

## 8 VERTEBRATE REMAINS, by *László Bartosiewicz*

### 8.1 Introduction

Animal remains were found in seven stratigraphically related major contexts of the midden (C31, C34, C36, C37, C38, C40 & C41). Charred and calcined bones from various contexts and some features termed 'hearths' above the midden horizon seem to represent subsequent accumulations that will not be discussed in detail.

Given the stratigraphic complexity of the site, the aim of this study is to characterise animal remains from the aforementioned major contexts. The number of identifiable specimens (NISP) was counted, and fragment weights were measured. Sub-assemblage sizes as well as the numbers of identifiable bones varied considerably between contexts (C31: NISP = 1864, 775.4g; C34: NISP = 173, 544.30g; C36: NISP = 982, 1673.2g; C37: NISP = 11, 2.73g; C38: NISP = 28, 50.28g; C40: NISP = 65, 6.14g; and C41: NISP = 1, 1.04g). It is possible that the greater number of species in some contexts is, to a great extent, the consequence of larger sample size (illus 42; Grayson 1984, 137). The results are detailed by context in Tables 20–27.

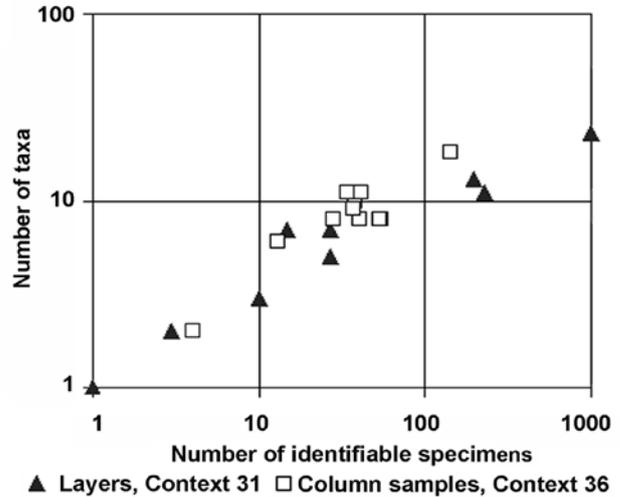
The zoological nomenclature used depended on the degree to which bones were identifiable. Linnaean binomial names were generally used in the identification of species. Sometimes, however, it was only possible to recognise broader categories, such as 'large ungulate' (aurochs, cattle, red deer, wild pig or horse), 'large artiodactyl' (aurochs, cattle, red deer or wild pig), 'large ruminant' (aurochs, cattle or red deer) or 'large bovine' (aurochs or cattle). The same hierarchical scheme was applied for small ungulates/ruminants. Measurements taken, following the standard published by von den Driesch (1976), are presented in the catalogue in the site archive.

The analysis of vertebrate remains from An Corran was carried out in 1996–97. This text has been updated only in terms of the most directly relevant publications post-dating its first submission.

### 8.2 Preservation and recovery

The taxonomic composition, as well as the heterogeneous state of preservation of this assemblage, suggest varying forms of deposition. Gautier (1987) distinguished at least four major sources of animal remains at archaeological sites. In the order of increasing complexity, faunal materials may originate from:

- intrusive animals (at An Corran, possibly bones of most rodents, shrews, puffins and occasional amphibians);



Illus 42 The relative abundance of taxa in major wet-sieved samples. The graph shows clearly that greater numbers of animal taxa are represented in samples of statistically viable sizes.

- carcasses originating from *in situ* death, water transport or importation by predatory animals (some bird bones, otter holts, owl pellets, as well as the gut-contents of larger fish preyed upon by otter or humans, may fall into this category);
- food refuse (for example bones showing marks of defleshing or marrow-extraction);
- waste material from craft activities (raw material from *in situ* bone and antler manufacturing, and bones with skinning marks).

Although many sites in central-west Scotland older than *c.* 6500 BP may have been submerged and/or destroyed by the sea during the Main Postglacial Transgression (Bonsall & Sutherland 1992), the evidence at An Corran suggests that it is unlikely to have been affected even by storm waves. However, some bones of terrestrial microfauna (amphibians, insectivores and rodents) may have been washed into the midden by rainwater from higher areas of the cliff, a phenomenon frequently observed in rock-shelters and caves (Bartosiewicz et al 2010). This type of accumulation is a characteristic source of microvertebrate remains.

In addition to differences in the origins of the archaeozoological material, it is also possible that bones found in pockets of the shell midden underwent different post-depositional taphonomic modifications. The lack of even incomplete articulated skeletal sections, a high degree of fragmentation, as well as the often heterogeneous state of preservation within

