

See discussions, stats, and author profiles for this publication at: <https://www.researchgate.net/publication/279060448>

Iberian Ordovician and its International Correlation

Article in *Stratigraphy* · January 2015

CITATIONS

10

READS

192

11 authors, including:



Artur A. Sá

Universidade de Trás-os-Montes e Alto Douro

165 PUBLICATIONS 564 CITATIONS

[SEE PROFILE](#)



I. Rábano

Instituto Geológico y Minero de España

177 PUBLICATIONS 1,140 CITATIONS

[SEE PROFILE](#)



G.N. Sarmiento

Complutense University of Madrid

106 PUBLICATIONS 822 CITATIONS

[SEE PROFILE](#)



Diego C García-Bellido

University of Adelaide

98 PUBLICATIONS 1,461 CITATIONS

[SEE PROFILE](#)

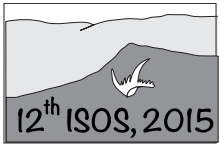
Some of the authors of this publication are also working on these related projects:



Furongian (upper Cambrian) Guole Konservat-Lagerstätte from South China [View project](#)



Los Dedos paleontological project [View project](#)



The Ordovician Exposed: Short Papers and Abstracts

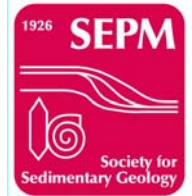
for the

12th International Symposium on the Ordovician System

June 3-17, 2015 at James Madison University

Harrisonburg, Virginia USA

Central Appalachian Mountains



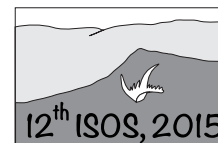
The Ordovician Exposed: Short Papers and Abstracts for the 12th International Symposium on the Ordovician System

June 3-17, 2015

James Madison University
Harrisonburg, Virginia USA
Central Appalachian Mountains

Organizing Committee:

Stephen A. Leslie, James Madison University (Chair)
Daniel Goldman, University of Dayton (Co-Chair)
Randall C. Orndorff, United States Geological Survey (Co-Chair)
John T. Haynes, James Madison University
Matthew R. Saltzman, The Ohio State University
John F. Taylor, Indiana University Pennsylvania
Achim Herrmann, Louisiana State University
Charles E. Mitchell, University of Buffalo
John E. Repetski, United States Geological Survey
Stig M. Bergström, The Ohio State University
Jesse Carlucci, Midwestern State University
Stephen R. Westrop, University of Oklahoma
Carlton Brett, University of Cincinnati



Suggested Reference Format:

[Authors], 2015. [Abstract title]. *Stratigraphy*, 12 (2): [page no.],

S.A. Leslie, D. Goldman, and R.C. Orndorff, eds.,
12th International Symposium on the Ordovician System,
Short papers and abstracts (online only)



locality in the Central Taurus (Turkey). Apart of the rare record of its nominal form, most of the associated graptolites may range from the previous biozone into the earliest Floian strata. The assemblage includes multiramous horizontal forms (*Clonograptus*, *Paradelograptus*) and two- to four-stiped rhabdosomes (*Kiaerograptus*, *Didymograptus* s.l., *Tetragraptus* s.l.). These two late Tremadocian (Tr3) graptolite zones bear not only planktic graptolites, but also remains of benthic dendroids of the genera *Dictyonema*, *Callograptus*, *Aspidograptus*, *Desmograptus* and *Ptilograptus*, most of them occurring as transported elements.

This research is a contribution to the projects CGL2012-39471 of the Spanish MINECO, RALI 197 of the French ANR, CAR/2014 (University of Cagliari, Italy) and IGCP 591 (IUGS-UNESCO).

Iberian Ordovician and its International Correlation

Juan Carlos Gutiérrez-Marco¹, Artur A. Sá², Isabel Rábano³, Graciela N. Sarmiento⁴, Diego C. García-Bellido⁵, Enrique Bernárdez⁶, Saturnino Lorenzo⁷, Enrique Villas⁸, Andrea Jiménez-Sánchez^{8,9}, Jorge Colmenar⁸, and Samuel Zamora¹⁰

¹*Instituto de Geociencias (CSIC, UCM), José Antonio Novais 12, 28040 Madrid, Spain, jcgrapto@ucm.es.*

²*Departamento de Geologia, Universidade de Trás-os-Montes e Alto Douro, PO Box 1013, 5001-801. Vila Real, Portugal; and Geosciences Center, University of Coimbra, 3000-272 Coimbra, Portugal.*

³*Museo Geominero, Instituto Geológico y Minero de España, Ríos Rosas 23, 28003 Madrid, Spain.*

⁴*Departamento de Paleontología, Facultad de Ciencias Geológicas, Universidad Complutense de Madrid, 28040 Madrid, Spain.*

⁵*The Environment Institute, Department of Biological Sciences, University of Adelaide, SA 5005, Australia.*

⁶*Departamento de Geología, Universidad de Atacama, Av. Copayapu 485, Copiapó (Atacama), República de Chile.*

⁷*Departamento de Ingeniería Geológica y Minera, Universidad de Castilla-La Mancha, Plaza Manuel Meca 1, 13400 Almadén (Ciudad Real), Spain.*

⁸*Departamento de Ciencias de la Tierra, Universidad de Zaragoza, Pedro Cerbuna 10, 50009 Zaragoza, Spain.*

⁹*Center of Biology, Geosciences and Environmental Education, University of West Bohemia, Klatovska 51, 306-19 Plzen, Czech Republic.*

¹⁰*Instituto Geológico y Minero de España, Manuel Lasala 44 -9ºB, 50006 Zaragoza, Spain.*

