

THE STOMACH CONTENTS OF A GRASS SNAKE, *NATRIX NATRIX*, IDENTIFIED FROM SKELETAL REMAINS

CHRIS GLEED-OWEN

Care for Quaternary Science, Coventry University, U.K.

INTRODUCTION

During the preparation of a Grass Snake, *Natrix natrix* (L.), for an osteological collection, its stomach contents were retrieved. The snake had been found run-over in the York area during 1994. It measured 570mm in total length and its sex was not determined. The semi-digested stomach contents were macerated in a glass beaker with a 2% aqueous solution of the plant enzyme papaine, maintained at 38°C within a heated waterbath. After 24 hours the resulting broth was decanted, leaving a residue of disarticulated bones which were carefully rinsed using tap water and retained in a 500µm sieve. The bones were then identified and separated, whilst still wet, under a low-power (x10) binocular microscope. Specific identification was carried out using modern comparative osteological material and SEM photographs of British specimens. Some of the criteria used to differentiate the vertebrae, femora and humeri of the British newts are set out by Holman and Stuart (1991), comparative osteology of the European anurans is addressed by Böhme (1977). Detailed osteological studies of the Anura and Urodela (Duellman and Trueb, 1994; Ecker, 1889; Francis, 1934) are also of use in specific identifications.

SKELETAL MATERIAL

The resulting collection of skeletal elements constitutes the remains of one Common Frog (*Rana temporaria* L.) and one Great Crested Newt (*Triturus cristatus* Laurenti), representing the Grass Snake's last meals. Though some of the bones were partially digested, their condition was sufficiently good to allow specific identification.

The identified remains are placed in left, axial and right columns according to their position in the body and are arranged in the following groups: cranial/hyomandibular; vertebral; pectoral/forelimbs; pelvic/hindlimbs; unidentified elements.

Order: Anura
Family: Ranidae
Rana temporaria Linnaeus, Common Frog

Material	Left	Axial	Right
Prootic-exoccipital	1		1
Parasphenoid		1	
Dentary			1
Hyoid			1
Atlas		1	
Trunk vertebra		7	
Sacrum		1	
Scapula	1		
Pre-coracoid	1		1
Humerus	1		1
Tibiofibula	1		1

Ilium	1		1
Ischium		1	
Urostyle		1	
Femur	1		1
Tibiofibula	1		1
Metapodials/phalanges (12)			

Order: Urodela
Family: Salamandridae
Triturus cristatus (Laurenti), Great Crested Newt

Prootic-exoccipital	1		1
Parietal	1		1
Frontal	1		1
Nasal			1
Parasphenoid		1	
Orbitosphenoid	1		1
Quadrate			1
Squamosal	1		
Pterygoid	1		
Maxillary		1	
Vomer	1		1
Dentary	1		
Articular	(1)		
Hyoid			
Atlas		1	
Trunk vertebra		18	
Sacrum		1	
Caudal vertebra		24	
Ribs	(6)		
Scapula			1
Humerus			1
Radius			1
Ulna			1
Puboischium	1		1
Ilium	1		1
Femur	1		1
Tibia	1		
Fibula	1		
Metapodials/phalanges (5)			
Unidentified hyobranchial elements (2)			

DISCUSSION

The proportions and appearance of the bones indicate that they belong to only one individual of each species, this is supported by the near-equal balance of left and right elements in the above lists. The newt skeleton is largely complete, although its left forelimb may have become detached whilst being eaten as its bones were

not retrieved. Most of the minute phalanges are absent, having not survived digestion whilst in the snake's stomach (careful treatment with papaine does not damage even very small bones). Several of the more delicate cranial elements were not found and may also not have been digested fully, especially if broken during mastication. Additionally, the newt may have been eaten head-first with digestion commencing there earlier. Conversely, the finely-sculptured caudal vertebrae were in excellent condition. The frog skeleton is of an immature specimen, the sex not apparent from its osteology. Though its bones are larger, they appear to have undergone more severe attack. Many of the cranial elements are absent and some of the long bones are reduced to splinters. Thus it appears that the frog was eaten some time before the newt and spent more time undergoing digestion in the snake's stomach. It is not clear if the frog was eaten whole, but it is likely that the missing cranial elements had probably been passed through already.

Both prey species are recorded from the York area (Arnold, 1973; Arnold and Burton, 1978) and this case serves as an unexpected example of how one species can offer surrogate data on the presence of two others in its locale. The skeletal remains also bear a first-hand testimony to the snake's dietary habits. Frogs and Great Crested Newts are regularly preyed upon by Grass Snakes (Frazer, 1989; Smith, 1969) and this example was no exception. The author would like to hear from any members who find a dead snake on which a similar study could be carried out.

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