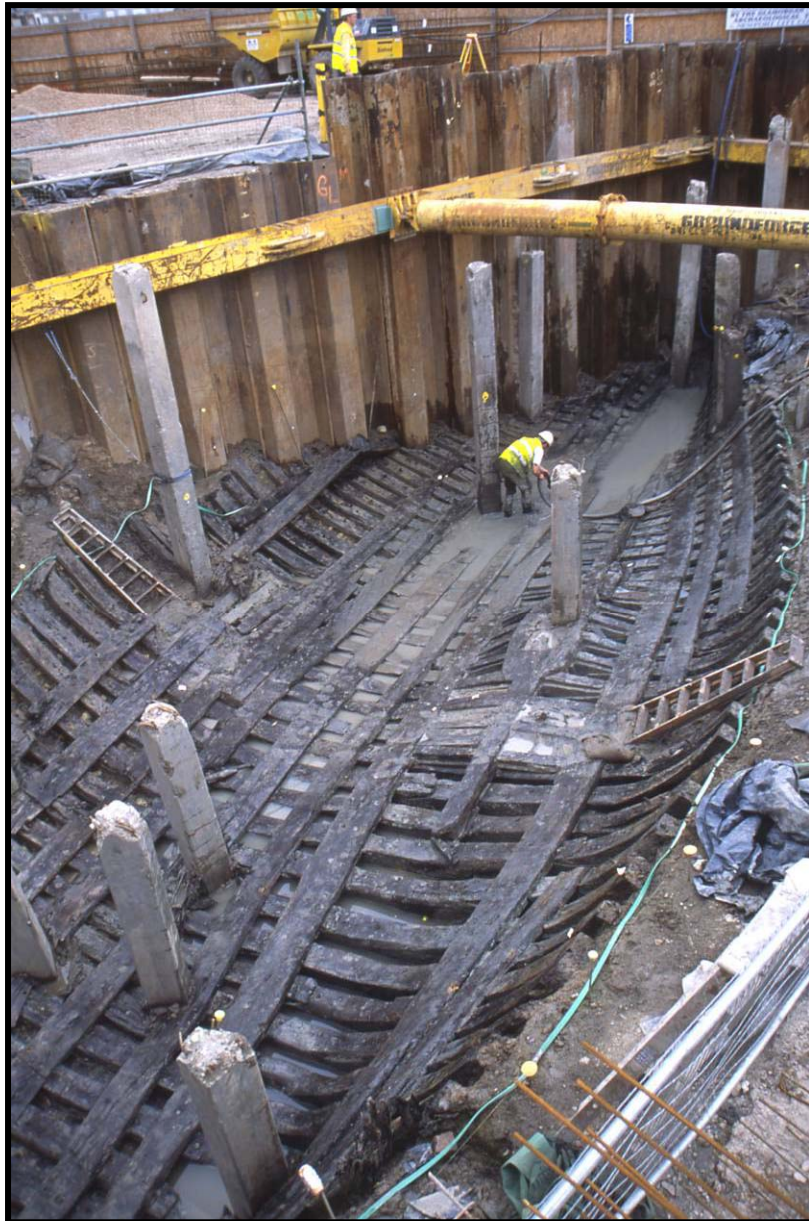


Newport Medieval Ship Project Specialist Report: FISH REMAINS



Site number: GGAT 467
Site location: NGR: ST 31286 88169 Kingsway, Newport, South Wales, UK.

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Introduction

Newport Ship Fish Remains from the Newport Ship
by Dr. Hannah Russ. 5 October 2012

The Newport Ship Project

Introduction

In 2002, during the construction of the Riverfront Theatre, on the banks of the River Usk in Newport, South Wales, an archaeological find of great significance was unearthed. In the summer of that year, while undertaking the excavations for the theatre's orchestra pit, the well-preserved remains of a 15th century clinker built merchant vessel were discovered.

The site, which was surrounded by a cofferdam, was being monitored by the Glamorgan Gwent Archaeological Trust at the time of discovery. The ship lay in what is locally known as a pill or small inlet, with its stern closest to the river and its bow facing into the inlet. The timbers were covered in thick alluvial mud, which created an ideal anaerobic environment for successful preservation. Seventeen strakes of planking remained on the port side and thirty-five on the starboard side of the ship. The vessel was approximately 30m in length.

A silver French coin was found purposely inserted into the keel of the vessel, dating the ship to after May 1447. Dendrochronological research has shown the hull planking to be from the Basque country and after 1449 in date.

After a much publicised 'Save Our Ship' campaign, it was decided that the ship would not be recorded and discarded but excavated with the aim to conserve. The riders, stringers, braces, mast step, frames and overlapping clinker planks and keel were dismantled one by one and lifted. Almost 2000 ship components as well as hundreds of artefacts were excavated.

This report examines and lists the faunal remains recovered during the Newport Medieval Ship excavation.

Fish remains from the Newport Ship

Hannah Russ

Introduction

Fish remains were recovered both through hand collection during the excavation of the Newport ship, and from samples taken from the ship site. The assemblage comprises 659 fish bones and scales, and fragments of these.

Methods

The fish remains from the Newport Ship were identified using modern comparative material at the University of Sheffield and in the author's personal collection. Published identification guides were also used, including Wheeler & Jones (1989) and Yee Cannon (1987). Based on the zooarchaeological assessment, three additional forms of analysis were selected to improve the information that could be gained from the Newport Ship fish remains.

Initial analysis of the assemblage showed an abundance of gadid (cod family) fish remains. The implication was that these may represent evidence for the use or transportation of dried stockfish. The stockfish trade was developing during the time that the Newport Ship was in use. Research in this area is on-going, with the main questions addressing the source of the fish, the trade routes and final destination of the stockfish (e.g. Barratt 1997; Barrett *et al.* 2008; 2011; Orton *et al.* 2011). These questions can be answered in part by looking at the biochemical composition of the fish bones themselves. By measuring the carbon and nitrogen isotope values of the archaeological bone and comparing these with those for modern specimens of known source (for example Atlantic Ocean, North Sea, Baltic Sea) we can identify where the fish lived and were caught. DNA studies can also contribute to our understanding of the stockfish trade, again by carrying out analysis on the archaeological remains and comparing them with the DNA profiles of modern specimens of the same species from different bodies of water. For this reason, three bones, all representing Atlantic cod (*Gadus morhua*), were selected for isotopic and DNA analyses.