**Table 20 Animal taxa identified**

Vernacular name	Latin name	Mesolithic		Post-Mesolithic	
		NISP	Weight, g	NISP	Weight, g
common eel	<i>Anguilla anguilla</i> L. 1758	53	0.9		
salmon/trout	Salmonidae	138	3.9	8	0.3
gadids	Gadidae	1589	46.2	4	3.0
cod	<i>Gadus morrhua</i> L. 1758	48	21.9		
whiting	<i>Merlangius merlangus</i> L. 1758	5	0.1		
saithe	<i>Pollachius virens</i> L. 1758	44	3.3		
cuckoo wrasse	<i>Labrus cf. mixtus</i> L. 1758	39	1.8		
cottids	Cottidae	20	0.3		
plaice	<i>Pleuronectes platessa</i> L. 1758	40	0.6		
dab	<i>Limanda limanda</i> L. 1758	9	0.2		
frog/toad indet.	<i>Anura</i> sp.	11	0.6		
great auk	<i>Alca impennis</i> L. 1758	17	50.8		
gannet	<i>Sula bassana</i> L. 1758	1	6.1	1	1.4
cormorant	<i>Phalacrocorax carbo</i> L. 1758	7	16.9		
white-tailed eagle	<i>Haliaeetus albicilla</i> L. 1758	2	5.5		
pomarine skua	<i>Stercorarius pomarinus</i> L. 1758	2	1.6		
gull	<i>Larus argentatus seu marinus</i>	2	1.0		
guillemot	<i>Uria aalge</i> L. 1758	1	1.1		
puffin	<i>Fratercula arctica</i> L. 1758	81	44.7		
willow tit	<i>Parus atricapillus</i> L. 1758	3	0.1		
thrush	<i>Turdus cf. merula</i> L. 1758	1	0.1		
perching bird indet.	Passeriformes	7	0.0		
common shrew	<i>Sorex araneus</i> L. 1758	16	0.2		
pigmy shrew	<i>Sorex minutus</i> L. 1758	6	0.1	2	<0.1
bank vole	<i>Clethrionomys glareolus</i> L. 1758	21	0.1		
field vole	<i>Microtus agrestis</i> L. 1758	6	0.1		
rodent indet.	Rodentia	48	1.0	1	<0.1
common hare	<i>Lepus timidus</i> L. 1758	9	7.1		
wild cat	<i>Felis silvestris</i> Schreb. 1777	3	2.8		
otter	<i>Lutra lutra</i> L. 1758	1	7.5		
brown bear	<i>Ursus arctos</i> L. 1758	1	1.7		
large canid	Canidae	1	1.4		
wild pig	<i>Sus scrofa</i> L. 1758	10	62.7		
pig indet.	Suidae	57	246.8	1	2.1
roe deer	<i>Capreolus capreolus</i> L. 1758	114	371.7	12	14.2
red deer	<i>Cervus elaphus</i> L. 1758	173	1628.9	14	76.7
cattle indet.	Bovinae	17	194.8	6	175.3
<b>NISP TOTAL</b>		<b>2603</b>	<b>2734.6</b>	<b>49</b>	<b>273.0</b>
fish indet.	Pisces	2228	56.5	62	1.7
frog/toad indet.	<i>Anura</i> sp.	11	55.9		
bird indet.	Aves	114	49.3	3	0.3
small ruminant indet.	Ruminantia	42	63.8		
large ruminant indet	Ruminantia	371	858.1	896	298.8
small artiodactyl	Artiodactyla	1286	225.8	221	64.1
non-identifiable		731	35.5	205	21.1
<b>Non-identifiable TOTAL</b>		<b>4783</b>	<b>1344.9</b>	<b>1387</b>	<b>386.0</b>

**Table 21 The distribution of major types of animal remains by archaeological context**

	Total		Small artiodactyl		Large artiodactyl		Other taxa	
	n	W, g	n	W, g	n	W, g	n	W, g
Hearths	1437	644.2	234	86.4	916	533.7	287	24.0
C 31	99	518.0	24	100.9	63	400.9	32	31.2
1	916	99.9	269	48.7	16	39.7	621	11.5
1/2	308	46.3	49	4.3	33	36.2	226	5.8
2	11	0.3	3	0.2	0	0.0	8	0.1
2/3	758	85.5	49	14.9	41	35.3	668	35.3
3	150	16.8	59	3.2	16	8.5	75	5.2
4	2369	407.0	475	110.4	81	252.1	1810	51.4
4/5	1	1.1	0	0.0	1	1.1	0	0.0
5	50	19.7	0	0.0	0	0.0	50	19.7
6	52	10.5	11	1.7	13	8.1	28	0.7
7/8	122	5.4	11	3.1	0	0.0	111	2.3
C 34	216	515.4	28	95.1	33	390.6	155	29.7
C 36	493	2001.5	140	340.2	209	1532.2	144	103.1
Sample A	144	34.2	45	6.7	3	0.7	96	27.8
Sample B	60	23.9	19	3.4	3	0.5	38	21.0
Sample C	138	32.9	20	4.2	8	20.3	110	8.4
Sample D	458	51.5	64	9.6	8	10.1	384	31.4
Sample E	90	30.1	9	1.1	0	0.0	81	29.0
Sample F	84	7.7	8	0.4	0	0.0	76	7.3
Sample G	79	45.5	10	1.8	1	0.1	68	42.6
Sample H	79	6.3	2	1.2	0	0.0	77	5.2
Sample I	93	26.3	4	0.4	10	6.4	79	22.5
Sample J	81	12.2	15	1.4	5	3.4	61	7.4
Sample R	5	5.5	0	0.0	1	0.4	4	5.1
C 38	191	64.8	24	8.5	19	59.0	144	0.4
C 37	144	7.5	4	1.0	2	1.7	138	4.8
C 40	189	9.9	86	0.0	16	5.0	86	2.2
C 41	5	4.4	1	1.0	4	3.4	0	0.0
<b>TOTAL</b>	<b>8822</b>		<b>1663</b>		<b>1502</b>		<b>5657</b>	
<b>TOTAL W, g</b>		<b>4734.3</b>		<b>849.8</b>		<b>3349.4</b>		<b>535.1</b>

the same context, suggest repeated prehistoric redeposition at the site.

At An Corran, vertebrate remains owe their survival, indirectly, to human activity, regardless of their origins (e.g. primary taphocoenoses, or remains of prey items accumulated by predatory animals or humans), as the calcareous organic matrix of massive shell deposits creates an alkaline environment. Masses of predominantly limpet shells (Bonsall et al 1994; Russell 1992, 34) buffer soil acidity, thereby promoting the preservation of bone within the midden.

