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Early–Middle Pleistocene Transitions: The Land–Ocean Evidence

EDITED BY

M.J. HEAD

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P.L. GIBBARD

University of Cambridge, UK

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Contents

Preface vii

HEAD, M.J. & GIBBARD, P.L. Early–Middle Pleistocene transition: an overview and recommendation for the defining boundary 1

MASLIN, M.A. & RIDGWELL, A.J. Mid-Pleistocene revolution and the 'eccentricity myth' 19

SCHEFUß, E., JANSEN, J.H.F. & SINNINGHE DAMSTÉ, J.S. Tropical environmental changes at the mid-Pleistocene transition: insights from lipid biomarkers 35

JAHN, B., SCHNEIDER, R.R., MÜLLER, P.-J., DONNER, B. & RÖHL, U. Response of tropical African and East Atlantic climates to orbital forcing over the last 1.7 Ma 65

HAYWARD, B.W., GRENFELL, H.R., SABAA, A.T. & SIKES, E. Deep-sea benthic foraminiferal record of the mid-Pleistocene transition in the SW Pacific 85

REALE, V. & MONECHI, S. Distribution of the calcareous nannofossil *Reticulofenestra asanoi* within the Early–Middle Pleistocene transition in the Mediterranean Sea and Atlantic Ocean: correlation with magneto- and oxygen isotope stratigraphy 117

FERRETTI, P., SHACKLETON, N.J., RIO, D. & HALL, M.A. Early–Middle Pleistocene deep circulation in the western subtropical Atlantic: southern hemisphere modulation of the North Atlantic Ocean 131

SUC, J.-P. & POPESCU, S.-M. Pollen records and climatic cycles in the North Mediterranean region since 2.7 Ma 147

CAPRARO, L., ASIOLI, A., BACKMAN, J., BERTOLDI, R., CHANNELL, J.E.T., MASSARI, F. & RIO, D. Climatic patterns revealed by pollen and oxygen isotope records across the Matuyama–Brunhes Boundary in the central Mediterranean (southern Italy) 159

BYRAMI, M.L., NEWNHAM, R.M., ALLOWAY, B.V., PILLANS, B., OGDEN, J., WESTGATE, J. & MILDENHALL, D.C. A late Early Pleistocene tephrochronological and pollen record from Auckland, New Zealand 183

DODONOV, A.E. The stratigraphic transition and suggested boundary between the Early and Middle Pleistocene in the loess record of northern Eurasia 209

VAN KOLFSCHOTEN, T. & MARKOVA, A.K. Response of the European mammalian fauna to the mid-Pleistocene transition 221

O'REGAN, H.J., BISHOP, L.C., LAMB, A., ELTON, S. & TURNER, A. Large mammal turnover in Africa and the Levant between 1.0 and 0.5 Ma 231

PALOMBO, M.R., RAIA, P. & GIOVINAZZO, C. Early–Middle Pleistocene structural changes in mammalian communities from the Italian peninsula 251

PALOMBO, M.R. & VALLI, A.M.F. Highlighting the Early–Middle Pleistocene transition in Italian and French large-mammal faunas: similarities and faunal renewals 263

CUENCA-BESCÓS, G., ROFES, J. & GARCIA-PIMIENTA, J. Environmental change across the Early–Middle Pleistocene transition: small mammalian evidence from the Trinchera Dolina cave, Atapuerca, Spain 277

MCNABB, J. Hominins and the Early–Middle Pleistocene transition: evolution, culture and climate in Africa and Europe 287

PETRAGLIA, M.D. Hominin responses to Pleistocene environmental change in Arabia and South Asia 305