Much of the Newport Ship assemblage comprised of small fragments of ribs and spines as well as small fragments of unidentifiable fish bones and scales. These types of remains cannot be identified using traditional zooarchaeological techniques as the bones either never had any diagnostic features that allow species identification, or they have lost their diagnostic features through fragmentation. It is common that a high percentage of fish remains from any archaeological site are unidentifiable. Any single fish can have hundreds of ribs and spines that are easily identified as fish bones, but not identifiable to species level. In addition, fish remains can be incredibly fragile and can often become very fragmented in the burial environment. Recently a new technique called Zoo-MS (Zooarchaeology by mass spectrometry) has been developed (e.g. Buckley *et al.* 2009). This technique can be used to provide a species identification for all the small 'unidentifiable' bones that are often well represented in archaeological fish bone assemblages. In total, 104 bone and scale fragments were selected for Zoo-MS analysis by Dr. Mike Buckley at the University of Manchester. The reason for sending these fragments for Zoo-MS analysis is to ensure that we have not missed recognising the presence of some species by only being able to identify bones and bone fragments that are species diagnostic, or well preserved. The bones of some fish species do not survive as well as those of other species, and as a general rule the remains of smaller fish do not survive (or are not recovered) as frequently as those of larger fish. This analysis will ensure that no bias in species representation occurs by using traditional zooarchaeological techniques alone.

Results

The total number of individual specimens present (NISP) in the Newport Ship assemblage is 659, and includes fish bones and scales. These came from 10 discreet contexts as well as from unstratified contexts, see Table 1. A high proportion of the assemblage (46%) is made up of ribs and spines and fragments of these, which are unidentifiable. A number of scales were also recovered (16% of the total NISP). The remains are generally well preserved, but in some cases are fragmentary, and as a result, are not identifiable by comparison with bones of modern specimens. Preservation of the Atlantic herring remains recovered from context 153 differs substantially from those from other contexts. These bones are from small herring (compared with the herring in other contexts), and are stained a dark brown and distorted. These characteristics are seen in fish remains that have passed through the digestive system, more specifically that of the otter (*Lutra lutra*) (Jones 1984; 1986; Nicholson 1993; 2000).

Element and species identification

The identifiable portion of the assemblage from the Newport Ship is dominated by the remains of cod family fish, including Atlantic cod (*Gadus morhua*), European hake (*Merluccius merluccius*), ling (*Molva molva/dypterygia*) and tusk (*Brosme brosme*), and Atlantic herring (*Clupea harengus*). The cod family remains include mainly vertebrae, but also elements found in the posterior region of the skull; posttemporal, postcleithra, supracleithra and cleithra. The Atlantic herring remains include both cranial and post cranial elements. All the fish scales recovered from the ship are congruent with Atlantic herring, but are not included in the NISP values for this species as the identification is tentative.

In addition to these dominant species several other taxa are also present in small numbers. These include six vertebrae of a skate, ray or small shark (Elasmobranchii); three bones from a sea bream family fishes, two of which can specifically be identified as blackspot seabream (*Pagellus bogaraveo*); two vertebrae of European conger (*Conger conger*); two flatfish family (Pleuronectidae) bones (a vertebra and a hypural (tail bone)), and a single vertebrae from an Atlantic salmon (*Salmo salar*).

Fish size

The Atlantic cod, European hake, ling, tusk and other gadid remains represent large specimens. Measurements on cleithra fragments indicate that the Atlantic cod would have been 100 – 110 cm in total length, while ling would have measured around 120-140 cm (see Brinkhuizen 1994, 200).

Distribution of remains

The remains were concentrated in three contexts 120, 130, and 152/171 (recorded as two separate contexts, but considered to only represent a single deposit). Contexts 130 and 152/171 were both sealed by overlaying alluvium, and as such are thought to represent material that had accumulated during use of the ship and therefore provide direct evidence of ship conditions, the diet of the crew and any possible cargo. Context 120 predates both 130 and 152/171, and is also thought to represent material deposited during the lifespan of the ship, rather than post-depositional material.

In terms of spatial distribution of the remains, Table 2, the pattern appears quite complex, while fish remains are represented in all parts of the ship, with only Frames 11-20 yielding substantially fewer fragments, there does not seem to be any areas of concentration based on bone fragment counts (NISP). However, identifiable fish remains appear to be slightly more concentrated towards each end of the ship (the stern and the bow – Frames 1-20 and 41 – 62). This, however, likely results from the sampling strategy which saw more environmental samples taken in these areas compared with the mid-ship section. The remains of large cod family fishes are restricted to areas at each end of the ship, being rare or absent from the mid-section (Frames 21-40). The majority of the cod family

remains were hand collected during the excavation, and therefore should not be biased by the sampling strategy.

Discussion

Fish remains have been recovered from a number of ship wrecks dating to the medieval period (Migaud 2011). A survey of faunal remains recovered during the excavations of such wrecks found that fish were the third most important food source used to sustain life aboard ship (after beef and pork); cod are the most frequently represented species (Migaud 2011). The presence of cod (including Atlantic cod (*Gadus morhua*), but also other cod family fishes including ling (*Molva molva/dypterygia*), hake (*Merluccius merluccius*) and tusk (*Brosme brosme*)), and the frequent absence of cranial bones has led to the conclusion that the remains represent stockfish that were being used on board to sustain the crew, or being transported overseas for trading purposes (e.g. Brinkhuizen 1994; Grenier *et al.* (eds.) 2007; Migaud 2011; Monaghan & Bound 2001). Historical records also support the use of fish in the diet of sailors during this period (e.g. Coy & Hamilton Dyer 2005; Seeman 1986). For example, a standard menu suggested by Coy and Hamilton-Dyer (2005) includes fish three times a week.

In comparison with fish remains recovered from other shipwrecks of similar date, the fish bone assemblage recovered from the Newport ship is diverse in terms of the species of fish that are represented. Other wrecks have yielded a heavy dominance of cod family fish bones which clearly represent the remains of stockfish. The presence of post cranial elements (vertebrae) and elements located to the posterior of the head (posttemporal, postcleithra, supracleithra and cleithra) of large cod family fishes recovered from the Newport Ship suggests that stockfish were either being used to sustain life aboard ship, or were being transported as cargo for trade overseas. However, while 'stockfish' is a term that is most frequently used to describe dried cod family fishes, it is also applied to dried fish products of a range of fish species. Other fish remains have been interpreted as representing stock fish, and have included herring, eel, salmon and shark (see Migaud 2011, 288 and references within), all species recorded in the Newport Ship assemblage. The majority of the herring are also likely to represent the remains of fish either being eaten aboard ship or being transported.

