Written in Bones

Studies on technological and social contexts of past faunal skeletal remains

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Whale Bones as architectural elements in and around Bremen, Germany

During the main phase of commercial whaling between the 17th and early 20th century whaling ships carried not only blubber and baleen back home to their European harbours but also substantial quantities of whale bones. Many of them were subsequently utilised as material for various functions to be introduced here. Several such objects in the area of the city of Bremen, Northern Germany, are presented, which are now historical monuments of early industrialisation and the (over-)exploitation of whales. Reasons and motifs for their utilisation are discussed. One aim of this paper is to draw the attention to these monuments often situated in remote places and – hopefully – initiate actions to document, inventory and preserve the remaining objects in the future.

Keywords: whale bones, whaling history, Germany, (Early) Modern Time, preservation

This article is a preliminary overview about a current research in local history. One aim of this paper is to point the attention of scholars concerned with worked bone artefacts to a peculiar class of objects made of large whale bones. I am referring here to objects of large dimensions (mainly between one and seven meters) that have been used for different purposes either in building structures or in open-air situations which may be combined under the loose term 'architectural elements'. I am using the imprecise term 'object' as I am not sure if 'artefact' is the appropriate expression in this case. The bones are often not modified very much, at least not fashioned in an elaborate planned way to fulfil a specific purpose (class I artefacts in sensu Choyke 1997) like many small bone artefacts. They are also different from artefacts defined as 'ad hoc' or 'expediency tools' (class II in sensu Choyke 1997) as they are definitely not made from raw material readily available and as they have been chosen with care for long time use. They may better be characterised as 'used bones'.

Strange enough, keeping in mind their sometimes impressive size, whale bone objects seem to escape the scope or interest or responsibility of people quite often, even of those who are professionally concerned with related subjects. The reasons for this circumstance are various:

• Large whale bone objects are often situated in remote places on private ground and therefore they do not fall in the responsibility of public administration.

• They are not buried in the soil and hence are no subject for excavators and archaeologists.

• As most of the oldest still existing examples are not dating before the 18th century they are also too young for the interest of most archaeologists.

• They are no buildings in strict sense and hence are not in the scope of the ancient monuments departments.

• They are simply too large for most persons working with bone artefacts like archaeozoologists, archaeologists or conservators.

• They are often not documented in written form and hence escape the scope of historians.

• Weathered whale bone can easily be confused with weathered wood by the untrained observer.

To conclude, large whale bones are a class of objects caught between two stools. The reason for my concern here is that most of the still existing objects are in a highly endangered preservation status, many are about to vanish. The number of objects is deteriorating rapidly due to weather, age, neglect, ignorance, indifference, vandalism and even theft (Ahlers 1911[1988]:24; Barthelmeß 1989:261-262, Redman

2004:xi). A lot of the once existing specimens are already gone. This is regrettable as whale bone objects have a high potential as historic monuments in itself, as I hopefully will be able to demonstrate, let alone their value as biological archives.

My personal fascination for the topic and motivation for this paper probably goes back to my childhood. In the year 1961, two years before I was born, a pair of huge blue whale mandibles of 7.10 m in length were presented to the city of Bremen by a Norwegian shipping company owner. They were mounted at the harbour of Vegesack in the North of Bremen (Fig. 1) and I remember being struck by this impressive monument as a child. This object, however, does not fit to the criteria mentioned above as it is a landmark in a centre of interest with a high identification value for the local public, which definitely does not suffer the fate of being overseen and forgotten. It was under the supervision of the ancient monuments department from the beginning of its existence. However, it posed preservation and public safety problems after 20 years already and was replaced by a 1:1 bronze replica in 1987. The original bones still survive in the magazine of the Übersee Museum, although they have regrettably been sawn into pieces for transport reasons[1].

Speaking of large whale bones implies a zoological restriction. Subject of this paper are objects made from bones of the large whale species, in particular the species of the families Balaenidae (right whales) and Balaenopteridae (finback whales or rorquals) plus the Grey Whale and the Sperm Whale (see table 1 for a list of species). The size of the whales ranges from a total length of 8 m in case of Minke Whales up to a maximum of 33 m in case of adult female Blue Whales (van den Brink 1957:157, 168-173). Mandibles of the Blue Whale can reach up to 7,5 m[2]. All the listed species have been targets of commercial whaling in early modern and modern history though at different times and levels.

Fig. 1. Bremen-Vegesack, Weser Utkiek, Blue Whale jaws, erected 1961 (photo: Harry Schwarzwälder 1981)

[1] See also Redman (2009:42-44).

[2] E. g. the whale bone arch at Bragar, Lewis, Scotland with 7.49 m measured along the outer curve (Redman 2004:321-325)

Table 1. Large whale species and their taxonomic order

Order Baleen Whales (Mystacoceti)			Order Toothed Whales (Odontoceti)
Family Right Whales (Balaenidae)	Family Finback Whales (Balaenopteridae)	Family Grey Whales (Eschrichtiidae)	Family Sperm Whales (Physeteridae)
Bowhead (*Balaena mysticetus*) Northern Right Whale (*Eubalaena glacialis*) Southern Right Whale (*Eubalaena australis*) Pacific Right Whale (*Eubalaena japonica*)	Blue Whale (*Balaenoptera musculus*) Common Rorqual (*Balaenoptera physalus*) Sei Whale (*Balaenoptera borealis*) Minke Whale (*Balaenoptera acutorostrata*) Humpback Whale (*Megaptera novaeangliae*)	Grey Whale (*Eschrichtius gibbosus*)	Sperm Whale (*Physeter macrocephalus*)

Overview about the current research status in Europe

While the history of European whaling has been documented fairly well and analysed in detail in most European countries, objects of whale bones – being physical evidence and relics of these socially and historically important commercial activities – have been mentioned only in passing in most cases, if at all. For Germany Bernhard Ahlers (1911[1988]:24-25, 30-35) and Wanda Oesau (1937:308-311, 1955:195-235) may be mentioned, who refer to whale bone monuments in substantial passages of their whaling history publications. Apart from numerous regional folklore publications on single local specimens comprehensive research on large whale bone objects itself is scarce. Zoologist Erna Mohr started a photographical collection of whale bone monuments in the 1930s of which only small parts have been published (e. g. Mohr 1935), but a copy of her collection survived in the archive of the Rotterdam zoologist Antonius Boudewijn van Deinse. To be mentioned is Klaus Barthelmeß who gathered an enormous amount of information on worldwide whaling history and has published numerous papers in several of which whale bone monuments have been documented (e. g. Barthelmeß 1994, 2008). The most comprehensive work on European large whale bone objects, however, has been undertaken by Nicholas Redman, who is devoted to whale bones for more than 35 years now and initially published an extensive catalogue listing 992 objects from 664 locations of the British Isles (Redman 2004).

