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ADDITIONAL HERPETOLOGICAL RECORDS FROM THE MIDDLE PLEISTOCENE (CROMERIAN INTERGLACIAL) FRESHWATER BED, WEST RUNTON, NORFOLK

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INTRODUCTION

Holman, Clayden and Stuart (1988) detailed fossil amphibians and reptiles collected up to 1986 from the well-known Middle Pleistocene (Cromerian Interglacial) Freshwater Bed at West Runton, Norfolk. Since that time John D. Clayden and Bernie Landau have collected much additional material from the site, including important herpetological remains. Although no previously unrecorded species were discovered, an unusual osteological morph of *Bufo bufo* occurs amongst the new material. Moreover, a minimum number of individuals of each species in the total herpetofauna may now be presented as a reflection of the composition of this ancient assemblage (Table 1).

THE WEST RUNTON FRESHWATER BED

The West Runton Freshwater Bed has yielded the richest vertebrate fauna of any non-cave site in Britain (Newton, 1982a, b; Hinton, 1926; Stuart, 1975, 1982). The fossil exposure lies at the base of the cliff east of the West Runton Gap (Woman Hythe), occupies a channel about 300 metres long, and has a maximum thickness of about two metres. The bed contains sand, silt and organic muds that are rich in molluscan shells, wood and other plant detritus as well as vertebrate fossils. This Freshwater Bed and its overlying marine sediments represent an early Middle Pleistocene interglacial cycle, and these deposits were designated the stratotype for the Cromerian Interglacial (Mitchell et al., 1973).

Stuart (1982) pictured the environment at the time of the deposition of the West Runton Freshwater Bed on the basis of the sedimentological and palaeontological evidence. The scene was of a slow-flowing river, rich in aquatic plants and fringed by fen, such as is found in a typical English lowland river today. The fossil herpetofauna is perfectly consistent with this picture (Holman, Clayden and Stuart, 1988; this paper).

SYSTEMATIC PALAEONTOLOGY

The fossils reported in this paper were collected by John D. Clayden (specimens abbreviated JCWR88) and Bernie Landau (specimens abbreviated BLWR88). All of the fossils were obtained by sieving the lower brecciated unit of the West Runton Freshwater Bed (Bed F of West, 1980; equivalent to Unit A of Stuart, 1975). When precise localities are available these are designated by e.g. '168-172', which indicates the distance in metres along the Freshwater Bed eastward from the datum at West Runton Gap (see West, 1980). Fossils reside in the John D. Clayden Collection, Sunnyholme, Lower Common, East Runton, Norfolk NR27 9PG. Lisa Hallock made the drawings of Figure 1.

Order Anura
Family Bufonidae
Bufo bufo (Linnaeus)

Material – Two left ilia JCWR88 1-2; '173-177'. Two right ilia JCWR88 104-105; '178-182'. Right ilium JCWR88 122; '283-287'. Right ilium JCWR 138; '277'.

Remarks – Holman (1985) gave characters for distinguishing *Bufo bufo* from other anuran species on the basis of individual ilia. On the basis of these characters, all of the West Runton *Bufo* ilia represent this species. Nevertheless, three of the six ilia above represent what appears to be an ilial morph that may be unusual in modern *Bufo bufo* skeletons. This morph was not recognised by Holman, Clayden and Stuart (1988, Fig. 1a) because of a lack of modern comparative skeletal material at that time. In the three new fossil specimens with this conditions,

the dorsal prominence arises from the shaft as a low, irregular, sharpened crest (Fig. 1a). In fact, in one of the new individuals the crest is so low that the ilium has a superficial resemblance to ilia of species of *Pelobates* (Böhme, 1977, p. 294, Figs. 8e, f). In the other three new fossil specimens and in eight of nine modern *Bufo bufo* skeletons the dorsal prominence arises from the shaft as a smoothly rounded but somewhat laterally roughened tubercle (Fig. 1b). The functional significance of these differences, if any, in fossil and modern *Bufo bufo* is not known. Moreover, whether the apparent differences in the frequency of occurrence of the "unusual" morph in fossil and modern populations represent evolutionary changes or merely sampling error is unknown. Certainly dimorphic characters such as these stress the need for adequate samples of both fossil and modern skeletons.