An exception to this is the herring remains in context 153. Context 153 yielded only Atlantic herring and unidentifiable remains, all of which are consistent with otter spraint residues. Remains of this type are not found in any other context; as such it appears that otter activity was restricted to the period of deposition represented by context 153.

Origins of the small number of remains from non stockfish species; flatfish and seabream family are more difficult to interpret. They come from sealed contexts which also contain fish remains of the species already discussed. While these potentially could be contamination from either external refuse piles, or from the natural environment that have washed in, they could also represent the remains of fresh fish caught and eaten aboard ship during voyages.

All the fish represented can be found in the eastern Atlantic and/or the western Mediterranean, with the exception of tusk, which is only found in more northerly waters of the Atlantic and northern North Sea (RNDM Aquamaps 2010). The presence of this fish suggests that the ship travelled not just south to Portugal, but also to more northern regions.

Results of the isotopic, DNA and Zoo-MS analyses are to follow.

		120	128	130	149	152	153	154	171	1013	3036	3055	130/ 152	u/s	Total
Gadidae (Cod family)	European hake (<i>Merluccius merluccius</i>)	7	0	4	0	6	0	0	2	1	0	0	0	0	20
	Ling (<i>Molva molva/ dypterygia</i>)	0	0	4	0	4	0	0	0	0	0	0	0	4	12
	Atlantic cod (<i>Gadus morhua</i>)	0	0	2	3	0	0	0	1	0	0	0	0	0	6
	Tusk (<i>Brosme brosme</i>)	0	0	1	0	0	0	0	0	0	0	0	0	0	1
	Cod family (Gadidae)	5	0	2	1	0	0	0	1	0	0	0	0	1	10
Atlantic herring (<i>Clupea harengus</i>)		6	0	12	0	19	11	0	41	0	0	0	9	0	98
Sparidae (Sea breams)	Blackspot seabream (<i>Pagellus bogaraveo</i>)	1	0	1	0	0	0	0	0	0	0	0	0	0	2
	Seabream family (Sparidae)	1	0	0	0	0	0	0	0	0	0	0	0	0	1
European conger (<i>Conger conger</i>)		1	0	1	0	0	0	0	0	0	0	0	0	0	2
Atlantic salmon (<i>Salmo salar</i>)		0	0	0	0	0	0	0	0	0	0	0	1	0	1
Flatfish family (Pleuronectidae)		0	0	1	0	1	0	0	0	0	0	0	0	0	2
Shark/skate/ray (Elasmobranchii)		0	0	2	0	1	0	0	3	0	0	0	0	0	6
Ribs/Spines		78	3	83	0	109	1	6	10	0	0	0	12	1	303
Scales		4	0	32	0	19	15	9	18	0	1	5	0	1	104
Unidentified		14	0	11	1	36	7	0	21	0	0	0	0	1	91
Total		117	3	156	5	195	34	15	97	1	1	5	22	8	659

Table 1: Summary of fish remains from the Newport Ship by context.

		F1-10	F11-20	F21-30	F31-40	F41-50	F51-62	No F	Total
Gadidae (Cod family)	European hake (<i>Merluccius merluccius</i>)	2	0	0	0	1	6	11	20
	Ling (<i>Molva molva/ dypterygia</i>)	2	2	2	0	1	0	6	13
	Atlantic cod (<i>Gadus morhua</i>)	2	0	1	0	3	1	0	7
	Tusk (<i>Brosme brosme</i>)	1	0	0	0	0	0	0	1
	Cod family (Gadidae)	1	3	1	0	1	0	2	8
Atlantic herring (<i>Clupea harengus</i>)		1	0	2	1	1	10	83	98
Sparidae (Sea breams)	Blackspot seabream (<i>Pagellus bogaraveo</i>)	1	0	1	0	0	0	0	2
	Seabream family (Sparidae)	0	0	1	0	0	0	0	1
European conger (<i>Conger conger</i>)		0	0	0	0	0	0	2	2
Atlantic salmon (<i>Salmo salar</i>)		0	0	0	0	1	0	0	1
Flatfish family (Pleuronectidae)		0	0	1	0	0	0	1	2
Shark/skate/ray (Elasmobranchii)		0	0	0	0	0	1	5	6
Ribs/Spines		30	6	49	38	38	10	131	302
Scales		3	0	0	1	0	3	97	104
Unidentified		9	2	11	3	8	6	53	92
Total		52	13	69	43	54	37	391	659

Table 2: Summary of fish remains from the Newport Ship by Frame number (F1=Bow, F62=Stern).

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Reviewed Native Distribution Map for *Brosme brosme* (Tusk). www.aquamaps.org, version of Aug. 2010. Web. Accessed 4 Oct. 2012.

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Site	F	MSG	Sample	Context	NISP	MNE	Element	L/R	Portion	Species	Common name	Butcher	Burnin	Gnaw	Comments	
Newport Ship	467	F25-27	882	168	120	\	14	?	Ribs	\	fragments	Unidentified	Unidentified	0	0	0 3 removed for zooms
Newport Ship	467	F25-27	882	168	120	\	1	1	Unidentified	\	complete	Unidentified	Unidentified	0	0	0
Newport Ship	467	F54-56	885	198	120	\	3	2	Scale	\		Unidentified	Unidentified	0	0	0
Newport Ship	467	F54-56	885	198	120	\	1	1	Articular	L	90%	<i>Clupea harengus</i>	Atlantic herring	0	0	0
Newport Ship	467	F54-56	885	198	120	\	1	1	Cleithrum	L	70%	<i>Clupea harengus</i>	Atlantic herring	0	0	0
Newport Ship	467	F54-56	885	198	120	\	3	?	Ribs	\	fragments	Unidentified	Unidentified	0	0	0
Newport Ship	467	F11-12	887	193	120	\	2	?	Ribs	\	fragments	Unidentified	Unidentified	0	0	0 1 removed for zooms
Newport Ship	467	F11-12	887	193	120	\	2	1	Posttemporal	\	fragments	Gadidae	Cod family	0	0	0
Newport Ship	467	F29-35	893	155	120	\	1	1	Caudal vertebra	\	complete	Sparidae	Seabream family	0	0	0
Newport Ship	467	F29-35	893	155	120	\	1	1	Postcleithrum	\	Prox 20%	Gadidae	Cod family	0	0	0
Newport Ship	467	F29-35	893	155	120	\	3	?	Ribs	\	fragments	Unidentified	Unidentified	0	0	0 2 removed for zooms
Newport Ship	467	\	895	58	120	\	1	1	Caudal vertebra	\	complete	<i>Merluccius merluccius</i>	European hake	0	0	0
Newport Ship	467	\	895	58	120	\	1	1	Caudal vertebra	\	complete	<i>Conger conger</i>	European conger	0	0	0
Newport Ship	467	\	899	162	120	\	1	1	Vertebra	\	45%	Gadidae	Cod family	0	0	0
Newport Ship	467	\	899	163	120	\	1	1	Caudal vertebra	\	90%	<i>Merluccius merluccius</i>	European hake	0	0	0
Newport Ship	467	\	899	163	120	\	1	1	Posttemporal	\	90%	<i>Merluccius merluccius</i>	European hake	0	0	0
Newport Ship	467	\	902	174	120	\	1		Precaudal vertebra	\	complete	<i>Merluccius merluccius</i>	European hake	0	0	0
Newport Ship	467	\	902	174	120	\	3	?	Ribs	\	fragments	Unidentified	Unidentified	0	0	0
Newport Ship	467	\	902	174	120	\	1	1	Precaudal vertebra	\	complete	<i>Clupea harengus</i>	Atlantic herring	0	0	0
Newport Ship	467	\	902	174	120	\	1	1	Precaudal vertebra	\	95%	<i>Merluccius merluccius</i>	European hake	0	0	0
Newport Ship	467	F35-39	905	164	120	\	3	?	Unidentified	\	fragments	Unidentified	Unidentified	0	0	0 1 removed for zooms,Also two pieces not fish in this sample

