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Marine Biodiversity: the Exploration and Understanding of
the Blue Planet
by
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There are over 230,000 marine plant and animal species and a few thousand marine microbes described worldwide. Many more await discovery. Their role in structuring marine ecosystems and driving biogeochemical cycles is only partially known. Besides, there are very different views on the respective roles of macro- and microbiota. Traditional theoretical ecology and fisheries biology tend to ignore bacteria and archaea altogether whereas in biogeochemistry and global change science the importance of higher organisms in driving the fluxes of elements is considered marginal at best. This has resulted in two (or more) very different world views, one where the earth is dominated by microbes, including viruses, and the other, more anthropocentric one, where species of interest (or visible) to humans are central. Top-down and bottom-up regulation of food webs are both valid approaches to understand ecosystem structure but they need conceptual reconciliation.

The recent discoveries in the microbial world have shown that our view of the oceans is still limited and even paradigms still shift easily. Examples of new genes and organisms abound and new biogeochemical processes are the recently discovered nitrification by Archaea, the Annamox reaction, and photosynthesis using rhodopsin-like pigments. But also our view of marine food webs and the role of higher organisms is still changing, for instance the importance of chemical messengers and chemical defences in the marine environment is only now becoming realized. These substances are potentially of great importance to mankind. Developments in technology are crucial for further exploration and molecular tools have already revolutionized knowledge on microbial and genetic diversity. New methods in using markers and tracers as well as new developments in modelling allow unravelling food webs in totally new ways.

The increasing human pressure on marine top predators in coastal areas and in the open ocean may have dramatic consequences on the functioning of benthic coastal systems and pelagic ecosystems worldwide. To this must be added the possible effects of climate change such as changing SST, circulation patterns, and ocean acidification. Despite over one century of systematic research on the marine environment, we still are lacking much basic knowledge on genetics, physiology, ecology, and behaviour that will allow for predictions on how populations will adapt to these changes. Again new technology will be crucial. Tagging and tracking of larger animals has allowed much better understanding of migration and feeding behaviour. And last but not least: exploration and discovery will continue to yield new information and new observation and information technology and data management technology are greatly improving our analytical capacity to understand and predict biodiversity and its change and therefore our capacity to protect and sustainably exploit the marine environment.

Biography

Carlo Heip (born 18 November 1945, Belgian nationality) is a marine biologist, presently director of the Centre for Estuarine and Marine Ecology of the Netherlands Institute of Ecology, director of the Royal Netherlands Institute for Sea Research (as of October 1, 2006) and professor at the universities of Gent (Belgium) and Groningen (The Netherlands). His current research is on the link between benthic biology, biodiversity, and biogeochemical cycles. He has over 100 papers in peer-reviewed journals and has edited six books. He was responsible for many EU-sponsored projects, including OMEX (Ocean Margin Exchange) and ECOFLAT, part of ELOISE (European Land-Ocean Interaction Studies). In recent years, as President of the European Marine Research Stations MARS network, he has been active in creating a marine biodiversity research programme for Europe. He is now co-ordinator of the EU Network of Excellence MARBEF (Marine Biodiversity and Ecosystem Functioning) and member of the steering and advisory committees of many European institutes and projects, and internationally in the DIVERSITAS programme and the Census of Marine Life.

