

Synapsid fauna of the Upper Pennsylvanian Rock Lake Shale near Garnett, Kansas and the diversity pattern of early amniotes

Richard A. KISSEL & Robert R. REISZ

Abstract

Stream channel infills near Garnett, Kansas preserve the most abundant and diverse assemblage of amniotes known from the Carboniferous. In addition to the diapsid *Petrolacosaurus kansensis* and the synapsids *Haptodus garnettensis*, *Xyrospondylus eordi*, and *Ianthasaurus hardestiorum*, at least three additional synapsid taxa can be recognized, including a new eupelycosaur genus that is represented by a partial skull and an isolated maxilla. *Ianthodon schultzei* n. gen. et sp. possesses three premaxillary and seventeen or eighteen maxillary teeth, and the individual teeth are generally conical in outline with only a slight recurvature near the tip. On the lingual surface, the teeth possess densely packed longitudinal fluting that extends to the tip of each tooth. No distinct caniniform tooth is present on the maxilla, but there is a modest caniniform region along the anterior one-third of the bone. *I. schultzei* is also characterized by a tall lacrimal, and the pineal foramen is found at the midpoint of the median parietal suture. Available evidence suggests that *Ianthodon* is a member of Sphenacodontia and is positioned within the “haptodont” grade of synapsids. Phylogenetic evidence and a review of occurrence data from Garnett and the 21 other reported Pennsylvanian amniote-bearing localities indicate that the early history of Amniota is characterized by: 1) a basal dichotomy into synapsids and sauropsids; and 2) an uneven rate of diversification, with synapsids rapidly diversifying and quickly developing a dominant role in the terrestrial ecosystems of the late Paleozoic.

Introduction

With at least 100 species of fossil taxa recognized, including 39 megaplant, 47 palynomorph, 5 arthropod, and 9 vertebrate species, the Missourian Garnett fossil locality of eastern Kansas (Fig. 1A) has produced the most diverse Pennsylvanian terrestrial flora and fauna known from North America (REISZ et al. 1982, REISZ & BERMAN 1986). The fossiliferous sediments at Garnett are the calcareous shales of the Rock Lake Member of the Stanton Formation (Fig. 1B), which are interpreted as a stream channel fill that was deposited during the gradual flooding of a stream valley during a regressive-transgressive sequence (REISZ & BERMAN 1986). Most of the vertebrate remains recovered from the locality are those of terrestrial amniotes, and the Garnett synapsid fauna represents the most abundant and diverse known for the Pennsylvanian. Of the eight amniote taxa recognized from the site, six synapsids have been identified: the edaphosaurid *Ianthasaurus hardestiorum* (REISZ & BERMAN 1986), the sphenacodontian *Haptodus garnettensis* (CURRIE 1977), the enigmatic *Xyrospondylus eordi* (REISZ et al. 1982), an undescribed ophiacodontid that may be referable to the genus *Ophiacodon* (REISZ & BERMAN 1986), an undescribed sphenacodontian (R. Reisz pers. obs.), and the new form described herein. Note that the nomen *Ianthasaurus hardestiorum* replaces that of *Ianthasaurus hardestii* here. In their description of the form, REISZ & BERMAN (1986) indicate that the specific name of *Ianthasaurus hardestii* honours Mr. and Mrs. C. A. Hardesty, the owners of the property on which the type specimen was found. However, since the specific name is intended to recognize the Hardesty family, the proper nomen for the species is *Ianthasaurus hardestiorum* (C. Sidor pers. comm. 2002). We recognize that correction and the nomen *Ianthasaurus hardestiorum* is used herein.

The whole contribution can be purchased as PDF file.

Availability

Generally all our publications are available as PDF files; full publications as a general rule after the printed version is out of print. If you have questions concerning particular contributions please contact us by e-mail:

pdf@pfeil-verlag.de.

The PDF files are protected by copyright.

The PDF file may be printed for personal use.

The reproduction and dissemination of the content or part of it is permitted.

It is not allowed to transfer the digital personal certificate or the password to other persons.

Prices

Books: Prices are to be found in the catalog.

Articles in journals and single contributions or chapters in books:

10 EURO basic price per order (including the first 10 pages),
and

0.50 EURO per page, beginning with the 11th page.

Page numbers are found in the contents of the publications.

Orders

Use our order form for PDF files or send your order informal per e-mail (pdf@pfeil-verlag.de). The only accepted payment is by credit card. While using the order form for PDF files, your data will be transmitted by secure link (ssl). You also may send the informations informally by e-mail, fax, phone or mail.

Handling

As soon as possible, depending on our business hours and your order, you will receive your PDF file together with the certificate and password by e-mail.

Larger PDF files can be downloaded from our webpage, if necessary.

Your invoice will be sent out by e-mail after we charged your credit card.

To open the encrypted PDF files you have to install your personal certificate after your first order. All PDF files with the same certificate can be opened from that time on.

Dieser Beitrag kann als PDF-Datei erworben werden.

Verfügbarkeit von PDF-Dateien

Prinzipiell sind von allen unseren Publikationen PDF-Dateien erhältlich. Komplette Publikationen in der Regel erst nachdem die gedruckte Version vergriffen ist. Anfragen bezüglich bestimmter Beiträge richten Sie bitte per E-Mail an pdf@pfeil-verlag.de.

Die PDF-Dateien sind urheberrechtlich geschützt.

Ein Ausdruck der PDF-Dateien ist nur für den persönlichen Gebrauch erlaubt.

Die Vervielfältigung von Ausdrucken, erneutes Digitalisieren sowie die Weitergabe von Texten und Abbildungen sind nicht gestattet.

Das persönliche Zertifikat und das Passwort dürfen nicht an Dritte weitergegeben werden.

Preise

Bücher: Die Preise sind dem Katalog zu entnehmen. Zeitschriftenbeiträge und einzelne Kapitel aus Sammelbänden bzw. Büchern:

10 EURO Grundbetrag pro Bestellung (einschließlich der ersten 10 Seiten),
und

0,50 EURO pro Seite ab der 11. Seite.

Den Umfang der Beiträge entnehmen Sie bitte den Inhaltsverzeichnissen.

Bestellungen

Bestellungen sind mit dem PDF-Bestellformular oder formlos per E-Mail (pdf@pfeil-verlag.de) an uns zu richten. Die Bezahlung ist ausschließlich per Kreditkarte möglich. Bei Verwendung unseres Bestellformulars werden die Kreditkartendaten über eine gesicherte Verbindung (ssl) übermittelt. Sie können die Daten aber auch formlos per E-Mail, Fax, Post oder telefonisch übermitteln.

Abwicklung

So bald wie möglich, aber abhängig von unseren Bürozeiten und der gewünschten Bestellung, schicken wir Ihnen die PDF-Datei(en) zusammen mit Ihrem persönlichen Zertifikat und dem zugehörigem Passwort per E-Mail. Größere Dateien bieten wir Ihnen gegebenenfalls zum Herunterladen an.

Der fällige Betrag wird von Ihrer Kreditkarte abgebucht und Sie erhalten die Rechnung ebenfalls per E-Mail.

Um die verschlüsselten PDF-Dateien öffnen zu können, muss bei der ersten Bestellung das passwortgeschützte persönliches Zertifikat installiert werden, welches anschließend auf dem Rechner verbleibt. Alle mit diesem Zertifikat verschlüsselten Dateien können anschließend auf diesem Rechner geöffnet werden.