Acta Palaeobotanica 60(2), 454–455, 2020
https://doi.org/10.35535/acpa-2020-0014

e-ISSN 2082-0259
ISSN 0001-6594

Book review

POYATO-ARIZA, F.J. & BUSCALIONI, Á.D. (eds.) 2016. Las Hoyas: a Cretaceous wetland. A multidisciplinary synthesis after 25 years of research on an exceptional fossil Lagerstätte from Spain. 262 pp. Verlag Dr. Friedrich Pfeil, München. ISBN 978-3-89937-153-6. [Price 75 EUR]

It is now commonplace to say that palaeontological research depends to a large extent on Konservat-Lagerstätten, that is, sedimentary deposits characterised by exceptional preservation of fossils. Perhaps the best-known ones are the Burgess and Chengjiang sites, which yielded diversified Cambrian faunas, but the Early Devonian flora of Rhynie is also familiar to most palaeontologists.

Las Hoyas is a Lower Cretaceous (lower Barremian) site situated in eastern Spain, approximately 150 km north-west of Valencia. It was discovered in 1985, so the present synthetic volume summarises about a quarter-century of research. As stated by the editors in the introductory chapter, the importance of the Las Hoyas fossil assemblage consists in (i) unique records, like those of articulated characean specimens; (ii) compositional fidelity resulting from the autochthonous character of the taphocoenosis; and (iii) recording of a key moment in Earth's history, namely at the beginning of the so-called Cretaceous Terrestrial Revolution, when angiosperms were just starting their expansion.

The book is printed in a large format and copiously illustrated with drawings and good-quality photographs, mostly in colour. There are four main parts, entitled Introduction, Fossil Record, Taphonomy, and Palaeoecology. The core of the volume is the second part (pp. 29–201) divided into 23 chapters on single groups of plants and animals. Among the chapters addressing the fossil record, the centre of attention is obviously on animals; the plants are discussed in two chapters totalling 26 pages. The first, authored by Montserrat de la Fuente and Reinhard Zetter, is about palynomorphs, whereas the megaflora is described by Carles Martín-Closas, Bernard Gomez and Véronique Daviero-Gomez.

Given the paucity of spores and pollen at Las Hoyas, the micropalaeobotanical chapter is based mainly on material from coeval strata (other sections belonging to the same formation). This is the first published description of the palynoassemblage which had previously been signalled in a few congress abstracts and analysed in an unpublished memoir. Sixty-five species are illustrated, among which there are five algae, 39 spore taxa, 9 gymnosperms and 12 angiosperms. Fifty-five of them are reported under open nomenclature, including 44 identified at genus level and 11 referred to by English morphological terms like "rugulate spore indet." The study employed Zetter's single-grain technique, so algae, spores and gymnosperm pollen are illustrated by series of three images, where the same spore or pollen grain is shown by light microscopy and by scanning electron microscopy (general view and enlargement of the surface). For angiosperm pollen there are series of two SEM micrographs. The images are of high quality and the accompanying descriptions are detailed. However, quantitative data on the whole assemblage seem a bit fuzzy, for example when the reader is informed in juxtaposed sentences that "*Exesipollenites* (…), *Ephedripites* (…), and *Eucommiidites* (…) constitute, all together, just a 9%", but "[a]ngiosperm pollen grains are commonly found, representing 9% of the total pollen grains" (p. 32): so, is 9% "just" or "common"? Similarly, does the number quoted in the sentence "[s]pores are dominant in amount and diversity, representing about 75%" refer to abundance or to diversity? Thirty-nine spore taxa out of 65 is 60%, but it is not stated whether all the taxa found have been illustrated or if some are omitted. In a work intended for the general reader such data should be given explicitly.

