Assessment of amphibian and reptile bones from Longstone Edge (472 LE), Derbyshire

Chris Gleed-Owen

c/o The Herpetological Conservation Trust
655A Christchurch Road
Boscombe
Bournemouth
BH1 4AP

chris.go@herpconstrust.org.uk

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Introduction

English Heritage's Central Archaeology Service excavated two Bronze Age barrows at Longstone Edge (SK 2088 7841) in 1996. The excavations and post-excavation analyses are reported elsewhere (Andrews, undated; Last *et al*, undated; Smith, undated). This assessment was requested in order to evaluate the significance of amphibian and reptile remains. Andrews (undated) recorded the presence of herpetofaunal remains in many contexts, and observed that they were fairly numerous in some. It is rare for amphibian and reptile remains from archaeological excavations to be investigated in any detail, probably owing to a lack of comparative material, expertise and perceived value. Herpetofaunal remains are useful as palaeo-environmental and biostratigraphic indicators in Quaternary science (e.g. Gleed-Owen, 1999), but also in archaeological investigations (Gleed-Owen, 2003; Pigière *et al*, in press). This assessment was carried out in the hope that it could shed some light on certain questions, although it was not expected to answer all of them.

Brief

This assessment aimed to examine a representative sample of sorted bone from a range of contexts, to estimate the number of identifiable elements (MNE) for each species and to extrapolate these to the rest of the material, whilst considering various questions as follows:

1) Agent of accumulation (predator, pitfall, hibernation/natural etc)
2) Use of site by humans/animals, abandonment, commensalism
3) Digestion vs. weathering, colour, possible mixing, burning, roots
4) MNE, MNI
5) Comparison between phases and deposits, relative abundance, modes of accumulation
6) Sex, age, demography, seasonality

Methodology

Bulk sample sieving for Peter Andrews' investigations produced three boxes of sorted bagged vertebrate remains. In most cases, the sorting technician had attempted (successfully) to separate many of the amphibian bones and some reptile bones already. However, this tends to be biased towards the most recogniseable elements (e.g. lizard jaws, amphibian long bones), and every bag of bone must still be examined in order to track down all the amphibian and reptile remains. Selected samples were chosen from a range of contexts: some samples from Barrow 2, but mostly from the Barrow 1 mound, cist grave, fissure, stone mound and subsoil. Sorted remains were examined from 41 sample fractions representing 23 samples, some with multiple sub-samples and more than one fraction. The remains were examined both directly and using a binocular microscope at x6-x40 magnification. Amphibian and reptile remains were separated, identified and counted for most of the samples, and estimated only were carried out for the others. Any separated material was appropriately sub-bagged with the other remains from the respective samples.

Results

Table 1 summarises the results for each sample and fraction, showing MNE for each amphibian and reptile species, and an estimate of non-herpetofaunal remains (an underestimate in some

Feature	Phase	Context	Sample	Fraction	non-herp	Bb/Bsp	Rt/Rsp	Anu	Af	Zv	Vb	Nn	Notes
Barrow 2		2001	5028	>1	c.130	3		4	1				
Barrow 2		2060	5082	>4	c.300	14	1						<1yr Bb
Barrow 2		2065	5084	>4	c.208	10							
Barrow 2		2066	5085	>4	c.300	10							
Barrow 2		2067	5088	>4	c.100	1							
Barrow 2		2058	5100.1	>4	15								
Barrow 2		2058	5100.10	>4	22	1							
Barrow 2		2058	5100.3	>4	c.20	1							
Barrow 2		2058	5100.4	>4	4								
Barrow 2		2058	5100.5	>4	12								
Barrow 2		2058	5100.6	>4	c.40	2	1						
Barrow 2		2058	5100.7	>4	7	1							
Barrow 2		2058	5100.8	>4	2								
Barrow 2		2058	5101	>4	c.15								
Barrow 2		2058	5112	>1	c.150				1				
barrow mound	4	1052	5070	>4	?	c.10		c.100+					
barrow mound	4	1055	5075.13	>4?	c.450	c.60	c.5						
barrow mound	4	1055	5075.14	>4?	c.350	c.60		c.5					
barrow mound	4	1055	5075.7	2-4	c.850	c.25	1		c.50	c.15			
barrow mound	4	1055	5075.9	2-4	c.700	c.20			c.50	c.15			
barrow mound	4	1058	5090.1	>4	c.2000+	c.217							
barrow mound	4	1058	5090.1	2-4	?	c.59	c.8	c.20	c.120	c.10			
barrow mound	4	1055/1056	5111.1	>4	?	c.30+							
cist grave fill	2	1059(75502)	5106	<1	?				c.2000+	c.50			Af ilium! imm Zv poss pt sk
cist grave fill	2	1059(75502)	5106	>4	c.136	21	4	9	1				tooth marks
cist grave fill	2	1059(75502)	5108	>4	1	8							poss Bb pt skellie (m ad)
cist grave fill	2	1059(75502/	5110	<1						1			
cist grave fill	2	1059(75502/	5110	>4	c.900	c.82	8						tooth marks
cist grave fill	2	1059(75502/	5110	2-4					2	3	1		Af poss pt sk, Zv imm
cist grave fill	2	1059(75502/	5107.1	>4	c.523	c.125	c.6	5	2				
cist grave fill	2	1059(75502/	5107.2	<1	?	c.5	c.1		c.500+	2			
cist grave fill	2	1059(75502/	5701.1	<1						3			
fissure fill	6	1080	5102.3	<4	63	5	1	10	11	2	1		tooth marks
fissure fill	6	1080	5102.4	>4	c.244	20	1		1		2		
fissure fill	6	1080	5102.1/2	<4	c.139	26	6	3	26	15	3		imm Zv (MNI 3), frog 1yr
fissure fill	6	1080	5102.5	>4	c.212	28	3	2	2				
fissure fill	6	1080/1081	5104.4	<4	c.215	c.47	4		c.120	c.18		1	
fissure fill	6	1080/1081	5104.5	>4	c.625	c.94	2		6	1			
stone mound	3	1095	5141.2/4	>4	c.100+	2							
subsoil	0/1/2	1057	5103	<4	c.100	2							
subsoil	0/1	1053	5145	>4		1							

