charred with no distortion (O'Connor 2016:45), suggesting that it has been through some sort of heating that can be interpreted as food preparation.

Another example is the material from Erkebispegården (j.s. 845), no.118204. On the humerus, there is a mark on the proximal epiphysis. It is up to the researcher to determine whether or not this is a mark left from human interaction with this animal.

This is where the challenge lies, how can one be certain that the modifications that are being analyzed are anthropogenic and not caused by natural taphonomic processes? Whether one considers a mark to be man-made or not must be evaluated based on other factors such as the placement of the marks and plausible reasoning behind the action that caused the mark. A probable interpretation of cut marks can be part of the overall understanding of the research but it can also cause misinformation.

## Bone Fragmentation - END

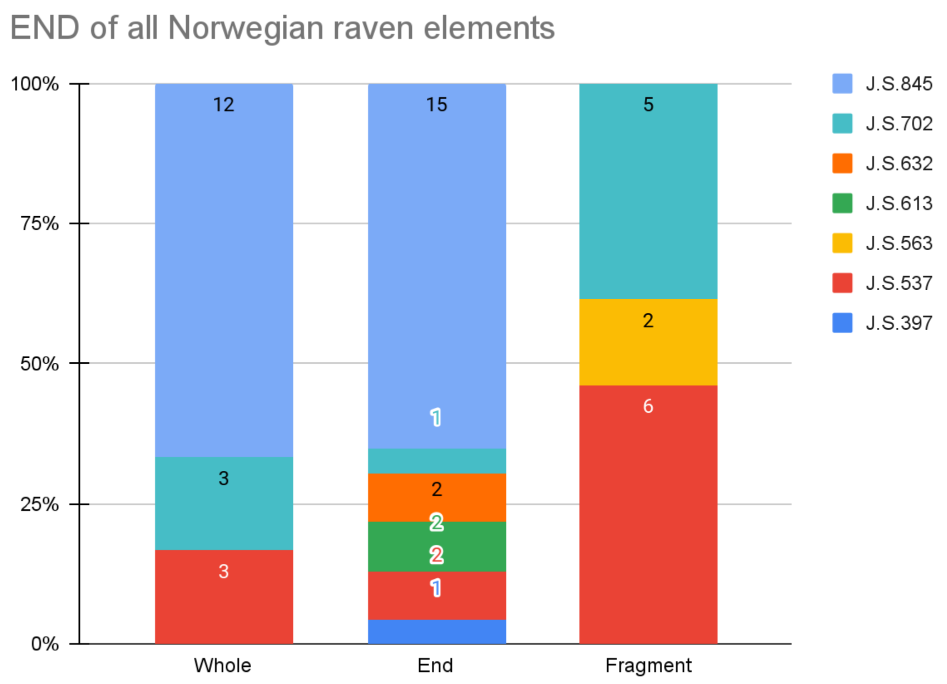


Figure 61: Chart of all the Norwegian raven ENDs.

For the 53 NMA raven elements (Fig. 61) we see that the majority (23) of the bones have gone through some fragmentation (END proximal, shaft, distal), the second largest group is the whole elements (18), and the remaining (13) were considered to be not eligible to be given a clearer description (frag).

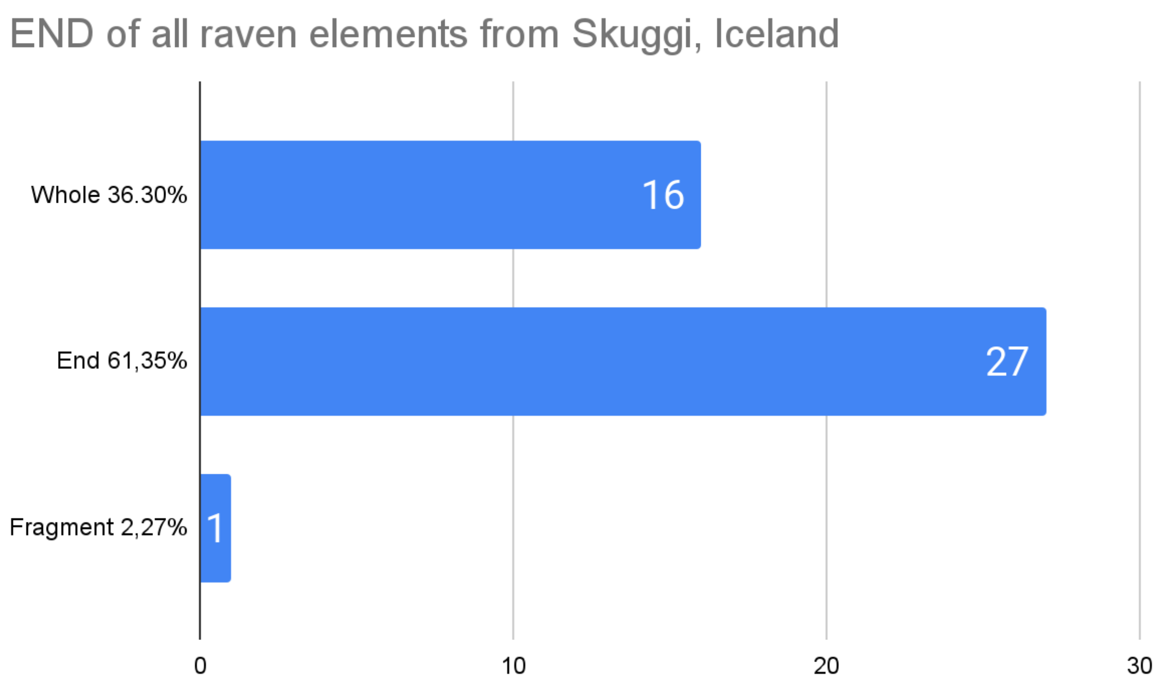


Figure 62: Chart of all the Icelandic raven ENDs.

The 44 IMA raven elements also showed a majority (27) of fragmented elements (ENDs) and secondly were the whole (16) elements, and lastly, one (1) fragment was not assigned a description.

