



中国地质调查项目 (12120114068001、1212010610211) 资助
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罗平生物群

——三叠纪海洋生态系统复苏和生物辐射的见证

The Luoping Biota:

A taphonomic window on Triassic biotic recovery and radiation

胡世学 张启跃 文 芑 黄金元 周长勇 谢 韬 吕 涛 刘腾林 迈克尔·本顿

Shixue Hu, Qiyue Zhang, Wen Wen, Jinyuan Huang, Changyong Zhou, Tao Xie, Tao Lu, Tenglin Liu, Michael J. Benton

云南出版集团公司 YUNNAN PUBLISHING GROUP CO. LTD.
云南科技出版社 YUNNNAN SCIENCE & AND TECHNOLOGY PRESS



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云南出版集团公司

云南科技出版社

· 昆明 ·

YUNNAN PUBLISHING GROUP CORPORATION

YUNNAN SCIENCE & TECHNOLOGY PRESS

· KUNMING ·

图书在版编目 (C I P) 数据

罗平生物群 / 胡世学等著. -- 昆明 : 云南科技出版社, 2014.11

ISBN 978-7-5416-8640-5

I. ①罗… II. ①胡… III. ①生物群—古生物学—研究—罗平县 IV. ①Q911.727.44

中国版本图书馆CIP数据核字(2014)第291613号

责任编辑: 赵 敏 章 沁

封面设计: 晓 晴

责任校对: 叶水金

责任印制: 翟 苑

云南出版集团公司

云南科技出版社出版发行

(昆明市环城西路609号云南新闻出版大楼 邮政编码: 650034)

昆明富新春彩色印务有限公司印刷 全国新华书店经销

开本: 787mm×1094mm 1/12 印张: 11.5 字数: 240千字

2015年5月第1版 2015年5月第1次印刷

印数: 1~3000册 定价: 128.00元

罗平生物群—第三次生
物大辐射的典型代表

陈洪福 2015.2.28

"The Luoping biota: a typical example of the great third radiation in earth history", autography by academician Professor Hongfu Yin

前言



三叠纪是地球生命演化发展史上一个关键的时期。它开始于一场空前绝后的生物大绝灭，终结于另一场大规模的生物灭绝事件。二叠纪末期的生物大绝灭导致了陆地上70%的物种和海洋里90%以上物种的绝灭，彻底改变了地球的生态环境。三叠纪早期的海洋环境极不稳定，出现了全球范围的缺氧事件，赤道地区还经历了极端的高温环境。严酷的环境迟滞了生物的复苏，整个海洋生态系统直到三叠纪中期才从二叠纪末大绝灭的灾难性后果中全面复苏过来。

罗平生物群是中国地质调查局成都地质调查中心2007年进行1:50000区域地质调查过程中首次发现并命名。经过成都地质调查中心罗平生物群研究团队多年的潜心研究，初步揭示了罗平生物群的面貌和科学意义。目前罗平生物群已发现的化石有6个门类40属100多种，其中大部分为新属新种。罗平生物群种类丰富、保存精美，堪称世界级的化石宝库，被誉为三叠纪海洋生态系统全面复苏的代表，是海生爬行类、新鳍鱼类和甲壳类节肢动物辐射的窗口，是中生代海洋生态系统形成的标志。

本书图文并茂，大量精美的化石照片展示了栩栩如生的罗平生物群各门类化石，为国内外科学研究人员和科学爱好者了解罗平生物群、探索两亿多年前神秘的三叠纪海洋世界提供了一个难得的机会。

罗平生物群的研究得到了中国地质调查局及罗平县地方政府的大力支持。殷鸿福院士一直关注罗平生物群的研究并给本书题词。Brian Choo博士和昆明学院陈庆韬老师绘制了精美的化石复原图。中科院北京脊椎动物和古人类研究所徐光辉博士和中国地质调查局武汉地质调查中心程龙博士提供了部分图片。中国地质大学童金南教授、张克信教授、陈中强教授、北京大学江大勇教授、合肥工业大学刘俊博士、美国肯特州立大学Rodney M. Feldann教授、Carrie E. Schweitzer教授、德国柏林自由大学Helmut Keupp教授及Michael Steiner博士、西澳大学罗茂博士等对罗平生物群研究提供了大量帮助，在此一并致谢！

Foreword

The Triassic was a crucial period in the history of the evolution of life. It started after the severest mass extinction (the Permo-Triassic mass extinction) and ended by another mass extinction, and marked the remarkable replacement of Palaeozoic ecosystems by modern ecosystems. The Permo-Triassic mass extinction led to the loss of about 70% of terrestrial species and >90% of marine species globally. The unstable environment in the Early Triassic, marked by global anoxia and high temperatures in the equatorial region, hampered the recovery process significantly. It was widely accepted that the full recovery of marine ecosystems took nearly 8-10 million years, by the time of the Middle Triassic.

