

PRELIMINARY NOTES ON FISH REMAINS FROM ARCHAEOLOGICAL SITES IN
THE NETHERLANDS

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1. INTRODUCTION

In the past decade a large number of fish remains have become available to the archaeozoological department of the Biological Archaeological Institute. These remains of fish were obtained in the course of sieving layers containing remains of larger vertebrates from prehistoric and early historical settlements. Archaeozoological research on fish remains from excavations in the Netherlands is a new field of study. As there are no suitable hand-books for the identification of fish remains, the availability of a comparative collection of recent fish skeletons is vital. To build up such a collection is a time-consuming process. The comparative collection of the Biological Archaeological Institute is not yet complete, and this is partly due to the fact that some species of fish have become rare or extinct in Western Europe as a result of human interference. Nevertheless the collection is now sufficiently complete to permit the identification of most subfossil fish remains.

The 15 settlement sites indicated in table 1 lie in the catchment areas of the rivers Rhine, Maas and IJssel, or in the coastal region of the Northern Netherlands (fig. 1). The sites date from various times between the first half of the fourth millennium B.C. up until A.D. 1700. The remains of 28 species have been identified*), as listed in table 1. For some of these sites the fish remains have already been published, in other cases archaeozoological investigations are still in progress. For some sites the fragments of flatfish (Pleuronectiformes) and of members of the carp family (Cyprinidae) have not been identified to species level, while for other sites this has been done only partly. Identification to species level is difficult within these two groups of fish because of the interspecific similarity of many skeletal parts. In this article the actual number of remains found of each species is not given; only the presence of one or more bones of an identified species is indicated by means of a cross in the table.

*) Of these the fresh- and sea-water species are still extant in Dutch waters; the anadromous species on the other hand have disappeared in the course of this century.

This brings us to the following question: in studying very large find complexes (say some 10,000 or more fish remains), is there any point in identifying all bone fragments as far as possible to species level (Clason & Prummel, 1977)? In working with such large find complexes it is preferable rather to take a random sample from the material collected, and to identify as narrowly as possible the species or groups of species represented. The proportions of the numbers of identified remains of the various species or groups in the sample is then taken to be representative for the total amount of material collected. In interpreting the results a wide range of factors must be taken into consideration: anatomical, ecological, ethological, zoogeographical, chemical, palaeogeographical, palaeoclimatological, not forgetting the influence of man. As the list given here of species identified is still incomplete (i.e. there are still a number of remains from the various sites that have to be identified), caution is necessary in drawing any conclusions. I shall come back to this point several times in the following discussion of the species and the sites where they have been found.

2. THE PERIOD 3500-2000 B.C.

Fish remains from this period have been found at five sites, namely Rotterdam-Bergschenhoek, Swifterbant, Hazendonk (Molenaarsgraaf), Vlaardingenvan and Kolhorn.

The Rotterdam-Bergschenhoek site was a small (about 12 m²) extraction camp for fowling and fishing on a small peat island in the reed-zone of a freshwater lake. The site was apparently visited once or twice a year for several years. The neolithic site is dated around 3500 B.C. (Louwe Kooijmans, personal communication). So far only freshwater fish species have been identified from the sieved material.

Swifterbant was a small neolithic settlement on a natural levee of a freshwater creek in the tidal delta system of the river IJssel. The site is dated around 3350 B.C. Most of the fish remains are of anadromous and freshwater species (Clason & Brinkhuizen, 1978). Two marine species were identified, namely the thin-lipped grey mullet (*Mugil capito* Cuvier) and the flounder (*Platichthys flesus* L.).



Fig. 1. The Netherlands at the present time, showing the location of sites I-XV mentioned in table I.

Both of these species, however, occasionally swim far upstream through fresh water. Only one fragment of flounder (an os anale) has been found so far. This species is possibly an indicator of slight tidal influence in fresh water.

The Hazendonk (Molenaarsgraaf) was a small sandy outcrop – a *donk* – in an extensive area of marsh. The site was occupied more or less permanently between 3400 and 2400 B.C. The abundant fish remains came from various well-dated layers. Thirteen species of fish (anadromous and freshwater species) have already been identified. This is

an important complex inasmuch as it provides the opportunity for studying the composition of the ichthyofauna over a period of about 1000 years.

The neolithic settlement of Vlaardingen was situated on a natural levee of a freshwater creek in the tidal delta system of the rivers Maas and Rhine. The settlement is dated around 2400 B.C. No sieving was carried out here, and consequently only the larger remains of three large species of fish were found. Other species must have been caught too, as is evident from the find of part of a fish weel (Van Iterson Scholten, 1977). Also the remains of

pike (*Esox lucius* L.) that were found indicate that smaller species must have been present, as this predatory fish represents a final link in the fresh-

water food-chain.

