

Case 3506***Allosaurus* Marsh, 1877 (Dinosauria, Theropoda): proposed conservation of usage by designation of a neotype for its type species *Allosaurus fragilis* Marsh, 1877**

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Abstract. The purpose of this application, under Article 75.5 of the Code, is to conserve the usage of the name *Allosaurus* Marsh, 1877 by replacement of the fragmentary and nondiagnostic holotype of *Allosaurus fragilis* Marsh, 1877 with a diagnostic skull and skeleton from the same quarry. The name of the genus *Allosaurus*, whose type species is *A. fragilis*, is widely accepted by palaeontologists and has been familiar to the public for decades and it is essential that an adequate type be available. It is proposed that all type species fixations for the genus *Allosaurus* be set aside and a neotype be designated.

Keywords. Nomenclature; taxonomy; Dinosauria; Theropoda; *Allosaurus*; *Allosaurus fragilis*; dinosaur; Jurassic; North America; Europe.

1. Marsh (1877) described the genus *Allosaurus* and its type species *A. fragilis* Marsh, 1877 (p. 515). The holotype of *A. fragilis* consists of a tooth, two dorsal centra, and a proximal phalanx of right pedal digit III which appear to represent the same individual from the lower Morrison Formation at Garden Park, Fremont County, central Colorado. The holotype is deposited in the Peabody Museum of Natural History, and bears reference number YPM 1930.

2. The genus *Allosaurus* is widely cited and utilised in the technical literature, stands as an exemplar of the large predaceous dinosaurs of the Late Jurassic, especially the archetypal Morrison Formation, and has become an iconic dinosaur name, about as well known to the public as *Iguanodon*, *Triceratops*, *Stegosaurus* and *Coelophysis*.

3. The Morrison Formation extends from Canada to New Mexico, and was deposited over a span of approximately 8 million years from the Oxfordian to the Tithonian (Trujillo et al., 2006; Carpenter & Wilson, 2008). *Allosaurus* has also been found in broadly contemporary deposits of the same age in Europe, at that time an archipelago off the east coast of North America (Mateus et al., 2006). The large number of specimens assigned to *Allosaurus* exhibit considerable diversity in morphology and may actually represent more than one taxon (Paul, 1988; Mateus

et al., 2006). The probability that this theropod genus consisted of a number of species preserved as a large and variable set of remains over a wide span of time and geographical area reinforces the requirement that the type species be based on a high quality specimen that provides the foundation for a detailed diagnosis.

4. Because a tooth, a pair of dorsals and a toe element are inadequate to diagnose a genus, much less a species, YPM 1930 can only be identified to family level. The same problem afflicts all specimens that potentially represent the same late Jurassic allosaurid genus from western North America. From the same Quarry 1 as YPM 1930, *Labrosaurus ferox* Marsh, 1884 (p. 333) is another nomen dubium because the holotype USNM 2315 is a peculiar dentary with apparent pathologies that further obscure its generic and specific status. Specimen YPM 1931, the holotype of *Allosaurus lucaris* Marsh, 1878 (Marsh, 1878, p. 242) from the middle Morrison Formation of southern Wyoming, consists of some presacral vertebrae and pectoral and forelimb elements. It is significantly younger than YPM 1930, probably represents a different species from YPM 1930, and may or may not belong to the same genus. It is not sufficiently complete to characterise a species. The name *Allosaurus lucaris* is therefore also a nomen dubium. *Antrodemus* Leidy, 1870, type species *Poicilopleuron valens* Leidy, 1870 (p. 4) is based on holotype USNM 218 (posterior half of the centrum of a proximal caudal) from northern Colorado. Because USNM 218 is entirely inadequate as a holotype in terms of quality and provenance, *Antrodemus* is a nomen dubium (Madsen, 1976; Paul, 1988; Glut, 1997; Holtz et al., 2004), and is no longer used by current researchers. *Epanterias amplexus* Cope, 1878 (Cope, 1878a, p. 406) comes from the much younger upper Morrison Formation at Garden Park, and is probably a different taxon from YPM 1930. It is a nomen dubium because holotype AMNH 5767, consisting of a few vertebrae, a pectoral element and a limb bone, is insufficiently diagnostic. Also unsatisfactorily diagnostic is the holotype of *Creosaurus atrox* Marsh, 1878 (Marsh, 1878a, p. 243), YPM 1890 from the middle Morrison Formation of southern Wyoming. It consists of two skull elements, two sacra, and a few pelvic and limb elements, and is a nomen dubium. *Hypsirophis discursis* Cope, 1878 (Cope, 1878b, p. 389), is a nomen dubium because the holotype AMNH 5731 is a neural spine. The holotype of *Allosaurus europaeus* Mateus, Walon & Antunes, 2006 (p. 128), ML 415, is the posterior half of a skull. Although marginally diagnostic, ML 415 may or may not belong to the same genus and species as, and be contemporary with YPM 1930, and the two individuals lived some 4000 km apart. All of the above taxa and type specimens are large allosaurid remains, all far too incomplete to be determinate, but broadly contemporary with, and potential synonyms of *A. fragilis* which itself is based on non-diagnostic remains.