Unlike in the previous chapter, the authors of the megaflora description were able to benefit from already published studies. Plant remains collected at Las Hoyas constitute about 30% of all megafossils, but at single beds this value may be as high as 100%. This corresponds to about 22% of the diversity (44 plant taxa as compared to 158 animal ones, unless my count is in error; data in the Appendix, pp. 258–259). In my opinion, the most important finding is that of macroscopically preserved characean thalli – the best such preservation on the world scale. This discovery had already been published, but the quality of the images in the book is better than in the original description [Martín-Closas & Diéguez, *Palaeontology*, 41(6), 1998]. There are also 13 species of ferns, known mostly (except for *Weichselia*) as rather small fragments. Conifers total 10 species, but most palaeobotanists probably will be especially interested in angiosperms, even if represented by only six species. The images are once more mostly good, but the discussion might profitably be more extensive. For example, *Montsechia vidalii* is included among angiosperms, whereas an alternative interpretation by Valentin Krassilov [*Acta Palaeobotanica*, 51(2), 2011] is not mentioned. As for *Ranunculus ferreri*, I think that classifying a Barremian

angiosperm within a modern genus requires at least a short comment.

The chapter ends with a section on "landscape ecology". Three palaeocommunity types (incorrectly called biomes) are distinguished: water vegetation with clavatoracean charophytes, other green algae, *Montsechia* and "*Ranunculus*"; marsh and swamp environments; and fern savannah with *Weichselia* and probable schizaeaceous ferns in the understory. Such a reconstruction is plausible, but the interpretation of *Frenelopsis ugnaensis* as a swamp plant on account of "a set of adaptations which prevented excessive water loss" (p. 55) seems logically flawed.

The palaeozoological chapters mostly follow a standardised plan, with an introduction placing the discussed group within the systematic context, a detailed description of the Las Hoyas material, and a conclusion on the importance of the material from this site for general knowledge of a given group. Among the animal fossils, insects, fish and amphibians deserve short mentions even in this palaebotany-oriented review. Sixty-six insect species (38 identified at species level and 28 under open nomenclature) belonging to 13 orders are listed; Coleoptera, Odonata and Neuroptera are the most diversified, but three species of Heteroptera account for over 40% of the assemblage. Perhaps the most interesting are filter-feeding beetles belonging to the extinct adephagan family Coptoclavidae; this is the only record of such a feeding strategy among Coleoptera. Sixteen genera of osteichthyans are present, including freshwater pyconodontids (unknown otherwise) and coelacanths (confirming previous disputed records). Some fish species are known as complete ontogenetic series. The Las Hoyas site yielded the only known complete skeletons of albanerpetids, otherwise known mostly as isolated bones from microvertebrate sites. Albanerpetids (incorrectly termed Albanerpetontidae, but the genitive of *herpeton* is *herpetou*) are a problematic extinct family of scale-covered amphibians which cannot be classified within any modern order. There are also a few dinosaurs, pterosaurs, crocodiles, birds, and a single mammal. A detailed analysis of the palaeozoological content of the book was given by James Farlow [*Historical Biology* 31(2): 1–4, 2017].

The third part (five chapters) includes an account of actuopalaeontological experiments aimed at elucidating the role of microbial mats in conservation processes. Fish preservation was studied in most detail: the absence of necrokinesis or disarticulation strongly indicates that remains have undergone no transport and that the assemblage is autochthonous. A few examples of preservation of soft parts are provided.

The fourth part consists of two chapters, the first one being a methodological discussion. As a conclusion the Las Hoyas biota is interpreted as representing an Early Cretaceous wetland, and its trophic network is presented. This chapter includes pictorial reconstructions of the angiosperms *Montsechia* and *Iterophyllum*, the conifer *Frenelopsis*, and the ferns *Weichselia* and *Ruffordia*.

All in all, I think this book should find a place in the library of any palaeontological institution, alongside descriptions of other Lagerstätten (Hunsrück, Crato, Messel, etc.). The Spanish site records a crucial interval in the history of the Earth's biosphere, one might say the European counterpart of the approximatively coeval or slightly younger Yixian Formation of Liaoning Province in China. Even if the book shows a certain number of imperfections betraying hasty preparation, one should not forget that less than thirty years of study is not much compared to Hunsrück (first publications in the 1860s), Messel (1877) or Burgess (discovered in 1909). The work on the Las Hoyas site is still in progress. Good luck!

Adam T. Halamski
Institute of Paleobiology,
Polish Academy of Sciences
Warsaw, Poland
e-mail: ath@twarda.pan.pl