Although the surface preservation of most bones from An Corran is good (relatively few eroded and

weathered bones were observed during the examination), the overall state of the material is extremely fragmented. In addition to the probably intentional breakage of large mammalian long bones, trampling and multiple redeposition probably played a role in this process.

Shades of very pale brown (HUE 10YR 8/3–8/4 & 7/3–7/4; MUNSELL 1990) dominate in the hand-collected midden material not affected by heat (burning may cause various forms of discoloration that obliterates the natural patina of excavated bone finds). Sieving of other midden material through mesh sizes of 1–4mm guaranteed that most bones and bone fragments were recovered, especially from

**Table 22 The distribution of animal remains by artificial layers in Context 31**

Layer No.	Frog/toad	eel	salmon/trout	gadids	cod	saithe	whiting	wrasse	cottids	plaice	great auk	cormorant	pomarine skua	gull	gulliemot	puffin	willow tit	thrush	perching bird	shrew	bank/field vole	common hare	wild cat	large canid	pig indet.	small ruminant	roe deer	red deer	cattle indet.
1			127	29	1		15									1			1	4	25				1	2	1	3	
2	2			12	8			4												4	2	2			1		2		
2/3				171	5	4	1									2				3	12						7	16	1
3	2	2		4								1							1	3			1		2		2		
4			1	896	16	10	1		2	2					1	3			4	1	7	1	1	1	3		22		
5				5	3	2																							
6																1												2	
7/8				14	9														1						1	4			

**Table 23 The distribution of animal remains by 30 x 30 cm column samples in Context 36**

Column sample	Frog/toad	eel	salmon/trout	gadids	cod	saithe	whiting	wrasse	cottids	plaice	great auk	cormorant	pomarine skua	gull	gulliemot	puffin	willow tit	thrush	perching bird	shrew	bank/field vole	common hare	wild cat	large canid	pig indet.	small ruminant	roe deer	red deer	cattle indet.
A			1	31		1		15						1						3	1							2	
B			1	15	3	1					1					4				2	2						1		
C	1		2	20	3	2										2	1				5						1		
D		27	10	49	4	6				4		1	1	1		21		1		1	6			1	3	5			
E				6		2				7	1					5	1			2	4						3	2	
F		7		33	3	5										1				1	1						3		
G			1	16	2	1	1		15																1	4			
H		1	1	29	1	1				1							1		1									1	
I			1	29	1	1	1													1				8			1	2	
J		2	2							1										2					2	2	3		
R																				2						3	1		

**Table 24 The anatomical distribution of identifiable fish remains**

	eel	salmon/trout	cod	saithe	whiting	gadid	cuckoo wrasse	cottid	dab	plaice
vomer			3	4		1				
parasphenoideum			2	4		3				
basioccipitale						7				
prooticum		1								
exoccipitale						1				
otolith*			1	2		2				
angulare			4	2		6				2
dentale	2		4	9	3	5				
pharyngeal tooth							2			
premaxillare			16	13	2	47	8			
maxillare		1	7	9		44				
suboperculare								1		
branchyostegale						3				
palatinum		2				4				
quadratum			2	1		6	1		1	
hyomandibulare			1			1		1		1
epihyale						3				
ceratohyale		3	1							
hypohyale						1				2
urohyale		1				1				
scapula			1							
coracoideum		1	1							
posttemporale						6				
cleithrum			1			5				1
basipterygium						1				
atlas			1			7				
vertebra praecaudalis	29	74	3			919	15	3		21
vertebra caudalis	22	53				514	13	15	8	6
radii		2								4
pterygiophori						2				3
<b>TOTAL</b>	<b>53</b>	<b>138</b>	<b>48</b>	<b>44</b>	<b>5</b>	<b>1589</b>	<b>39</b>	<b>20</b>	<b>9</b>	<b>40</b>

\*Otoliths were also recovered from the flotation samples: see addendum to section 10.

fish and micromammals. Flotation samples prepared for the purposes of macrobotanical analyses also yielded small fragments of vertebrate bones.

### 8.3 Results

Below, the major groups of animals listed in Tables 20–27 are briefly described in the order of their taxonomic affiliations. The biological features of the

taxa deemed most relevant to prehistoric exploitation are summarised in order to elucidate the role they may have played at the time of midden formation.

#### 8.3.1 Poikilothermic vertebrates

Common eel (*Anguilla anguilla* L. 1758) may attain a maximum length of 1.4m (Campbell 1989, 274).

**Table 25 The anatomical distribution of bird remains**

	great auk	gannet	cormorant	white-tailed eagle	pomarine skua	gull sp.	guillemot	puffin	willow tit	thrush	perching bird	bird indet.
neurocranium fragment												2
frontale								1				
mandibula	3					1		1				1
atlas												
epistropheus	1											
cervical vertebra	1							4				5
thoracic vertebra	1							2				
synsacrum			1									3
rib												21
sternum						1						3
clavicula								1				1
coracoideum	2							9				3
scapula	1							4				
humerus	2	1	3					16				7
radius				1				7				3
ulna	2		1					14			4	7
carpometacarpus			2				1	6			1	
femur	1			1				1	1			2
patella												
tibiotarsus	2				1			4		1	2	9
tarsometatarsus	1							2	2			2
phalanx proximalis					1			8				4
phalanx media								1				2
phalanx distalis												2
long bone												33
flat bone												3
<b>TOTAL</b>	<b>17</b>	<b>1</b>	<b>7</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>1</b>	<b>81</b>	<b>3</b>	<b>1</b>	<b>7</b>	<b>113</b>

Bones of this species occurred sporadically at the site. The colourless elvers of eel move into brackish water and then up the rivers to live in fresh water for several years. Some of them, however, remain in the brackish waters of the estuaries in the lower reaches of the rivers. The rest move downstream on their spawning migration towards the end of the summer (Angel 1977, fig. 40). In September–October, the silver eels move into the sea. With the exception of a large but non-measurable dentale fragment, the An Corran bones seem to represent small individuals. Present-day otter spraints from Mull (Argyll) contained up to 7.4% eel remains (Watt 1991, 24, table 7).