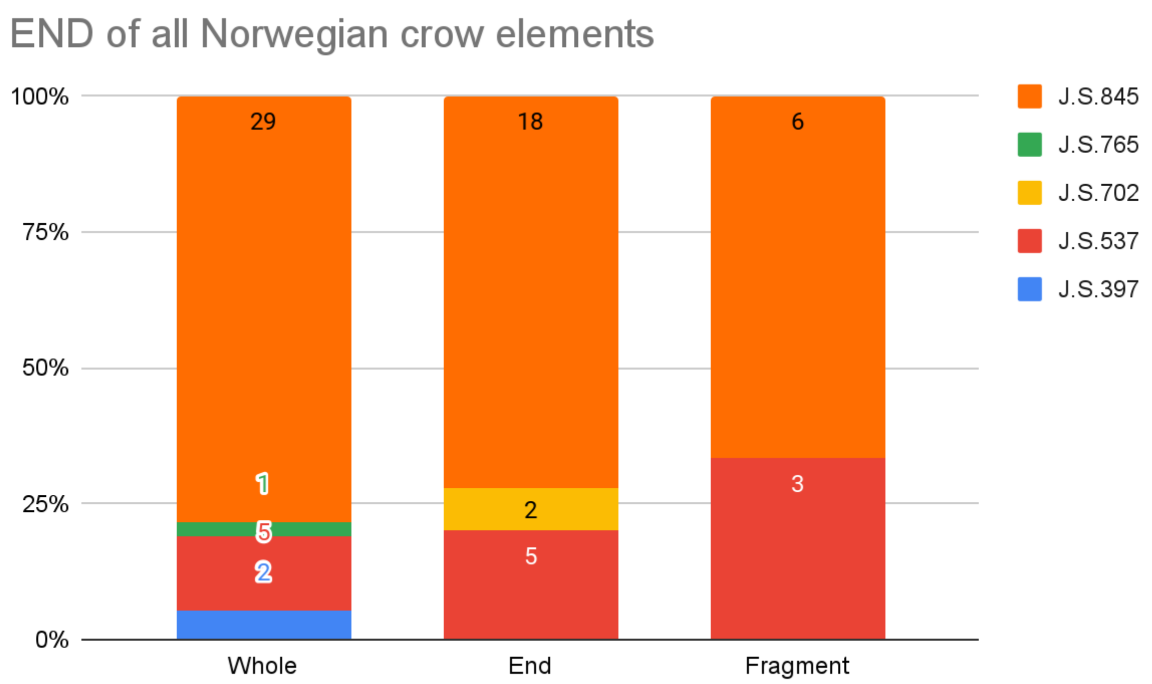


Figure 63: Chart of all the Norwegian crow ENDs.

Unlike the findings from NMA and IMA ravens. The 71 NMA crow elements showed that the majority (37) of the elements were whole, the fragmented ones (25) were second, and nine (9) fragments were not assigned a description.

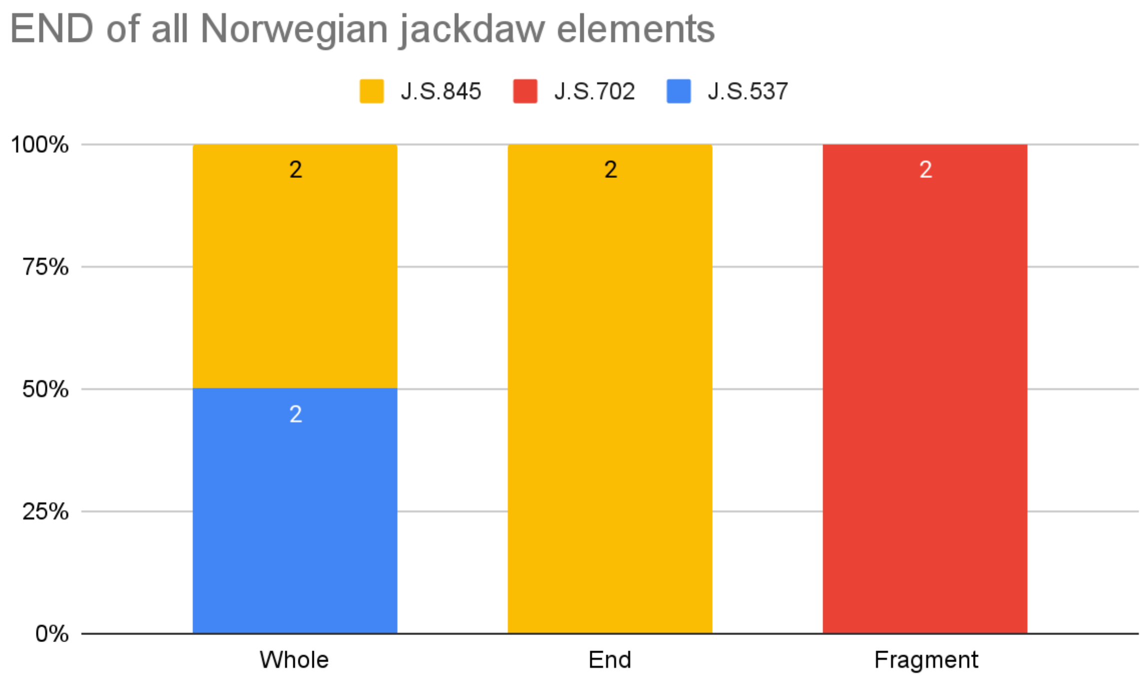


Figure 64: Chart of all the western jackdaw ENDs.

The NMA western jackdaw elements consisted of 8 elements, sorted into four (4) whole, two (2) ENDs and 2 not assigned by END (frag).

An important factor about the fragmented remains is the affected part and degree of fragmentation. This material was identified by others before this study, and that identification depended on the elements showing *Identifiable traits*. This means that in some sense none of this material can be "too fragmented".

## Possible MNI from all material from all sites

| MNI of Corvidae | | | |
|---|---|---|---|
| | Common raven (*C. corax*) | Crow (*C. corone)* | Western jackdaw (*C. coloeus*) |
| Bryggen | 1 | 2 | - |
| Rosenkrantz gate 4 | 1 | - | - |
| Mindets Tomt | 5 | 5 | 1 |
| Grønnengen and Nordre Felt II | 2 | 2 | 1 |
| Hvistedahl Tomt | 1 | - | - |
| Televerkstomten | 2 | - | - |
| Folkebibliotekstomten | - | 1 | - |
| Erkebispegården | 8 | 14 | 2 |
| Norwegian sum | 20 | 24 | 4 |
| | | | |
| Skuggi, Iceland | 4 | - | - |
| total sum | 24 | 24 | 4 |

Table 40: Possible total Corvidae MNI of ravens, crows, and jackdaws in this study.

The element representation of Corvidae from Norway (Table 27) shows that more elements than the ravens and jackdaw combined represent the hooded crows. However, it is worth noting that most of the material consists of between one to five elements per identification number that was excavated, except for one of the individual crows in Erkebispegården that contained 27 elements (Fig. 47). If for the sake of argument subtract these 27 elements we would be left with 44 crow elements, which would place the TNF of crow behind raven by 10 elements. This means that even though the crows appear to be greater represented (TNF-wise), this may only be the case when considering the existing elements and not the number of individual corvids that were brought to EBG. When we add the possible MNI from all sites (tab. 40), we see that the number comes closer together, with 20 ravens (NMA), and

24 crows (NMA). Together with the Icelandic material the MNI of Corvidae in this study is listed as 24 common ravens, 24 crows, and 4 Western jackdaws. Not surprisingly, the two sites that had the highest number of fragments (Erkebispegården and Mindets Tomt) also had the highest minimal number of individuals.

**Element representation**

There is a diversity in the elements used in this study (Tab. 28), ranging from 1 - 12 specific elements, the ones that er in the majority are the NMA raven humerus (20,3%), Carpometacarpus (11.1%) and femur (11.1%), there is also a high amount of sternums (14,8%), but that is biased considering how fragmented most of them are.
For the NMA crow, we see a high amount of ulna (16,9%), humerus (9,8%) and vertebrate (10,4%). The majority of the vertebrates are from the spine of one crow, so again, biased.
A more surprising aspect is that there is no representation of corvid craniums or upper mandible/beaks in the Norwegian material. There is, however, one fragmented piece of a lower mandible from Erkebispegården J.S.845 square B (number 119400), which suggests that the cranium was also discarded but might have been broken down due to taphonomy. However, parts of the beaks are quite compact, and it is reasonable to assume that if they were discarded, they could be present in element-rich assemblages. When it comes to the Icelandic material, we see two sets of mandibles.