My own research began over ten years ago, with the idea of a survey on the remaining whale bone monuments in Northern Germany. Almost inevitably the research brought me in contact with Klaus Barthelmeß and Nicholas Redman leading to a joint project where my (small) part was to contribute detailed information on local specimens to Nick Redman's already existing overwhelming collection of facts. While gathering evidence it became obvious that a stout local base with knowledge of landscape details, personal contacts, access to archives, etc. is required for this project, resulting in the restriction of this paper to the region of Bremen where I am able to dig down deep into historical sources. In the meantime, after my presentation at the WBRG meeting in Wrocław, three additional volumes have been published on whale bone monuments of Germany, Austria, the Czech Republic and Switzerland (Redman 2009), the Netherlands and Belgium (Redman 2010a) and additional specimens of the British Isles (Redman 2010b).

Although this means that unlike the situation in 2009 a substantial part of the whale bone objects in Europe is now at least generally inventoried, there are still many large gaps to be filled. Most of the objects are still lacking a zoological identification to species level due to lack of comparative material, identification literature and scientific know-how. Identification could be and should be the starting point of a zoohistoric research. Conservational issues have only preliminary been tackled to date (e. g. Barthelmeß 2008; Huiskes 2001). Local historic data, often kept only as aural history by local families, should be documented and subsequently historically integrated.

Key data of the history of European whaling

It is not the aim of this paper to give a detailed overview about the history of European whaling, a topic that has been tackled by various authors on regional, national and international level[3]. Nevertheless the objects dealt with here cannot be understood without their historical, social, economic and political background. The changing historic circumstances are inseparably linked with their existence. It is hence necessary to outline some key features as background to understand the objects.

Historical evidence for active hunting of large whales in Europe before the 16th century does exist only for the Basque countries, the Inuit and arguably for Norway. Any other documented use of whales until then refers either to small cetacean species or to the exploitation of eventually stranded individuals of large species (Barthelmeß 1992; Clark 1989:88-90; Mulville 2005). Of special relevance here are the Basques, who set up watch posts in the Bay of Biscay at least since the 11th century – the earliest historic document existing for Bayonne in 1059 AD. The Basques were hunting the Northern Right Whales during their annual journey along the European coastline initially on a local subsistence basis. Since approximately 1535 they expanded their whaling to the North Atlantic. At the beginning of the 17th century British expeditions went for hunting seals at Spitsbergen where they realised the abundance of

[3] For summarising overviews see for instance Barthelmeß 1992; Clark 1989:87-95; Ellis 1993; Münzing 1987; Mulville 2005; Rijkelijkehuizen 2009.

whales. In the year 1611 British ship owners firstly employed Basque whalers for whaling at Spitsbergen. 1612 Dutch ships joined in the whale hunt at Spitsbergen and were immediately subject to hostility by the British. This resulted in the establishment of a Dutch whaling company in 1614, which sent out armed ships to protect the national whalers. Until 1615 Denmark and Norway were able to take part in the enterprise. Whaling was conducted on the traditional Basque way with small rowboats and hand harpoons. This method implied that only some species were in the range of the whalers, the ones who are swimming slow enough and do not sink when killed, which resulted in their English name "right whales". Hunted were almost exclusively Bowheads and Northern Right Whales in the sheltered bays of Spitsbergen, Jan Mayen and Greenland, which were their birth places. The dead whales were brought to stations at the coast, where the blubber was processed (bay fishery). Reacting to the hunting pressure the whales retreated from the coastline and probably already mid of the 17th century the population has been significantly reduced. Consequently the whaling stations became unprofitable and were all abandoned by the end of the 17th century. When the 1st German company from Hamburg joined the business in 1643, whaling was already mainly an offshore activity (ice fishery, pelagic fishery). At the beginning of the 18th century the whale populations had declined dramatically and consequently profits dropped rapidly. In search for new sources of profit the Sperm Whale came into the fore since 1713. 1789 whaling was extended into the Pacific Ocean. The supply of ships with steam engines and fire armed harpoons since the 1860s allowed hunting of the fast swimming rorquals for the first time. Between mid of the 17th and end of the 19th century more than 10.000 German whaling voyages are documented, approximately 1,600 of which were carried out from Bremen. Turning towards local issues, the 1st whaling ship left Bremen for the North Atlantic in 1653. Bremen ships took part in pacific whaling activities from 1836 on. The last classical whaling voyage from Bremen took place in 1872 (Ahlers 1911[1988]; Meyer 1965; Küchelmann 2008)[4]. To give an impression of the economic importance: Between 1653 and 1709 during 300-350 whaling voyages from Bremen 1,100-1,300 whales were caught (Küchelmann 2008:132-136; Meyer 1965). Between 1695 and 1868 1,554 ships caught 3,749 whales plus more than 590.000 seals (Ahlers 1911[1988]:35). One whale would provide approximately 100-150 barrel of blubber plus 500-550 pieces of baleen. The price of train oil in Bremen fluctuated from 1688 to 1799 between 5.5 and 28.0 Reichsthaler per barrel (Meyer 1965). As an example for baleen one ship brought 5,000 pounds from two caught whales in 1692 which were sold for 3.000 Reichsthaler (Koster 1700[2004]:375). Between 1813 and 1830 the income of an average craftsman was 150-200 Reichsthaler per year, a teacher earned 1000 Reichsthaler per year (Schwarzwälder 1995:94).

The key data given above shall highlight some important circumstances: Since 1611 European whaling was an exclusively commercial enterprise with high business risks, enormous profit rates and a large impact on the related societies. Whaling was one of the main motors of the industrial revolution. It changed the involved societies and economies completely and – who wonders – resulted in national and international political complications. And – turning to the bone objects in question here – it also left a directly visible imprint on the landscape. Applying the above outlined historic facts has implications on the species composition of the whale bone objects in the whalers home countries: Between the beginning of the 17th and early 18th century only Bowheads and Northern Right Whales were in the reach of whalers and subsequently are the only ones that could have been brought home from the Arctic. From the early 18th century onwards Sperm Whale bones can be found. Bones of rorquals cannot be used for monuments before the 1860s. Exceptions are some monuments consisting of bones of stranded individuals. Few data exist for the European subspecies of the Grey Whale, which almost certainly had been hunted to extinction already around 1700 (Barthelmeß 1992:50).

[4] There has been a short German whaling revival in the early 20th century, which is left out here.