Index 321

Cover illustration:
The Montalbano Jonico composite section in southern Italy is a candidate global stratotype section for the Early–Middle Pleistocene Subseries boundary (Ciaranfi *et al.* 2001; Ciaranfi & D'Alessandro 2005). The photograph shows the northern portion of the Montalbano Jonico badlands, in whose central area a volcaniclastic layer (V5, marked by a white line) is clearly exposed. The Apennine Chain and the valley of the Agri River are visible in the background. The steep slopes at Montalbano Jonico expose hemipelagic deposits of the southernmost part of the Lucania Foredeep. The composite section comprises several stratigraphic sections that reveal continuous deposition from the late Early Pleistocene to early Middle Pleistocene. The deposits form a poorly stratified sequence of silty clays and muddy sands, studied in detail for a thickness of more than 500 m. Observations on the physical and biotic features of the sediments indicate several deepening–shallowing cycles within a generally regressive framework. A lower stratigraphic interval, *c.* 180 m thick, consists of massive bioturbated muds and includes the volcaniclastic layer V5 and several muddy turbidites. Macrofossil assemblages recovered suggest deposition in an upper continental slope setting. The upper stratigraphic interval, more than 300 m thick, consists mainly of silty muds that give way to silty sands at the top. This interval was deposited mainly in inner to outer shelf environments. The Montalbano Jonico composite section is constrained by nannofossil biostratigraphy, sapropel and oxygen isotope stratigraphy. Two alternative potential levels for the Early–Middle Pleistocene Subseries boundary have been considered for this section. The lower is located about 25 m above the volcaniclastic layer V5, close to the 'small *Gephyrocapsa*' – *Pseudoemiliania lacunosa* zonal boundary. This boundary is almost coincident with Marine Isotope Stage (MIS) 25 and sapropel no. 19. The higher potential horizon is located close to MIS 19, which falls near the Matuyama–Brunhes palaeomagnetic Chron boundary.

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Photograph kindly supplied by J.-P. Suc. Caption supplied by N. Ciaranfi.

Preface

This book arose from a one-day international conference on the 'Early–Middle Pleistocene transitions: the land–ocean evidence' held in the Department of Geography, University of Cambridge on 4 April 2003. The scientific programme comprised nine invited talks and six posters. The meeting was sponsored by the Godwin Institute for Quaternary Research (University of Cambridge), International Union for Quaternary Research (INQUA) Commission on Stratigraphy and INQUA Subcommission for European Quaternary Stratigraphy, the Quaternary Research Association, and the International Commission on Stratigraphy's (ICS) Subcommission on Quaternary Stratigraphy. It was organized by M. J. Head and P. L. Gibbard. The approximately 50 participants from England, France, Germany, Italy, Norway, Russia and the Netherlands made this an international event.

The main purpose of the meeting was to assess the biotic response to climatic and physical changes that characterized the Early–Middle Pleistocene transition (*c.* 1.2–0.6 Ma) in both marine and terrestrial realms, and thereby explore the very origins of our present biota. The meeting would also provide the ICS Subcommission on Quaternary Stratigraphy with background information useful for its task in formally recommending the position of the Early–Middle Pleistocene Subseries boundary for ratification by 2008. This book contains most of the presentations at the conference, together with several additional contributions solicited to provide a balanced coverage. A total of 18 chapters are presented, covering such diverse fields as Milankovitch theory, palaeoceanography using isotopes and microfossils, marine organic geochemistry, tephrochronology, the record of loess and soil deposition, terrestrial vegetational change, and the migration and evolution of hominins as well as other large and small mammals. The geographical scope has been global. We hope this Special Publication has achieved the goals of the conference and, moreover, furthered enquiries about the nature and mechanisms of Quaternary climate change. We also hope it will inform judgement on the future placement of the Early–Middle Pleistocene Subseries boundary.

The sponsoring organization, the Godwin Institute for Quaternary Research (GIQR), was established by the University of Cambridge in 1995 to replace the former Subdepartment of Quaternary Research, which was itself founded in 1948 to study world events throughout and since the Ice Age. Under its first Director, Sir Harry Godwin, the Subdepartment became nationally and internationally famous. The GIQR today continues to provide a focus for Quaternary studies in Cambridge, these being undertaken across the departments of Archaeology, Earth Sciences, Geography, Plant Sciences and Zoology that collectively attest to the multidisciplinary nature of Quaternary research.

The production of this volume would not have been possible without the patience and cooperation of the authors, and commitment of the chapter reviewers. The Department of Geography of the University of Cambridge kindly absorbed the postage costs. At the Geological Society, we are especially grateful to John Gregory and Angharad Hills for encouragement and sound advice, and to Sarah Gibbs for much assistance during the final stages of production. On a final, personal level, M.J.H. is indebted as ever to his family, Sarah, Jamie and Caroline, for their enduring support and tolerance. P.G. thanks Ann as ever.

The transition from Early to Middle Pleistocene marks a fundamental change in Earth's climate system, and represents one of the major episodes in Earth history. We hope this volume will not only stimulate further research into this important interval, but also encourage reflection upon the future of climate change and associated biotic adaptations.

Martin J. Head
Philip L. Gibbard
Cambridge, UK
May 2005