5. The genus *Allosaurus* continues to be in use despite the absence of an adequate type specimen for its type species because *Allosaurus fragilis* is tacitly diagnosed on the basis of two nearly complete and well described skulls and skeletons: USNM 4734 (Gilmore, 1920) is from the same Garden Park quarry as YPM 1930 (Evanoff & Carpenter, 1998); it was erroneously referred to as a paratype of *A. fragilis* by Madsen (1976, p. 10). Madsen's (1976, p. 10) neotype designation of the even more complete DINO 2560 (National Monument Collection, formerly UUVF 6000 (University of Utah Vertebrate Paleontology)) is invalid as the original type material is extant (Article 75.1 of the Code), and does not comply with Article 75.3.6 of the

Code. The long-skulled DINO 2560 comes from the middle Morrison Formation of northeastern Utah, and its younger age and anatomical differences suggest that it is probably a different taxon from YPM 1930 and short-skulled USNM 4734. With *Allosaurus* remaining unstable, it is technically reasonable for a researcher to apply a new genus and species name to any of a number of diagnostic specimens, including USNM 4734 and DINO 2560 that are potentially assignable to the genus *Allosaurus*. Because the taxonomic identity of the nominal species *Allosaurus fragilis* cannot be determined from its existing name-bearing type, and stability and universality are threatened thereby, we request the Commission to set aside under its plenary power the existing name-bearing type and designate specimen USNM 4734 as neotype.

6. Designation of USNM 4734 as the neotype of *Allosaurus fragilis* will ensure the permanent stability of the genus. This neotype choice complies with Article 75.3.6 of the Code by being from the original type locality and geological horizon. The probability that the well-preserved USNM 4734 represents the same genus and species as YPM 1930 is high because they were collected from the same quarry, minimising issues of temporal and geographic distance between holotype and neotype.

7. The International Commission on Zoological Nomenclature is accordingly asked:

- (1) to use its plenary power to set aside all previous type fixations for the nominal species *Allosaurus fragilis* Marsh, 1877 and to designate specimen USNM 4734 in the United States National Museum, Smithsonian Institute, Washington DC as the neotype;
- (2) to place on the Official List of Generic Names in Zoology the name *Allosaurus* Marsh, 1877 (genus: masculine), type species by monotypy *Allosaurus fragilis* Marsh, 1877;
- (3) to place on the Official List of Specific Names in Zoology the name *fragilis* Marsh, 1877, as published in the binomen *Allosaurus fragilis* and as defined by the neotype designated in (1) above.

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Comments on this case are invited for publication (subject to editing) in the *Bulletin*; they should be sent to the Executive Secretary, I.C.Z.N., c/o Natural History Museum, Cromwell Road, London SW7 5BD, U.K. (e-mail: iczn@nhm.ac.uk).