History of the use of whale bones as architectural elements

The presently oldest documented evidence for the use of large whale bones as architectural elements has been found at the Neolithic settlement of Skara Brae, Orkney Islands, Scotland, where jaw bones and a skull seem to have been used as roofing material (Clark 1989:107; Mulville 2002:40-41; Redman 2004:297). Chronologically next following are archaeological records from the Iron Age of the Shetland Islands, Scotland. Here a Sperm Whale skull fragment has been used as cover of a stone drain at the site of Dun Vulan, South Uist, two hollowed out vertebrae were used as supports for a hearth at

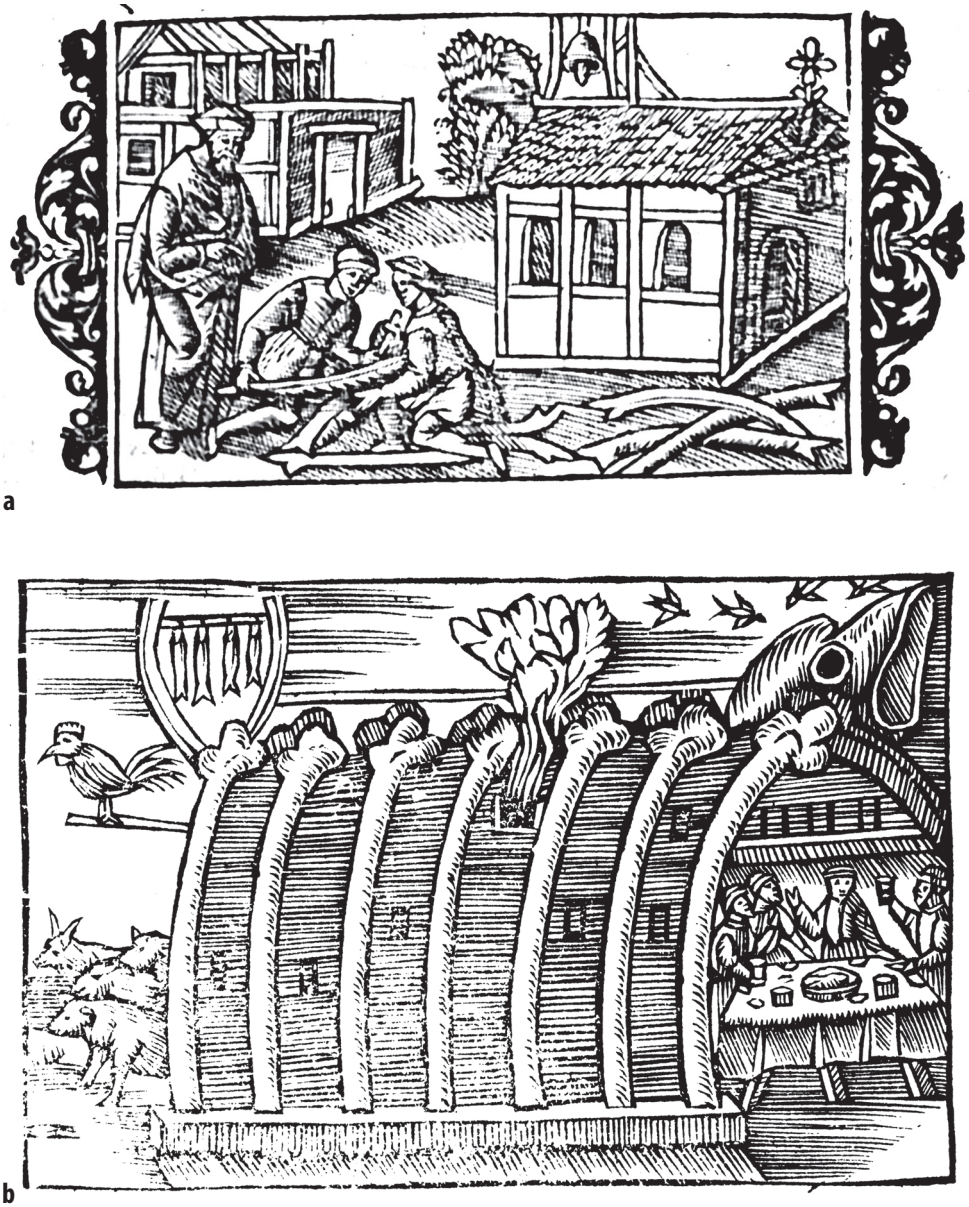


Fig. 2. Woodcuts from Magnus (1555, book 21); a) carpenters sawing whale bones for construction use; b) hut built from whalebones

A'Cheardach Mhor, Drimore, South Uist, and several objects of modified whale bone have been utilised as stakes and supports at the broch of Scalloway, Mainland (Mulville 2002:40-41; Smith 1998).

For the Early Middle Ages archaeological evidence has been found again on the Shetland Islands at the Norse site of Kilpheder, North Uist, where a Blue Whale humerus has been built into a wall (Mulville 2002:40-41). More regularly whale bones have been used for house construction at sites of Arctic indigenous cultures like the Thule Inuit (ca. 1000-1600 AD) in Greenland and Canada (Clark 1989:107; Pax 1933:365-366; Savelle[5] 1997, 2000). Here large parts of the skeleton of Bowheads have been used for the construction of different buildings like dwellings, ceremonial houses, burials, caches and boat rests. Different skeletal elements have been utilised for different functions depending on their shape and dimensions, e. g. mandible, maxilla, scapula and ribs for frames and roofs and compact elements like skull, radius, ulna and vertebrae for walls.

Other evidence can be extracted from historic documents. The probably oldest reference is a report of Nearchos, admiral of Alexander the Great. Nearchos, sailing from the mouth of the Indus to the Euphrat in 327 BC, reports about his encounter with the Ichthyophagi, who use bones from stranded whales to build their houses. His report is lost but quoted in detail by Flavius Arrianus (2nd century AD) in his Anabasis Alexandri[6]. Further Strabo (63 BC

[5] With lots of further references.

[6] *„This man returned and reported that he found some fishermen upon the shore living in stifling huts, which were made by putting together mussel-shells, and the back-*

– 19 AD) quotes the report in his Geography[7], Plinius (23-79 AD) in his Naturalis historia[8]. Much later, in the 16th century, Olaus Magnus gives a detailed description of the features of houses made by the Scandinavien tribes from the bones of stranded whales (Fig. 2)[9]. Finally, there are medieval reports on church doors in Iceland made of whale bones[10] (Saeftel 1970:135).

At the Arctic Inuit sites it is obvious that the use of whale bones is a necessity resulting out of the lack of other appropriate construction materials. In remote Northern places like Iceland, the Shetlands or the Orkneys construction materials like wood or stone maybe not available in sufficient quantities and whale bones may at least come in handy in certain circumstances. However, this precondition does certainly not hold true for the Central European home countries of the commercial whalers where wood and other construction material is abundant. Carrying whale bones from the Arctic to Central Europe as construction material does not make sense from the economic point of view, which was the first priority of the ship owners. Nevertheless whale bones appear in significant quantities in Central Europe with the begin of the Early Modern European large scale whaling in the 17th century, not only in coastal areas but also in the inland (Redman 2004, 2009, 2010a, 2010b). In the following chapter different uses of large whale bones in Central Europe shall be presented using mainly examples from the city of Bremen. Reasons and motives shall be discussed.

bones of fishes were used to form the roofs." (Arrian, Anabasis, book 6b, chapter 23); „*The richest among them have built huts; they collect the bones of any large fish which the sea casts up, and use them in place of beams. Doors they make from any flat bones which they can pick up. But the greater part of them, and the poorer sort, have huts made from the fishes' backbones."* (Arrian, Anabasis, book 8b – Indica, chapter 29); *„Some of these whales go ashore at different parts of the coast; and when the ebb comes, they are caught in the shallows; and some even were cast ashore high and dry; thus they would perish and decay, and their flesh rotting off them would leave the bones convenient to be used by the natives for their huts. Moreover, the bones in their ribs served for the larger beams for their dwellings; and the smaller for rafters; the jawbones were the doorposts, since many of these whales reached a length of five-and-twenty fathoms."* (Arrian, Anabasis, book 8b – Indica, chapter 30); see also Ellis (1993:43) and Saeftel (1970:139).