cases).

Table 1. Amphibian and reptile remains from selected samples from Longstone Edge. Species abbreviations: Bb/Bsp – *Bufo bufo/*sp (common toad), Rt/sp = *Rana temporaria/*sp (common frog), Anu = Anura indet. (frog/toad), Af = *Anguis fragilis* (slow-worm), Zv = *Zootoca (Lacerta) vivipara* (common lizard), Vb = *Vipera berus* (adder), Nn = *Natrix natrix* (grass snake).

Discussion

General

Although amphibian and reptile remains are moderately abundant within many of the samples seen, the herpetofauna it represents is quite impoverished. However, this is not surprising for an upland site, as about half the UK species are largely found in lowland habitats. Common toad (*Bufo bufo*) seems to make up the majority of the remains, with very little common frog (*Rana temporaria*). This is quite unusual in itself, as common frog is normally the most common and ubiquitous amphibian in archaeological deposits. Both are quite 'commensal' species, but reflecting their tolerance of, rather than preference for, disturbed environments. The majority of the remains are adults or subadults, with just a few juvenile bones (i.e. 1 year old or less). A juvenile toad was noted from Barrow 2 and a juvenile frog from Barrow 1 fissure fill, the other remains were mostly adults. It is quite common to find abundant juvenile anuran (frog/toad) bones in archaeological contexts, and sometimes in vast numbers (Gleed-Owen, 2003). A mixture of age groups is more usual, and the Longstone samples are distinctly biased towards adults.

It is possible to sex frogs and toads using the humerus which bears crests in males. Both sexes of frog and toad were present here, but an assessment of relative numbers was not carried out.

There were large numbers of slow-worm (*Anguis fragilis*) vertebrae and osteoderms in some samples, and this is the second most numerous herpetofaunal species overall in MNE terms, in the samples seen. Slow-worms do have over 500 bones and 5000+ osteoderms each though, compared to less than 150 bones in a frog or toad. Common lizard (*Zootoca vivipara*) remains were less numerous but fairly ubiquitous in any sample with a retained residue finer than 4mm. Adder (*Vipera* berus) bones were scarce, but its presence in archaeological contexts is rare in any case, and it would not be expected in association with human settlement. One fragmentary grass snake (*Natrix natrix*) vertebra is the only evidence of that species, normally the most common snake of lowland (especially riparian/floodplain) archaeological sites.

On three occasions I noted the possible evidence of partial skeletons (size-matched pairs of elements etc), of common toad, lizard and slow-worm, all within the cist grave fill. A slow-worm ilium was recovered from one cist fill sample; the vestigial pelvic girdle of slow-worms rarely preserves normally.

