

IDENTIFICATION OF *BUFO CALAMITA* AND *BUFO BUFO* ON THE BASIS OF SKELETAL ELEMENTS

J. ALAN HOLMAN

Michigan State University Museum, East Lansing, Michigan 48824-1045, U.S.A.

Identification of *Bufo calamita* bones from sites at Ightham, Kent, and Cow Cave, Devon, that represent times just after the last British glaciation (Holman, 1985, 1988) have sparked recent articles in the Bulletin by David Wilkinson and Trevor Beebee. More discussion will probably ensue, since records of *B. calamita* are forthcoming from additional ancient sites in Britain and outside of the present range of the species. Thus, the veracity of the identification of species of *Bufo* on the basis of skeletal elements is an important issue.

Since my first paper on British fossil amphibians and reptiles (Holman, 1985), I have seen additional fossil and modern skeletons of European *Bufo* species, have found an important additional literature reference to skeletal variation in *Bufo* (Sanchiz, 1977), and have had helpful comments from my colleague in Paris, J. C. Rage. The following discussion has a two-fold purpose: (1) to establish the veracity of the identifications of fossil *Bufo calamita* and *B. bufo* in Britain, and (2) to provide criteria for identification of spoiled field specimens of modern *Bufo*. Toad bones might be expected to turn up in carnivore scats; owl pellets; in the stomachs of fishes, snakes or birds; or in decomposing carcasses or flattened road-kills in the field.

I have previously identified fossil and modern *Bufo calamita* and *B. bufo* on the basis of frontoparietals (Holman, 1988, p. 216, Fig. 3), sacra (Holman, 1988, p. 216, Fig. 4) and ilia (Holman, 1985, 1988). I am presently convinced that the ilium is by far the most reliable element upon which to identify species of *Bufo*. There is quite a bit of intraspecific variation in other *Bufo* skeletal elements, including the frontoparietal and the sacrum. In fact, I suggest that persons without enough modern *Bufo* skeletons to determine the extent of these variations, should restrict themselves to the ilium in making specific identifications.

Fortunately, the anuran ilium is one of the more durable skeletal elements, and often appears in fossil deposits, stomach contents and scats of predators, or in spoiled field specimens. Moreover, the ilium is easy to detach from a dead specimen in hand with a little practice. The only tool needed is a small scissors. First, one should find the puboischiatic symphysis, the prominent bony spur that projects from the posterior end of the animal. The ilia project anteriorly from this symphysis as a pair of prominent lateral rods (see Ballasina, 1984, p. 13, Fig. 1). A small cut in either side will expose an ilium which may be grasped between ones index finger and thumb. The bone is first worked free from its sacral attachment anteriorly, then bent outward to separate it from its posterior symphysis. This technique becomes very simple after a few trials. Tissue may be removed from the ilium either by drying the bone and picking the material away with a forceps; or by macerating the bone in a vial of warm water for a few days. The latter method is least pleasant, but it produces a very clean specimen whose diagnostic characters may be easily observed. The bones should be looked at under at least 10X magnification.

I believe that the ilium of *Bufo* is an especially useful skeletal element for identification purposes because it reflects differences in locomotion. The differences in movements between *Bufo calamita* and *B. bufo* are obvious to all field observers of these forms. *Bufo calamita* makes short "mouse-like" dashes that do not occur in *B. bufo*. Thus, as one might expect, the ilia of *B. calamita* and *B. bufo* are morphologically distinct (Fig. 1).

In my previous papers I stressed the differences between the dorsal prominences in the two species. *Bufo calamita* has a relatively high and triangular prominence, whereas *B. bufo* has a low rounded or roughened one. An "unusual" morph also occurs in an occasional ilium of *B. bufo* (Holman, 1989, p. 10, Fig. 1) where the dorsal prominence arises from the ilial shaft as a low, irregular, sharpened crest.

Happily, another character (Fig. 1) has been described (Sanchiz, 1977; J. C. Rage, personal

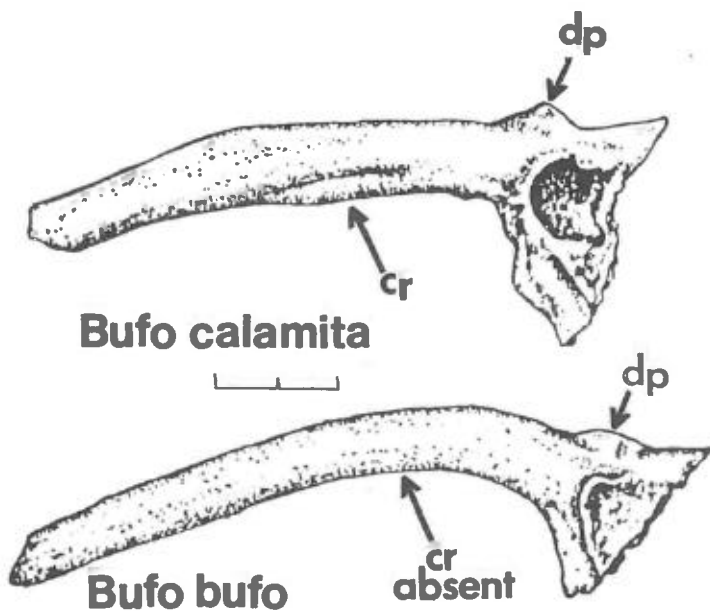


Fig. 1

Left ilia in lateral views of modern *Bufo calamita* and *Bufo bufo* (remade from Holman, 1988). Abbreviations are: cr = "calamita ridge"; dp = dorsal prominence. The line = 4 mm. and applies to both specimens.

communication) that may be more reliable than the dorsal prominence shape. This character, which I term the "calamita ridge" (abbreviated cr in Fig. 1) should, in combination with dorsal prominence shape, provide positive identification of *B. calamita* and *B. bufo* in fossil and modern populations in Britain. J. C. Rage, in his communication to me, described this feature as the "calamita blade", but in specimens that I have seen, the structure is more ridge-like than blade-like. The "calamita ridge" may be described as an elongate ventral ridge on the posterior part of the ilial shaft of *B. calamita*, separated from the upper part of the shaft by an indented area. This structure is absent in *B. bufo*.

Both *Bufo calamita* and *B. bufo* may be separated from the third European species of *Bufo*, *B. viridis*, on the basis of the ilium. *Bufo viridis* has a deep fossa that occurs just anterior to the acetabulum and a two-lobed dorsal prominence that is lacking in *B. calamita* and *B. bufo*.

COMMENT

I here suggest that ilia of *Bufo* found in scats or stomach contents of predators or extracted from spoiled specimens in the field may be utilized to make positive identifications of *Bufo calamita* and *B. bufo*. I further strongly urge that when these skeletal elements are recovered, that they be saved, with proper data, for future variational and comparative studies.

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