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A comparison of animal bones from two wrecks of ships (17th and 18th century) stranded on the North Sea coast of Schleswig-Holstein

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Abstract. Animal remains from two Modern-Age wrecks of cargo boats are compared. The assemblage rescued in the wrecks is strongly influenced by taphonomic circumstances as well as the quality of the cargo. One boat contained nearly exclusively remains of cargo, i.e. bones of processed haddock. These bones are interpreted as remains of a cargo which was ruined by water and thus not worth saving. In the other wreck the excavator found no remains which could have been derived from cargo. It is therefore assumed that the ship had loaded cargo which was not destroyed by water and could be salvaged. The excavation brought forth, however, a lot of objects from daily life as well as animal remains of different mammal species, primarily domestic ones, fowl, and fish, which in all probability must have belonged to the provisions of the crew.

Key words. Archaeozoology, ship wreck, haddock, cargo, provisions, excavation produce.

Introduction

In the course of time, many ships were stranded on the coast of the North Sea (Kühn 1995), some of which could be excavated in the recent past (van der Horst 1991; Kramer 1995; Kühn 1995; Nissen 1969). Not only the ships themselves could be secured in order to study their type and how they were built, but also different finds, which either belong to the equipment of the ship and the property of the crew or represent remains of the cargo, are available for analyses. Such analyses can thus point to trading activities and throw light on life on board (e.g. Brinkhuizen 1994a, 1994b; Englert 1997).

Two wrecks were excavated in a now marshy area near the coast of the North Sea in Schleswig-Holstein. Besides other finds, they contained some animal bones, among which remains of fishes predominated. This material is discussed in the following study.

The wreck from the Hedwigenkoog, Kreis Dithmarschen

This wreck was discovered in 1969 in the Hedwigenkoog some hundred meters to the north of Büsum (Fig. 1) in the northern part of Dithmarschen. Obviously it was wrecked during a tidal wave, for it was found in a former „Wehle“, a deep hole caused by streaming water, in the gap of the embankment in the western part of the Hedwigenkoog, where the dike broke several times between 1717 and 1723 AD. According to dendrochronological investigations, the ship was built not earlier than 1690 AD. The type of the ship as well as its equipment point to the early 18th century, and the remains of the cargo and objects of daily life (e.g. ceramics, leather shoes) in it date from around 1720 AD.



Fig. 1. Schleswig-Holstein, with the topographic situation of the localities and waters mentioned.

Several circumstances, like its topographic situation within the „Wehle“ and the remains of the cargo (see below), seem to rule out that the ship was sunk in order to close the dike. Probably the ship was stranded and it must have been the wreck which caused the rupture of the embankment. Later the ship must have broken up, its valuables been emptied, and itself unrigged.

In 1969 the wreck was going to be excavated, but several unfavourable circumstances allowed only some parts of the structure and findings to be rescued. It was only recently that the wreck as well as the finds were analysed, primarily on the basis of photographs, drawings and excavation reports (Englert 1997); the fish remains which were secured shall be described below.

The wreck from the Uelvesbüller Koog, Kreis Nordfriesland

This wreck was discovered in the Uelvesbüller Koog at the seaside embankment of the Adolfskoog in the northern part of the Eiderstedt peninsula (Fig.1). It was found at the base of the embankment where it obviously was stranded, its plank board partly broken up. Several traces of saw and axe show that the crew – or other persons – had tried to save parts of the ship like stem, deck and rig. According to the archaeological finds, the stranding of the ship must have happened in the first half of the 17th century. Therefore, it may be assumed that this ship was some 100 years older than that of the Hedwigenkoog.

During its excavation in 1994, which was carried out very carefully, a relatively large number of objects was found. Most of them came from near the fire-place, including some of daily life items like pottery, a coin, a comb and a girdle, tools like a knife, and fuel (firewood, peat). Several bones were also discovered there and these are reported below.