Newport Ship	467	F35-39	905	164	120	\	4	?	Ribs/spines	\	fragments	Unidentified	Unidentified	0	0	0	1 removed for zooms
Newport Ship	467	F46-50	908	195	120	\	2	?	Ribs/spines	\	fragments	Unidentified	Unidentified	0	0	0	1 removed for zooms
Newport Ship	467	F46-50	908	195	120	\	3	1	Vertebra	\	fragments	Unidentified	Unidentified	0	0	0	
Newport Ship	467		909	164	120	\	1	1	Brancheostegal ray	\	60%	Unidentified	Unidentified	0	0	0	
Newport Ship	467		909	164	120	\	1	1	Posttemporal	R	65%	<i>Merluccius merluccius</i>	European hake	0	0	0	
Newport Ship	467	F29-35	910	155	120	\	6	?	Ribs/spines	\	fragments	Unidentified	Unidentified	0	0	0	2 removed for zooms
Newport Ship	467	F29-35	910	155	120	\	1	1	Precaudal vertebra	\	complete	<i>Pagellus bogaraveo</i>	Blackspot seabream	0	0	0	
Newport Ship	467	F29-35	910	155	120	\	2	2	Caudal vertebra	\	Complete	<i>Clupea harengus</i>	Atlantic herring	0	0	0	
Newport Ship	467	F29-35	910	155	120	\	1	1	Unidentified	\	fragments	Unidentified	Unidentified	0	0	0	
Newport Ship	467	F45-6	913	186	120	\	1	1	Caudal vertebra	\	complete	<i>Merluccius merluccius</i>	European hake	0	0	0	
Newport Ship	467	F45-6	913	186	120	\	28	?	Ribs/spines	\	fragments	Unidentified	Unidentified	0	0	0	3 removed for zooms
Newport Ship	467	F45-6	913	186	120	\	3	?	Unidentified	\	fragments	Unidentified	Unidentified	0	0	0	
Newport Ship	467	F44-46	914	183	120	\	1	1	Caudal vertebra	\	complete	<i>Clupea harengus</i>	Atlantic herring	0	0	0	Many small fragments of wood - not fish bones - also in this sample
Newport Ship	467	F17	919	178	120		1	1	Caudal vertebra	\	70%	Gadidae	Cod family	0	0	0	
Newport Ship	467	F18-20	883	176	120	\	1	1	Unidentified	\	fragments	Unidentified	Unidentified	0	0	0	
Newport Ship	467	F11-12	887	193	120	\	1	1	Unidentified	\	fragments	Unidentified	Unidentified	0	0	0	1 removed for zooms
Newport Ship	467	F13-15	891	181	120	\	1	1	Rib/spine	\	fragments	Unidentified	Unidentified	0	0	0	1 removed for zooms
Newport Ship	467	F18-20	892	176	120	\	1	1	Rib/spine	\	fragments	Unidentified	Unidentified	0	0	0	1 removed for zooms
Newport Ship	467	F35-39	894	164	120	\	1	1	Scale	\	complete	Unidentified	Unidentified	0	0	0	1 removed for zooms
Newport Ship	467	F41-43	897	172	120	\	1	1	Unidentified	\	fragments	Unidentified	Unidentified	0	0	0	1 removed for zooms
Newport Ship	467	\	918	\	120	\	1	1	fin ray	\	fragments	Unidentified	Unidentified	0	0	0	1 removed for zooms
Newport Ship	467	\	917	58	120	\	2	?	Ribs/spines	\	fragments	Unidentified	Unidentified	0	0	0	2 removed for zooms