The Luoping Biota was discovered in 2007 by the Chengdu Center of the China Geological Survey during regional mapping work at the scale of 1:50,000. Several big excavations carried out in the following years revealed the fossil assemblage and the scientific significance. So far, 6 animal phyla, including more than 100 species and 40 genera have been recognized, most of which are new taxa. The exceptional preservation and high diversity of the fossils elevates the Luoping Biota to be counted as one of the most significant Lagerstätten in the world. The Luoping biota is seen as one of the most diverse Triassic marine fossil lagerstätten in the world, and it has been used as a marker of the recovery of marine ecosystems after the Permo-Triassic mass extinction. The Luoping biota also documents the diversification of crustacean arthropods, neopterygian fishes, and marine reptiles, and furthermore, the establishment of Mesozoic marine ecosystems by the Middle Triassic.

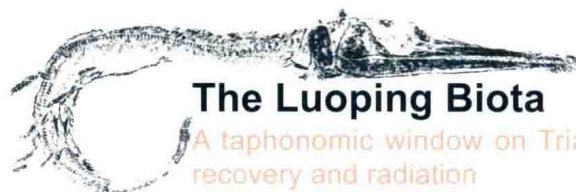
This book provides readers with hundreds of colourful pictures of the spectacular fossils from the Luoping biota. It offers a window into a true Middle Triassic community 244 million years ago. It also offers important lessons regarding the early evolution of Mesozoic marine ecosystems.

Research work on the Luoping biota was financially supported by the China Geological Survey. The field work was supported by the local government of Luoping County. We sincerely thank academician Professor Hongfu Yin for his help and encouragement over the years, and the autography for this book. We would like to thank Dr. Brian Choo and Mr. Qingtao Chen for their extraordinary reconstruction of the fossils, and Dr. Guanghui Xu (Institute of Vertebrate Paleontology and Paleoanthropology, Chinese Academy of Sciences), Dr. Long Cheng (Wuhan Center of China Geological Survey) for providing some important pictures. Thanks are also given to Prof. Jinnan Tong, Zhong-qiang Chen, and Kexing Zhang (all from China University of Geosciences, Wuhan), Prof. Dayong Jiang (Peiking University), Dr. Jun Liu (Hefei University of Technology), Prof. Rodney M. Feldann and Dr. Carrie E. Schweitzer (both from Kent State University, U. S. A.), Prof. Helmut Keupp and Dr. Michael Steiner (both from Freie Universität Berlin, Germany), and Dr. Mao Luo (The University of Western Australia) for constructive and informative discussions.



