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The Lower Cretaceous lizard genus *Chometokadmon* from Italy

Susan E. Evans [a,*], Pasquale Raia [b], Carmela Barbera [b]

[a] *Department of Anatomy and Developmental Biology, University College London, Gower Street, London WC1E 6BT, UK*
[b] *Dipartimento di Paleontologia, Università di Napoli, Largo S. Marcellino 10, Napoli, Italy*

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Abstract

The Lower Cretaceous (Albian) locality of Pietraroia, Italy, has yielded a rich and diverse assemblage of fossil vertebrates, including at least one genus of rhynchocephalian (*Derasmosaurus*) and three named lizards (*Chometokadmon*, *Costasaurus* and *Eichstaettisaurus*). The type and only specimen of *Chometokadmon* is well-preserved but has never been comprehensively described or assessed. It was mistakenly classified as a sphenodontian for many years, but detailed reanalysis has shown that *Chometokadmon* is a squamate. The genus has a relatively unspecialised postcranial skeleton, but the skull is distinctive in having an elongated parietal, expanded squamosal, recurved teeth, and cranial osteoderms. A combination of cranial and postcranial characters (including separable cranial osteoderms, an elongate supratemporal, tooth and pubic morphology) supports a relationship with Anguimorpha, a hypothesis corroborated by cladistic analysis.

Keywords: Squamata; Lizards; Anguimorphs; Italy; Cretaceous; Pietraroia

1. Introduction

The Lower Cretaceous (early Albian; Bravi and Garassino, 1998) locality of Pietroroia is in the Apennine Mountains of southern Italy, roughly 75 km northeast of Naples. Excavations have been ongoing, albeit intermittently, for more than 150 years (Costa, 1864, 1866; D'Erasmo, 1915). During this time, the site has yielded a rich assemblage of plants, invertebrates (echinoderms, crustaceans, molluscs) and vertebrates, including fish, amphibians, small reptiles and dinosaurs, most notably the juvenile theropod dinosaur *Scipionyx samniticus* (Leonardi and Teruzzi, 1993; Dal Sasso and Signore, 1998; Bausch and Bravi, 1999; Bravi, 1999). The lepidosaur fauna includes at least one rhynchocephalian, *Derasmosaurus* (Barbera and Macuglia, 1988) and three named lizards, *Chometokadmon* (Costa, 1864), *Costasaurus* (Estes, 1983) and *Eichstaettisaurus* (Evans et al., 2004). Another partial skeleton may represent a second, unnamed, rhynchocephalian (Evans et al., 2004), and a fourth lizard taxon awaits description.

Chometokadmon fitzingeri was described by Costa (1864) on the basis of a single specimen (MPN 539) that he identified as a lizard. In an appendix to the same paper, Costa figured and briefly described another small skeleton (MPN 541) from the same locality. He interpreted this as a second lizard, distinct from *Chometokadmon*, and subsequently named it *Lacerta brevicauda* (Costa, 1866). D'Erasmo (1915) synonymized the two specimens under *Chometokadmon* and referred a third specimen (now lost) to the same genus. Based on the acrodont dentition of Costa's second specimen (MPN 541), D'Erasmo attributed *Chometokadmon* to Rhynchocephalia, despite noting dental inconsistencies in the holotype. Most subsequent reviewers (e.g., von Huene, 1956; Cocude-Michel, 1963; Kuhn, 1969) followed D'Erasmo, although Romer (1956) listed *Chometokadmon* as an indeterminate lizard. The question was resolved by Barbera and Macuglia (1988); Costa was essentially correct. The holotype specimen of *Chometokadmon* is a squamate, but MPN 541 is a rhynchocephalian, and is now the holotype of the genus *Derasmosaurus* (Barbera and Macuglia, 1988).

* Corresponding author.
E-mail address: ucgasue@ucl.ac.uk (S.E. Evans).

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Barbera and Macuglia (1988) gave a preliminary description of *Chometokadmon* and tentatively referred it to Scincidae. In the intervening period, however, there has been considerable progress in our knowledge of Jurassic and Early Cretaceous squamates and squamate phylogeny (for a review, see Evans, 2003), prompting a detailed reanalysis of the specimen. Relatively little articulated lizard material exists for the Jurassic and Early Cretaceous, particularly in Euramerica. Furthermore, Pietraroia provides the only European squamate assemblage contemporaneous with mid-Cretaceous (Albian–Cenomanian) lizard assemblages from North America (Nydam, 2000; Nydam and Cifelli, 2002) and Asia (Nessov, 1985, 1988, 1997; Alifanov, 1993).