Remains from salmon and trout (Salmonidae) were found exclusively in wet-sieved samples (illus 43). This may be due to the poor preservation of their structurally weak, fatty bones. Nevertheless, most of the remains originate from fairly large, adult individuals. This may be indicative of the site's location several hundred metres from the mouth of the nearest stream. Approximately 170mm long smolts of salmon (*Salmo salar* L. 1758; Angel 1977, fig. 36) move down rivers and into the sea in May and June. They spend some time in estuaries, where they acclimatise to salinity; most migrate to the sea when they are approximately 100–190mm long (Muus & Dahlström 1977, 76). The maximum

**Table 26 The anatomical distribution of mammalian remains**

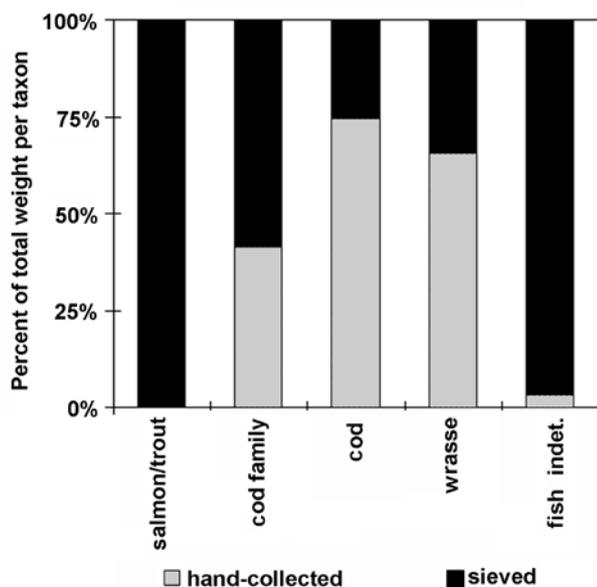
	common hare	wild cat	otter	brown bear	canid	wild pig	pig indet.	roe deer	red deer	bovine	small ruminant	large ruminant	small artiodactyl
neurocranium fragment							2	2	3			3	
frontale													
nasale													
os incisivum												1	
zygomaticum							1	1	1				
maxilla									1	1			
mandibula						1	2	5	5			5	
upper tooth						1	1	11	5	3			
lower tooth						2		13	6				1
atlas								1	1				
epistropheus							2	1	2	1			
cervical vertebra							3	3	3	1	3	4	6
thoracic vertebra							4	4	6		1	4	5
lumbal vertebra							2	6	4	1	1	7	1
sacral vertebra								1					
rib							5		4	5	7	40	228
sternum											5		6
scapula											1	5	
humerus	1						1	1	1		1	2	1
radius									3	2	2	6	2
ulna		1	1				1	2	5		1	2	3
carpalia							1	6	5	2			
metacarpus	1					3	7	15	39			4	
ilium								1	1				
acetabulum pelvis								1	1				1
femur	1						1	5	5	1	3	9	6
patella								1	1				
tibia	4					1		11	6			8	3
fibula							1						
calcaneus							1		1				
astragalus									4				
centrotarsale							3	1	1				
metatarsus						2	4	16	36			4	1
phalanx proximalis	1	1		1	1		6	3	7				
phalanx media	1	1					6	2	6		1		1
phalanx distalis							3	1	4				
long bone									6		16	124	413
flat bone												143	608
<b>TOTAL</b>	<b>9</b>	<b>3</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>10</b>	<b>57</b>	<b>114</b>	<b>173</b>	<b>17</b>	<b>42</b>	<b>371</b>	<b>1286</b>
antler (206.8 g)									41				

**Table 27 Bone measurements (mm)**

Species/bone	Context	GL	Bp	Bd	SD	Smallest depth	Bd	Dd
<b>Great auk</b>								
coracoideum	C 31	55.2						
coracoideum	C 36	55.2						
humerus	Sample E(a)		24.5	12.1				
humerus	Sample B(a)	55.9	24.9	9.5	9.9	4.9	10.6	12.1
ulna	C 36	55.6						
ulna	C 36	55.7						
femur	C 36		15.1	11.0				
tibiotarsus	C 31		13.6	14.1				
tibiotarsus	C 36						12.5	12.9
tarsometatarsus	C 36	52.9	13.6	10.8	6.9	4.2	13.9	10.2
<b>Cormorant</b>								
humerus	C 36						14.0	10.2
humerus	C 36				7.8	6.1	15.2	11.1
carpometacarpus	C 36	57.2						
carpometacarpus	C 36	60.1						
<b>White-tailed eagle</b>								
radius	C 36		11.0	8.9				
femur	C 34		26.1	16.2				
<b>Guillemot</b>								
carpometacarpus	C 31	43.1						
<b>Pomarine skua</b>								
tibiotarsus	C 36	81.1					7.9	6.1
<b>Puffin</b>								
coracoideum	Sample D	38.1						
coracoideum	Sample E(a)	36.4						
coracoideum	C 36	31.2						
coracoideum	C 36	34.1						
coracoideum	C 31	37.9						
humerus	C 36	59.6	13.9	5.2	5.2	3.1		
humerus	Sample D	57.8						
humerus	C 31	60.2						
humerus	C 31	60.6	14.1	6.8	3.2	5.0	8.7	6.5
humerus	C 36		13.8	6.3				
humerus	C 31	59.8	13.6	6.5	3.0	4.8	8.9	5.7
humerus	C 36	59.8	13.2	6.9	3.2	4.7	6.5	7.0
humerus	C 36		14.1	7.2	5.1	3.3		
humerus	C 36	59.1	13.5	6.6	4.9	3.2	6.7	8.0
humerus	C 36	62.8	13.2	6.8	5.1	3.2	6.7	7.9
humerus	C 36	61.9	13.8	7.0	3.2	5.0	6.8	7.2
humerus	C 36	61.9	14.1	7.0	5.1	3.2	6.8	7.1
radius	C 36	44.9						
radius	C 36	45.1						
radius	C 36	46.1						
ulna	Sample E	58.2						
ulna	Sample E	49.3						
ulna	Sample D	47.1						