[7] „*Their dwellings are built with the bones of large whales and shells, the ribs furnishing beams and supports, and the jaw-bones, door-ways. The vertebral bones serve as mortars in which fish, which have been previously dried in the sun, are pounded."* (Strabo, Geography, book 15, chapter 2).

[8] „*The commanders of the fleets of Alexander the Great have related that the Gedrosi, who dwell upon the banks of the river Arabis, are in the habit of making the doors of their houses with the jaw-bones of fishes, and raftering the roofs with their bones, many of which were found as much as forty cubits in length*." (Plinius, Naturalis historia, book 9, chapter 2).

[9] „*9. Of houses erected from whole whalefisch ribs. When the meat and the intestines of this monstrous animal are consumed and decomposed, the bones remain altogether. They look like a large ship. When rain and air has cleaned and whitened them, folks were ordered, who carry them to the place where they are wanted and erect them like a house. At the top of the roof ridge or at the sides smoke holes were included, the whole is divided up into convenient rooms. From the skin of this animal, which has been treated and dried by the wind in advance, they make doors. One also provides stables for cattle and pigs therein for the livestock, like in other houses*." Translated from the German version (Magnus 1555/2006:331-332, book 21, chapter 9) by the author.

[10] „*Churches and other buildings are constructed from fishbones, that is whale bones, and these are called ‚criptoporticus'*." Unfortunately Saeftel (1970:135) does not give a source for his quote.

Function of whale bones in Early Modern and Modern Central Europe

Whale bones as constructive elements in buildings

Olaus Magnus' report on whale bone houses has been sometimes questioned as an unrealistic legend. Seen from the present state of research it was probably a common practise in the Middle Ages in certain regions of Northern Europe. In fact houses that are built alike the one illustrated by Magnus (Fig. 2:b) survived until the 20th century even in England, Scotland and Ireland. Fig. 3:a shows the whale jaw shed in Whitby, Co. North Yorkshire, short before its regrettable final demolition in 1930 (Redman 2004:171-172; Saeftel 1970:132)[11]. Similarly, only a photo survived of a barn in Bremen (Lesumbroker Landstraße 111, Fig. 3:b) which was built with

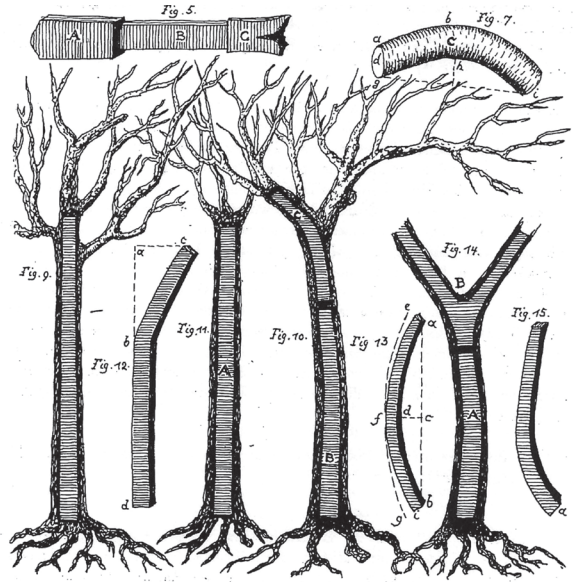
[11] Further buildings with incorporated whale bone supports are documented from England (a 2nd one in Whitby; Liverpool; Kings Lynn and Wiggenhall St. Germans, Co. Norfolk), Scotland (Greenland and Whaligoe, Co. Highland) and Ireland (Port, Co. Donegal; Strandhill, Co. Sligo) (Redman 2004:119, 132-133, 172, 281, 336, 342).

Fig. 3. Barns built with jaw bone supports. a) Whitby, Co. North Yorkshire, England, during demolition in 1930 (photo: Frank Sutcliffe, Whitby Museum; from Redman 2004:171); b) Bremen-Lesum, Lesumbroker Landstraße 111, during demolition in 1906 (photo: Focke-Museum Bremen, inv. no. B.477e); c) Bremen-Lesum, Niederbüren 2, barn with jaw bone segments in foundation (photo: Susanne Henßen 2009)

jaw bone supports, but had to be removed due to elevation of the dyke in 1906 (Redman 2009:31; Saeftel 1970:130-134). A few kilometres beyond another barn (Niederbüren 2; Fig. 3:c) still exists in good shape with two pieces of jaw bones incorporated in the foundations (Redman 2009: 36-38)[12].

The question remaining is, why did the builders of these houses choose whale bones in the documented cases? As already stated above shortage of wood is no reasonable argument neither for Bremen nor for Whitby or any of the other mentioned locations. For the two barns in Bremen a strong connection to the whaling business is evident: Both farmsteads, to which the barns belong, were inhabited by families of whaling ship captains in the 18th and early 19th century. This may account at least for the access and availability of whale bones and one may think of the purchase price in relation to wooden beams as a possible argument. I will return to this thread later on in the discussion. Another argument may have been the different material properties of bone and wood. Whale bones are more resistant to weathering and fouling than most types of wood (Ahlers 1911[1988]:25; Mohr 1935:369; Oesau 1937:308), which may have reduced the amount of care necessary for the maintenance of the buildings. There is one other hypothesis that needs to be discussed here. In a specific architectural type of roof-construction, the so-called bentwood or cruck-roofings, the anatomic features of trees are applied as constructive elements. Trees sometimes have been especially chosen and shaped during their growth for a later desired purpose as a specific constructive element in roof construction. In these cases trees are not sawn up into straight beams but the natural form of the tree is fit into the roof construction (Fig. 4). Cruck houses can be documented from the early Middle Ages onward in North-West Europe (Saeftel 1970). If this hypothesis holds true, Baleen Whale mandibles may have

[12] Apart from the two mentioned buildings in Bremen there is one other documented building in Germany and only rumours remaining about a second one. The former is a pigsty from the village of Oevenum, isle of Föhr, built out of 10 jawbones, now restored in the Carl-Häberlin-Friesenmuseum in Wyk (Oesau 1955:216-219; Redman 2009:120-122). The latter is a barn in Klein-Grönland, Schleswig-Holstein, said to have had 10-12 jaw bone supports and to be demolished mid of the 19th century (Oesau 1937:308-309; Redman 2009:xxv, 131).