Newport Ship	467	F61	915	221	120	\	1	1	Ribs/spines	\	fragments	Unidentified	Unidentified	0	0	0 1 removed for zooms
Newport Ship	467	F44-46	914	183	120	\	2	?	Ribs/spines	\	fragments	Unidentified	Unidentified	0	0	0 2 removed for zooms
Newport Ship	467	\	912	220	120	\	1	1	Ribs/spines	\	fragments	Unidentified	Unidentified	0	0	0 1 removed for zooms
Newport Ship	467	F21-23	911	171	120	\	2	?	Ribs/spines	\	fragments	Unidentified	Unidentified	0	0	0 2 removed for zooms
Newport Ship	467	F41-43	907	172	120	\	1	1	Ribs/spines	\	fragments	Unidentified	Unidentified	0	0	0 1 removed for zooms
Newport Ship	467	Bow	299	\	128	Bow	3	?	Ribs	\	fragments	Unidentified	Unidentified	0	0	0 3 removed for zooms
Newport Ship	467	F7-8	387	\	130	\	7	?	Ribs/spines	\	fragments	Unidentified	Unidentified	0	0	0
Newport Ship	467	F7-8	387	\	130	\	1	1	Caudal vertebra	\	complete	<i>Clupea harengus</i>	Atlantic herring	0	0	0
Newport Ship	467	F7-8	387	\	130	\	1	1	Caudal vertebra	\	complete	<i>Merluccius merluccius</i>	European hake	0	0	0
Newport Ship	467	F8-9	388	\	130	\	9	?	Ribs/spines	\	fragments	Unidentified	Unidentified	0	0	0 3 removed for zooms
Newport Ship	467	F8-9	388	\	130	\	1	1	Precaudal vertebra	\	complete	<i>Merluccius merluccius</i>	European hake	0	0	0
Newport Ship	467	F6-8	390	\	130	\	3	?	Ribs	\	fragments	Unidentified	Unidentified	0	0	0 1 removed for zooms
Newport Ship	467	F5-6	392	\	130	\	2	?	Ribs	\	fragments	Unidentified	Unidentified	0	0	0 1 removed for zooms
Newport Ship	467	F28-29	394		130	arboa	22	?	Ribs/spines	\	fragments	Unidentified	Unidentified	0	0	0 2 removed for zooms
Newport Ship	467	F28-29	394		130	arboa	1	1	Caudal vertebra	\	complete	Pleuronectidae	flatfish	0	0	0
Newport Ship	467	F40-41	395	\	130	\	5	?	Ribs	\	fragments	Unidentified	Unidentified	0	0	0
Newport Ship	467	F40-41	395	\	130	\	1	1	Caudal vertebra	\	complete	<i>Molva molva</i>	Ling	0	0	0
Newport Ship	467	F9-6	795	\	130	u	2	1	Cleithrum	R	Medial 65%	<i>Molva molva</i>	Ling	0	0	0 Large fish
Newport Ship	467	F5-6	796		130	\	2	1	Supraclithrum	R	70%	<i>Gadus morhua</i>	Atlantic cod	0	0	0
Newport Ship	467	F8-9	798	\	130	\	2	2	Unidentified	\	fragments	Unidentified	Unidentified	0	0	0
Newport Ship	467	F8-9	798	\	130	\	2	2	spines	\	fragments	Unidentified	Unidentified	0	0	0
Newport Ship	467	F8-9	798	\	130	\	1	1	Parasphenoid	\	complete	<i>Brosme brosme</i>	Tusk	0	0	0

Newport Ship	467	F8-9s	799	\	130	v	1	1	Scapula	\	45%	<i>Gadidae</i>	Cod family	0	0	0
Newport Ship	467	\	800	\	130	\	1	1	Preopercular	\	60%	Unidentified	Unidentified	0	0	0
Newport Ship	467	F22-23	881	88	130	\	1	1	Precaudal vertebra	\	complete	<i>Molva molva</i>	Ling	0	0	0
Newport Ship	467	F22-23	881	88	130	\	1	1	Precaudal vertebra	\	complete	<i>Gadus morhua</i>	Atlantic cod	0	0	0 Destroyed in isotopic analysis
Newport Ship	467	F6-7	888	160	130	\	1	1	Ribs	\	fragments	Unidentified	Unidentified	0	0	0
Newport Ship	467	F6-7	888	160	130	\	1	1	Hyomandibular	L	complete	<i>Pagellus bogaraveo</i>	Blackspot seabream	0	0	0
Newport Ship	467		1317	59	130	\	8	?	Ribs/spines	\	fragments	Unidentified	Unidentified	0	0	0 2 removed for zooms
Newport Ship	467		1317	59	130	\	1	1	Scale	\	complete	Unidentified	Unidentified	0	0	0
Newport Ship	467		1317	59	130	\	1	1	Precaudal vertebra	\	complete	<i>Clupea harengus</i>	Atlantic herring	0	0	0
Newport Ship	467		1317	59	130	\	1	1	Precaudal vertebra	\	10%	<i>Clupea harengus</i>	Atlantic herring	0	0	0
Newport Ship	467	\	1318	72	130	\	24	24	Scale	\	complete	<i>Unidentified</i>	Unidentified	0	0	0
Newport Ship	467	\	1318	72	130	\	1	1	Caudal vertebra	\	complete	<i>Clupea harengus</i>	Atlantic herring	0	0	0
Newport Ship	467	\	1318	72	130	\	1	1	Vertebra	\	complete	Elasmobranchii	Shark/skate/ray	0	0	0
Newport Ship	467		1322	89	130	\	2	2	Caudal vertebra	\	complete	<i>Merluccius merluccius</i>	European hake	0	0	0
Newport Ship	467		1322	89	130	\	13	?	Ribs/spines	\	fragments	Unidentified	Unidentified	0	0	0 2 removed for zooms
Newport Ship	467		1322	89	130	\	3	3	Unidentified	\	complete	Unidentified	Unidentified	0	0	0
Newport Ship	467		1322	89	130	\	1	1	Posttemporal	\	85%	Unidentified	Unidentified	0	0	0
Newport Ship	467		1328	160	130	\	1	1	Vertebra	\	complete	<i>Conger conger</i>	European conger	0	0	0
Newport Ship	467		1328	160	130	\	1	1	Vertebra	\	20%	Elasmobranchii	Shark/skate/ray	0	0	0
Newport Ship	467		1328	160	130	\	5	5	Caudal vertebra	\	complete	<i>Clupea harengus</i>	Atlantic herring	0	0	0
Newport Ship	467		1328	160	130	\	2	2	Precaudal vertebra	\	complete	<i>Clupea harengus</i>	Atlantic herring	0	0	0
Newport Ship	467		1328	160	130	\	4	4	scale	\	complete	Unidentified	Unidentified	0	0	0 3 removed for zooms