Material and methods

The bones discovered in the two wrecks (Tables 1 and 3) were identified based on the reference collection of the Institut für Haustierkunde, stored in the laboratory of the Archäologisch-Zoologische Arbeitsgruppe in the Archäologisches Landesmuseum in Schleswig. The material was analysed according to taphonomic features like species composition, skeletal representation, status of conservation etc. The size of the animals in question was estimated whenever possible and the ecological requirements of the identified species were taken into consideration.

Results

The wreck from the Hedwigenkoog contained a lot of fish remains. Those stored in the magazine of the Archäologisches Landesmuseum came exclusively from haddock (*Melanogrammus aeglefinus*); the total is 1538 bones and bone fragments (Table 1), as well as a number of costae, lepidotrichia, scales, etc., which were not taken into consideration. Most of the bones are vertebrae and a further number is derived from the shouldergirdle; the skeletal elements of the head are absent except for five urohyalia. This indicates prepared fish, which were already decapitated and probably gutted. The haddock remains probably were a special merchandise, which could have been also dried or salted as a sort of stockfish. The chord lengths of 60 measurable cleithra suggests an average total length between around 30 to 50 cm, according to a direct comparison with recent skeletal material (Englert 1997). Only one cleithrum with a chord length of 89 mm points to a total length of 60 cm (factor 6,75; Heinrich 1994). The mean value for the chord length of the cleithra amounts to 60,74 mm,

Table 1: Hedwigenkoog wreck. Haddock – *Melanogrammus aeglefinus*. List of skeletal elements and number of identified specimens (NISP). According to 53 right cleithra and 3 left ones without a right counterpart the minimum number of individuals (MNI) amounts to 56; exclusive of lepidotrichia, spines, scales etc. (ENGLERT 1997).

Skeletal element	left	medium/serial	right	NISP total
urohyale	•	5	•	5
supracleithrale	28	•	38	66
cleithrum	48	•	53	101
postcleithrale	29	•	35	64
scapula	16	•	21	37
coracoideum	26	•	22	48
basipterygium	18	•	22	40
vertebra praecaudalis	•	491	•	491
vertebra caudalis	•	670	•	670
pterygiophorus	•	16	•	16
total				1538

Table 2: Hedwigenkoog wreck. Haddock – *Melanogrammus aeglefinus*. Cleithrum, frequency according to size and estimation of total length (factor after Heinrich 1994; measurements: Englert 1997).

Distribution of Measurements – Chord Length cl. c. l.									
size-class mm	48–51,9	52–55,9	56–59,9	60–63,9	64–67,9	68–71,9	72–75,9	...	89–91,9
number	2	7	19	15	12	3	1		1
var.br	x		s		s_x		n		
49,0–89,0	60,74		6,66		0,86		60		
Total length (estimation)									
factor 6,75 x measurement	min ca. 330 mm			max ca. 600 mm			x ca. 410 mm		

corresponding to an estimated total length of 41 cm (Table 2). The maximum length of haddock is about 100 cm (Ehrenbaum 1936). The relatively uniform size of the fishes also points to merchandise. All in all, 101 cleithra were found, which refer to a minimum number of 56 individuals according to body side and size.

Besides these fish remains, only some remains of movable objects like pottery or shoes and some fuel (peat) were found. As stated above, the fixed equipment on deck was obviously dismantled. It is therefore to be concluded that only non-valuable items were left in the wreck, i.e. that part of the cargo which was ruined by water. In this case, the fish probably had been the main part or even the whole of the cargo, for it must be conceded that an unknown part of the bone material would have been overlooked in the clay-soil during the excavation, which was carried out without any sieving. However, two samples of approximately 5 to 10 litres of soil were saved and sieved during the retrieval campaign. All haddock remains come from these samples. Because of their special quality, these haddock remains are not derived from the provisions of the crew. In that case, remains of various species ought to be expected. However, a flatfish skeleton found near the fire-place could have been a remnant of the provisions. Unfortunately the skeleton is lost; only a slide of it exists in the archives of the Archäologisches Landesmuseum. It can be assumed that further animal remains of the provisions, apart from that skeleton, were overlooked just as remarked above for many haddock bones.