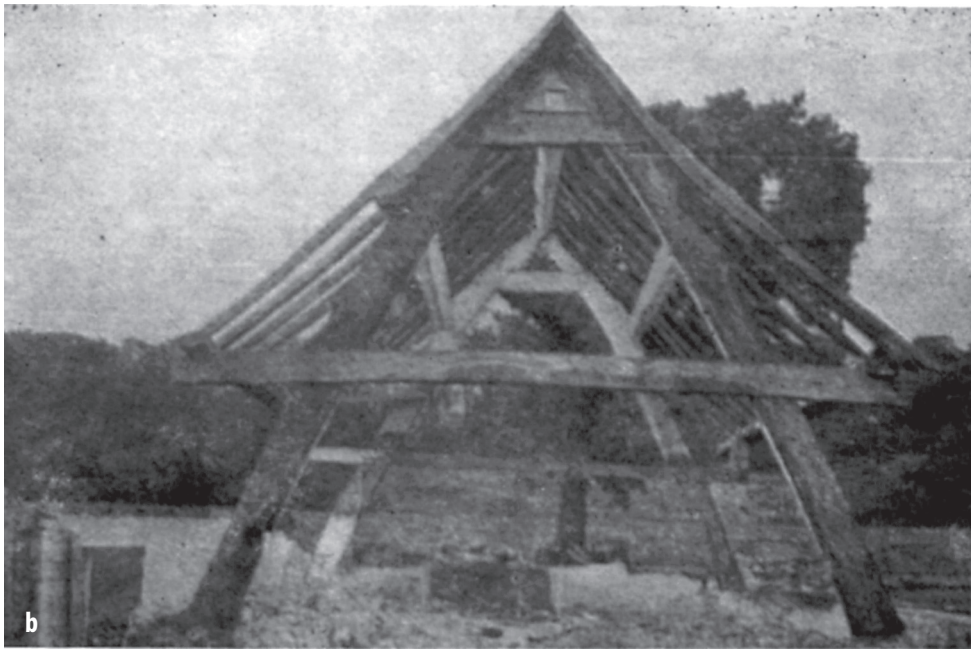


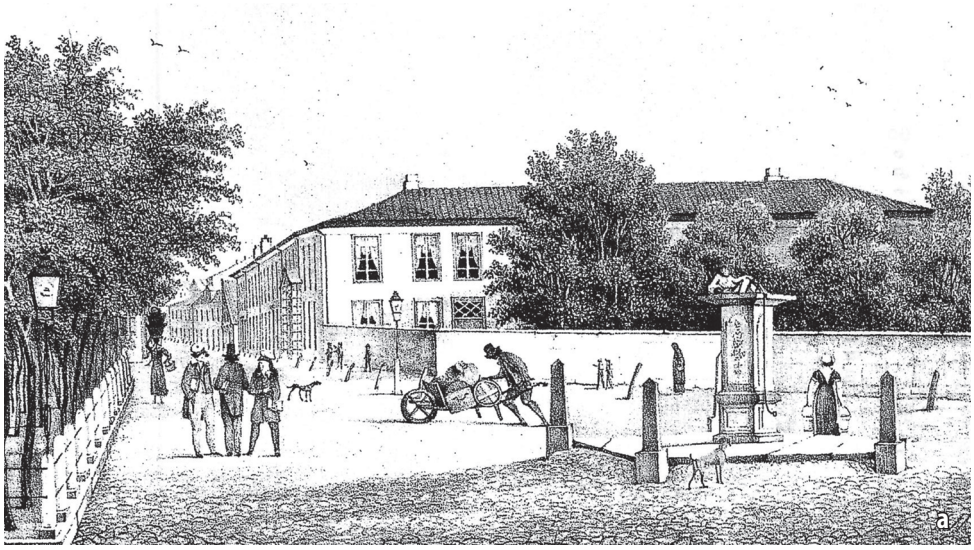
Fig. 4. a) Detail from an 18th centrury technical book on forest economics: „De l'Exploitation de Bois" by du Monceau, Paris 1764; b) cruck house in Midhope, South Yorckshire (from Saeftel 1970:12, Fig. 2)

Fig. 5. Examples of jaw bone arches; a) Schwanewede, Leuchtenburger Straße 44, still in situ (photo: Küchelmann 2009); b) Bremen-Lesum, Lesumbroker Landstraße 111, arch no. 1 (photo: E. Eisinger ca. 1900; Focke-Museum Bremen, inv. no. L98); c) Bremen-Neustadt, Kirchweg 200 (photo: Helga Koch 1972); d) half of the same arch today (photo: Küchelmann 2009)

been sought for in some cases because of their shape which may have been ideal for this type of house (Barthelmeß 1989:245-247; Saeftel 1970:130-140).

Jaw bone arches

The most eye-catching use of large whale bones were archways made of two lower jaws placed upright into the ground with the condyles at the bottom. These objects pose less interpretative problems than the former. They were usually erected by individuals, families or communities with relations to the whaling business. Often captains of whaling vessels brought a pair of jawbones home and erected them in front of their estates. Ship-owners and merchants also had a preference for arches. In most cases these arches represent symbols of status, profession, prestige and wealth as well as aesthetic or decorative elements. The habit became a Europe wide fashion in the 18th century and persisted until the early



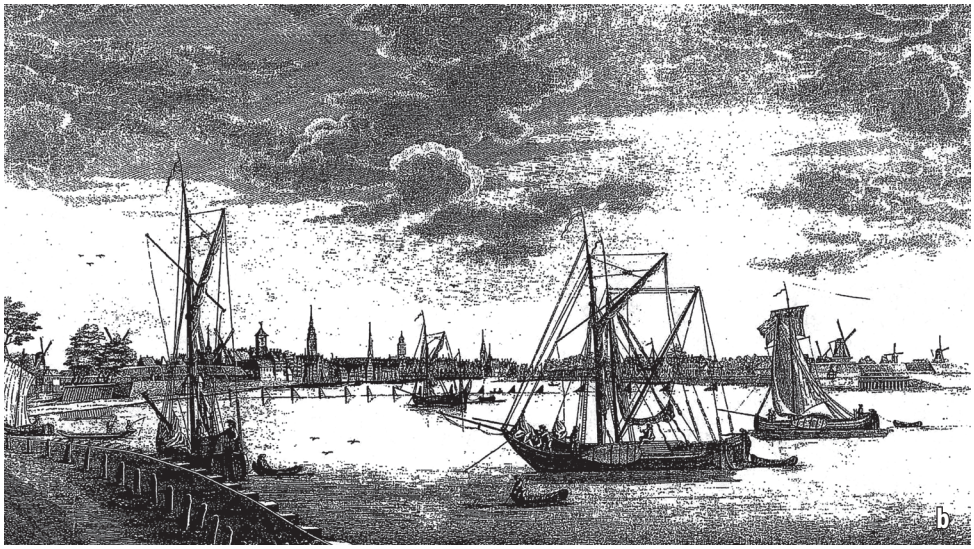


Fig. 6. Whale bone post rows in Bremen
a) Domsheide, 24 posts along the wall, lithograph of 1819, probably by Gottfried Menken;
b) Stephanitorsbollwerk, 16 posts along the river banks, copper engraving by Wolfgang C. de Mayr after drawing by J. H. Grönninger 1773;
c) Wallanlagen, photo by Erna Mohr 1933

