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Foreword and acknowledgements

This abstract volume has been prepared for the 3rd annual meeting of the IUGS/UNESCO International Geoscience Programme Project 591 *The Early to Middle Palaeozoic Revolution*. The meeting was hosted by the Department of Geology, Lund University, in June 9–19 2013 and followed the successful annual meetings held in Madrid/Ludlow (2011) and Cincinnati (2012). The Lund conference was arranged jointly with the annual meetings of the Cambrian, Ordovician and Silurian subcommissions on stratigraphy, and included a post-conference excursion to key geological localities in Skåne, Västergötland and the Oslo Region. The conference was a focus for cutting-edge research in Lower and Middle Palaeozoic geology and palaeontology, and the presentations covered a wide range of topics from morphology and taxonomy of various fossil groups through advances in geochemistry and stratigraphy to biogeography, palaeoecology and palaeoclimatology. We would like to express our sincere gratitude to Anders Lindskog and Kristina Mehlqvist for their meticulous editing of the meeting proceedings. We are also grateful for valuable input from the organization and scientific committee associated with the meeting. We acknowledge financial support from the Swedish Research Council (grant D0013001 to MC), the Geological Survey of Sweden, the Geological Society of Sweden, the Department of Geology at Lund University, and the municipality of Lund.

Lund on 8 May 2013

Mikael Calner (meeting chair)

Oliver Lehnert (vice chair)

Per Ahlberg

A complete record of the ‘Lower’ Cambrian–Middle Ordovician succession of Öland, southern Sweden, based on the Tingskullen core

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The exposed Lower Palaeozoic succession on the island of Öland, southeastern Sweden, encompasses strata of ‘Middle’ Cambrian (provisional Cambrian Epoch 3) through Darriwilian age. These strata were deposited in the interior parts of the palaeocontinent Baltica, during a time when the continent experienced little tectonic influences and global sea level was exceptionally high. Later tectonic influences from the evolving but distant Caledonian foreland basins to the south and northwest were relatively minor to this area, and the thin sedimentary succession on Öland has never been buried to considerable depths (not below the oil window). In order to study the succession using new methods, such as carbon isotope geochemistry, the Tingskullen drillcore was recovered in the year 2010 (Crafoord grant 20050748 to MC). It was drilled c. 670 m northeast of the old church ruin at Källahamn in the northeastern part of the island. This area yields the youngest outcropping strata on Öland and thus is the only place where a complete succession can be retrieved in one single core. The total cored interval is 107 m and the diameter of the core is 39 mm.

The oldest strata in the core are ‘Lower’ Cambrian (provisional Cambrian Series 2) sandstone of which only the upper five metres were cored before the drilling was stopped. Petrographically, the sandstone is a quartz arenite with greenish mudstone intercalations. It represents the När Sandstone Member of the File Haidar Formation, which is sharply overlain by a 55-m -thick ‘Middle’ Cambrian (provisional Cambrian Series 3) succession of bioturbated, shaly mudstone with thin siltstone stringers belonging to the Borgholm Formation. The upper part of this succession is of particular interest since it represents a more basin marginal equivalent to the organic-rich alum shale that formed in dysoxic to anoxic environments in the central parts of the basin. A provisional subdivision of the formation into the Mossberga, Bårstad and Äleklinta members is possible. The Bårstad Member is richly fossiliferous and has yielded abundant trilobites indicative of the *Ptychagnostus praecurrens* agnostoid Zone (equivalent to the *Acadoparadoxides pinus* trilobite Zone; e.g., Ahlberg 1989). The trilobite fauna from this member is dominated by *Ellipsocephalus polytomus* and paradoxid trilobites of the *Acadoparadoxides oelandicus* plexus. Agnostoids are rare but represented by the zonal

index. The silt- and very fine-grained sandstone facies with wrinkle structures that are typical for the Äleklinta member at its type locality on western Öland (Calner & Eriksson 2012) is not present in the core, in which the corresponding interval is much more argillaceous. The Borgholm Formation grades upwards into a 0.5 m thick shale succession with ‘orsten’ lenses. This succession likely represents the Furongian part of the Alum Shale Formation. It is overlain by the Tremadocian ‘*Obolus* bed’, which has a thickness of 0.5 m and shows palaeokarstic features at the top. The palaeokarst surface is overlain by a 2-m-thick interval of a conspicuously dark shale belonging to the Djupvik Formation (Ceratomyge Shale; Fig. 1). The Djupvik Formation reflects the end of siliciclastic sedimentation and is overlain by a 46-m-thick Lower to Middle Ordovician succession of grey and red, temperate water limestone (the ‘orthoceratite limestone’). This succession can be subdivided into the Köpingsklint, Bruddesta, Horns Udde, and Gillberga formations, and equivalents to the Segerstad, Skärlov, Seby, Folkeslunda, Källa and Persnäs limestones. Where possible, we have followed the lithostratigraphic subdivision of the Öland succession provided by Stouge (2004). The lower portions of the Ordovician $\delta^{13}\text{C}$ composite curve for Sweden presented by Calner et al. (2013, this volume) are based on the Tingskullen core.

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References

- Ahlberg, P., 1989: Cambrian stratigraphy of the När 1 deep well, Gotland. *Geologiska Föreningens i Stockholm Förhandlingar* 111, 137–148.
- Calner, M. & Eriksson, M.E. 2012: Microbially induced sedimentary structures (MISS) from the Paleozoic of Sweden. In N. Noffke & H. Chafetz (eds.): Microbial mats in siliciclastic depositional systems through time. *Society of Economic Paleontologists and Mineralogists Special Publication* 101, 29–35.
- Calner, M., Lehnert, O. & Joachimski, M.M., 2013: A $\delta^{13}\text{C}$ composite standard for the Ordovician of Sweden based on the Tingskullen (Öland) and Borenshult (Östergötland) cores. *This volume*.
- Stouge, S., 2004: Ordovician siliciclastics and carbonates of Öland, Sweden. In A. Munnecke, T. Servais & C. Schulbert (eds.): International Symposium on Early Palaeozoic Palaeogeography and Palaeoclimate (IGCP 503), September 1–3, 2004, Erlangen, Germany. *Erlanger Geologische Abhandlungen, Sonderband* 5, 91–111.



Fig. 1. Conspicuously dark shale of the Djupvik Formation fills palaeokarst grikes in the late Tremadocian 'Obolus bed' (leftmost column) and is sharply overlain by grey to slightly reddish 'orthoceratite limestone'. These transitions mark major changes in sea-level and in the type of sedimentation in the early Ordovician of Sweden. Tingskullen core, Öland. Stratigraphic up is from left to right.