**Measurements - Why they were not prioritized**

The importance of taking all measurement possible (based on Cohen and Serjanton's guide 1996:106-108), was not done consistently by this author when handling the materials at the laboratory,  this is something that should have been prioritized as the statistics derived from that could have aided in an interesting analysis of the material, as a whole and based on site. The work done by Stewart (2007), and Walker (2021), have shown great results for how measurements can add to the existing knowledge of avian fauna, and not partaking in that was a missed opportunity in this study. The measurements that have been taken have proven useful, for instance when checking whether or not the two elements are from the same individual.

# 6 Discussion

In this chapter, I will be discussing the results of the data I gathered in comparison to earlier research.
In order to discuss how a study of Corvidae material from multiple settlements in Medieval Norway and Iceland can add further knowledge on the subject, we first need to discuss the current knowledge on the subject. There is a divide in some of the previous interpretations from the archeologists who have handled these remains beforehand, and there is variation also based on the Corvidae species.

Both Nordeide (2003) and Hufthammer (1999) interpret the corvid remains at EBG as remains from animal consumption. This seems to have been more because of the surprising amount of material (Nordeide 2003:308) rather than any proof on the bones or from historical sources. This plausibility is supported by Hufthammer (1999) supports this plausibility, who says that if the bones came from birds killed because they were causing damage there (pest), they would hardly end up in the deposits at Erkebispegården. Therefore, it is possible that crows played some role in the diet (Hufthammer 1999:38). I agree and disagree with this because both sides can be correct. I find it very possible that corvids were part of the urban environment and probably caused some frustration for the locals, and if a worker had the chance to catch and kill a corvid. They would probably seize that opportunity; after that, it might be consumed and discarded. Neither chose not to include western jackdaws in their tables (originals Hufthammer 1999:12,19 and Nordeide 2003, 302-305. shortened version see tab.19, 20, and 21), for animals that were considered to have been food sources at Erkebispegården. This makes sense, considering it is much smaller than the common raven and crow, and they are poorly represented at Erkebispegården.

The most interesting interpretation comes from Schia (1988), who considered the elements of hooded crows at Mindets Tomt to indicate that crow meat was an important food source in the establishing phase of the urban settlements in Oslo, further, he stated that crows meat was a pleasant meal (Schia & Griffin 1988:183), the interesting part is the differing opinion he has on ravens from the same layers, he describes raven meat as not being *Highly regarded,* due to

this he speculated that if they were not used for food then they were probably hunted for sport (Schia & Griffin 1988:183). Also, Tjeldvoll (1990), presented the raven from Hvistedahl Tomt in an interesting way. The raven seemed not to be grouped together with the game meat, but rather with rats. Indicating that she assumed that their role was more like a pest, rather than a food source.
Avian remains, and game meat is generally relatively underrepresented in the faunal material from NMA urban environments.

Most of my material is from Erkebispegården, and Nordeide (2003) had an interesting note in her doctoral dissertation regarding the dining culture at Erkebispegården, meal time was the part of the day where everyone was together, and the seating showed this. Important people had better seating and better food, the workers were given food that could symbolize their statues (so probably plain and low quality). So while the higher strata dined on imported foods and meats, the lower-strata worker might have only been fed porridge. Finding ways to supplement such a restricted diet would take little time for those of the lower strata. Corvids might be among the few meaty animals under no taxation or ownership. A worker might not have the weapons or the means to hunt or fish, but occasionally, they might be able to catch a crow or a raven. which could lean towards Richardsons' (1951) interpretation of 'raven-stew'. In the case of the Skuggi material, it has some of the few elements in this study that possibly could have butcher marks on some of its bones (femurs, mostly). Serjeantson & Morris (2011) pointed out that there previously had been a preference among archaeologists who often prefers functional explanations of animal remains rather than cultural ones. There could have been more room in this study for the ritualistic and symbolic meaning behind the deposit, but I do not think it is probable for this period (being the Middle Ages).

## How can modern ecology and zooarchaeological analysis be used to understand previous cultures' relationship with the Corvidae species?

This part of the discussion will introduce the theoretical framework of Behavioral Ecology and Actor-Network theory, to see if there are some roles that the Corvidae held in NMA, what their network is, and how that matches with the behaviors of Corvidae species.

Modern societies negatively view corvids' natural behavior (Rees et al. 2013, Hogstad et al. 1992, and Houston 1977). Although the studies presented here have been from within the last 50 years, there is no reason to believe this is a modern view. The modern interest groups that view corvids as pests often have professions that are affected by corvids. In the case of modern farmers of sheep (Houston 1977), or grain (Blanco et al. 2022, Hufthammer 1999:12). Fowl hunters know corvids as predatory to other bird eggs and young (Rees et al. 2013). One can presume that both NMA farmers and hunters would have seen how corvids would interfere with their tasks. Farmers might have seen how corvids would injure their ewes and peck at weak lamb, and hunters would probably have witnessed how nest-predation of game fowl would ruin their future hunting (or even their opportunity to harvest the eggs). It would make sense for hunters and farmers to seize the opportunity to take out corvid. This might further correlate to the urban environments in which the NMA Corvidae elements were found, in the Anglo-Scandinavian York, there seemed to be a correlation between the organic refuse with the frequency and abundance of Corvid taxa  (O'Connor 2004:436-437). I find it very likely that Corvidae species were part of the fauna in and around urban settlements in NMA. Another factor could be that they were not commonly trapped or hunted. Hence, humans rarely disposed of them within their settlements (Sykes 2014).

## If Corvidae materials are underrepresented, how can this be detected with the current material?

Here I will talk about how the amount of available information increases when working with material that is from more recent excavations, this is especially the case for EBG and Skuggi

(the most recent ones), where all the information that is needed is both published and easily available.
working with materials that are from excavations that have not published their findings, in e.g., Nordre Felt and Storgaten 35.

The strategies used in collecting the material and the accompanying documentation have undergone several changes throughout the years, as this study utilizes materials from nine different excavations spanning from 1955 to 2008. Bird bones are often quite small compared to those of mammals, so sifting is considered to be the best field tool to increase the number of small remains. At one point, this was considered a new and unusual method, This was the case during the excavation of Mindets Tomt, where only one-half of a grid (4x4 sq.m) was sifted (Schia & Griffin 1988:7). According to Molaug (n.d.:8), Nordre Felt II placed a high priority on collecting all faunal remains. Additionally, the excavation at Mindets Tomt conducted a sifting test, which subsequently made sifting a significant component of the excavation between 1982 and 1984. In Folkebibliotekstomten, sifting was implemented during the last season, it was only done on the oldest layers. The effectiveness of sifting seems apparent when viewing the number of faunal remains from avian and pisces species found in the individual layers (lie 1989).
The most recent excavation is Skuggi from 2008 (Harrison 2010). There is a clear focus on methodology and all matter from TR1 was dry-sieved through 4 mm mesh, and all possible faunal remains were processed at the laboratories in New York at the CUNY Northern Science & Education Center (NORSEC).
The percentage of identified bird elements in NMA faunal remains listed in this study goes from 0,40% - 2,2% (Tab. 9, 16, and 23) the exception is Erkebispegården period 4 - 11 where the identified elements from birds are 8,2% (Tab. 19). Compared to the identified bird elements from IMA (Skuggi), we see that their faunal remains of birds consist of 18,7% (Tab. 24). This shows the recovery bias that had affected the faunal representation due to these excavations taking place before sieving became common practice (Walker et al. 2019:25, 29). But it is also worth noting that sieving just increases the TNF of fragments in general, and creates a larger collection of pieces that are too fragmented to be identified.