Kolhorn is a neolithic site about which very little is known so far, as no systematic research has yet

TABLE I

The fish species which were found in:

I Rotterdam-Bergschenhoek, **II** Swifterbant, **III** Hazendonk (Molenaarsgraaf), **IV** Vlaardingen, **V** Kolhorn, **VI** Hoogkarspel, **VII** Velsen, **VIII** Valkenburg Z.H., **IX** Dorestad (Wijk bij Duurstede), **X** Alkmaar, **XI** Leeuwarden (Speelmanstraat), **XII** Leeuwarden (St. Jacobsstraat), **XIII** Dokkum, **XIV** Utrecht³), **XV** Groningen.

<i>Raja clavata</i> L.	-	thornback ray	
<i>Clupea harengus</i> L.	-	herring	
<i>Gadus morhua</i> L.	-	cod	
<i>Gadus aeglefinus</i> L.	-	haddock	
<i>Mugil capito</i> Cuvier	-	thin-lipped grey mullet	
<i>Trigla lucerna</i> L.	-	yellow gurnard	M
<i>Scophthalmus maximus</i> L.	-	turbot	
<i>Pleuronectes platessa</i> L.	-	plaice	
<i>Platichthys flesus</i> L.	-	flounder	
<i>Solea solea</i> L.	-	sole	
Pleuronectiformes ¹⁾	-	flatfish	
<hr/>			
<i>Acipenser sturio</i> L.	-	sturgeon	
<i>Alosa alosa</i> L.	-	allice shad	A
<i>Salmo salar</i> cf. <i>trutta</i> L.	-	salmon/sea trout	
<i>Coregonus oxyrhynchus</i> L.	-	houting	
<hr/>			
<i>Esox lucius</i> L.	-	pike	
<i>Abramis brama</i> L.	-	bream	
<i>Barbus barbus</i> L.	-	barbel	
<i>Blicca björkna</i> L.	-	white bream	
<i>Cyprinus carpio</i> L.	-	carp	
<i>Leuciscus idus</i> L.	-	ide	
<i>Rutilus rutilus</i> L.	-	roach	
<i>Scardinius erythrophthalmus</i> L.	-	rudd	F
<i>Tinca tinca</i> L.	-	tench	
<i>Siluris glanis</i> L.	-	catfish	
<i>Anguilla anguilla</i> L.	-	common eel	
<i>Lota lota</i> L.	-	burbot	
<i>Perca fluviatilis</i> L.	-	perch	
<i>Acerina cernua</i> L.	-	ruffe	
Cyprinidae	-	carp fishes	

M = Marine species, A = Anadromous species, F = Freshwater species

(x) identification not certain

* part of the excavated earth was sieved

Preliminary notes on fish remains

been carried out. The site probably dates from around 2200 B.C. Among the small amount of bone material available it was possible to identify one anadromous and three marine species of fish. In my opinion it seems not impossible that this site had more economic contact with the coast than the

above-mentioned sites, in view of the presence of cod (*Gadus morhua* L.). This theory is supported by the find of the tooth of a sperm whale (*Physeter macrocephalus* L.) (Clason, personal communication).

In Denmark remains of both freshwater and ma-

3500-2000 B.C.					700 B.C.-A.D. 1000				A.D. 1000-1700					
I'	II'	III'	IV	V	VI	VII'	VIII	IX'	X	XI	XII	XIII	XIV	XV
-	-	-	-	-	-	x	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	x	-	-	-	-	x	-
-	-	-	-	x	-	x	x	-	x	x	x	x	x	x
-	-	-	-	-	-	x	-	x	x	x	x	-	-	x
-	x	-	x	x	-	x	x	-	-	-	-	-	-	-
-	-	-	-	-	-	x	-	-	x	-	-	-	-	-
-	-	-	-	-	-	-	-	x	-	-	-	-	-	-
-	-	-	-	-	-	-	-	x	-	x	-	-	x	-
-	x	-	-	-	-	-	-	x	-	x	-	-	-	-
-	-	-	-	-	-	-	-	-	-	x	-	-	-	-
-	-	-	-	x	-	x	x	-	x	-	x	x	-	x
-	x	x	x	x	-	x	x	x	-	-	-	-	-	-
-	-	x	-	-	-	x ²⁾	-	x	-	-	-	-	-	-
-	x	x	-	-	-	x	-	x	-	-	-	-	-	-
-	-	-	-	-	-	-	-	x	-	-	-	-	-	-
x	x	x	x	-	x	x	x	x	-	-	-	-	-	-
-	x	-	-	-	-	x	-	x	-	-	-	-	-	-
-	-	(x)	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	x	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	x	-	-	-
-	x	x	-	-	-	-	-	x	-	-	-	-	x	-
-	x	x	-	-	-	x	-	-	-	-	-	-	-	-
-	x	(x)	-	-	-	-	-	x	-	-	-	-	-	-
x	x	x	-	-	x	x	x	x	x	-	-	-	-	-
x	x	x	-	-	x	x	-	x	-	-	-	-	x	-
-	-	x	-	-	-	-	-	x	-	-	-	-	-	-
x	x	x	-	-	x	x	-	x	-	x	x	-	x	-
-	x	-	-	-	-	-	-	-	-	-	-	-	x	-
x	-	x	-	-	x	x	-	-	-	x	-	-	-	-

1) *Pleuronectes platessa* L., *Platichthys flesus* L. and *Limanda limanda* L.