Fig. 7. a) The bark ‚Harmony' from Hull, England, with six whale jaw bones lashed to the masts, aquatint by Edward Duncan after painting by William John Huggins 1829 (from Barthelmeß 1989:244, Fig. 1); b) Bowhead humerus head with bone oil holes (from Barthelmeß 1989:251, Fig. 8)

20th century. One can pose a gender question here: As the whalers were exclusively men, this is obviously a male habit. For Bremen at the present state of research 16 arches can be tracked historically, six of which are still remaining as mounted monuments today, one has been replaced by a bronze replica and one is stored in a warehouse (Fig. 5)[13].

Posts and post rows

Post rows probably once have been the most frequent feature of whale bones in Bremen. Several 19th and early 20th century authors report on the use of whale bone segments as fender posts to separate vehicle from pedestrian lanes, to protect houses from the wheels of vehicles or simply for decorative reasons[14]. At the present state of research it was possible to track down 11 historical objects (single posts or post rows) with a minimum of 57 posts[15]. Today three are remaining, only one of which is still in situ. Figure 6 shows three of these locations. The Domsheide (Fig. 6:a) is one of the most central and main public places then and today, adjacent to the dome and the market place. The Stephanitorsbollwerk (Fig. 6:b) is situated outside the Early Modern city defences in an area where the train oil factories were located in the 18th and 19th century (Küchelmann 2008:134). Whale bone post were obviously so abundant in Bremen, that they became objects recognised as absolute normality, not worth to be mentioned or kept in mind or any record. A particularly apparent example for this are the posts visible in fig. 6c. They are situated in the former city defence area converted into a highly frequented public park in 1802 and were photographed by zoologist Erna Mohr in 1933. Although the public parks department keeps an extensive historical archive about

[13] Two arches in the village of Leuchtenburg, located just across the city boundaries of Bremen in the adjacent county of Osterholz, are included here.

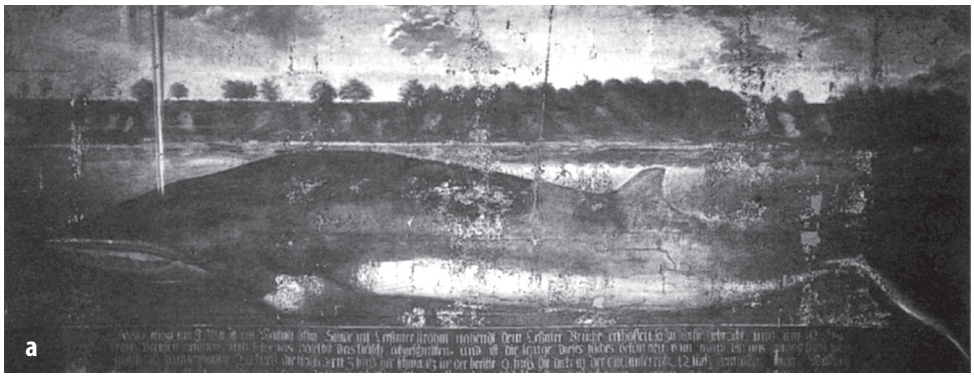
[14] For example: „*Vor den Häusern waren dickleibige Pfähle angebracht, welche die Mauer [...] zwar schützten, den Fahrweg aber noch mehr verengten. [...] In Bremen recht häufig fußdicke Stücke von Walfischkinnladen, die man oben glatt absägte und mit Blech benagelte.*" Kohl (1871:4). „Thick posts were fixed in front of the houses, which protected the wall, but further reduced the vehicle lane. [...] In Bremen quite frequently foot thick pieces of whale jawbones, which were sawn plain at the top and shod with iron covers". See also Redman (2009:45).

[15] Five additional possible locations await clarification presently.

the development of the parks there is no trace left of these quite impressive objects in the records and the exact location is still unknown.

The obvious abundance of whale bones utilised for quite profane objects in public areas makes the inconsistency with the profit interests of the whaling companies already mentioned above apparent. Digging down deeper here reveals several literal and iconographic sources from the 18th to 19th century reporting on a specific custom of European whalers to carry the jaws of the whales back home lashed to the masts of their ships (Ahlers 1911[1988]:34; Barthelmeß 1989; Oesau 1937:308; Redman 2004:xvii-xxii). A comprehensive analysis of iconographic representations of whale bones carried on sailing ships (Fig. 7:a) dated between 1780 and 1849 has been published by Bartelmeß (1989). The prime reason for this custom was not to bring jaws back home as status symbols. Instead it was a method to extract oil contained in the jaw bones. Holes where drilled into the condyles (Fig. 7:b) and a barrel was placed on deck underneath. During the return voyage the oil – said to

Fig. 8. Right scapula of Bowhead (*Balaena mysticetus*) painted as advertising sign for a distillery in 1745, Focke-Museum Bremen, inv. no. B.1151, lost (from Barthelmeß 1994:261)