Martinussen (1992) stated that the representation of wild species found at Televerkstomten accurately represents the wildlife in the natural landscape around Medieval Trondheim (Marthinussen 1992:93 & 1992:88-89). Walker et al. (2019) stated that their ubiquitous presence in modern urban settings could be a reflection of their prevalence in urban environments in the NMA, then it would mean that they are poorly represented in the NMA, leading me to conclude that the low representation corvidae elements (and birds in general) in the archaeological record is due to excavations be conducted prior to the collection methods standards and that bird bones might be at a weaker disposition when it comes to taphonomic processes that can break down the osteological matter.

# 7 Conclusion

The results of this study are based partly on the data regarding the Corvidae species and partly on research previously published.

In trying to find out what roles Corvidae species could have in the Medieval periods of Norway and Iceland, I have included ecological studies and descriptions of each species' behavior and habitats and my conclusion on finding their roles as actors is conjecture at best, I find it very probable that at least crows and western jackdaws lived close to and within urban settlements (the network). There is diversity in the opinions between foregoing archaeologists and academics on whether or not Corvids were eaten, and I consider Corvidae remains to have been food for when there were no better options; something that might have been eaten by people with few resources. In the rich urban centers of NMA, there will also be workers with few resources, and the same can be said for those the tenants at Skuggi.

There was a challenge in comparing some of the locations due to their small amount of Corvidae elements, and the lack of documentation of the excavations. The focus mainly stayed on the element-rich sites (Erkebispegården, Mindets Tomt, and Skuggi).

There has previously been little to no analysis done on this subject apart from when corvid elements were documented as found in excavations, or included in large-scale studies of birds in Medieval Norway in general. One of my contributions to further research on this subject is all the data I have gathered, photographed, and quantified (illustrations, tables, and graphs). The physical analysis of the elements did not lead to any major discoveries. That might be because of the elements included in the study, but also due to my inexperience in the field. Further studies on this subject are necessary in order to reach a more satisfying conclusion on the matter.

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# Appendix

Following are the appendices referred to in this study.

| Page | Appendix | Description |
|---|---|---|
| pp.144-153 | Appendix 1 | Data recorded on the Norwegian and Icelandic material included in this study (pp.1-10). |
| pp.154-155 | Appendix 2 | NABONE recording system - codes used for mammal and bird bones, as well as for fragmentation of the bones (pp.1-2). |

| Bryggen, Bergen | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| J.S. number | Species | Number | Element | Side | MM | END | Gl | Bp | Did | Dip | SC | Notes |
| 397 | *C. corax* | 19351 | ULN | R | 111.2 | DIS,S, | | 13.9 | 11.7 | | 6 | poor |
| J.S. number | Species | Number | Element | Side | MM | END | Gl | Bp | Did | Dip | SC | |
| 397 | *C. cornix* | 18258 | ULN | R | 81.3 | W | 81.3 | 10.3 | 10.7 | 11.4 | 4.6 | |
| 397 | *C. cornix* | 20004 | ULN | L | 88.2 | W | 88.2 | 11.1 | 10.4 | 12.1 | 4.8 | |

| Mindets Tomt, Oslo | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| J.S. number | Species | Square | Burnt layer | Element | Side | mm | END | Gl | Bp | Bd | Did | Dip | SC | Notes |
| 537 | *C. corax* | P20 | fire 3 and under, possibly over fire 5 | FEM | L | | W | 68 | 13.6 | 12.5 | | | 6.1 | |
| 537 | *C. corax* | P22 | fire 7 and under, over fire 8 | CMT | L | 53.8 | | | | | | | | |
| 537 | *C. corax* | O21 | under fire 9 | COR | R | 52.6 | | | | | | | | |
| 537 | *C. corax* | O22 | fire 9 and under | HUM | L | 92.2 | W | | | | | | 7.7 | |
| 537 | *C. corax* | O22 | fire 9 and under | SCA | R | 56.2 | PRO, S | | | | | | | |
| 537 | *C. corax* | O22 | fire 9 and under | FEM | L | | W | 69.5 | 14.3 | 14.5 | | | 6 | |
| 537 | *C. corax* | O22 | fire 9 and under | TMT | R | | W | 66.7 | 12.7 | 8.9 | | | 5 | |
| 537 | *C. corax* | O23 | under fire 9, down to sterile sand | STE | | 78.9 | F | | | | | | | pieces fit |
| 537 | *C. corax* | O23 | under fire 9, down to sterile sand | STE | | 34.8 | F | | | | | | | pieces fit |
| 537 | *C. corax* | O23 | under fire 9, down to sterile sand | STE | | 20.4 | F | | | | | | | no overlap |
| J.S. number | Species | Square | Burnt layer | Element | Side | MM | END | Gl | Bp | Bd | Did | Dip | SC | Notes |
| 537 | *C. cornix* | P21 | under fire 9 | ULN | R | 32.8 | DIS, S | | | | 10 | | | no overlap |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 537 | *C. cornix* | P21 | under fire 9 | ULN | R | 55.4 | PRO, S | | 10.9 | | | 11.6 | 4.8 | no overlap |
| 537 | *C. cornix* | P22 | fire 7 and under, over fire 8 | ULN | L | 52.5 | DIS, S | | | | | | | |
| 537 | *C. cornix* | P22 | fire 8 and under, over fire 9 | ULN | L | | W | 80 | 9.1 | | 9.7 | 11.7 | 5.1 | |
| 537 | *C. cornix* | O22 | fire 9 and under | ULN | R | 38.8 | S | | | | | | | |
| 537 | *C. cornix* | O23 | under fire 9, down to sterile sand | HUM | R | | W | 64 | 17.6 | 14.5 | | | 6.2 | |
| 537 | *C. cornix* | O23 | under fire 9, down to sterile sand | HUM | L | | W | 64 | 17.7 | 14.6 | | | 6.2 | |
| 537 | *C. cornix* | O23 | under fire 9, down to sterile sand | COR | L | | W | 43.1 | | | | | | |
| 537 | *C. cornix* | O23 | under fire 9, down to sterile sand | SCA | R | 37 | F | | | | | | | |
| 537 | *C. cornix* | O23 | under fire 9, down to sterile sand | STE | | 23.1 | F | | | | | | | |
| 537 | *C. cornix* | O23 | under fire 9, top part | SYN | | 43.6 | F | | | | | | | small piece fell off, stored in same bag and photographed |
| 537 | *C. cornix* | O23 | under fire 9, top part | FEM | R | | W | 17.6 | 10.4 | 10.9 | | | 4.5 | |
| 537 | *C. cornix* | O23 | under fire 9, top part | CMT | L | 44.0 | PRO, S | 9.7 | | | | | | |
| **J.S. number** | **Species** | **Square** | **Burnt layer** | **Element** | **Side** | **mm** | **END** | **Gl** | **Bp** | **Bd** | **Did** | **Dip** | **SC** | **Notes** |
| 537 | *C. monedula* | O22 | fire 9 and under | HUM | R | | W | 46.4 | 14.4 | 10 | | | 4.8 | |
| 537 | *C. monedula* | O22 | fire 9 and under | RAD | L | | W | 57.9 | 7.5 | 6.4 | | 9.1 | 3.5 | |

