LIZARD EGG SHELLS FROM THE LOWER CRETACEOUS OF CUENCA PROVINCE, SPAIN

by ROLF KOHRING

ABSTRACT. The Lower Cretaceous vertebrate-bearing coaly marls and limestones of Uña (Province of Cuenca, Spain) have yielded fragmentary reptilian egg shells. The shell is of gekkonid microstructure type, and thus they can be confidently assigned to the lizards. These fragments represent the oldest known gekko-like egg shells.

FOSSIL egg shells have been reported nearly worldwide, especially from Upper Cretaceous and Tertiary deposits, and they have been assigned, according to their microstructure and biomineralization, to turtles, crocodiles, dinosaurs, and birds (reviewed by Hirsch and Packard 1987). Fossilized egg shells of snakes and lizards, however, are only rarely described, owing to their largely non-mineralized composition; nearly all squamates produce eggs with soft shells consisting of interlacing protein fibrils and some calcareous matter, probably homologous to the membrana testacea of avian eggs (Schleich and Kästle 1988). Only the recent gekkonids (Lacertilia) develop calcified (and thus fossilizable) rigid egg shells, characterized by a continuous layer, composed of tightly abutted jagged columns, and surface nodes. The thickness of both fossil and recent gekkonid egg shells ranges from 35 to 280 μm (Schleich and Kästle 1988).

Fossil gekko-like egg shells are reported from the Lower Miocene of Kenya (Hirsch and Harris 1989), the Oligocene of the Mainz Basin (Schleich and Kästle 1988), the Lower Eocene of Wyoming (Hirsch and Packard 1987), the Cretaceous/Tertiary-boundary of Peru (Hirsch in Mourier *et al.* 1988), the Upper Cretaceous of both Montana (Hirsch and Quinn, in press) and India (Sahni *et al.* 1984), and the Lower Cretaceous of Mongolia (Alifanov 1989). One genus (*Ilerdaesaurus* sp.) of this material is under study by A. Richter (Berlin). According to Hoffstetter (1964) gekkonids are known since the Upper Jurassic. The lizards of Uña are not yet described (Krebs, pers. comm.)

LOCALITY AND STRATIGRAPHY

The coal-bearing marls and limestones of Uña (province of Cuenca, Spain) have yielded tetrapods, especially frogs (Fey 1988), turtles and lizards (Krebs, pers. comm.), crocodiles (Brinkmann 1989), and early mammals (Henkel and Krebs 1969). They have been dated as Upper Barremian on the basis of palynomorphs (Mohr 1989), ostracodes, and charophytes (Schudack 1989). The palaeoenvironment of Uña is postulated to have been lacustrine, with marshy, deltaic deposits (Gierlowski-Kordesch and Janofske 1990). The egg shells described here are well preserved; only their margins are partially pyritized, as is typical also for the gastropods, ostracodes, and charophytes of Uña.

THE MATERIAL

Description

In all, eight tiny, dark brown coloured shell fragments (5 × 10 mm), embedded in the coaly sediment, have been studied in thin sections and by scanning electron microscopy (SEM, Cambridge Stereoscan 360). In thin section, the egg shells display a continuous layer with hardly visible fine, closely spaced growth-stage lines and a light coloured secondary layer in the outer part, which is obviously a diagenetic structure (Hirsch, pers.

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comm.) (Pl. 1, fig. 5). It is never pyritized in any of the specimens. In XPL an extinction pattern with cone-shaped wedges in the upper part of the primary layer and partially in the secondary layer is visible.

In SEM studies, some further morphological features can be observed. The shell consists of a nearly complete homogenous calcitic layer without recognizable shell units (Pl. 1, figs 2 and 6), and therefore is very similar to the recent gekko *Ptyodactylus* (Schleich and Kästle 1988). In its upper part, the 20 μm thick secondary layer with horizontal crystallites is visible (Pl. 1, fig. 4). This characteristic structure has been mentioned also from Upper Cretaceous gekko-like egg shells of Montana (Hirsch and Quinn, in press) and from hadrosaurian egg shells (Hirsch and Packard 1987). The surface is covered with a thin 3 μm mineralized layer, as is typical for nearly all recent gekkos (Schleich & Kästle 1988). However, this layer has never been reported from fossil lizard eggs. The shell thickness, including surface nodes, is 170–180 μm. The diameter of these nodes is about 100 μm (Pl. 1, fig. 1).

Discussion

Other distinctive reptilian egg shell microstructures, such as pores, pore openings, and basal aragonitic mammallae could not be found. Probably the rigid gekkonid egg shell is not homologous to those of other reptiles or birds.

The remarkable structural similarities to modern gekkonid egg shells allow the assignment of the Uña material to the lizards. These late Barremian fragments are the oldest known certain lizard egg shells. Due to the poor knowledge of the problematic diagenetic pattern of egg shells an identification of the very thin outer layer as a mineralized organic cover seems hitherto impossible. The fragmentation of the shells suggests substantial transport. The primary shapes and sizes of the eggs cannot be reconstructed.

