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Preface

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The Continuous Plankton Recorder (CPR) survey was instigated by Sir Alister Hardy in 1931 and has since evolved into a unique marine monitoring programme that provides marine scientists with their only measure of plankton communities on an oceanic scale. Towed by numerous ships-of-opportunity since the beginning of the 1930s, the recorder itself, once in operation, continuously collects plankton as vessels ply their normal trading operations. Using unchanged and consistent methodology, CPRs have been towed by these vessels, from many different nations, for nearly 5 million nautical miles, resulting in the collection of nearly 500 000 plankton samples from the world's oceans of which close to 200 000 have been analysed. In the early years following its inception, the survey focused on understanding the importance of plankton to the marine food-web, and in particular supplying synoptic information about the distribution of the plankton to assist fishermen in finding herring in the North Sea. Over the ensuing decades, with the growth of the survey into many regions of the North Atlantic, the utility of the CPR data set transcended its original concept with the ability to examine spatial variability of the plankton on a scale never imagined before. With this in mind, it was decided to publish this spatial information in an atlas form. The first CPR Atlas, authored by the Edinburgh Oceanographic Laboratory, was published in 1973 by the Institute for Marine Environmental Research. This Atlas used approximately 40 000 samples collected between 1958 and 1968. After 30 yr and using more rigorous statistical analysis that takes into account diel vertical migrations and seasonal variability (Beaugrand 2004, this volume), the original monograph has been updated to incorporate the 110 000 new samples that have been analysed since the early 1970s. This greatly improves the robustness of the distribution maps since the previous Atlas, includes the results from a period of significant climate change and provides the most geographically detailed maps of common plankton taxa in any ocean.

While fishery questions still drive scientific research at the survey (Beaugrand et al. 2003), many new questions and policy issues have emerged since the last Atlas was published, following the realisation that the marine environment has become progressively perturbed by human impacts. It is fortunate then that plankton are particularly useful ecological indicators, and planktonic variations in space and time, on the scale of the CPR survey, help us to distinguish between natural variability and anthropogenic changes. At the forefront of these new environmental concerns are biodiversity and the changing function of marine ecosystems in response to climatic warming. With this in mind, it is hoped that the CPR Atlases can act as critical baselines in the coming decades, since measuring these responses through shifting biogeographical patterns is an important component in documenting these changes. Comparing the 2 Atlases, it is already apparent that a number of sub-tropical species are shifting northwards in their distributions in the North Atlantic; conversely some boreal species are retreating from more southerly localities.

One of the legacies of Sir Alister Hardy's initial vision, following 70 yr of subsequent work, is the culmination of a unique data set containing information on the diversity of marine plankton (approximately 450 plankton species/taxa). From this resource 240 common planktonic taxa are represented in the following biogeographical charts. It is hoped that this information will not only provide a tool for new international biodiversity initiatives such as 'Census of Marine Life' and defining ecological regions but also provide a useful taxonomic aid for various other plankton surveys in the North Atlantic. Since the last CPR Atlas was published, the introduction and geographical spread of non-indigenous plankton has become increasingly topical, as the appearance of such species can have important ecological and economic implications. A species distribution map not published in the previous Atlas is that of the marine diatom *Coscinodiscus wailesii.* This species is a relatively recent addition to the planktonic flora of the North Atlantic, originating from the North Pacific Ocean; it was first found in the Western Approaches of the English Channel in 1977. Since

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then, the species has subsequently spread into many European Shelf seas and other neritic areas of the North Atlantic (Edwards et al. 2001). Its current distribution in the North Atlantic is shown in Fig. 12. Monitoring distributions and the rate of spread of non-indigenous species is essential in establishing the effectiveness of any management strategy to limit invasions.

Throughout its 70 yr history, the survey has had many ups and downs, including financial deprivations and a near closure of the survey in 1989. Now, in 2004, the survey is in a more stable situation with a thriving scientific base at the Sir Alister Hardy Foundation for Ocean Science in Plymouth, England and a number of 'sister' surveys in various seas and oceans around the world. The CPR survey's evolution over the last 7 decades illustrates how the survey has adapted to changing policies and how it continues to provide an essential utility for marine management. The CPR survey has now become an important implement in our understanding of how pelagic ecosystems respond to global change. These achievements, however, would not have been possible without the voluntary and whole-hearted cooperation of the many shipping companies and the Masters and crews of the towing vessels. After 7 decades of operation there have also been over 90 plankton analysts who have contributed to the CPR database to make the CPR survey the longest, and geographically the most extensive, marine biological survey in the world. A debt of gratitude is due to all those who have been involved with the CPR survey since 1931, some of whom are named in the acknowledgements. We would also like to thank the editors at MEPS who, by publishing the new CPR Atlas, have allowed this new Atlas to become much more widely available to the marine scientific community.

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