| Storgaten 35 (Hvistedahl Tomt), Tønsberg | | | | | | | |
|---|---|---|---|---|---|---|---|
| **J.S. number** | **Species** | **Layer** | **Element** | **Side** | **END** | **MM** | **NOTES** |
| 563 | *C. corax* | 31 | CMT | R | PRO,S | 47 | PIECES FIT |
| 563 | *C. corax* | 31 | CMT | R | DIS, S | 49.7 | PIECES FIT |

| Rosenkrantzgate 4, Bergen | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| J.S. number | Species | Number | Square | Layer | Element | Side | mm | END | Notes |
| 613 | *C. corax* | 76/11679 | H28 | over F 273-225 | HUM | R | 88.5 | PRO, S | |
| 613 | *C. corax* | 76/11679 | H28 | over F 273-225 | HUM | L | 77.8 | S | |

| Televerkstomten, Trondheim | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| J.S. number | Species | Number | Layer | Element | Side | Gl (mm) | END | Notes |
| 632 | *C. corax* | 48119 | VC 201 | TBT | LEFT | 109.5 | W | |
| 632 | *C. corax* | 43357 | VD 174 | COR | LEFT | | DIS | |

| Oslo Område (Nordrefelt II & Grønnengen), Oslo | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| J.S. number | Species | Location | Square | Layer | Element | Side | mm | END | Gl (mm) | Bp | Bd | Dip | SC | Did | Notes |
| 702 | *C. corax* | GRØNNENGEN | P15 | 5057 | HUM | LEFT | | W | 92.7 | 26.4 | 20.5 | | 9.2 | | |
| 702 | *C. corax* | GRØNNENGEN | P15 | 5057 | HUM | RIGHT | 42 | PRO | | 26.3 | | | | | |
| 702 | *C. corax* | GRØNNENGEN | P15 | 5057 | STE | | 61.3 | | | | | | | | pieces fit |
| 702 | *C. corax* | GRØNNENGEN | P15 | 5057 | STE | | 20 | | | | | | | | pieces fit |
| 702 | *C. corax* | GRØNNENGEN | P15 | 5057 | COR | LEFT | 39 | | | | | | | | |
| 702 | *C. corax* | GRØNNENGEN | Q16 | 5750 | ULN | LEFT | | W | 116 | 11.4 | | 17.3 | 6 | 12 | |

| J.S. number | Species | Location | Square | Layer | Element | Side | mm | END | Gl | Bp | Bd | Dip | SC | Did | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 702 | *C. corax* | GRØNNENG | Q16 | 5750 | STE | | 30 | | | | | | | | |
| 702 | *C. corax* | GRØNNENGEN | Q16 | 5750 | VER | | 21 | | | | | | | | |
| 702 | *C. corax* | NORDREFELT II | Q16 | 5753 | TMT | RIGHT | | W | 69.3 | 12.4 | 9.1 | | 4.8 | | |
| **J.S. number** | **Species** | **Location** | **Square** | **Layer** | **Element** | **Side** | **mm** | **END** | **Gl** | **Bp** | **Bd** | **Dip** | **SC** | **Did** | **Notes** |
| 702 | *C. corone* | GRØNNENGEN | Q16 | 5122 | HUM | LEFT | 55.9 | DIS, S | | | | | | | |
| 702 | *C. corone* | NORDREFELT II | Q15 | 5074 | HUM | | 19.6 | DIS | | | | | | | |
| **J.S. number** | **Species** | **Location** | **Square** | **Layer** | **Element** | **Side** | **mm** | **END** | **Gl** | **Bp** | **Bd** | **Dip** | **SC** | **Did** | **Notes** |
| 702 | *C. monedula* | NORDREFELT II | Q16 | 5026 | VER | M | | | | | | | | | |
| 702 | *C. monedula* | NORDREFELT II | Q16 | 5026 | VER | M | | | | | | | | | |

**Folkebibliotekstomten, Trondheim**

| J.S. number | Species | Number | Square | Layer | Element | Side | mm | END | Gl | Bp | Did | Dip | SC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 765 | *C. corone* | 96715 | | 505 | ULN | R | 86.1 | W | 86.1 | 11.1 | 9 | 12.5 | 5.0 |

**Erkebispegården, Trondheim**

| J.S. number | Species | Number | Square | Layer | Y | X | Quad | Frag | Element | Side | END | Gl | Lm | La | Bf | Bp | Bd | Dp | Dd | Did | Dic | Dip | SC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 845 | *C. corax* | 115799 | 91/B | 98 | N | 13 | C | 5 | ULN | R | PRO, S | | | | | | | | | | | | |
| 845 | *C. corax* | 118232 | 91/1B | 319 | M | 13 | A | 5 | CMT | R | PRO, S | | | | | | | | | | | | |