Institutional abbreviations. BMNH, The Natural History Museum, London, UK; MPN, Museo di Paleontologia, Napoli, Italy.

2. Geology and material

At the locality of ''Civita di Pietraroja'' (Mt. Matese, southern Italy), two distinct plattenkalk horizons are exposed. The lower horizon is relatively unfossiliferous (Bausch and Bravi, 1999). Above it is a thick sequence of lagoonal limestones, overlain by a second plattenkalk horizon that is the source of the major finds from Pietraroia (early Albian; Bravi and Garassino, 1998). The thickness of this second plattenkalk increases to the southwest reaching a maximum (ca. 15 m) at the original ''la Cavere'' outcrop. Bausch and Bravi (1999) have reconstructed a shallow lagoonal environment, close to land and frequently isolated from the open sea, but subject to tidal influence and occasional storms. The water would therefore have varied in the level of salinity, and this is reflected in the rock layers that show varying marine or terrestrial influence. The low lying landmass with which the deposit was associated was one of a chain of islands running for perhaps 100–200 km, rather like the Antilles or Bermuda island chain today.

3. Systematic palaeontology

Lepidosauria: Haeckel, 1866
Squamata: Oppel, 1811
Anguimorpha: Fürbringer, 1900
Genus *Chometokadmon* Costa, 1864

Type and only species. *Chometokadmon fitzingeri* Costa, 1864.

Holotype. MPN 539, articulated skeleton and partial counterpart.

Locality and horizon. La Cavere outcrop, Pietraroia, Mount Matese, Italy. Upper Plattenkalk horizon. IGM (Italian Military Geographic Institute) map sheet 162, III SW-Cusano Mutri, N4577431, E2482228. Lower Cretaceous, Albian.

Diagnosis (emended from Kuhn, 1969). Lizard showing the following combination of derived characters: premaxilla with long nasal process; large maxilla with sharp, recurved teeth; maxilla meets frontal posterodorsally to separate prefrontal and nasal; maxilla with tapering in-turned premaxillary process and posterior process not extending beyond midpoint of orbit; large, ovoid, posteriorly extended external nares; narrow, paired nasals; jugal reaching anterior margin of orbit but separated from prefrontal by lacrimal; maxilla excluded from orbital rim; frontals paired with subparallel orbital margins; nasals and frontals sculptured with low tubercles; small cranial osteoderms associated with orbital and postorbital regions, not attached to skull bones; parietal elongate with long narrow body and long divergent posterior processes; parietal foramen small, anterior to midpoint of bone; supratemporal elongate reaching anterior to level of postparietal notch; squamosal broad with small dorsal process and curved posterior head; anterior margin of supraoccipital overlaps posterior edge of parietal; paroccipital processes long, crested and tapering; vertebrae procoelous, with broad, low neural spines, wide horizontal zygapophyses, but no zygosphene–zygantrum system; anterior caudals with long transverse processes, caudal autotomy septum present (bisecting transverse process); ilium with short narrow blade and small anterior process; pubis directed anteriorly with short symphysis; femur straight, foot longer than femur; fused astragalocalcaneum, wide but proximodistally short, with small groove between tibial and fibular facets; only distal tarsals 3 and 4 retained; fifth metatarsal short and hamate with lateral flange; other metatarsals elongate; phalanges becoming increasingly gracile distally.

4. Description

The type and only specimen (MPN 539) is preserved in dorsal view and is fully articulated (Fig. 1), but both sides of the skull are damaged behind the orbit, and parts of the forelimbs are either obscured by the body (right) or still in the matrix (left). The tail had been autotomised during life and had regenerated to almost its full length. The feet are damaged but are shown in impression on a partial counterpart (mounted in plaster adjacent to the main block).

4.1. Skull

The premaxilla appears to be single, but it is not well preserved and the width of the alveolar region can only be estimated. The dorsal process is narrow and elongate, meeting the tips of the nasals and separating them only for a short distance. A small bifurcate process lies in contact with the tip of the right maxilla, and probably represents the right edge of the premaxillary alveolar margin. (Figs. 1, 2A, B)

The maxilla is well preserved on the right side of the skull, but less so on the left. It is a large bone with a long, deep facial process that had a nearly straight dorsal suture with the nasal and an acute posterior margin that met the prefrontal, lacrimal, and jugal, but was excluded from the anterior and ventral orbital margins. The posterodorsal angle of the bone met the