The animal remains from the wreck from the Uelvesbüller Koog are of a different quality. Many objects of daily life were found and the animal remains, which primarily are remains of provisions, probably belong to them (Table 3). Besides some undeterminable bone fragments (mainly of large or medium-sized mammals), remains of cattle (*Bos primigenius* f. taurus) and pig (*Sus scrofa* f. domestica) were identified. They come from more or less fleshy parts of the body (costa, sacrum, tibia). A very large first vertebra (atlas, BFcr: 58,5 mm; Table 4) could have belonged to wild boar (*Sus scrofa*). Horse (*Equus ferus* f. caballus) is represented by a second phalanx. This seems peculiar, for there is no meat in the distal part of the extremity to which this skeletal element belongs.

Fowl are represented by some remains of chicken (*Gallus gallus* f. domestica) and goose (*Anser anser* f. domestica?). These bones are partly from the tip of the wing, especially in the goose (2 phalanx 1 anterior, 1 phalanx 2 anterior, 1 carpometacar-

Table 3: Uelvesbüller Koog wreck. Species list according to the number of identified specimens (NISP) and to the minimum number of individuals (MNI); * probably *Pleuronectes platessa*; 9 fragments of mammal bones, 1 bird bone, and some fish scales could not be determined.

Species	NISP	MNI	Skeletal Elements
<i>Bos primigenius</i> f. taurus	4	1	sacrum, 2 costae, cartilago costalis
<i>Equus ferus</i> f. caballus	1	1	phalanx 2
<i>Sus scrofa</i> f. domestica	2	1	2 tibiae
<i>Sus scrofa</i> ?	1	1	atlas
<i>Rattus</i> spec.	1	1	incisivus
Mammalia total	9		
<i>Gallus gallus</i> f. domestica	2	1	carpometacarpus, tibiotarsus
<i>Anser anser</i> f. domestica	6	1	vertebra, humerus, carpometacarpus 2 phalanges 1 ant, phalanx 2 ant.
Aves total	8		
<i>Clupea harengus</i>	5	1	dentale, 4 vertebrae caudales
Cyprinidae	1	1	vertebra praecaudalis
<i>Gadus morhua</i>	5	1	5 vertebrae caudales
<i>Melanogrammus aeglefinus</i>	1	1	cleithrum
Pleuronectidae	37	2	cleithrum*, 7 vertebrae praecaudales, 26 vertebrae caudales, hypurale, 2 ossa analia
Osteichthyes total	49		
total	66		

Table 4: Uelvesbüller Koog wreck. Measurements of mammal and bird bones according to von den Driesch (1976), those of fishes according to Morales & Rosenlund (1970): *the vertebrae are derived from one individual.

Excavation-Unit	Species	Skeletal Element	Measurement (mm)
55/6	<i>E. ferus</i> f. caballus	phalanx 2	GL: 44,5 BP: 53,0 KD: 46,3 Bd: 49,5
55/3	<i>Sus scrofa</i> ?	atlas	BFcr: 58,5 H: 52,3
55/12	<i>G. gallus</i> f. dom.	tibiotarsus	GL: 112,3
55/10	<i>A. anser</i> f. dom.?	humerus	Bd: 25,3
55/11	<i>A. anser</i> f. dom.?	carpometacarpus	GL: 95,4 Bp: 23,3
55/9	<i>A. anser</i> f. dom.?	phalanx 1 anterior	GL: 40,5
55/16	<i>A. anser</i> f. dom.?	phalanx 1 anterior	GL: 41,0
51	<i>Gadus morhua</i> *	5 vertebrae caudales	v.ce.gr.l.: 9,3 9,5 9,6 10,7 11,8
51	<i>Clupea harengus</i>	dentale	dn.gr.l.: 23,3
51	<i>Clupea harengus</i>	3 vert. caud. ant.	v.ce.gr.l.: 3,3 3,8 3,8
51	<i>Clupea harengus</i>	vertebra caudalis	v.ce.gr.l.: 3,1
51	<i>Pleuronectes platessa</i> ?	cleithrum	cl.c.l.: 36,2