Appendix 1 Norwegian and Icelandic Material

| | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 845 | *C. corax* | 119794 | 91/B | 364 | M | 12 | A | 5 | HUM | L | DIS, S | | | | | | | | | | | | |
| 845 | *C. corax* | 119988 | 91/1A | 347 | N | 14 | B | 5 | COR | L | DIS, S | | | | | | | | | | | | |
| 845 | *C. corax* | 121519 | 91/B | 494 | M | 12 | D | 10 | TBT | R | S | | | | | | | | | | | | 4.5 |
| 845 | *C. corax* | 162904 | 91/ I | 87 | K | 2 | D | 10 | COR | R | W | 61.8 | 57.4 | | 17.4 | 17.3 | | | | | | | |
| 845 | *C. corax* | 162904 | 91/ I | 87 | K | 2 | D | 5 | HUM | R | DIS, S | | | | | | 21.2 | | | | | | |
| 845 | *C. corax* | 162904 | 91/ I | 87 | K | 2 | D | 11 | ULN | R | W | 120.1 | | | | | | | 14.8 | 15.1 | | 16.8 | 6.5 |
| 845 | *C. corax* | 162904 | 91/ I | 87 | K | 2 | D | 10 | RAD | R | DIS, S | | | | | | | | | | | | 2.7 |
| 845 | *C. corax* | 162904 | 91/ I | 87 | K | 2 | D | 10 | FEM | L | W | 73.4 | | | | 15.3 | 15.1 | 14.2 | | | | | 6.7 |
| 845 | *C. corax* | 162904 | 91/ I | 87 | K | 2 | D | 10 | FEM | R | DIS, S | | | | | 15.7 | | 14.0 | | | | | 6.8 |
| 845 | *C. corax* | 162904 | 91/ I | 87 | K | 2 | D | 10 | TMT | L | W | 67.52 | | | | 12.8 | 8.8 | | | | | | 4.6 |
| 845 | *C. corax* | 166412 | 91/G | 925 | K | 5 | A | 10 | SCA | R | W | 64.4 | | | | | | | | | 19.3 | | |
| 845 | *C. corax* | 166412 | 91/G | 925 | K | 5 | A | 2 | FEM | L | DIS | | | | | | 15.9 | | 12.6 | | | | |
| 845 | *C. corax* | 166875 | 91/G | 925 | H | 6 | D | 10 | HUM | R | W | 98.9 | | | | 26.7 | 21.0 | | | | | | 9.5 |
| 845 | *C. corax* | 166520 | 91/G | 925 | K | 5 | C | 10 | HUM | L | DIS, S | | | | | | 21.9 | | | | | | 9.4 |
| 845 | *C. corax* | 166520 | 91/G | 925 | K | 5 | C | 11 | ULN | L | W | | | | | | | | | 14.3 | | | 7.2 |
| 845 | *C. corax* | 166520 | 91/G | 925 | K | 5 | C | 11 | RAD | R | W | 11.4 | | | | | 9.6 | | | | | | 3.0 |
| 845 | *C. corax* | 166520 | 91/G | 925 | K | 5 | C | 10 | CMT | L | W | 74.4 | 67.2 | | | 17.3 | 17.9 | | | | | | |
| 845 | *C. corax* | 166520 | 91/G | 925 | K | 5 | C | 10 | STE | M | PRO | | | | | | | | | | | | |
| 845 | *C. corax* | 167214 | 91/G | 978 | I | 6 | D | 10 | CMT | R | PRO, S | | | | | 17.0 | | | | | | | |
| 845 | *C. corax* | 167796 | 91/G | 1002 | H | 4 | D | 10 | HUM | L | W | 95.2 | | | | 25.6 | 20.2 | | | | | | 8.9 |
| 845 | *C. corax* | 167796 | 91/G | 1002 | H | 4 | D | 5 | FUR a | M | M + S | | | | | | | | | | | | |
| 845 | *C. corax* | 167796 | 91/G | 1002 | H | 4 | D | 5 | FUR b | L | PRO, S | | | | | | | | | | | | |
| 845 | *C. corax* | 167796 | 91/G | 1002 | H | 4 | D | 10 | STE | M | PRO | | | | | | | | | | | | |
| 845 | *C. corax* | 167796 | 91/G | 1002 | H | 4 | D | 10 | FEM | R | W | 68.0 | | | | 15.2 | 15.0 | | | | | | 6.6 |
| 845 | *C. corax* | 167796 | 91/G | 1002 | H | 4 | D | 11 | TBT | R | W | 110.3 | 10.7 | 111.8 | | | | | | | | 17.9 | 5.8 |