**Table 27 (cont.) Bone measurements (mm)**

Species/bone	Context	GL	Bp	Bd	SD	Smallest depth	Bd	Dd
ulna	C 36	45.2						
ulna	C 36	47.2						
ulna	C 36	45.2						
ulna	C 36	47.3						
ulna	C 36	58.5						
ulna	C 36	48.0						
ulna	C 36	49.5						
ulna	C 36	49.7						
ulna	C 36	46.9						
ulna	C 36	58.5						
carpometacarpus	C 36 bottom	37.2						
carpometacarpus	C 36	42.1						
carpometacarpus	C 36	38.7						
carpometacarpus	C 36	32.7						
femur	C 31	46.2	8.7	6.0	3.9	4.8	8.1	8.2
tibiotarsus	C 36						5.7	5.9
tarsometatarsus	Sample F(a)	35.9	8.2	6.1	3.8	3.1	7.2	6.1
<b>Common hare</b>								
humerus	C 36				5.3	5.1	11.1	9.0
<b>Otter</b>								
ulna	C 36	91.2						
			<b>Cranial art. surf.</b>					
<b>Pig indet.</b>								
epistropheus, subadult	C 36		56.9					
epistropheus	C 36		38.1					
<b>Roe deer</b>								
humerus	C 31		36.1	45.5				
radius	C 31		26.2	16.9				
radius	C 36		29.0	17.5				
tibiotarsus	Sample G(a)		45.9					
astragalus	C 34	32.2	30.4				20.3	18.0
metatarsus	C 34						22.2	15.3
metatarsus	C 34						22.9	15.9
metatarsus	C 34		19.8					
<b>Red deer</b>								
antler, lower beam	C 36				33.0	26.9		
antler, upper beam	C 36				31.1	21.9		
humerus	C 34						64.3	58.2
radius, subadult	Sample A(a)						47.1	36.9
metacarpus, subadult	C 36						41.5	28.9
metacarpus	C 34						41.2	27.1
metacarpus	C 36				32.2			
metacarpus	C 36		<b>GLm</b>	32.5				
astragalus	C 31	53.4					31.9	27.2
astragalus	C 31	53.2	50.1				33.8	29.9
astragalus, subadult	C 31	42.0	39.9				27.0	23.2
metatarsus	C 31		31.2					



Illus 43 Percentage proportions of fish bone weights recovered by different methods

adult length of these fish is 1.5m, although none of the bones recovered at An Corran belonged to such large individuals. However, mediolateral diameters measured on the caudal articular surface of a modern reference specimen (total length 423mm; weight 986g), are smaller than the 7.6mm and 8.9mm observed on prehistoric individuals identified in the 1–4mm fraction of the wet-sieved samples. Trout (*Salmo trutta* L. 1758, maximum adult length 1m), a species of very similar life history, is distinguished from salmon by its plumper body. Young trout migrate to the sea when 150–250mm long, but they stay in the vicinity of the coast for 0.5–5 years (Muus & Dahlstrøm 1977, 78). Consequently, fragments not identifiable at a species level may equally originate from salmon or trout.

With the exception of cod itself, species in the cod family (Gadidae) prefer waters of high salinity. Their remains dominate the An Corran fish bone assemblage, both in terms of NISP and bone weight. The young especially, represented by masses of small bones in the wet-sieved material, may be caught along the shore. Species identification was limited to the few most diagnostic skeletal elements. Cod also formed the major part of identified fish remains at the east-coast site of Morton (McCormick & Buckland 1997, 90). More recently, fishing in Scottish waters has increasingly concentrated on species in the cod family (Barrett et al 1997, 1).

At An Corran, cod (*Gadus morhua* L. 1758) and saithe (*Pollachius virens* L. 1758) contributed most identifiable Gadidae bones. Both small and some larger individuals are present. A dentale inner length of 47.5mm was measured on one specimen. The majority of cod remains, however, originate from small individuals, possibly in their first year of life. Saithe, also common at An Corran, reach a maximum

length of 1.3m, while they are 600–700mm long in their fifth year. The young fish spend their first 3–4 years in shallow water (Muus & Dahlstrøm 1977, 110). Numerous small maxillaria and premaxillaria (8–12mm long) from An Corran correspond to the first-year age group in the bimodal size distributions obtained for this species by Mellars & Wilkinson (1980, 21). Whiting (*Merlangius merlangus* L. 1758) can attain maximum lengths of 400–500mm. These fish occur in the coastal eel-grass zone down to depths of 200m (Muus & Dahlstrøm 1977, 106). They are about 200mm long at the age of two years, which is in line with the small size of bones observed at An Corran.