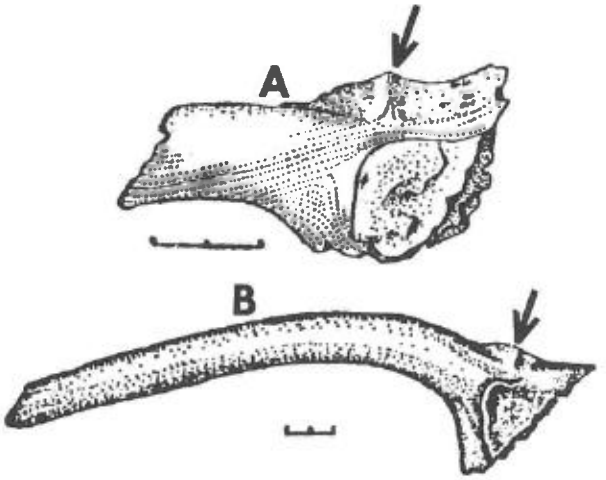

Fig. 1.

A. fossil left ilium of "unusual" morph of fossil *Bufo bufo* from West Runton Cromerian Site (from Holman, Clayden and Stuart, 1988).

B. modern left ilium of "normal" morph of modern *Bufo bufo* (from Michigan State University Museum Number 3380).

The lines each equal 2mm.
The arrows indicate the dorsal prominence in each specimen.

Family Ranidae
Rana arvalis arvalis Nilsson

Material – Left ilium JCWR88 12; '173-177'.

Remarks – Holman, Clayden and Stuart (1988) discuss characters for the identification of *Rana arvalis arvalis* on the basis of individual ilia. The recovery of additional material representing this species is important, as *Rana arvalis* does not occur naturally in Britain today, but occurs in the adjacent low countries of the Continent (Arnold and Burton, 1985, p. 258, map 37).

Rana temporaria Linnaeus

Material – Two left ilia JCWR88 3-4; '173-177'. Five right ilia JCWR 5-9; '173-177'. Two left ilia JCWR88 106-107; '168-172'. Right ilium JCWR88 137; '277. Two sacra JCWR88 8-10; '173-177'.

Remarks – Holman (1985) discusses the identification of *Rana temporaria* based on individual ilia and Holman, Clayden and Stuart (1988) discuss the identification of this species on the basis of individual sacra.

Class Reptilia
Order Squamata
Family Anguidae
Anguis fragilis Linnaeus

Material – Vertebra JCWR88 145.

Remarks – Holman (1988) discusses the identification of individual osteological elements of this species.

Family Colubridae
Natrix natrix (Linnaeus)

Material – Vertebra BLWR88 1.

Remarks – Szyndlar (1984) and Holman (1985) have discussed the identification of this species on the basis of individual vertebrae.

DISCUSSION

The new material from the West Runton Freshwater Bed coupled with data provided in Holman, Clayden and Stuart (1988) has enabled the author to determine the minimum number of each herpetological species represented at the site (Table 1). Minimum numbers of individuals of each species are based either on the largest number of either non-paired elements (other than serially repeated elements such as vertebrae and ribs) or of right or left elements. If animals were represented by vertebrae only, lots of vertebrae from separate localities at the site were counted as one individual per lot.

The preponderance of semi-aquatic forms needing slowly moving or still aquatic situations in which to breed (Table 1) is evident at once. The abundance of *Bufo bufo* and *Rana temporaria* which together comprise 70.37% of the fauna is noteworthy. These two species are undoubtedly the most abundant herptiles in Britain today, and the fact that they appear to have been the most abundant herps in the diverse West Runton fossil fauna over 350,000 years ago (age estimate based on Stuart, 1982) is of considerable interest.

TABLE 1: Minimum number of individuals and general habitat of herptiles of the West Runton Freshwater Bed (Middle Pleistocene; Cromerian Interglacial).

Species	Minimum No. Ind.	% of Total	General Habitat
Bufo bufo	20	37.0	Ubiquitous terrestrial, obligatory aquatic breeder
Rana temporaria	18	33.3	Moist terrestrial, obligatory aquatic breeder
Rana arvalis arvalis	4	7.4	Moist terrestrial, obligatory aquatic breeder
Natrix natrix	4	7.4	Terrestrial, but usually near aquatic habitats
Rana "esculenta" or *ridibunda*	3	5.6	Quiet aquatic habitats, obligatory aquatic breeder
Anguis fragilis	2	3.7	Ubiquitous terrestrial, semifossorial
Triturus vulgaris	2	3.7	Moist terrestrial, ubiquitous aquatic breeder
Vipera berus	1	1.9	Ubiquitous terrestrial
TOTALS	54	100.0	

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