pus). It seems possible that people used the wings of geese as a sort of hand-broom. A carpometacarpus, a phalanx 1 ant., and a phalanx 2 ant., all from the left side of the body, are derived from the same individual. Whether the goose remains derived from the greylag goose or from its domestic form could not be determined. The latter, however, is more likely.

Finally, the fish remains are to be mentioned. Some bones are derived from flatfish (Pleuronectidae) and one of them, a cleithrum, is probably from plaice (*Pleuronectes platessa*). At least two individuals are represented by two ossa analia. Herring (*Clupea harengus*) and cod (*Gadus morhua*) are also represented by some bones, which point to one specimen. Haddock and a cyprinid are represented by one bone each.

This variety of species, not only fish but also birds and mammals, and their location near the fire-place suggest that they were provisions of the crew. Nevertheless, the wings of geese may have had a special purpose. The second horse phalanx seems very strange in this connection with finds of provisions.

Last but not least there is one more species, the rat (*Rattus* sp., probably *Rattus rattus*, see below). Not only was an incisor of the upper jaw found, but also gnawing marks on one of the tibiae of pig prove that the ship lodged this rodent.

Discussion and conclusions

Both ships, although of different type, must be characterized as cargo boats (Kühn 1995, Englert 1997), even if only one of them contained remains of its cargo, i.e. processed haddock which must have been ruined by water. Additional cargo, if there was any, as well as the cargo of the second ship must have been worth securing. We may conclude that this boat was not loaded with spoiled merchandise, which people would have left on board. On the other hand, many of the remains of the crew's provisions were found only in this second ship, which was excavated systematically, but not in the first one, except for the flatfish skeleton documented by a slide. This supports the conclusion stated above, that the remains of the provisions as well as an unknown part of the haddock remains from the Hedwigenkoog wreck were probably lost by taphonomic reasons, i.e. the rescue-excavation procedure.

There is nothing to say about the cargo of both ships except to speculate on the haddock. This species occurs in the North Atlantic, and in European waters the North Sea is the centre of haddock distribution. To the south, it decreases rapidly in the English Channel and the Bay of Biscay and to the east in the Danish Straits. It is known that haddock migrate on a large scale in order to follow their prey, that is especially herring spawn besides small fishes. They move as three- and four-year-old animals into the southern and eastern North Sea, where they formed the basis of an important fishery. Elder generations, however, prefer to stay in the northern and western part of the North Sea (Ehrenbaum 1936). The total length of haddock in its third year of life ranges between 28 and 36 cm (Ehrenbaum 1936), and four- to five-year-old ones measure 40 to 50 cm (Curry-Lindahl 1985). Thus most of the fishes may have been three to four years old, or possibly partly had reached their fifth year of life according to a total length spectrum mainly between 30 and 50 cm, as determined by the cleithra. The analysis of a sample of 30 praecaual vertebrae also points mainly to this age class: 23 of them come from three- and four-year-old

specimens, while two are from younger (2 years) and five from older (5 and 6 years) ones. It was very difficult to "read" the year-rings, this result should be taken with reservations.

Taking into consideration the age and size of the fishes in question as well as their migrations, it is fair to assume that they were caught in the eastern or southern North Sea, possibly in the German Bight, in any case not far away. An important fishery for haddock is asserted in an 18th century description by Hasselmann (cit. in Englert 1997: 41 pp.) for the waters around the island Helgoland and further northwest. The main fishery season started in spring and lasted to July. Thus it is possible that it was haddock from Helgoland, which had been bought by the owner of the cargo boat. Its port of destination could have been the market of Hamburg or Altona, if not a smaller one in or near the Eider estuary like Büsum, Tönning or Friedrichstadt (Fig. 1).