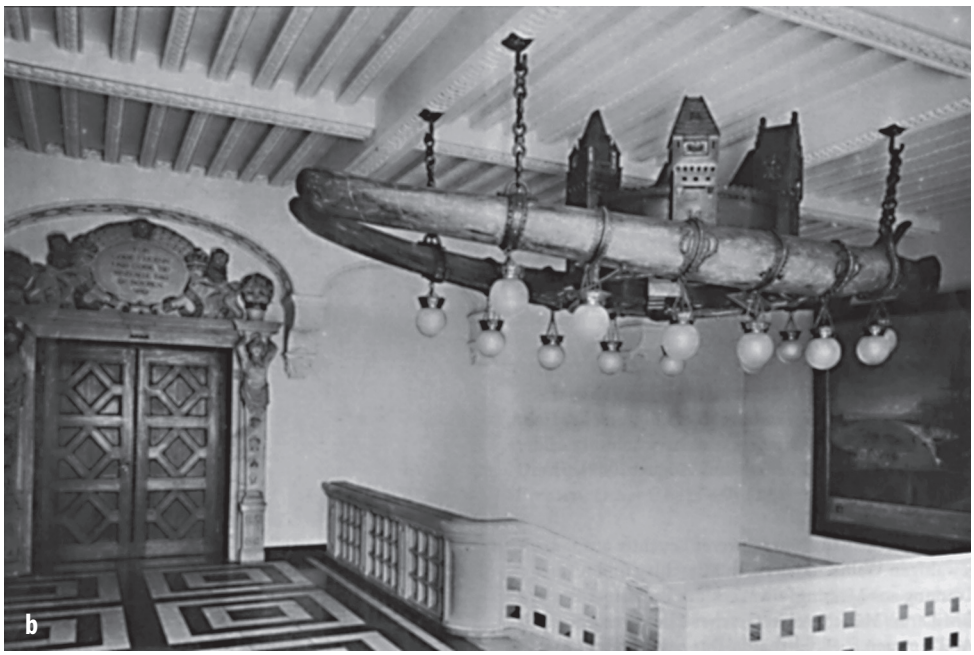


Fig. 9. a) Minke Whale (*Balaenoptera acutorostrata*) shot in the river Weser in 1669, oil painting by Franz Wulfhagen 1669; b) chandelier of Common Rorqual (*Balaenoptera physalus*) jawbones in the city hall 1921 (photo: collection Barthelmeß, from Redman 2009:39)

be of extraordinary fine quality – slowly drips into the barrels[16]. Even some notes on prices for jaws are conveyed: A pair of jaw bones was sold for 30-32 Shilling in Hull, England, in the 1820s to 1830s. Other sources from Hull are speaking of prices between 12 Shilling and 2 Pounds 4 Shilling per pair in 1844 depending on the size with an average of 1 Pound per pair. However, according to Captain William Barron from Hull, talking about the "late days" of whaling in 1895 the price declined at the end of the 19th century: "*they do not pay for the care and trouble of bringing them home. The price used to be 30s per pair.*" (Barthelmeß 1989:251-252; Redman 2004:xix-xxi). The practice provides a convincing explanation for the abundance of whale bones in Europe in general and for the overrepresentation of jaw bones compared to other skeletal elements in particular.

Signs

Another function less frequently recorded is the use of whale bones as signs suspended at pubs, guesthouses, shops, etc. to attract customers. For this purpose in the majority of cases the scapula has been utilised, which offered a large flat surface area to be painted and inscribed. For Bremen one extraordinary specimen of this type of object is documented, a painted right scapula of a Bowhead used as sign for a distillery (Fig. 8)[17].The painting shows glasses, distillation devices and a Bowhead. On the bottom an advertisement tells "Here brandy is sold and distilled"[18]. The painter has kindly added the year 1745. The exact location of the former distillery is not known. The sign entered the records for the first time in 1884, when it was exhibited in an exposition about whales and whaling. In 1919 it became part of the collection of the Focke-Museum and although not destroyed it got lost in the 2nd World War.

Fig. 10. Cattle rubbing post, Bremen-Lesum, Niederbüren 2 (photo: L. G. ca. 1905; Focke-Museum Bremen, inv. no. B.477c)

Exhibition objects

At least since the origin of the Early Modern Wunderkammern in the 16th century whale bones attracted attention as collectable items (Barthelmeß 1994:260-261) and during the whole period covered in this paper – from the 17th century until today – there are numerous examples of whale skeletons and skeletal elements in museum collections and exhibitions. For Bremen presently 19 items are recorded, 16 of which are still existing[19]. Only three objects of special interest shall be introduced here.

On the 9th of May 1669 an unlucky Minke Whale swam approximately 60 km up the river Weser until the city of Bremen, where he was shot with a gun. A life

[16] An example of a lively description gives Friedrich Gottlieb Köhler in 1820: „*Die Kinnlade wird gleichfalls hinauf gewunden. Man hängt sie an die Wände des Schiffes und setzt ein Faß darunter, worein nach und nach ein feiner Thran tröpfelt ...*" „The jaw is wound up as well. One suspends them in the shrouds of the ship and sets a barrel underneath, wherein by and by a fine train oil drips ...". Quoted after Barthelmeß (1989:251). Other sources quoted by Barthelmeß (1989:250-251) are Carl Friedrich Posselt (1795) and William Scoresby (1820). See also Redman (2004:xvii-xix) quoting Walter Scott (1821) and William Bell (1862).

[17] Barthelmeß (1994) gives a detailed description of seven additional painted scapulae used as advertising media from other locations. In Hamburg the name of the street ‚Schulterblatt' is said to have been derived from a scapula pub sign. For these and other whale bones as signs in Germany see also Redman (2009:9-11, 15-16, 33-34, 44-45, 53-54, 56-58, 87-88, 111, 117-118, 129-130, 133, 136-137, 150). A rib in front of a pharmacy in Verona, Italy, may be mentioned here as example for other skeletal elements used for the same purpose.

[18] „*Hir vorkaufft und brenndt man Brhanndte Wein*".

[19] Two arches, one set of posts and the above mentioned sign, displayed in two museums have been counted also in the other categories.

size painting was made of the whale (Fig. 9:a). Later on the whale was flensed and processed, the skeleton was macerated and mounted in the city hall alongside with the painting. 1809 the skeleton was transferred to the museum, where it is still on display, being the oldest mounted large whale skeleton at least in Europe (Redman 2009:40-42). In 1884 a large exhibition on whaling was held in the garden of the artists society showing a variety of exhibits around the topic whales and whaling. Today in the city hall a chandelier consisting of two 5.40 m long jaw bones of a Common Rorqual is installed (Fig. 9:b).

Miscellaneous

Other utilisations of whale bones include fences, bridges, boundary stones, cattle rubbing posts, draw wells, tomb slabs, seating devices (like chairs, stools, benches) and chopping blocks (Oesau 1937, 1955; Redman 2004, 2009, 2010a, 2010b). Of all these functions only two objects are recorded for Bremen, a chair made of a vertebra in the Museum Schloss Schönebeck (Redman 2009:36) and a cattle rubbing post (Redman 2009:38) once set in a field in Bremen-Lesum (Fig. 10).

Summary

The city of Bremen stretches approximately 50 km along the river Weser, it covers 325 km^2 and has approximately 546,000 inhabitants[20]. For this rather small area at the present state of research 46 objects could be documented consisting of a minimum of 119 bones (Table 2)[21]. This is probably only the tip of the iceberg. There are still several objects that need to be clarified before they can be included in the statistic as confidently recorded. Most probably many objects have long vanished without leaving any trace. Com-

[20] Status September 2010, http://www.statistik-bremen.de/aktuelle_statistiken/01b.htm, 26.1.2011.

[21] For a compilation of the majority of objects from Bremen described in this article see also Redman (2009:26-45).