The Luoping Biota

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recovery and radiation



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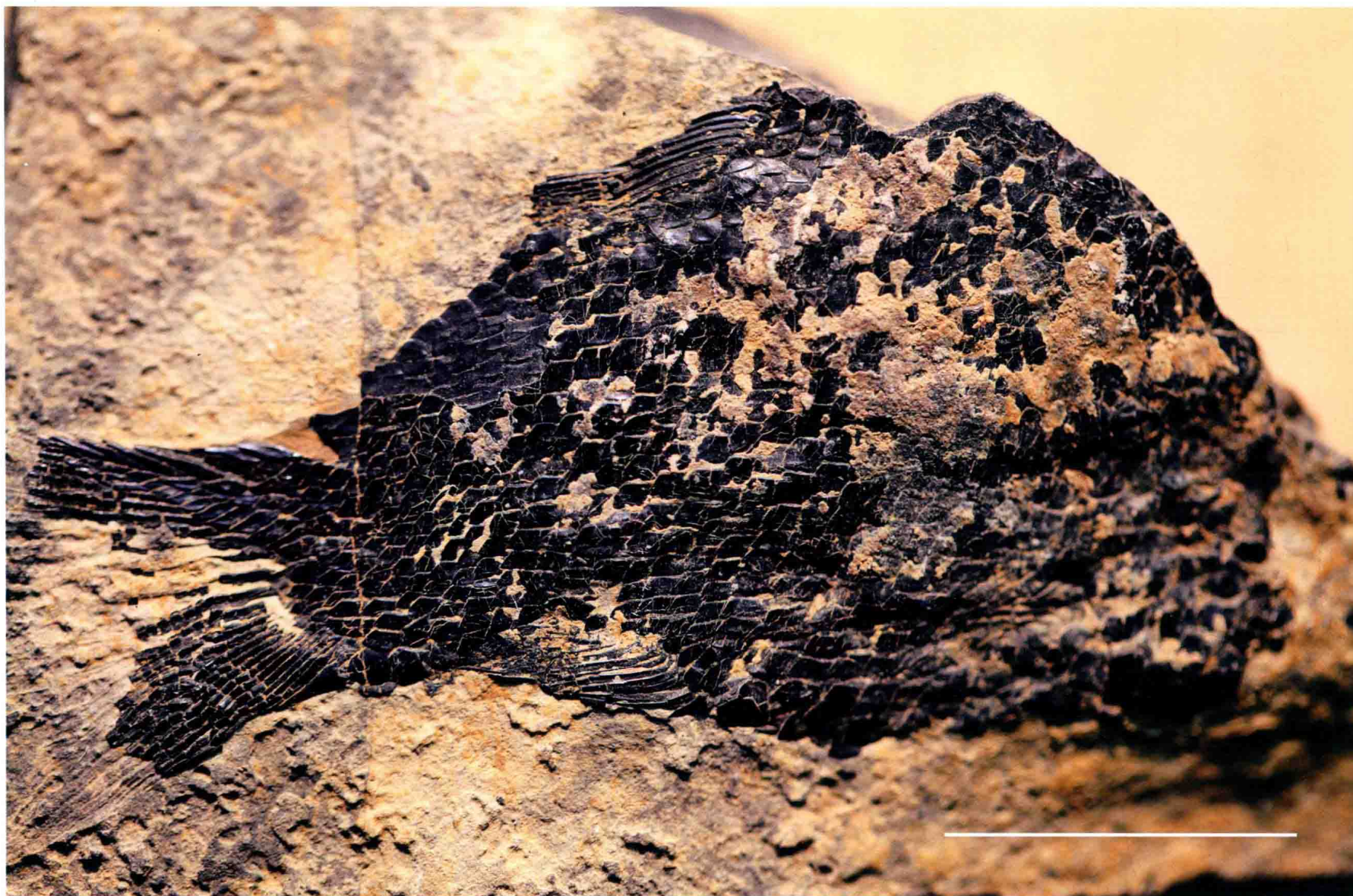
2007年10月，中国地质调查局成都地质调查中心云南1:50000区域地质调查项目组在野外地质调查过程中，在距罗平县城东南15km的罗雄镇大洼子村附近中三叠统关岭组二段地层中发现大量保存完好的鱼类化石，随后又发现了大量爬行类及其他动、植物化石。经过研究证实其生物门类的多样性、化石保存的完整性举世罕见，将其正式命名为“罗平生物群”。

The Luoping Biota was discovered in 2007 by the Chengdu Center of the China Geological Survey during regional mapping work at the scale of 1:50,000 from the Dawazi Village, Luoxiong Town, 12km southeast of the City of Luoping, Yunnan Province, SW China. Although fishes were the first group to be recovered, later excavation has led to the discovery of more marine reptiles and many other fossil groups. Later, in 2008, the unusual fossil assemblage was named as “The Luoping Biota”.





罗平县大洼子村——罗平生物群化石最早发现地
The Dawazi Village near the county town of Luoping, from where the Luoping fossils were recovered for the first time.



最先发现的第一块罗平生物群化石，比例尺为1cm
The first recovered specimen of the Luoping biota.
Scale bar is 1cm.



罗平生物群产地、层位及时代

Fossil sites, stratigraphy and age of the Luoping Biota

罗平生物群产地主要分布在罗平县城周围，主要化石点有大洼子、九光等地。目前在罗平进行了三次大规模的化石发掘，采集了大量化石，发掘所留的采场构成了罗平生物群国家地质公园的核心部分和主要景观。产罗平生物群化石的地层为中三叠世关岭组二段，根据含化石地层中发现的微体化石牙形石的鉴定结果，确认罗平生物群时代为中三叠世安尼期派尔逊亚期，从化石层相伴产出的火山灰夹层中锆石同位素测年获绝对年龄为距今约2.44亿年。

Fossil localities of the Luoping biota are recovered from the area surrounding the county town, among which Dawazi and Jiuguang are the two most important localities. Three big excavations have been carried out and hundreds of fossils have been collected. The three quarries from the excavations comprise the central part of the Luoping Biota National Geopark. The interval containing the Luoping biota is the middle part of Member II of the Guanling Formation. The age of the Luoping biota is assigned to the Pelsonian Substage of the Middle Triassic Anisian Stage based on the index conodont fossils. An age of 244 million years is estimated for the Luoping biota, based on zircons derived from volcanic tuff layers.





九光村，另一个罗平生物群重要化石产地
Jiuguang Village, another important fossil
locality of the Luoping biota.



罗平生物群上石坎采场
Shangshikan quarry for fossil excavations.