| J.S. number | Species | Number | Square | Layer | Y | X | Quad | Frag | Element | Side | END | Gl | Lm | La | Bf | Bp | Bd | Dp | Dd | Did | Dic | Dip | SC | NOTES |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 845 | *C. corone* | 116365 | 91/1A | 121 | M | 14 | C | 5 | HUM | R | DIS, S | | | | | | 16.5 | | | | | | 7.1 | |
| 845 | *C. corone* | 116365 | 91/1A | 121 | M | 14 | C | 10 | ULN | R | DIS, S | | | | | | 10.9 | | | | | 11.4 | | |
| 845 | *C. corone* | 116365 | 91/1A | 121 | M | 14 | C | 10 | RAD | R | W | 77.1 | | | | | | | | | | | 2.1 | |
| 845 | *C. corone* | 116365 | 91/1A | 121 | M | 14 | C | 5 | CMT | R | W | 52.7 | | | | 11.4 | | | | 11.3 | | | | |
| 845 | *C. corone* | 117029 | 91/1A | 275 | L | 14 | B | 10 | TBT | R | W | | | | | | | | | | | | | poor condition |
| 845 | *C. corone* | 117078 | 91/1A | 263 | M | 14 | A | 10 | HUM | R | DIS, S | | | | | | 14.4 | | | | | | 6.5 | Light mark under distal (3.7mm) |
| 845 | *C. corone* | 118204 | 91/B | 311 | N | 12 | A | 10 | HUM | R | W | 70.3 | | | | 18.6 | 15.1 | | | | | | | BM (?) |
| 845 | *C. corone* | 118204 | 91/B | 311 | N | 12 | A | 5 | CMT | R | W - 1E | 52.0 | | | | 10.2 | | | | 10.5 | | | | |
| 845 | *C. corone* | 118209 | 91/B | 312 | N | 12 | C | 5 | CMT | L | W | 51.4 | | | | | | | | 11,7 | | | | |
| 845 | *C. corone* | 118865 | 91/1A | 274 | M | 15 | C | 5 | SYN | | | | | | | | | | | | | | | |
| 845 | *C. corone* | 118865 | 91/1A | 274 | M | 15 | C | 2 | PEL | | | | | | | | | | | | | | | |
| 845 | *C. corone* | 118870 | 91/1A | 274 | M | 14 | A | 1 | FUR | RS | PRO, S | | | | | | | | | | | | | |
| 845 | *C. corone* | 119111 | 91/1A | 135 | O | 15 | A | 2 | ULN | R | DIS, S | 76.4 | | | | | 6.7 | | | | | | 1.9 | |
| 845 | *C. corone* | 119111 | 91/1A | 135 | O | 15 | A | 10 | RAD | R | W | | | | | | | | | 9.6 | | | | |
| 845 | *C. corone* | 119400 | 91/B | 257 | N | 13 | B | 5 | MAN | RS | S | | | | | | | | | | | | | |
| 845 | *C. corone* | 119938 | 91/B | 478 | | | | 5 | ULN | L | DIS, S | | | | | | | | | 9.5 | | | | |
| 845 | *C. corone* | 120176 | 91/1A | 504 | N | 14 | C | 5 | FEM | R | PRO, S | | | | | 10.9 | | | | | | | | |
| 845 | *C. corone* | 120176 | 91/1A | 504 | N | 14 | C | 2 | RAD | R | DIS, S | | | | | | 6.9 | | | | | | | |
| 845 | *C. corone* | 120141 | 91/1A | 504 | N | 14 | D | 10 | TBT | R | W | 90.3 | | | | | | | 8.2 | | | 14.6 | 3.8 | |
| 845 | *C. corone* | 120141 | 91/1A | 504 | N | 14 | D | 10 | TMT | L | W | 60.8 | | | | 10.3 | 7.4 | | | | | | 3.7 | |
| 845 | *C. corone* | 120141 | 91/1A | 504 | N | 14 | D | 1 | SYN | M | | | | | | | | | | | | | | |
| 845 | *C. corone* | 121363 | 91/1A | 503 | M | 15 | C | 2 | COR | RS | PRO | | | | | | | | | | | | | |
| 845 | *C. corone* | 121363 | 91/1A | 503 | M | 15 | C | 1 | PEL | L | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 845 | *C. corone* | 121363 | 91/1A | 503 | M | 15 | C | 1 | SYN | M | | | | | | | | | | | | | | |
| 845 | *C. corone* | 121363 | 91/1A | 503 | M | 15 | C | 2 | CLAW | | W | | | | | | | | | | | | | |
| 845 | *C. corone* | 121363 | 91/1A | 503 | M | 15 | C | 1 | RNG | M | W | | | | | | | | | | | | | |
| 845 | *C. corone* | 121363 | 91/1A | 503 | M | 15 | C | 5 | FEM | L | W | 54.9 | 52.0 | | | 11.0 | 11.9 | | | | | | 4.6 | |
| 845 | *C. corone* | 121363 | 91/1A | 503 | M | 15 | C | 5 | FEM | R | PRO, S | | | | | 11.2 | | | | | | | | pieces fit |
| 845 | *C. corone* | 121363 | 91/1A | 503 | M | 15 | C | 5 | FEM | R | DIS, S | | | | | | 11.9 | | | | | | | pieces fit |
| 845 | *C. corone* | 121363 | 91/1A | 503 | M | 15 | C | 10 | TBT | L | W | 91.3 | | | | | | | 8.6 | | | 14.8 | 3.7 | |
| 845 | *C. corone* | 121363 | 91/1A | 503 | M | 15 | C | 10 | TBT | R | PRO, S | | | | | | | | | | | | | pieces fit |
| 845 | *C. corone* | 121363 | 91/1A | 503 | M | 15 | C | 5 | TBT | R | S | | | | | | | | | | | | | pieces fit |
| 845 | *C. corone* | 121363 | 91/1A | 503 | M | 15 | C | 2 | FUR | LS | PRO, S | | | | | | | | | | | | | |
| 845 | *C. corone* | 121363 | 91/1A | 503 | M | 15 | C | 1 | VER | M | W | | | | | | | | | | | | | |
| 845 | *C. corone* | 121363 | 91/1A | 503 | M | 15 | C | 1 | VER | M | W | | | | | | | | | | | | | |
| 845 | *C. corone* | 121363 | 91/1A | 503 | M | 15 | C | 1 | VER | M | W | | | | | | | | | | | | | |
| 845 | *C. corone* | 121363 | 91/1A | 503 | M | 15 | C | 1 | VER | M | W | | | | | | | | | | | | | |
| 845 | *C. corone* | 121363 | 91/1A | 503 | M | 15 | C | 1 | VER | M | W | | | | | | | | | | | | | |
| 845 | *C. corone* | 121363 | 91/1A | 503 | M | 15 | C | 1 | VER | M | W | | | | | | | | | | | | | |
| 845 | *C. corone* | 121363 | 91/1A | 503 | M | 15 | C | 1 | VER | M | W | | | | | | | | | | | | | |
| 845 | *C. corone* | 121363 | 91/1A | 503 | M | 15 | C | 1 | VER | M | W | | | | | | | | | | | | | |
| 845 | *C. corone* | 121363 | 91/1A | 503 | M | 15 | C | 1 | VER | M | W | | | | | | | | | | | | | |
| 845 | *C. corone* | 121363 | 91/1A | 503 | M | 15 | C | 1 | DIGIT | | W | | | | | | | | | | | | | |
| 845 | *C. corone* | 121363 | 91/1A | 503 | M | 15 | C | 2 | PHAL/ HALLUX | | W | | | | | | | | | | | | | |
| 845 | *C. corone* | 121363 | 91/1A | 503 | M | 15 | C | 2 | PHAL/ HALLUX | | W | | | | | | | | | | | | | |
| 845 | *C. corone* | 121363 | 91/1A | 503 | M | 15 | C | 5 | FIB | R | W | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 845 | *C. corone* | 121363 | 91/1A | 503 | M | 15 | C | 5 | FIB | L | PRO, S | | | | | | | | | | | | | |
| 845 | *C. corone* | 121363 | 91/1A | 503 | M | 15 | C | 5 | TMT | R | W | 60.0 | | | | 10.6 | 7.2 | | | | | | 3.8 | |
| 845 | *C. corone* | 121363 | 91/1A | 503 | M | 15 | C | 5 | TMT | L | DIS, S | | | | | | | | | | | | 3.8 | |
| 845 | *C. corone* | 137485 | 91/1A | 385 | M | 9 | | 10 | HUM | L | W | 66.5 | | | | | 14.7 | | | | | | 5.8 | |
| 845 | *C. corone* | 121746 | 91/B | 556 | N | 12 | D | 5 | RAD | L | | | | | | | | | | | | | | |
| 845 | *C. corone* | 166405 | 91/G | 925 | G | 6 | B | 10 | TMT | R | W | 64.4 | | | | 12.9 | 8.7 | | | | | | 4.2 | |
| 845 | *C. corone* | 167354 | 91/G | 970 | H | 5 | D | 10 | ULN | L | W | 87.4 | | | | 11.4 | 12.6 | | | 8.8 | | | 5.0 | |
| **J.S. number** | **Species** | **Number** | **Square** | **Layer** | **Y** | **X** | **Quad** | **Frag** | **Element** | **Side** | **END** | | | | | | | | | | | | | |
| 845 | *C. monedula* | 119769 | 91/1A | 302 | | | | 5 | CMT | R | W -1 S | | | | | | | | | | | | | |
| 845 | *C. monedula* | 120090 | 91/1A | 450 | L | 14 | b | 5 | HUM | L | W | | | | | | | | | | | | | |
| 845 | *C. monedula* | 120090 | 91/1A | 450 | L | 14 | b | 10 | ULN | R | W | | | | | | | | | | | | | |
| 845 | *C. monedula* | 120090 | 91/1A | 450 | L | 14 | b | 5 | RAD | R | DIS, S | | | | | | | | | | | | | |