Wrasse (*Labrus cf. mixtus* L. 1758) vary in length between 300 and 350mm. Some unusually large premaxillare fragments recovered in the hand-collected assemblage from An Corran must represent adult individuals. They live in the algal zone on rocky coasts (Muus & Dahlstrøm 1977, 128), usually below 10m (Campbell 1989, 288). Among the non-gadid species, the contribution of Labrids to prehistoric faunal assemblages seems to decrease through time (Barrett et al 1997, fig. 4).

Bullheads, or sea scorpions (Cottidae), are predatory, bottom-living fish with no swimbladder. They do not move far from the area in which they grew up (Muus & Dahlstrøm 1977, 12). Although these usually small fish are of no known commercial value today, their remains made up 11.3–12.4 per cent of the fish bone recovered from otter spraints in Mull (Argyll; Watt 1991, 24, table 7). The remains of similarly small individuals were recovered at An Corran.

The family of right-eyed flatfish (Pleuronectidae) is represented by dab (*Limanda limanda* L. 1758), commonly occurring in coastal waters. The length of this flatfish species rarely exceeds 400mm (Muus & Dahlstrøm 1977, 182). The other flatfish, plaice (*Pleuronectes cf. platessa* L. 1758), is a bottom-living species on mixed mud and sandy grounds from the shore to depths of 200m. Although most adult plaice occur at depths of 10–15m, the young usually frequent shallower coastal waters (Muus & Dahlstrøm 1977, 184) and may even be caught by hand. At An Corran, all plaice bones suggest young individuals.

A sporadic presence of long bones of frogs/toads (*Anura*) was recognised, although some less typical bones of these animals may have been included among the non-identifiable fish bones. Remains from these small terrestrial animals typically represent the 'taphonomic gain' caused by active intrusion or water transport (precipitation) of their bones.

### 8.3.2 Birds

The exploitation of birds was of great importance in coastal adaptations throughout the Mesolithic and later periods in north-west Europe (e.g. Grigson 1989, 60). In the An Corran collection, numerous species

are represented by relatively few bones, although it is unclear how many originate from natural deaths, rather than human foraging. Avian skeletons only contain approximately half the number of bones of mammals, a natural phenomenon that also contributes to their greater variety in samples, regardless of the origins of the find material (Bartosiewicz & Gál 2007, 42).

Seventeen bones of great auk (*Alca impennis* L. 1758), extinct in Britain since 1844 (Barnes 1975, XV), were identified. Remains of this bird have also been recorded from Mesolithic assemblages on Oronsay (Mellars 1978, 319). Most dimensions of these bones correspond to those of the single reference skeleton from Funk Island (Newfoundland) kept in National Museums Scotland (registration no. Z.1951.74).

Although today the British Isles are among the most important breeding grounds for gannet (*Sula bassana* L. 1758), this large pelicaniform bird is represented by only two heavily weathered bones, one of these in the post-Mesolithic material. Bones from the other species in this order, cormorant (*Phalacrocorax carbo* L. 1758), are more common and occur in two size groups. The two gracile carpometacarpalia bones found in C36 may be shag (*Phalacrocorax cf aristotelis* L. 1758), a species characterised by a strong preference for marine habitats (Barnes 1975, 23).

A femur and a radius fragment from white-tailed eagle (*Haliaeetus albicilla* L. 1758) were also identified. This once-common species is more typical of coastal habitats than the golden eagle, and its eyries are usually on sea cliffs and pinnacles (Barnes 1975, 83). The bones from this bird are also rather weathered, although less so than the gannet bones (see above).

Remains of pomarine skua (*Stercorarius pomarinus* L. 1758), common or herring gull (*Larus marinus seu argentatus* L. 1758) and guillemot (*Uria aalge* L. 1758) form a group of finds that originate from birds most commonly encountered in marine environments. Although their bones occur sporadically in the material and represent meat-poor regions of the animals' body, it is possible that these animals occasionally served as a complementary resource of animal protein.

Puffin (*Fratercula arctica* L. 1758) bones dominate among the bird remains. Of known Scottish Mesolithic assemblages, these birds were recorded only at Morton, although they occur sporadically in archaeozoological assemblages throughout later periods (McCormick & Buckland 1997, table 2). It seems possible that many of the extremity bones recovered are actually paired elements from the same individual. Although the presence of this bird at a site located along the rocky seashore should not be surprising, its massive presence in the archaeozoological assemblage is remarkable.

Willow tit (*Parus atricapillus* L. 1758) and a non-identifiable species of thrush (*Turdus cf merula* L. 1758), as well as sporadic remains of small perching

birds, may be considered natural deposits at this site. As opposed to the aforementioned species, all characteristic of marine habitats, these small birds remind us that the midden was located in the woodland/littoral ecotone, although they are unlikely to be connected to the human occupation of the site.

### 8.3.3 Mammals

Bones of common shrew and pigmy shrew (*Sorex araneus et minutus* L. 1758) are also present. Although these insectivores are known from Carding Mill Bay I and II (Bartosiewicz et al 2010; Hamilton-Dyer & McCormick 1992) they were not recorded at Morton or Oronsay. It is possible that these animals found their way into the cracks and cavities of the An Corran midden in recent times. Equally, the possibility of water transport should not be discounted.

Of the numerous rodent bones deposited at this site, only bank vole (*Clethrionomys glareolus* L. 1758) and field vole (*Microtus agrestis* L. 1758) could be identified to species on the basis of tooth enamel patterns. This is interesting from an environmental perspective, as bank voles inhabit mixed woodland, and it is the only vole species that climbs bushes (Mitchell & Delap 1974, 56). Field vole was also considered one of the faunal indicators of a forested environment at the site of Carding Mill Bay I (Hamilton-Dyer & McCormick 1992). Nine fragmented bones of common hare (*Lepus cf timidus* L. 1758) in the Mesolithic deposits most probably represent prey brought to the site by humans.