2) *Alosa alosa* L. or *Alosa fallax* Lacépède.

3) Identification by Dr. J. Lepiksaar, Museum for Natural History, Gothenburg, Sweden.

rine fish occur in late Kongemose-early Ertebolle settlements (Rosenlund, 1976). On the basis of archaeological evidence it was concluded some time ago that the beginning of coastal line-fishery from boats was a feature of the final stages of the mesolithic period (Clark, 1948). From the data in our table we could conclude that sea fishery in the Netherlands developed only in the late Neolithic (Kolhorn). This conclusion cannot be justified however. On the basis of palaeogeographical evidence we know that during the Atlantic period the coast of the Netherlands extended further westwards towards the North Sea than the present coast. Any settlements which then lay in the immediate vicinity of the sea must have disappeared underwater over the centuries, not only as a result of the rapid rise in sea level and sinking of the land, but also due to the occasional flooding which occurred when storms coincided with high spring tides. This means that we find only those settlements from the Atlantic period that lay further inland. The ichthyofauna of these settlements may occasionally have included marine species, but would have consisted predominantly of freshwater and anadromous species. To demonstrate the existence of a coastal fishery during Atlantic times in the Netherlands we are dependent on finds of remains of marine species from inland settlements. These remains must come from species which do not occur in fresh water, as the thin-lipped grey mullet and the flounder do.

Thus in Denmark an artefact, made out of the dorsal spine of the spur dog (*Squalus acanthias* L.), a marine species, was found in an inland settlement of the early Ertebolle culture. This must have been brought there from the coast (Noe Nygaard, 1971).

In the Netherlands so far no remains have been found dating from the late Atlantic period of strictly marine species of fish or artefacts made out of bones of marine species of fish. It is known that in the late Atlantic period our inland settlements did have contacts with the coast. The Rotterdam-Bergschenhoek site has yielded several bones of the grey seal (*Halichoerus grypus* L.) (Clason, personal communication). In view of the specific function of this extraction camp (fowling and freshwater fishery by means of fish weels) it is however unlikely that remains of marine species are present among the fish remains.

3. THE PERIOD 700 B.C.-A.D. 1000

In the table species are included from four sites, namely Hoogkarspel, Velsen, Valkenburg Z.H. and Dorestad (Wijk bij Duurstede).

The farm complex of Hoogkarspel, which dates from around 700 B.C., was situated in an environment of natural pasture. The site yielded a few fish remains which all belonged to freshwater species.

The Roman military settlement of Velsen was situated near the coast on the bank of the Oer IJ river, a former tributary of the Rhine. The settlement was occupied during the first half of the first century A.D. Fourteen species of fish have been identified so far. The conditions for preservation were favourable here to such an extent that even the calcified centra of the vertebral column of cartilaginous fish (Chondrichthyes) have been preserved.

The Roman castellum of Valkenburg was also situated near the coast and was occupied during the first few centuries of the Christian era. Remains of sturgeon (*Acipenser sturio* L.) have already been described (Clason, 1967). In addition remains of both freshwater and marine species are also present.

Dorestad (Wijk bij Duurstede) was an important harbour and market town in early mediaeval times. It was situated on the Kromme Rijn river south of Utrecht. Among the very abundant fish material it was possible to identify 19 species (Prummel, 1978).

It is evident from the table that a large number of species is represented especially in Velsen and Dorestad. This is primarily due to the fact that during the excavation sieving of random samples of soil was carried out. In addition other factors played a role however. In the immediate vicinity of the settlement of Velsen both freshwater and sea fishery was practised. As the fishing waters were close to the settlement, during transport there would have been little or no decomposition of the fish that had been caught. Consequently one would expect a large number of species of fish at Velsen.

The castellum of Valkenburg, comparable in terms of location and date, has yielded fewer species than the settlement of Velsen. This is most probably a result of the collection technique employed; the state of preservation of the fish remains found is excellent here too.

As Dorestad was situated inland, only freshwater fishery could have been practised in the surround-

ing region. However remains of sea fish have been found here too. In view of the distance between the coast and Dorestad, these fish must have been preserved in some way to prevent decomposition. It is not impossible that these fish were preserved by means of smoking or salting (Prummel, 1978).