The regional chronostratigraphy of the British Ordovician, established mainly for shelly facies, is hard to correlate in the Iberian Peninsula, especially after the separation and drift of Avalonia from Gondwana by the early Middle Ordovician. The same applies to the Ordovician global scale, whose stratotypes involve deeper-water facies and faunas not recorded in the high-paleolatitudinal settings of southern peri-Gondwana. In order to solve the problem, an alternative regional scheme for the “Mediterranean” Ordovician was proposed in the 1970s. This comprises five regional stages plus the global Tremadocian and Hirnantian, which are largely based on the distribution of endemic shelly fossils combined with some graptolites and a good palynological record. This Ordovician scale presents precise correlation potential for southwestern and central Europe (Ibero-Armorica, Sardinia, Bohemia, Bulgaria) and the vast area from northern Africa to Saudi Arabia and part of the Middle East. Sporadic occurrences of graptolites and shelly faunas of Baltic or Avalonian affinities allow for indirect correlation with the global stages through their own regional scales. Despite the advantages of such a regional “Mediterranean” scale, the terms “Ordovician Odyssey” and “*Quo vadis* Ordovician?”, used as titles for the books that arose from the Ordovician symposia of 1985 (Las Vegas) and 1990 (Prague), are still applicable to the Iberian Ordovician chronostratigraphy. Some authors prefer to use the global scale directly, without valid references to precise correlation, whereas others use the old British scale without acknowledging the redefinition by British authors between 1972 and 2010.

In Iberia, as well as in other peri-Gondwanan areas lying in high paleolatitudes close to the Ordovician South Pole, the general scarcity of graptolites and conodonts in the Lower and Middle Ordovician, and the largely endemic nature of the shelly faunas, impose serious difficulties for correlating the successions in this region with the new global chronostratigraphy. This is illustrated by the fact that only two of the taxa used for the definition of the global stages and series have been recorded in paleogeographically southern

peri-Gondwana (*Levisograptus austrodentatus* in Turkey and *Metabolograptus extraordinarius* in Bohemia). The situation is similar with the taxa defining the base of the *stage slices*, were only Dw2's (*Didymograptus artus*) and Ka3's (*Amorphognathus ordovicicus*) diagnostic species are recognizable where appropriate litho- and biofacies are developed, and may be distant from their respective FADs. Single records of the graptolites *Tetragraptus azkharensis* (a form closely allied to *T. approximatus*, F11) and *Dicellograptus complanatus* (Ka4) are known from France, but come from Ordovician olistoliths within Carboniferous mélanges in Montagne Noire and south Armorican Massif.

The paleontological record from the Iberian Ordovician includes low diversity benthic assemblages of trilobites, ostracods, brachiopods, echinoderms, molluscs, etc., regarded as cold-water faunas, later shifting to more temperate types, and even relatively warm-water faunas due to the Boda event that preceded the Hirnantian glaciation. Faunal affinities suggest strong links within a single paleogeographical realm (equivalent to the “Mediterranean”, “*Selenopeltis*” or “Calymenacean-Dalmanitacean” provinces of previous authors). Within this common scenario, faunal differences are strongly conditioned by the development of different biofacies defined by the type of substrate, inshore-offshore gradients and even paleocurrents.

The Ibero-Bohemian Ordovician scheme allows regional correlations within the southern peri-Gondwanan areas and can be regarded of similar rank and suitability as other regional scales used in Australasia, Baltoscandia, Avalonia, North America or China. According to the current policy of the International Ordovician Subcommittee, a fundamental contribution to the development of a global chronostratigraphy will be the detailed cataloguing of as many as possible of these commonly distinctive regional Ordovician sections.

This work has been supported by the IBEROR project (ref. CGL2012-39471/BTE) of the Spanish Ministry of Economy and Competitiveness.

Late Ordovician, deep-water *Foliomena* brachiopod fauna from the island of Bornholm, Denmark

David A.T. Harper¹ and Arne T. Nielsen²

¹*Palaeoecosystems Group, Department of Earth Sciences, Lower Mountjoy, Durham University, Durham DH1 3LE, UK, david.harper@durham.ac.uk*

²*Natural History Museum of Denmark (Geological Museum), University of Copenhagen, Øster Voldgade 5-7, DK-1350 Copenhagen, Denmark.*

The deep-water brachiopod *Foliomena* fauna is one of the most widespread, Phanerozoic marine assemblages. Distributional data for the *Foliomena* and related biotas from over 30 localities, globally, through the early Sandbian to late Katian interval, are now available from deeper-water, marginal biofacies. The fauna was first described in detail from the Lindegård Mudstone in Scania, southernmost Sweden, in the early 1970s and this association of small, thin-shelled brachiopods has since then been recorded from the Avalonian, Gondwanan and Laurentian margins together with its most diverse and extensive development in South China. A hitherto unpublished assemblage collected in the 1800s from the upper Katian Lindegård Mudstone of Bornholm, Denmark, including *Christiania*, *Cyclospira*, *Dedzetina* and *Foliomena* itself together with species of *Glyptorthis*, *Leptestiina*, *Nubialba*, *Proboscisambon* and *Sowerbyella* confirms the persistence of this deep-water biofacies in southern Scandinavia and develops further the evolutionary and geographical patterns of the *Foliomena* fauna around the margins of Baltica, prior to its extinction at the end of the Katian. Deep-water facies persisted into the Hirnantian on Bornholm where the shelly fauna is characterised by sparse *Aegiromena*, indicative of the deepest-water associations of the terminal Ordovician *Hirnantia* fauna.

Milankovitch cycles in the Juniata Formation, Late Ordovician, central Appalachian basin, USA