| **Skuggi, Eyjafjörður , Iceland** | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Year** | **Species** | **Layer** | **Element** | **Side** | **END** | **Gl (mm)** | **NOTES** |
| SKÖ08 | *C. corax* | 3 | MAN | R.S | DORSAL END | 53.4 | |
| | *C. corax* | 3 | RAD | R | PRO + S | 51.4 | |
| SKÖ09 | *C. corax* | 3 | PHAL | - | W | 13 | noted as “talon” |
| SKÖ09 | *C. corax* | 10 - 9/10 | CLAW | - | W | 15.3 | |
| SKÖ09 | *C. corax* | 10 - 9/10 | TBT | R | DIS | 14 | |
| SKÖ09 | *C. corax* | 10 - 9/10 | COR | R | DIS | 25.6 | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| SKÖ09 | *C. corax* | 10 | FEM | R | DIS | 12.7 | |
| SKÖ09 | *C. corax* | 11 | FEM | R | PRO | 10.5 | |
| | *C. corax* | 11 | FEM | L | PRO | 5,5 | pieces fit at breaking point |
| | *C. corax* | 11 | FEM | L | PRO | 9 | pieces fit at breaking point |
| | *C. corax* | 11 | TBT | R | DIS | 10.1 | |
| | *C. corax* | 11 | TBT | L | DIS | 10.5 | |
| | *C. corax* | 11 | FEM | R | PRO | 14 | |
| | *C. corax* | 11 | FEM | L | PRO | 10.5 | |
| SKÖ09 | *C. corax* | 11 | MAN | lower | CENTER TIP | 71.1 | overlap |
| | *C. corax* | 11 | MAN | lower | CENTER TIP | 55.8 | overlap |
| | *C. corax* | 11 | MAN | R | DORSAL END | 38.2 | |
| | *C. corax* | 11 | MAN | upper | CENTER TIP | 25.9 | |
| | *C. corax* | 11 | ULN | R | SHAFT | 38.4 | |
| | *C. corax* | 11 | RAD | R | PRO | 17.3 | |
| | *C. corax* | 11 | FEM | R | DIS | 27.2 | |
| | *C. corax* | 11 | FEM | L | DIS | 18.7 | |
| | *C. corax* | 11 | TMT | L | DIS | 21.8 | |
| | *C. corax* | 11 | PHAL | - | DIS, S | 21.4 | |
| | *C. corax* | 11 | PHAL | - | DIS, S | 14.1 | |
| | *C. corax* | 11 | PHAL | - | DIS + SHAFT | 15.9 | |
| | *C. corax* | 11 | PHAL | - | DIS + SHAFT | 20.1 | |
| | *C. corax* | 11 | PHAL | - | DIS + SHAFT | 19.8 | |
| | *C. corax* | 11 | PHAL | - | W | 15 | |
| | *C. corax* | 11 | PHAL | - | W | 12.9 | |
| | *C. corax* | 11 | PHAL | - | W | 9.8 | |
| | *C. corax* | 11 | PHAL | - | W | 17.2 | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | *C. corax* | 11 | PHAL | - | W | 13.1 | |
| | *C. corax* | 11 | PHAL | - | W | 15.5 | |
| | *C. corax* | 11 | PHAL | - | W | 17.1 | |
| | *C. corax* | 11 | PHAL | - | W | 14.8 | |
| | *C. corax* | 11 | PHAL | - | W | 8.9 | |
| | *C. corax* | 11 | PHAL | - | W | 8.9 | |
| | *C. corax* | 11 | CLAW | - | W | 18.9 | |
| | *C. corax* | 11 | CLAW | - | W | 13.3 | |
| | *C. corax* | 11 | CLAW | - | W | 13.6 | |
| | *C. corax* | 11 | CLAW | - | W | 13.6 | |
| | *C. corax* | 11 | COR | L | PRO + SHAFT | 35.5 | |
| | *C. corax* | 11 | COR | L | DIST | 18.6 | |

## BONE ELEMENTS

### MAMMAL & BIRD

| | |
|---|---|
| HCO | Horn core fragment |
| ANT | Antler fragment |
| ANTS | Antler, shed pedicle |
| S+A | Skull & attached antler |
| S+H | Skull & attached horn core |
| SKL | Skull fragment |
| FRN | Frontal |
| PAR | Parietal |
| TEM | Temporal |
| PET | Petrous (bulla) |
| ZYG | Zygomatic |
| OCC | Occipital |
| NAS | Nasal |
| ROS | Rostrum |
| PMX | Premaxilla |
| MAX | Maxilla |
| MAN | Mandible |
| IN | Incisor |
| PM | Premolar |
| MO | Molar |
| CN | Canine |
| PC | Post canine (seals) |
| TTH | Tooth fragment |
| HYD | Hyoid |
| ATL | Atlas |
| AXI | Axis |
| CEV | Cervical vertebra |
| TRV | Thoracic vertebra |
| LMV | Lumbar vertebra |
| CDV | Caudal vertebra |
| VER | Vertebral fragment |
| SAC | Sacrum |
| PAT | Patella |
| PES | Articulated foot |
| INN | Innominate |
| LBF | Long bone fragment |
| UNI | Unidentified bone element |
| STE | Sternum |
| RIB | Rib |
| CC | Costal cartilage |
| SCP | Scapula |
| HUM | Humerus |
| RAD | Radius |
| RUL | Radius & ulna |
| ULN | Ulna |
| CAR | Carpal |
| TAR | Tarsal |
| AST | Astragalus |
| CAL | Calcaneus |
| TRC | Naviculocuboid |
| CTA | Carpal/tarsal fragment |
| MTC | Metacarpal |
| MC1 | Metacarpal 1 |
| MC2 | Metacarpal 2 |
| MC3 | Metacarpal 3 |
| MC4 | Metacarpal 4 |
| MC5 | Metacarpal 5 |
| PHA | Phalanx fragment |
| PH1 | Phalanx 1 |
| PH2 | Phalanx 2 |
| PH3 | Phalanx 3 |
| SES | Sesamoid |
| FEM | Femur |
| TIB | Tibia |
| TIF | Tibia & fibula (seals) |
| LML | Lateral malleolus |
| FIB | Fibula |
| MTT | Metatarsal |
| MT1 | Metatarsal 1 |
| MT2 | Metatarsal 2 |
| MT3 | Metatarsal 3 |
| MT4 | Metatarsal 4 |
| MT5 | Metatarsal 5 |
| MTP | Metapodial fragment |
| BAC | Baculum |

### ADDITIONAL BIRD

| | |
|---|---|
| SYN | Synsacrum |
| TBT | Tibiotarsus |
| CMT | Carpometacarpus |
| TMT | Tarsometatarsus |
| PPX | Proximal phalanx (wing) |
| DPX | Distal phalanx (wing) |
| UNG | Ungus (talon) |
| RNG | Tracheal ring |
| FUR | Furcula |
| COR | Coracoid |
| LSA | Lumbosacral |
| QUA | Quadrate |
| SCL | Scapholunar |
| CUN | Cuneiform |

## TAPHONOMY

### END

| | |
|---|---|
| PRO | Proximal |
| DIS | Distal |
| S | Shaft |
| MED | Medial (on the center line of the body) |
| LAT | Lateral (off the center line of the body) |
| ANT | Anterior |
| POS | Posterior |
| UP | Upper tooth |
| LW | Lower tooth |
| P+E | Proximal shaft & detached epiphysis |
| D+E | Distal shaft & detached epiphysis |
| PE | Proximal epiphysis (detached) |
| DE | Distal epiphysis (detached) |
| V+E | Vertebra & detached epiphysis |
| E | Detached vertebral epiphysis |
| W-S | Fish vertebra with intact centrum but lacking all spines |
| ACE | Acetabulum of the innominate |
| W | Whole bone |
| F | Fragment (unidentified) |

**FRAGMENT SIZE** NB : Only substantial bone fragments should be counted, so as to prevent an artificially inflated bone count resulting from taphonomic factors (i.e. exfoliation) rather than human activity (i.e. butchery). While there is a size category "1" (fragments smaller than 1 cm), fragments 1 – 5 mm in size should not be counted unless they can clearly be assigned to individual skeletal elements. Bone rinds should not be counted either, as they have most likely flaked off of bones already counted.

| | |
|---|---|
| 1 | Below 1 cm maximum dimension |
| 2 | From 1 – 2 cm |
| 5 | From 2 – 5 cm |
| 10 | From 5 – 10 cm |
| 11 | Larger than 10 cm maximum dimension |