Possible remains of a wild cat (*Felis silvestris* Schreb 1777) were tentatively identified on the basis of the unusual robusticity of otherwise non-measurable bone fragments. No marks of skinning are evident, either on the proximal end of the ulna or on the phalanges recovered from the midden deposit. This adaptable terrestrial animal has not yet been reported from Mesolithic sites in Scotland, although Barbara Noddle (McCormick & Buckland 1997, 87) identified its remains in the Neolithic assemblage at Skara Brae, Orkney, where it was interpreted as a possible import from the Scottish mainland. If, as is possible, the An Corran bones originate from a former inhabitant of the rockshelter, it may be hypothesised that prehistoric wild cat contributed to the accumulation of bones from smaller animals at this site.

Otter (*Lutra lutra* L. 1758) is an important carnivore representing a class of its own at shell midden sites along the west coast of Scotland, both taphonomically and culturally. Although only two bones were recovered at An Corran, the number of otter bones was second only to those of seal at the 'Obanian' site of Cnoc Coig, Oronsay, where these animals had evidently been hunted (Grigson & Mellars 1987, 274). Although otter thrives in fresh water, populations adapted to marine environments have regularly been observed (Mitchell



Illus 44 Brown bear phalanx CAT 98 from C34 (photo: NMS)

& Delap 1974, 64). The ulna and phalanx found at An Corran show no signs of skinning, and surface preservation suggests moderate weathering. Whilst the diet of otters is varied, high concentrations of small fish bone, especially when flattened, distorted and showing signs of digestion, would alternatively be characteristic of offal and faeces from otter holts (Cerón-Carrasco 1992, 3), the daily hideouts of these animals. This, however, is not the case at An Corran.

The second posterior phalanx from a relatively small and gracile brown bear (*Ursus arctos* L. 1758) is one of the more remarkable zoological finds from this site (CAT 98; illus 44). Its surface is eroded and of a pinkish grey colour (HUE 7.5YR 7/2; MUNSELL 1990), which is somewhat different from the typical pale brown shades observed on the bones of this site. Exposure to weathering may either be indicative of a natural deposit, or differential treatment by humans. Terminal phalanges of the distal extremity segment are often left in skins, and are therefore easily interpreted as a sign of exploitation for pelt (Bartosiewicz 1989, 612). Unfortunately, in the absence of skinning marks on this piece of bone, it is possible that this find is more indicative of the forested surroundings than the human occupation of the site. Recent radiocarbon measurement of a bear skull from Shaws (Dumfriesshire) resulted in a date of 7590±95 BP (AA-18503; Kitchener & Bonsall 1997), corresponding to the oldest determination available for the An Corran shell midden. Brown bear became extinct in Scotland some time after AD 500, but before the 10th century (Kitchener et al 2004, 75).

The fifth anterior proximal phalanx of a canid was also found in the prehistoric material. On the basis of its dimensions, this bone may either originate from a medium-sized dog (*Canis familiaris* L. 1758) or a small wolf (*Canis lupus* L. 1758). Although wolf was almost certainly the first animal to be domesticated by prehistoric people, its remains have not yet been encountered in Mesolithic shell middens in Scotland. The skeletal element recovered here is not sufficiently characteristic to resolve the problem of Mesolithic dog domestication in Scotland. Similar to other carnivore remains from An Corran, no marks of skinning were recognised on this bone.

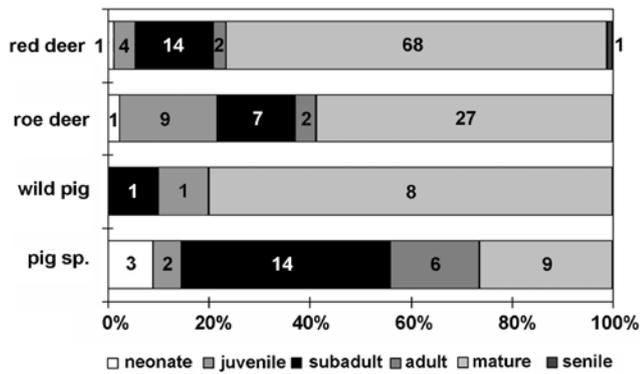
Wild boar (*Sus scrofa* L. 1758) is another mammal

the domestic form of which is often difficult to recognise. Only ten of the sixty-seven suid bones are large enough to be determined definitively as wild pig, also present at Morton and on Oronsay (McCormick & Buckland 1997, table 6.1). The remainder are either from young individuals or medium-sized animals of unknown age. Although pig domestication is unlikely to have taken place before the Neolithic period, several biological traits of this species could have facilitated the development of a 'special relationship' between wild pigs and humans that preceded domestication in a classical sense (Bolomey 1973, 48). As with dogs, these multipara, social animals were more likely to have scavenged on human refuse than the ancestors of other herbivorous domesticates. The presence of these indeterminate pig bones may also be related to contamination from later prehistoric layers, where pig had become incorporated into the domestic fauna.