In interpreting fish remains from some settlements the question arises as to what extent the remains represent food refuse. In the former bed of the Oer IJ river in Velsen and in that of the Kromme Rijn in Dorestad remains have been found of freshwater and marine species. The remains of the marine species almost certainly ended up here as a result of human interference. The remains of the freshwater species on the other hand could partly have come from fish which died a natural death. The site of Velsen provides an example of this. Here in a wet depression, that did not connect with the Oer IJ, were found a number of almost complete skeletons of the bream (*Abramis brama* L.). In view of the fact that the skeletons were complete, we can assume that these fish were not eaten. The fish probably ended up here as a result of human activity. To keep the fish alive and thus fresh, they were put into a small pool from which they could not escape. A similar example is provided by a Frisian terp: in a depression several complete skeletons were found of a flatfish, possibly flounder (*Platichthys flesus* L.) (Van Giffen, 1913).

4. THE PERIOD A.D. 1000-1700

Most of the fish remains from this period were found in the course of investigations on mediaeval urban centres. The remains from Alkmaar come from 12th-14th century occupation layers (Clason & Brinkhuizen, 1978). In Leeuwarden fish remains were collected recently from occupation layers dating from the 12th-16th century (Speelmanstraat) and the 12th-14th century (St. Jacobsstraat). Those from Dokkum came from a 14th-16th century refuse pit (Van Gelder-Ottway, this volume). The fish remains from Utrecht came from the Catharijne Convent (15th century and later), while those from Groningen (Raamstraat) were collected from around part of the fundaments of the castle of Alva (demolished 1577) that were exposed on a building site (Van Gelder-Ottway, 1976-1977).

The absence of anadromous species is remarkable. There are two possible explanations for this. In the first place the absence of some anadromous species that are oily fish can be explained by the fact that their skeletal parts are generally poorly preserved, as they tend to dissolve in the fatty acids released during decomposition. This applies to such species as allice shad, twaite shad, houting, salmon and sea trout. A second explanation is provided by the geographical location of the sites. With the exception of Utrecht all the sites concerned lie to the north of the great rivers (i.e. the Rhine and associated rivers entering the Rhine delta) and therefore outside the area of natural distribution of the anadromous species in the Netherlands. Occasional specimens can be caught, but not in such huge numbers as in the region of the great rivers. Among the fish remains from mediaeval and later settlements in this last-mentioned region we would certainly come across anadromous species, notably sturgeon. This is confirmed by a find made in 's-Hertogenbosch. Here a fragment of a dermal plate of a sturgeon was found among the kitchen refuse from a 13th-century tannery (Prummel, in press). Remains of various parts of sturgeon are also present among material recently obtained from a site, not mentioned in the table, in the town of Utrecht.

It is evident from the table that remains of sea fish such as cod, haddock and flatfish occur regularly in the late mediaeval urban sites. This is in contrast to the freshwater species. We could conclude from this that in mediaeval towns the consumption of sea fish dominated over the consumption of freshwater fish. We know from written sources, however, that freshwater fishery was of considerable importance at the time in question.

In archaeological investigations of mediaeval towns it is not the more humble dwellings that are found, but rather "special" features such as the remains of stone houses, monastic buildings, etc. It stands to reason therefore that the fish remains from these sites are not representative samples of the total amount of fish refuse of the mediaeval town.

It is known for example that in mediaeval Holland and Utrecht the religious and secular authorities laid claim to ownership rights regarding any sturgeon that were caught. In the eastern regions

the financially prosperous Hanse towns had bought or secured the rights of the sovereign regarding catches of sturgeon. To butter up the nobility the town authorities of the towns along the IJssel used gifts of sturgeon to maintain good relations (Lobregt & Van Os, 1977). This meant that the highly valued sturgeon became increasingly scarce and did not end up on everyone's table. It is also reasonable to assume that in mediaeval towns near the coast the consumption of fresh sea fish was for financial reasons a privilege of a certain class of the population only.

It is interesting to note that remains of carp (*Cyprinus carpio* L.) were found in mediaeval Leeuwarden. These are the oldest remains of this species known so far in the Netherlands. The carp is a native species in the Danube basin in Central and Eastern Europe. Carp remains have been identified from a number of late mesolithic and early neolithic sites in Yugoslavia and Hungary (Bökönyi, 1974). So far it is not clear exactly when the carp first arrived in the Netherlands. It is highly unlikely in my opinion that the Romans introduced the species into the Netherlands. The Roman settlements of Velsen and Valkenburg Z.H. have not yielded any carp remains.

If the Romans had introduced the carp, then we should certainly have found remains of this species in early mediaeval Dorestad. This is not the case however. The theory that carp, a species easy to

keep in ponds, were introduced into the Netherlands in the Middle Ages seems to be justified in view of the above-mentioned arguments. The first written mention of carp dates from 1342 (Boddeke, 1971).

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