BOOK REVIEW

RECENT NEW ZEALAND DEEP-WATER BENTHIC FORAMINIFERA: TAXONOMY, ECOLOGIC DISTRIBUTION, BIOGEOGRAPHY, AND USE IN PALEOENVIRONMENTAL ASSESSMENT, by Bruce W. Hayward, Hugh R. Grenfell, Ashwaq T. Sabaa, Helen L. Neil, and Martin A. Buzas, 2010. GNS Science Monographs 26 (New Zealand Geological Survey Paleontological Bulletin 77), ISBN 978-0-478-19777-8, 363 p. NZ$40 plus postage. (www.gns.cri.nz/Home/Products/Publications-for-Sale-Monographs).

Bruce Hayward's group at Geomarine Research (Auckland, NZ) complements their earlier monograph on the shallow-water (<50 m) foraminiferal fauna of New Zealand (Hayward and others, 1999) with this new tome devoted to its deeper (50–5000 m) counterpart. This long-term project was undertaken to document the ecologic and biogeographic distribution of foraminifera around New Zealand, primarily to provide the kind of data on the modern fauna that can be extrapolated to the past with better reliability and precision for regional benthic foraminiferal paleoenvironmental assessments. Co-authoring this book is the biostatistics guru of foraminiferology, Marty Buzas of the Smithsonian Institution, Washington, DC. Analytic metrics are presented throughout the text, which includes 44 tables and 191 color figures.

In this comprehensive work, the authors combine new data with those reanalyzed from five previous studies by Hayward and others. Of the 563 benthic species listed, they diagnose 345 of the most common and distinctive species and describe two new species. Those 347 species are illustrated on 32 well-composed plates of scanning electron micrographs and multifocus images, and one plate that appropriately comprises drawings to illustrate the lenticulinid species that would otherwise be difficult to distinguish. At that point, this would have been sufficient as a useful taxonomic monograph but, as the title indicates, it goes well beyond that. The 123 pages preceding the taxonomy section cover other aspects of the study, including previous work, oceanographic setting, materials and methods, findings, and conclusions. Their findings elaborate on species distribution, diversity, frequency, duration, and biogeography, and their subsequent conclusions summarize their utility in assessing specific paleoenvironmental parameters.

Hayward and others strategically employ a variety of numerical and statistical data in their study, beginning with census counts (59,000 specimens) of 424 species in 264 samples used to plot the faunal distribution. Using several similarity coefficients, they effectively apply Q- and R-mode cluster analyses to these data to distinguish nine associations and their 13 subassociations, and eight groups mostly corresponding to bathymetry. They also use canonical correspondence analysis to relate faunal associations to environmental parameters, confirming that shelfal associations link to factors that vary latitudinally, while deeper associations link to those that are depth-related. Statistical analyses also show that species diversity (α, H) and faunal eveness (E) decrease southward. Using SHEBI (see Buzas and Hayek, 1998), they identify 16 mappable communities around New Zealand.

The taxonomy section is systematically arranged and includes the typical information for each species, such as its plate-figure numbers, synonymy, distinguishing features, and taxonomic remarks, as well as its geographic, bathymetric, and biostratigraphic ranges in the New Zealand region based on this study, 32 composite shallow-water localities, and 130 composite stratigraphic sections. Also, the world geographic distribution of each species is also noted. The New Zealand distributions of 102 of the more common species are conveniently displayed by latitude-depth charts that have plotted circles proportionally sized to their relative abundance.

Although this compendium is focused on the New Zealand region, its utility extends well beyond the Australasian realm. Many of the species are widespread (69% of their deep-water species are cosmopolitan), which makes this a useful reference for species identifications that are based on modern systematics and taxonomy. The methods incorporated into this study can also be applied elsewhere, as they are independent of geography and oceanography. In addition, the geographic and bathymetric data can be integrated into research on the evolution and dispersal of Neogene species (249 of their species have fossil records), and may be used to reveal or confirm paleoceanographic conditions and pathways. Finally, for a foraminiferal research project of this magnitude, this book is a template for what constitutes excellence in content, format, and overall presentation.

Considering the vast number of color figures, it is most fortunate (and appreciated) that the authors were able to get this publication subsidized so it can be offered at an attractive price. This should entice those interested in Late Tertiary, Quaternary, or Recent benthic foraminifera to obtain a copy.

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