In terms of NISP, roe deer (*Capreolus capreolus* L. 1758) is the second best represented mammal in the faunal assemblage from An Corran. In addition to identifiable remains, the majority of small ruminant bone splinters also undoubtedly represent roe deer bones. Although some of these bones are indistinguishable from those of sheep (hence the term 'small ruminant'), this latter species is present only in the form of post-Mesolithic contamination of the midden. Roe deer remains occurred both on Oronsay and at Morton (McCormick & Buckland 1997, table 6.1). Together with wild pig, roe deer is considered to be an animal of deciduous woodland or parkland habitats, although recently increasing adaptation to open grassland has been recorded in Hungary (Bencze 1979, 56). Although roe deer bones, especially metapodia, were a highly prized raw material in prehistoric central Europe (e.g. Bartosiewicz & Choyke 1994; Schibler 1981), relatively few modified pieces were found at An Corran. None of the antler fragments were identified as belonging to roe deer. Although age-able bones were documented for large game animals, the percentage distribution by age groups is primarily influenced by assemblage size (illus 45).

Red deer (*Cervus elaphus* L. 1758) was probably the most important game animal exploited at An Corran. However, both the high number of identifiable bones and more than 1.5kg of deer remains are distorted by the disproportional representation of dense metapodial fragments that make up over one-third of the material.

Although only a few measurable red deer bones are present in the An Corran collection, earlier research has shown that Mesolithic red deer remains from elsewhere in Scotland (Risga & the Oban caves) fall within the size range of Mesolithic samples from England, whilst comparable measurements of bones from some island sites are considerably smaller (illus 46; Grigson & Mellars 1987, 258). As is shown by the size indices calculated according to Uerpmann (1982), all measurements taken on the bones from



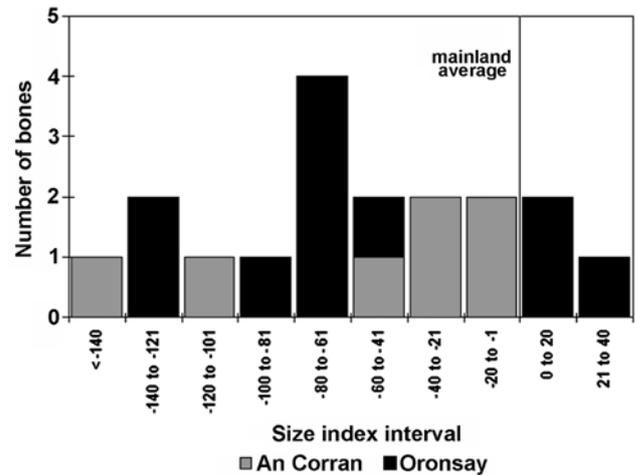
Illus 45 The age distribution of bones from large game. The greater age variability in red deer may in part be a product of sample size, while the high proportion of immature pig remains shows how difficult it is to assign these bones to either the wild or domestic category.

An Corran fall below the average of mainland red deer measurements.

Animal remains underwent several post-mortem processes prior to being deposited in the midden. The full sequence of these events is best represented by the example of red deer. These animals were evidently killed elsewhere; there is no evidence of primary butchery. Many of the bones must have been brought in with portions of meat. Others may have been carried to the midden for manufacturing purposes. Following possible marrow-fracturing and/or pot-sizing (as much as the ethnocentric term 'pot' can be used in such early contexts), some long bone splinters were used as simple tools, which apparently further influenced the loci and modes of their final deposition.

Only a few small red deer antler fragments (a total of 207g) were recovered from the midden. Two of them show marks of rudimentary carving, and many are carbonised and crushed. It is not possible to determine whether the fragments originate from shed antler or from hunted stags. Due to different procurement strategies and fragmentation properties, antler fragments are not normally included in the quantitative evaluation of skeletal materials.

On the basis of their size and morphology, the 17 bovine remains identified in the Mesolithic assemblage were originally thought to represent domestic cattle (*Bos taurus* L. 1758). However, little is known of the Mesolithic status and size of aurochs (*Bos primigenius* Boj. 1827) in coastal Scotland, and the stratigraphic uncertainty of many of these bones (some of them definitely from C36) makes interpretation difficult. This difficulty was confirmed when three of the *Bos* bones were radiocarbon dated and shown categorically to be of Mesolithic age (see below), thus suggesting they are from aurochs rather than domestic cattle. Bovine remains at this site are much less common than those of red deer.



Illus 46 The distribution of size indices calculated from the parameters of red deer measurements from mainland sites. The few measurable specimens from An Corran all fall below the mainland average (index value 0).

#### 8.4 Discussion

It is thought that, at An Corran, bones from terrestrial large game animals may largely have been introduced by humans with meat. It is more difficult to interpret the remains of smaller animals (including those of fish and birds) of limited dietary capacity as human food remains, unless such hypotheses are directly corroborated by evidence for butchery or burning (Hamilton-Dyer & McCormick 1992, 34). The taxonomic review of animal remains identified at An Corran suggests that, although a number of natural taphonomic factors clearly contributed, the majority of animal remains could indeed be linked to human activity. Therefore, in spite of the undeniable chronological and stratigraphic uncertainties, some environmental and functional interpretations may be attempted.

Of the fish species identified at An Corran, gadid fish (especially cod and saithe), salmon/trout and flatfish were of major importance throughout human history. The occasional larger individual bones from these fish may be regarded as clear evidence of human fish consumption, although none shows evidence of butchery. However, numerous charred and carbonised small fish remains were also recovered. Although the possibility of secondary burning cannot be ruled out, it is noteworthy that a comparable combination of small fish bone (interpreted alternatively as otter spraints) and burnt whiting vertebrae were reported from the 'Obanian' shell midden of Carding Mill Bay I (Hamilton-Dyer n.d.) near Oban.

Seasonality may have been an important element in the occupation and use of the An Corran site, as was demonstrated by the analysis of fish otoliths from the island of Oronsay (Mellars & Wilkinson 1980). Fully grown Salmonids, the bones of which