Local environment
The preponderance of common toad implies a scrubby or deciduous wooded environment, with a still water body (breeding pond) nearby, usually clear and deep. However, it is a fairly ubiquitous species, and may inhabit a range of environments. The common frog is an open country species, suggesting open grass and herb cover, rather than blanket woodland. The slow-worm is also a species of rank grass, herbs and open scrub, on unploughed land, as it inhabits the interface between topsoil and damp leaf litter and roots. It is a secretive species but emerges for basking, when it may be picked off by predators. Common lizards also require a relatively undisturbed environment, with rank, often tussocky grass and bramble, or mature, well-structured heather, gorse and other shrubs. There were no newt remains at all (and almost no grass snake); the mainly lowland nature of these species versus the site’s topography and altitude can probably explain their absence. It also suggests that the herpetofauna represents the local environment, rather than that from further afield which could conceivably be within the reach of avian predators.

Predation/taphonomy
The majority of the remains examined showed some signs of digestion by predators, often with very heavy reduction and etching. This is particularly evident in the frog and toad remains; it is less easy to identify massive reduction and other digestive evidence in the smaller bones of the other species. There is clearly a bimodality or ‘polymodality’ in the types of digestion damage seen within samples though. Some samples had fairly homogenous levels of digestion, others had a wide range of levels. Digestion was sometimes unapparent or light, moderate in some bones, and very strong in others, often within the same sample fraction. This may or may not be due to presence of more than one predator species as argued by Andrews (undated report), and may or may not reliably indicate exactly which predator species were the agents of accumulation.

Considering the seasonal and circadian cycles of the prey species raises a pertinent question: are the prey species active and available when the alleged predator species are active? Amphibians are most active at night and especially in the spring from March to May (breeding season); therefore this is the most likely time that predators will find them. Frogs tend to breed a few weeks earlier than toads and do not have such an *en masse* peak migration, as do toads. Toads in particular embark on mass migrations during damp/wet nights in March or April, heading for traditional breeding ponds. This is the most likely time that so many adult toads would have been predated. Toad skin is also very distasteful to many animals, and some may skin them before eating them. Scatterings of mutilated toads are sometimes found near breeding sites, although there is no agreement whether this is carried out by corvids, otters or other mustelids. The fact that it hasn’t been observed probably suggests nocturnal mustelids. It is quite possible, therefore, that nocturnal raptors or mustelids predated the majority of the toads during breeding migrations. This could also help explain the bias towards toads and the paucity of frog remains. I couldn't say whether the raptor(s) involved are eagle owl and/or tawny owl as suggested by Andrews.

The reptile species identified are almost exclusively active during the day; only exceptionally are active on a hot night. Reptiles usually emerge at least two hours after sunrise and disappear well before sunset. This means that nocturnal animals could not be responsible for the accumulation of these remains. Adders, slow-worms and lizards are endotherms (they rely on ambient temperature) and poikilotherms, that is they actively thermoregulate to reach their desired body temperature by basking in the sun, or in bright cloudy or hazy conditions. They are very efficient at absorbing heat and in the summer only need to bask for an hour or so in the morning and late afternoon; at other times of year (and in sub-optimal weather) they may bask for several hours a day. They hibernate throughout the winter (about October to March in Derbyshire), and do not normally come above ground in cold, windy or rainy weather. Once warmed up, reptiles tend to be active hunting for food, looking for mates and defending territories (in spring), but usually under cover of vegetation. Basking would probably be the most dangerous time for them in terms of avian predators, but mustelids can find them within dense vegetation (I have seen a common lizard burst out of a grassy road verge closely followed by a weasel, which then caught it despite the lizard 'throwing' its tail).

As there is definite evidence of digestion in some of the reptile remains, it implies accumulation by a diurnal predator. I am not able to comment on the possibility of short-eared owl as suggested by Andrews, but other species should be considered in my view: diurnal raptors such as the kestrel could be key predators, and small mustelids such as weasels could also be important. At least three toad bones examined (2 from cist fill, 1 from fissure) are crushed/splintered and have small teeth marks like those of a small mustelid. I have seen similar teeth marks in material from Three Holes Cave, Devon (Gleed-Owen, 1998).

Amphibians and reptiles considered together, there is a range of digestive evidence in these remains from very strong to almost imperceptible in terms of breakage, end reduction, warping, articular surface removal, cancellous bone exposure, etching, thinning, rounding and smoothing. I would support Andrews' suggestion that avian predators, perhaps eagle owl or tawny owl, may have been responsible for many of the accumulated bones. However, I would need to see evidence of digested/regurgitated bones from scats/pellets of a range of species before I would be confident of the predator species. I believe the circumstantial evidence suggests both nocturnal and diurnal predation, most likely implying at least two predator species.