Newport Ship	467		1328	160	130	\	3	?	Unidentified	\	fragments	Unidentified	Unidentified	0	0	0
Newport Ship	467		1328	160	130	\	4	?	Ribs/spines	\	fragments	Unidentified	Unidentified	0	0	0 2 removed for zooms
Newport Ship	467		1328	160	130	\	1	1	Quadrate	L	complete	<i>Clupea harengus</i>	Atlantic herring	0	0	0
Newport Ship	467	F13-14	391	\	130	\	2	?	Ribs/spines	\	fragments	Unidentified	Unidentified	0	0	0 2 removed for zooms
Newport Ship	467	F33-34	389	\	130	\	2	?	Ribs/spines	\	fragments	Unidentified	Unidentified	0	0	0 2 removed for zooms
Newport Ship	467	F5-6	393	\	130	\	2	?	Ribs	\	fragments	Unidentified	Unidentified	0	0	0 1 removed for zooms
Newport Ship	467	F8-9	797	\	130	\	1	1	Unidentified	\	fragments	Unidentified	Unidentified	0	0	0 1 removed for zooms
Newport Ship	467	\	904	152	130	TAR	1	1	Ribs/spines	\	fragments	Unidentified	Unidentified	0	0	0 1 removed for zooms
Newport Ship	467	F5-6	1084	153	130		2	2	Scale	\	complete	Unidentified	Unidentified	0	0	0 2 removed for zooms
Newport Ship	467	F8-9s	43	\	130	4/10/	1	1	Scale	\	complete	Unidentified	Unidentified	0	0	0 1 removed for zooms
Newport Ship	467	cF45s	802		149	\	1	1	Cleithrum	\	20%	Gadidae	Cod family	0	0	0
Newport Ship	467	CF45	803	\	149	u	3	1	Cleithrum	L	complete	<i>Gadus morhua</i>	Atlantic cod	0	0	0 Very large fish, One fragment removed for isotope/DNA analysis
Newport Ship	467	cF45s	802		149	\	1	1	Unidentified	\	fragments	Unidentified	Unidentified	0	0	0
Newport Ship	467	F28-29	322	\	152	\	9	1?	Unidentified	\	fragments	<i>Unidentified</i>	Unidentified	0	0	0
Newport Ship	467		804		152	u	1		Caudal vertebra	\	90%	<i>Molva molva</i>	Ling	1	0	0 Chop to RHS lateral edge
Newport Ship	467	F23-24	804	\	152	u	1	1	Precaudal vertebra	\	95%	<i>Molva molva</i>	Ling	1	0	0 slice to left lateral
Newport Ship	467	F17-18	805	\	152	u	2	1	Cleithrum	R	Medial 65%	<i>Molva molva</i>	Ling	0	0	0 Large fish
Newport Ship	467		889	92	152	\	2	2	Ribs/spines	\	complete	Unidentified	Unidentified	0	0	0
Newport Ship	467	F33-34	890	61	152	\	1	1	Caudal vertebra	\	complete	<i>Clupea harengus</i>	Atlantic herring	0	0	0
Newport Ship	467	F33-34	890	61	152	\	7	?	Ribs/spines	\	fragments	Unidentified	Unidentified	0	0	0 2 removed for zooms
Newport Ship	467	\	903	108?	152	G	1	1	Caudal vertebra	\	Complete	<i>Merluccius merluccius</i>	European hake	0	0	0
Newport Ship	467	\	903	108?	152	G	5	?	Ribs	\	fragments	Unidentified	Unidentified	0	0	0

Newport Ship	467 \	903	108?	152	G	2	2	Unidentified	\	fragments	Unidentified	Unidentified	0	0	0
Newport Ship	467 F33-34	906	\	152	\	24	?	Ribs/spines	\	fragments	<i>Unidentified</i>	Unidentified	0	0	0 4 removed for zooms
Newport Ship	467 F59-60	1315	149	152	\	3	3	Caudal vertebra	\	c95%	<i>Merluccius merluccius</i>	European hake	0	0	3 Rodent gnawing on centrum of all three
Newport Ship	467 F59-60	1315	149	152	\	1	1	Precaudal vertebra	\	90%	<i>Merluccius merluccius</i>	European hake	0	0	1 Rodent gnawing on centrum of all three
Newport Ship	467 F59-60	1315	149	152	\	1	1	Vertebra	\	20%	Elasmobranchii	Shark/skate/ray	0	0	0
Newport Ship	467 F59-60	1315	149	152	\	1	1	Precaudal vertebra	\	complete	<i>Clupea harengus</i>	Atlantic herring	0	0	0
Newport Ship	467 F59-60	1315	149	152	\	6	?	Unidentified	\	\	Unidentified	Unidentified	0	0	0
Newport Ship	467 F59-60	1315	149	152	\	4	?	Ribs	\	fragments	Unidentified	Unidentified	0	0	0 1 removed for zooms
Newport Ship	467	1319	112	152	\	1	1	Caudal vertebra	\	complete	<i>Merluccius merluccius</i>	European hake	0	0	1 Rodent gnawing on centrum of all three
Newport Ship	467	1319	112	152	\	30	?	Ribs/spines	\	fragments	<i>Unidentified</i>	Unidentified	0	0	0 5 removed for zooms
Newport Ship	467	1319	112	152	\	1	1	Quadrate	R	Complete	Unidentified	Unidentified	0	0	0
Newport Ship	467	1319	112	152	\	1	1	Caudal vertebra	\	complete	<i>Clupea harengus</i>	Atlantic herring	0	0	0
Newport Ship	467	1319	112	152	\	1	1	Precaudal vertebra	\	20%	<i>Clupea harengus</i>	Atlantic herring	0	0	0
Newport Ship	467	1321	108?	152	\	10	?	Ribs/spines	\	fragments	<i>Unidentified</i>	Unidentified	0	0	0 1 removed for zooms
Newport Ship	467	1321	108?	152	\	1	1	Hypural	\	complete	Pleuronectidae	flatfish	0	0	0
Newport Ship	467	1321	108?	152	\	3	3	Precaudal vertebra	\	complete	<i>Clupea harengus</i>	Atlantic herring	0	0	0
Newport Ship	467	1321	108?	152	\	2	2	Caudal vertebra	\	complete	<i>Clupea harengus</i>	Atlantic herring	0	0	0
Newport Ship	467	1321	108?	152	\	1	1	First vertebra	\	complete	<i>Clupea harengus</i>	Atlantic herring	0	0	0
Newport Ship	467 F4-4	1321	108?	152	\	6	?	Unidentified	\	fragments	<i>Unidentified</i>	Unidentified	0	0	0
Newport Ship	467	1323	60	152	\	5	?	Ribs/spines	\	fragments	Unidentified	Unidentified	0	0	0 2 removed for zooms
Newport Ship	467	1326	69	152	\	1	1	Precaudal vertebra	\	complete	<i>Clupea harengus</i>	Atlantic herring	0	0	0
Newport Ship	467	1326	69	152	\	1	1	Caudal vertebra	\	complete	<i>Clupea harengus</i>	Atlantic herring	0	0	0