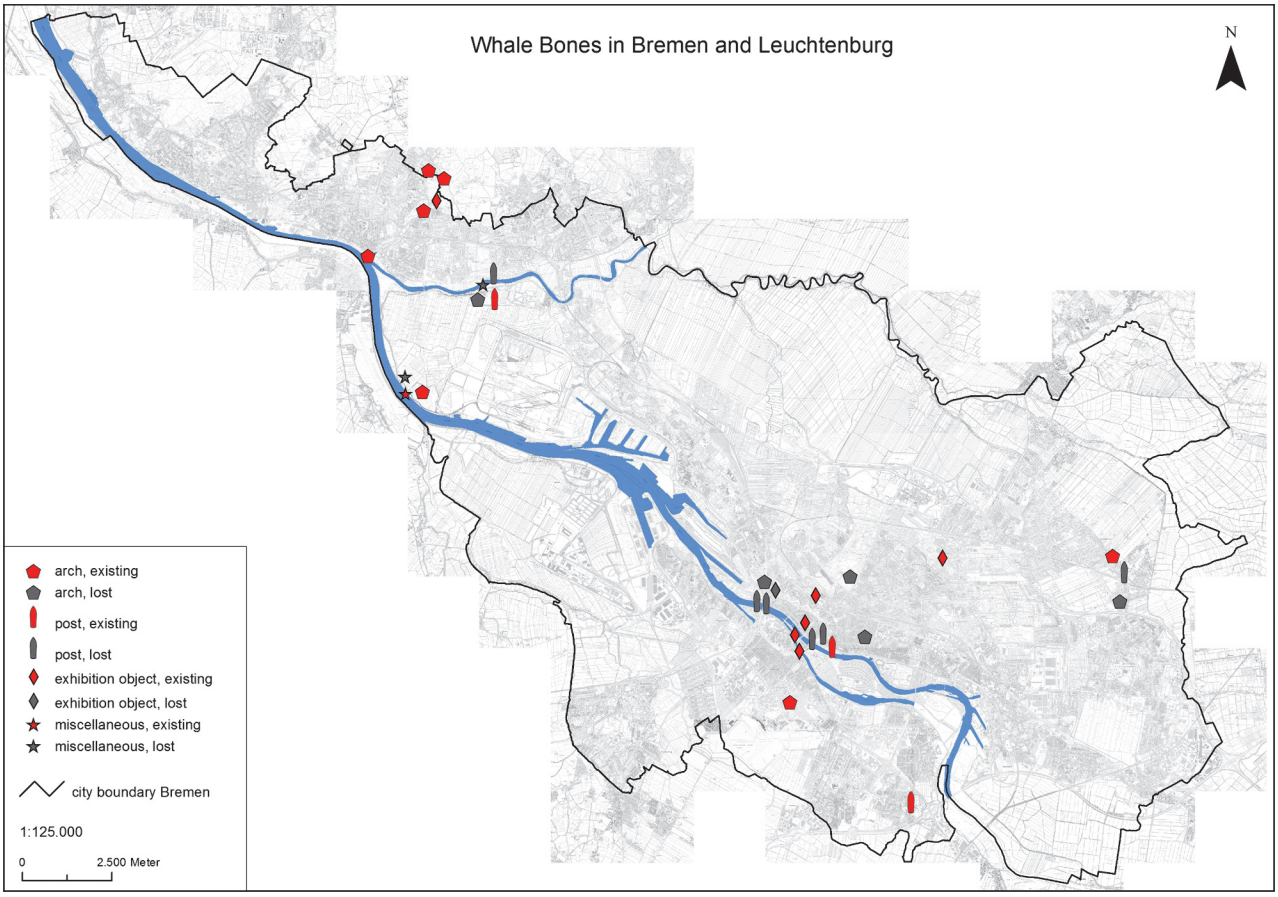


Fig. 11. Map of Bremen with the location of historic and present distribution of whale bone objects

paring the historic record with the situation today it becomes evident that at least 41% of the objects once existing have been lost, counted by single bones this number increases to 64% of lost bones. This is mainly due to the posts / post rows of which nearly all are gone today. In contrast nearly all the items stored in museums survived, a fact that can easily be attributed to curating and the lack of weathering in sheltered indoor conditions. To visualise this, the historic and present distribution of the whale bone objects has been plotted on a map of the city (Fig. 11). What becomes readily apparent here and needs to be explained are the three visible clusters. The cluster in the North-West is most strongly related to the real whaling history. The harbour of Bremen-Vegesack was built 1618-1623 and became the main whaling harbour of Bremen since the middle of the 17th century. In its vicinity many whaling ship captains had their homesteads, which resulted in a concentration of whale bone objects in this area. The cluster in the area of the city centre is probably simply due to the fact that it was the main centre of activity since the Early Middle Ages. Further, it is the location of the two main museums. Less easily to explain is the cluster in the East. These are the today's city quarters of Oberneuland and Rockwinkel, formerly independent villages in the countryside under the administration of the senate of Bremen, not within the city boundaries until 1921. Since the 17th century both villages were a favoured settlement area of wealthy citizens of Bremen, who built summer residences with large parks here (Stein 1967:92-94). Most of these citizens were involved in the trading business and therefore several arches erected here seem to have been more a reflection of the felt affiliation to seafaring of this clientele than an evidence of direct practical involvement in whaling itself. In particular: While in the Northern quarters of Lesum, Leuchtenburg, Vegesack and Schönebeck, the occurrences of whale bones are mainly related to the estates of families of whaling ship captains, often farmers, the bones in the quarters of Oberneuland and Rockwinkel are mainly related to large manors owned by persons of high social status, often ship-owners and merchants.

As I hopefully was able to demonstrate, this is just the beginning of an extensive research project. Lots of questions waiting to be revealed and resolved. Additional facts and information is still very welcome. And if you, dear reader, happen to find a whale bone in a condition like the one in figure 5:d, please take action!

Table 2. Whale bone objects in the city of Bremen and Schwanewede-Leuchtenburg

class of object	no. of objects historic evidence	no. of bones historic evidence	no. of objects today	no. of bones today
arches	16	32	8	16
posts / post rows	11	57	3	3
exhibition objects*	16	23	15	22
miscellaneous	3	7	1	2
total	46	119	27	43

1arch = 1 object but 2 bones; 1 post row = 1 object but n bones

* 2 arches, 1 at the Museum Schloss Schönebeck and 1 at the former location of the Focke-Museum, have been counted as arches; 1 set of 3 posts formerly in the Focke-Museum, now lost, has been counted as post row; of 3 complete skeletons in the Übersee-Museum (two mounted), the single bones have not been counted, they are included here as 3 objects / 3 bones.

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A research like this cannot be undertaken without the aid of many helpful persons. I am first of all indebted to Nicholas Redman (Teddington, UK) without whom the large set of detailed data, of which this paper is only a short summary, would not have been as comprehensive as it is now. I would like to dedicate this paper to Klaus Barthelmeß (Köln), who contributed valuable information for several years and also to this paper. Klaus died unexpectedly in February 2011 while this article was in preparation. I am further grateful to the following persons for their contributions, interest, support, photos, patience, ... :

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