Obviously such goods were traded from the markets in question to other places. The haddock remains found in a cess-pit of the 15/16th century in Schleswig, on the basis of size and age seem to be of the same origin, i.e. the German Bight or adjacent waters (Heinrich 1987). Evidence for long distance trade of fish is given by a wreck which was discovered in Dutch coastal waters. It was a ship of the Dutch East India Company which sank in 1735. In the wreck a barrel with remains of decapitated anchovies (*Engraulis encrasicolus*), which presumably were being transported to Batavia, was found (Brinkhuizen 1994a). Another wreck of a 16th century merchant vessel discovered in Dutch waters contained barrels with remains of headless fish, some also with a large part of the backbone removed, i.e. cod, torsk (*Brosme brosme*) and ling (*Molva molva*) or blue ling (*Molva dipterygia*) (Brinkhuizen 1994b). Following from zoogeographical considerations - especially torsk and blue ling are native to the northern parts of the North Sea - the barrels containing these fish could have been part of a cargo loaded perhaps in a Scottish or Norwegian harbour. The author, however, did not exclude that this fish could have been part of the crew's provisions.

The provisions to which the animal remains of the wreck from the Uelvesbüller Koog obviously point must have been relatively varied, the more so as eggshells, nutshells and kernels were also found (Kühn 1995). The species diversity is relatively high, but bone frequencies are low, probably because food remains were thrown overboard. Thus the findings could point to food remains which were lost on deck and thus fell between its planks. Besides common domestic species like cattle and pig, parts of game animals (wild boar?) were possibly also eaten sometimes. Furthermore, chicken and goose belonged to the menu as well as fish. Marine species like herring, cod, haddock and flatfish are to be expected from the waters the ship sailed, but the occurrence of freshwater fishes like cyprinids is not unusual, for such ships visited markets situated on the lower course of rivers like the Eider (e.g. Friedrichstadt) or the Elbe (e.g. Hamburg).

It remains to be settled whether the rat's upper incisor belongs to the black rat (*Rattus rattus*) or to the brown rat (*Rattus norvegicus*). In all probability it must have been the former species, known also under the name "ship-rat" (Niethammer 1975). The brown rat is better adapted to coolness and moisture. It possibly reached the western part of Europe for the first time in early modern times (Heinrich 1991, annotation 9: 140).

All in all, the comparison of these wrecks shows that the amount and quality of finds is influenced to a high degree by taphonomic factors (i.e. excavation procedure). Furthermore the quality of the cargo must be taken into consideration: Only the remains of cargo which probably had lost its value after it was ruined by water are found.

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Zusammenfassung

Tierreste aus zwei neuzeitlichen Frachtschiff-Wracks werden verglichen. Die Fundmaterialien sind in ihrer Qualität sowohl durch taphonomische Gegebenheiten als auch durch die Beschaffenheit der Ladung stark beeinflusst. Ein Schiff enthielt als Überrest der Ladung nahezu ausschließlich Knochen von aufbereitetem Schellfisch, einer Fracht also, die vom Wasser verdorben und nicht rettenswert war. In dem anderen Wrack fand der Ausgräber keine Reste, die zur Ladung gehört haben könnten. Es wird daher angenommen, dass das Schiff Fracht geladen hatte, die nicht vom Wasser zerstört worden war und gerettet werden konnte. Die Ausgrabung brachte jedoch viele Gegenstände des täglichen Lebens zutage sowie auch Reste verschiedener Säugetierarten, hauptsächlich von Haustieren, sowie von Geflügel und Fisch, die wahrscheinlich zum Proviant der Besatzung gehörten.

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