Newport Ship	467		1326	69	152	\	6	6	scale	\	complete	Unidentified	Unidentified	0	0	0
Newport Ship	467		1326	69	152	\	8	?	Ribs/spines	\	fragments	Unidentified	Unidentified	0	0	0 1 removed for zooms
Newport Ship	467		1326	69	152	\	6	?	Unidentified	\	fragments	Unidentified	Unidentified	0	0	0 1 removed for zooms
Newport Ship	467		1327	148	152	\	11	0	Scale	\	complete	Unidentified	Unidentified	0	0	0 1 removed for zooms
Newport Ship	467		1327	148	152	\	1	1	Epihyal	L	complete	<i>Clupea harengus</i>	Atlantic herring	0	0	0
Newport Ship	467		1327	148	152	\	2	2	Precaudal vertebra	\	complete	<i>Clupea harengus</i>	Atlantic herring	0	0	0
Newport Ship	467		1327	148	152	\	1	1	Caudal vertebra	\	complete	<i>Clupea harengus</i>	Atlantic herring	0	0	0
Newport Ship	467		1327	148	152	\	3	?	Ribs	\	fragments	Unidentified	Unidentified	0	0	0 1 removed for zooms
Newport Ship	467		1329	114	152	\	7	?	Ribs/spines	\	fragments	Unidentified	Unidentified	0	0	0 2 removed for zooms
Newport Ship	467		1329	114	152	\	1	1	Precaudal vertebra	\	complete	<i>Clupea harengus</i>	Atlantic herring	0	0	0
Newport Ship	467		1329	114	152	\	1	1	Scale	\	complete	Unidentified	Unidentified	0	0	0
Newport Ship	467		1329	114	152	\	1	1	Dentary	R	25%	<i>Clupea harengus</i>	Atlantic herring	0	0	0
Newport Ship	467		1329	114	152	\	3	?	Unidentified	\	fragments	Unidentified	Unidentified	0	0	0
Newport Ship	467		1330	108	152	\	1	1	Scale	\	complete	Unidentified	Unidentified	0	0	0
Newport Ship	467		1330	108	152	\	1	1	Precaudal vertebra	\	complete	<i>Clupea harengus</i>	Atlantic herring	0	0	0
Newport Ship	467		1330	108	152	\	1	1	Unidentified	\	fragments	Unidentified	Unidentified	0	0	0
Newport Ship	467	F36-37	920	136	152	\	1	1	Rib/spine	\	fragments	Unidentified	Unidentified	0	0	0
Newport Ship	467		889	92	152	\	2	2	Unidentified	\	fragments	Unidentified	Unidentified	0	0	0 2 removed for zooms
Newport Ship	467	F20-21.5	916	94	152	\	2	?	Ribs/spines	\	fragments	Unidentified	Unidentified	0	0	0 2 removed for zooms
Newport Ship	467	F9-10	321	\	152	\	1	1	Ribs/spines	\	fragments	Unidentified	Unidentified	0	0	0 1 removed for zooms
Newport Ship	467	\	1324	67	153	\	15	15	Scale	\	complete	Unidentified	Unidentified	0	0	0 2 removed for zooms
Newport Ship	467	\	1324	67	153	\	10	10	Vertebra	\	complete	<i>Clupea harengus</i>	Atlantic herring	0	0	0 distorted - digested?, also darkly stained

Newport Ship	467 \	1324	67	153	\	7	?	Unidentified	\	fragments	Unidentified	Unidentified	0	0	1 removed for zooms, distorted, also darkly stained
Newport Ship	467 \	1324	67	153	\	1	1	Parasphenoid	\	25%	<i>Clupea harengus</i>	Atlantic herring	0	0	0 distorted - digested?, also darkly stained
Newport Ship	467 \	1324	67	153	\	1	1	Ribs/spines	\	fragments	Unidentified	Unidentified	0	0	0 1 removed for zooms
Newport Ship	467	1325	68	154	\	6	?	Ribs/spines	\	fragments	Unidentified	Unidentified	0	0	0 1 removed for zooms
Newport Ship	467	1325	68	154	\	9	8	Scale	\	complete	Unidentified	Unidentified	0	0	0 1 removed for zooms
Newport Ship	467 F60-61	287	\	171	\	3	1	Preopercular	\	75%	<i>Clupea harengus</i>	Atlantic herring	0	0	0
Newport Ship	467 F60-61	880	190	171	\	1	1	Preopercular	\	40%	<i>Clupea harengus</i>	Atlantic herring	0	0	0
Newport Ship	467 \	884	177	171	\	5	4	Scale	\		Unidentified	Unidentified	0	0	0
Newport Ship	467 F60-61	886	190	171	\	1	1	Caudal vertebra	\	complete	<i>Gadus morhua</i>	Atlantic cod	0	0	0 Destroyed in isotopic analysis
Newport Ship	467 F60-61	886	190	171	\	1	1	Caudal vertebra	\	complete	<i>Merluccius merluccius</i>	European hake	0	0	0
Newport Ship	467 F60-61	886	190	171	\	1	1	Cleithrum	L	Medial 10%	<i>Merluccius merluccius</i>	European hake	0	0	0
Newport Ship	467 F60-61	896	190	171	\	2	1	Parasphenoid	\	60%	<i>Clupea harengus</i>	Atlantic herring	0	0	0
Newport Ship	467 F60-61	896	190	171	\	1	1	Caudal vertebra	\	complete	<i>Clupea harengus</i>	Atlantic herring	0	0	0
Newport Ship	467 \	1320	177	171	\	14	14	Caudal vertebra	\	complete	<i>Clupea harengus</i>	Atlantic herring	0	0	0
Newport Ship	467 \	1320	177	171	\	11	11	Precaudal vertebra	\	complete	<i>Clupea harengus</i>	Atlantic herring	0	0	0
Newport Ship	467 \	1320	177	171	\	2	2	otic bullae	\	complete	<i>Clupea harengus</i>	Atlantic herring	0	0	0
Newport Ship	467 \	1320	177	171	\	1	1	Dentary	R	85%	<i>Clupea harengus</i>	Atlantic herring	0	0	0
Newport Ship	467 \	1320	177	171	\	1	1	Quadrate	R	80%	<i>Clupea harengus</i>	Atlantic herring	0	0	0
Newport Ship	467 \	1320	177	171	\	1	1	Articular	L	25% including	<i>Clupea harengus</i>	Atlantic herring	0	0	0
Newport Ship	467 \	1320	177	171	\	1	1	Opercular	R	20% including	<i>Clupea harengus</i>	Atlantic herring	0	0	0
Newport Ship	467 \	1320	177	171	\	13	13	Scale	\	complete	Unidentified	Unidentified	0	0	0
Newport Ship	467 \	1320	177	171	\	1	1	Hyomandibular	L	70%	<i>Clupea harengus</i>	Atlantic herring	0	0	0