A systematic examination of the relative occurrence and severity of digestion between features, phases, contexts, species and elements was not feasible, but I could discern little difference anyway. The cist fill seemed to have lower frequencies of digestion damage, the barrow mound higher occurrences. Barrow 2 samples had very few remains compared to Barrow 1, but the few herpetofaunal remains that were present all seemed to be digested.

Some of the amphibian remains were totally undamaged and apparently undigested. Assessing the agent(s) of accumulation for these is somewhat speculative. Aside from predation by predators leaving no digestive marks, all of the species identified could find their way into crevices and voids deliberately, e.g. using them as hibernacula. Pitfall is also an obvious possibility at a site with natural fissures in the bedrock. The possible partial skeletons in the cist grave may represent pitfall or hibernation deaths, or could even have been interred accidentally by humans. There's no evidence to suggest any ritual significance at all. Root marks were apparent in cist fill and fissure fill samples, but also in some bones from both barrow mounds.

MNE, MNI, potential

Nearly all elements of the amphibian and reptile skeleton are identifiable to order or higher, and many are identifiable to genus or species. Amphibian bones that can't be identified to genus (in this case, frog/toad, *Rana/Bufo*) are in the minority, and even metapodials and phalanges can be tied to genus. Some of the thinner cranial elements tend not to survive well in archaeological contexts.

Almost any reptile bone is recogniseable and can be separated as either snake, slow-worm or other lizard. Therefore, there are few amphibian and reptile bones in an assemblage such as this that can't be of some use. Unfortunately no comprehensive identification guide exists for European species and identification relies upon experience and comparative material. The samples studied contained probably in excess of 4000 amphibian and reptile remains. About half of these are slow-worm osteoderms from just two <1mm fractions; these are similar in size to sand grains and hard to quantify without separating them from the residue. MNI counts would be possible on the amphibians and common lizard using paired elements; it would be difficult for snakes and slow-worms where almost all bones are vertebrae and unpaired elements. Table 2 illustrates the importance of the <1mm residues and smaller fractions for common lizard and slow-worm, and the importance of larger fractions for the other species. The range of samples examined and the variation in abundance should be fairly representative. Extrapolating for the rest of the material, I would estimate that it contains between 12-15,000 amphibian and reptile bones. These could take 20 days to study fully and would probably not prove useful for answering archaeological questions in this case.

Fraction	Bb/Bsp	Rt/Rsp	Anu	Af	Zv	Vb	Nn
<1	5	1		2500	56		
>1	3		4	2			
2-4	104	8	20	222	43	1	
<4	80	11	13	157	35	4	1
>4	727	24	119	4	0	2	

Table 2. Summary of MNE estimates for amphibian and reptile taxa for each size fraction of sieved samples.

Conclusions

The herpetofaunal remains from Longstone Edge are quite abundant, but fairly impoverished. Predation seems to be the main agent of accumulation, probably raptors and mustelids. There is little difference between phases, contexts and features. It would not be worth pursuing any further analysis for archaeological reasons.

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References

Andrews, P. Undated (2003?). *The microfauna from Longstone Edge*. Unpublished report for English Heritage, Portsmouth.

Gleed-Owen, C.P. (1998). *Quaternary herpetofaunas of the British Isles: taxonomic descriptions, palaeoenvironmental reconstructions and biostratigraphic implications.* Unpublished PhD thesis, Coventry University.

Gleed-Owen, C.P. (1999). The palaeoclimatic and biostratigraphic significance of herpetofaunal remains from the British Quaternary. *In*: Andrews, P. & Banham, P. (eds.) *Late Cenozoic Environments and Hominid Evolution: a tribute to Bill Bishop.* Geological Society, London, 201-215.

Gleed-Owen, C.P. (2003). Holocene herpetofaunas from Scania and Halland, southern Sweden. *Quaternary Newsletter.*

Last, J., Andrews, P., Baker, P., Beswick, P., Campbell, G., Leary, R., Makey, P., Mays, S. Murphy, P., Smith, W. & Vallender, J. (Undated). *The Excavation of Two Bronze Age Barrows on Longstone Edge, Derbyshire.* Unpublished report, English Heritage, Portsmouth.

Pigière, F., Lentacker, A., Desender, K. & Gleed-Owen, C.P. (In press) Etude archéozoologique du site romain de la Haute Eloge à Bruyelle. *In*: Bausier, K. *et al.* (eds.) *Le site de la Haute Eloge à Bruyelle-Antoing*. Etudes et Documents, Série Fouilles.

Smith, W. (Undated). *Assessment of charred plant remains from Bronze Age barrows at Longstone Edge, Derbyshire.* Unpublished report for English Heritage, Portsmouth.