A single thin-shelled (about 50 μm) fragment is known from the Upper Jurassic (Kimmeridgian) coaly marls and limestones of Guimarota (Central Portugal), where turtle egg shells have been described (Kohring 1990). It is similar in microstructure to recent gekkonid egg shells, but its real taxonomic position is uncertain (Pl. 1, fig. 8).

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EXPLANATION OF PLATE 1

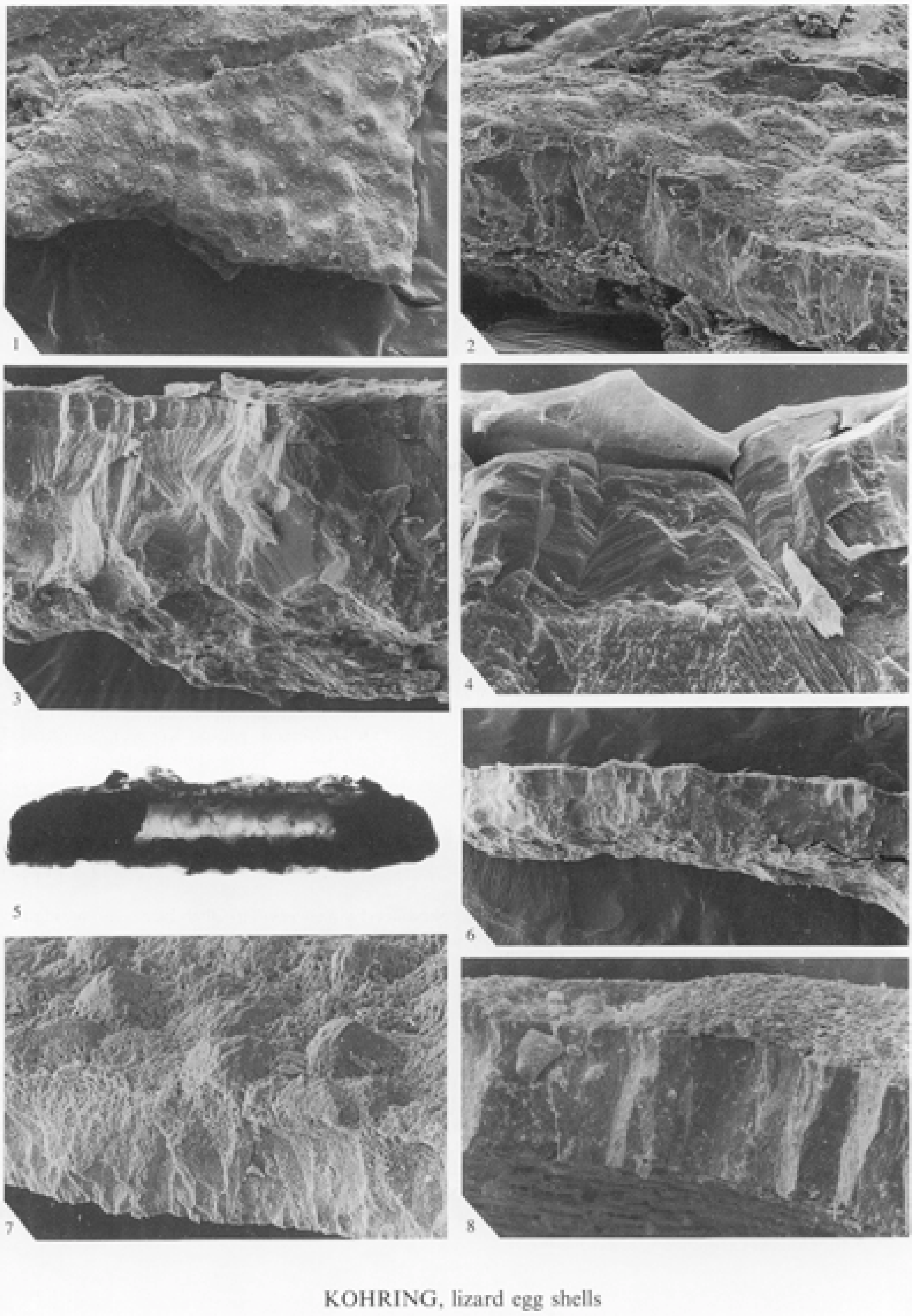
Figs 1–6. Lizard egg shell fragments from the Lower Cretaceous of Uña. 1, outer surface with nodes, × 50. 2, lateral view with homogenous calcitic layer, secondary layer, outside is up, × 100. 3, lateral view, note secondary layer, × 200. 4, Secondary layer, × 400. 5, lateral view in thin section in ordinary light, outside with a secondary layer is up, note pyritized margins, × 50. 6, lateral view, × 80.

Fig. 7. Recent gekko egg shell, *Tarentola* sp., lateral view with nodose outer surface, × 300.

Fig. 8. Uncertain gekko-like egg shell from the Upper Jurassic of Guimarota, lateral view, × 300.

Specimens are housed in the Institut für Paläontologie, Freie Universität Berlin under the registered numbers Un Bar ES 1–8.

PLATE 1



KOHRING, lizard egg shells

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