

The Ordovician Exposed:



brought to you

provided

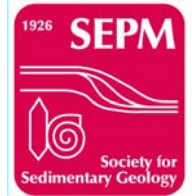


for the 12th International Symposium on the Ordovician System

June 3-17, 2015 at James Madison University

Harrisonburg, Virginia USA

Central Appalachian Mountains



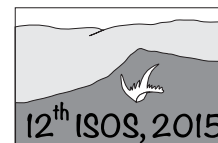
The Ordovician Exposed: Short Papers and Abstracts for the 12th International Symposium on the Ordovician System

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)



SADLER, P.M., KEMPLE, W.G. and KOOSER, M.A., 2003, Contents of the compact disk—CONOP9 programs for solving the stratigraphic correlation and seriation problems as constrained optimization. *In* P.J. Harries (ed.), *High resolution approaches in stratigraphic paleontology*. Dordrecht, Topics in Geobiology, v. 21, Kluwer Academic Publishers, 461–465.

SHEETS, H.D., MITCHELL, C.E., IZARD, Z.T., WILLIS, J.M., MELCHIN, M.J. and HOLMDEN, C. 2012: Horizon annealing: a collection-based approach to automated sequencing of the fossil record. *Lethaia*, v. 45, pp. 532–547.

A biostratigraphic reappraisal of Tremadocian graptolites from SW Europe and NW Africa

Juan Carlos Gutiérrez-Marco¹, Gian Luigi Pillola², Artur A. Sá³ and Emmanuel L.O. Martin⁴

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

² Dipartimento di Scienze Chimiche e Geologiche, Università di Cagliari, Via Trentino 51, 09127 Cagliari, Italy. pillolag@unica.it

³ 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. asa@utad.pt

⁴ UMR CNRS 5276 Laboratoire de Géologie de Lyon, Terre, Planètes, Environnement (LGLTPE), Géode - campus de la Doua, Université Lyon 1, 2 rue Dubois, 69622 Villeurbanne cedex, France. emmanuel.martin@univ-lyon1.fr

Tremadocian graptolites are rare fossils in the whole peri-Gondwanan Europe, northwestern Africa and the Near and Middle East. This is in part due to the absence of suitable marine facies, which are largely dominated by shallow-water siliciclastic sediments such as green shales and coarse sandstones, but also owing to the general lack of a distinctive sedimentary record. The Cambrian/Ordovician boundary involves, regionally, major erosive unconformities (excepted in SW Sardinia) and diachronic stratigraphic gaps, mainly associated to the denudation of rift shoulders during a multistage rifting through the Furongian and the Lower Ordovician epochs. This rifting was connected to the opening of the Rheic Ocean, which also generated thick volcano-sedimentary sequences and plutonism related to the long-lived Ollo de Sapo Magmatic Event, ranging in age between *ca.* 490 and 465 Ma, with a maximum at about 477 Ma and a youngest age of approximately 479 Ma for the massive metavolcanic sequences.

Early Tremadocian (Tr1) graptolites are represented in North Africa (Morocco, Algeria) and in scattered localities in Sardinia, southeastern France and northern Turkey. They compose a low-diversity assemblage of quadriradiate pendent *Rhabdinopora* (*R. flabelliformis* and its ecological subspecies *R. f. socialis*, *R. f. anglica* or *R. f. norvegica*, adapted to shallow and mid-shelf environments), without *Staurograptus* and with very few *Anisograptus?* (a triradiate genus). Representatives of the early biradiate development (*Adelograptus* or *Aorograptus* Zone) have been rarely recognized in the Algerian Sahara and in northern Mauritania, with the extremely rare occurrence of *Adelograptus* “*tenellus*” and remains of other branched species (*Paradelograptus?*, *Aorograptus?* spp.). Slightly above these beds, a single Saharan borehole yielded the enigmatic anisograptid *Choristograptus louai*, a graptolite recently recorded also in the Fezouata Formation of Morocco, probably from a horizon of middle Tremadocian (Tr 2) age. In the same unit the occurrence of *Bryograptus* has been cited from one locality, but is pending revision.

In contrast with the few graptolite records from early to middle Tremadocian beds, late Tremadocian green shales, with locally abundant graptolites, are widely distributed over the entire area, but with little lateral continuity. This is the case of the *Araneograptus murrayi* Zone that has been recognized in NW Africa (Mauritania, Morocco, Algeria), as well as in the Ossa Morena Zone of the Iberian Massif, SW Sardinia (Fluminense area), SE France (Montagne Noire), and Germany (Thuringia). Besides the large conical rhabdosomes of *A. murrayi*, that locally occur in massive monospecific concentrations (maybe reflecting mass mortality caused by toxic events?), the zonal assemblage yielded other anisograptids (*Kiaerograptus*, *Paratemnograptus*), sigmagraptids (*Paradelograptus*) and early dichograptines (*Clonograptus*, *Tetragraptus* s.l., *Didymograptus* s.l.). Finally, the latest Tremadocian *Hunnegraptus copiosus* graptolite Zone has been identified in SW Spain, the Moroccan Anti-Atlas and in a single

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).