Newport Ship	467 \	1320	177	171	\	1	1	Posttemporal	R	20%	<i>Clupea harengus</i>	Atlantic herring	0	0	0
Newport Ship	467 \	1320	177	171	\	1	1	Posttemporal	L	20%	<i>Clupea harengus</i>	Atlantic herring	0	0	0
Newport Ship	467 \	1320	177	171	\	3	3	Vertebra	\	complete	Elasmobranchii	Shark/skate/ray	0	0	0
Newport Ship	467 \	1320	177	171	\	2	1	Vertebra	\	80%	Unidentified	Unidentified	0	0	0
Newport Ship	467 \	1320	177	171	\	8	?	Ribs	\	fragments	Unidentified	Unidentified	0	0	0 2 removed for zooms
Newport Ship	467 \	1320	177	171	\	1	1	Supraclithrum	\	25%	Gadidae	Cod family	0	0	0
Newport Ship	467 \	1320	177	171	\	18	?	Unidentified	\	\	Unidentified	Unidentified	0	0	0 1 removed for zooms
Newport Ship	467 F60-61	896	190	171	\	2	?	Rib/spine	\	fragments	Unidentified	Unidentified	0	0	0
Newport Ship	467 \	898	177	171	\	1	1	Subopercular	\	complete	Unidentified	Unidentified	0	0	0 1 removed for zooms
Newport Ship	467	900	418	1013	\	1	1	Vertebra	\	50%	<i>Merluccius merluccius</i>	European hake	0	0	0
Newport Ship	467	525	\	3036	found in	1	1	Scale	\	complete	Unidentified	Unidentified	0	0	0
Newport Ship	467 spit 3	1256		3055	\	1	\	Scale	\		Unidentified	Unidentified	0	0	0
Newport Ship	467 spit 14	1257	4 of 4	3055	\	4	4	Scale	\		Unidentified	Unidentified	0	0	0
Newport Ship	467	1188	2810	u/s	o	1	1	Caudal vertebra	\	95%	<i>Molva molva</i>	Ling	0	0	0
Newport Ship	467 \	1189	2813	u/s	\	1		Ribs	\		Unidentified	Unidentified	0	0	0
Newport Ship	467 \	1283	\	u/s	z, also	1	1	Scale	\	complete	Unidentified	Unidentified	0	0	0 1 removed for zooms
Newport Ship	467 F45-48	901	189	130/152	\	1	1	Precaudal vertebra	\	complete	<i>Salmo salar</i>	Atlantic salmon	0	0	0
Newport Ship	467	1316	189	130/152	\	12	?	Ribs/spines	\	fragments	<i>Unidentified</i>	Unidentified	0	0	0 3 removed for zooms
Newport Ship	467	1316	189	130/152	\	4	4	Precaudal vertebra	\	complete	<i>Clupea harengus</i>	Atlantic herring	0	0	0
Newport Ship	467	1316	189	130/152	\	3	3	Caudal vertebra	\	complete	<i>Clupea harengus</i>	Atlantic herring	0	0	0
Newport Ship	467	1316	189	130/152	\	1	1	Posttemporal	L	20%	<i>Clupea harengus</i>	Atlantic herring	0	0	0
Newport Ship	467	1316	189	130/152	\	1	1	Basioccipital	\	complete	<i>Clupea harengus</i>	Atlantic herring	0	0	0

Newport Ship	467	\	801		u/s	\	1	1	Caudal vertebra	\	complete	<i>Molva molva</i>	Ling	0	0	0
Newport Ship	467	\	801		u/s	\	2	1	Postcleithrum	L	80%	<i>Molva molva</i>	Ling	0	0	0
Newport Ship	467	1042	1188	2810	u/s	o	1	1	Caudal vertebra	\	complete	<i>Molva molva</i>	Ling	0	0	0
Newport Ship	467	1042	1188	2810	u/s	o	1	1	Vertebra	\	5%	Unidentified	Unidentified	0	0	0

Context	Ling	Cod	Hake	Tusk	Herring	Conger	Seabream	Salmon	Gadidae	Sparidae	Shark/skate/ray	Flatfish	Ribs/Spines	Unidentified	Scales	Total
120	0	0	7	0	6	1	1	0	5	1	0	0	78	14	4	117
128	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	3
130	4	2	4	1	12	1	1	0	2	0	2	1	83	11	32	156
149	0	3	0	0	0	0	0	0	1	0	0	0	0	1	0	5
152	4	0	6	0	19	0	0	0	0	0	1	1	109	36	19	195
153	0	0	0	0	11	0	0	0	0	0	0	0	1	7	15	34
154	0	0	0	0	0	0	0	0	0	0	0	0	6	0	9	15
171	0	1	2	0	41	0	0	0	1	0	3	0	10	21	18	97
1013	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
3036	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
3055	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	5
130/152	0	0	0	0	9	0	0	1	0	0	0	0	12	0	0	22
Unstratified	4	0	0	0	0	0	0	0	1	0	0	0	1	1	1	8
Total	12	6	20	1	98	2	2	1	10	1	6	2	303	91	104	659

		F1-10	F11-20	F21-30	F31-40	F41-50	F51-62	No F	Total	
Gadidae (Cod family)	European hake (Merluccius merluccius)	2	0	0	0	1	6	11	20	
	Ling (Molva molva)	2	2	2	0	1	0	6	13	
	Atlantic cod (Gadus morhua)	2	0	1	0	3	1	0	7	
	Tusk (Brosme brosme)	1	0	0	0	0	0	0	1	
	Cod family (Gadidae)	1	3	1	0	1	0	2	8	
Atlantic herring (Clupea harengus)		1	0	2	1	1	10	83	98	
Sparidae (Seabreams)	Blackspot seabream (Pagellus bogaraveo)	1	0	1	0	0	0	0	2	
	Seabream family (Sparidae)	0	0	1	0	0	0	0	1	
European conger (Conger conger)		0	0	0	0	0	0	2	2	
Atlantic salmon (Salmo salar)		0	0	0	0	1	0	0	1	
Flatfish family (Pleuronectidae)		0	0	1	0	0	0	1	2	
Shark/skate/ray (Elasmobranchii)		0	0	0	0	0	1	5	6	
Ribs/Spines		30	6	49	38	38	10	131	302	
Scales		3	0	0	1	0	3	97	104	
Unidentified		9	2	11	3	8	6	53	92	
Total		52	13	69	43	54	37	391	659	