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9

Zooplankton Identification Manual for North European Seas (ZIMNES)

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9.1 Background

The ecological importance of marine zooplankton cannot be overestimated. Throughout the world's oceans, plankton species abundance and diversity impact, determine and drive global cycles, food-web structure and ecosystem stability (Banse, 1995; Sommer, 1996; Lindley et al., 2003). Plankton communities mediate transfer of organic matter from the productive photic zone to deep waters, and biogeochemical processes that drive the carbon cycle (Russell-Hunter, 1970). Plankton species form the foundation for productivity and the harvest of the seas and monitoring data on these species are important to inform marine management (Brander et al., 2003; Reid et al., 2003; Stevens et al., 2006). We know that anthropogenic influences, together with climatic factors and changes affect their diversity, distribution and dynamics in marine ecosystems (Molinero et al., 2005, 2008).

Marine research projects, surveys and monitoring programmes often require routine taxonomic identification of marine zooplankton (Bottger-Schnack et al., 2004). This work requires taxonomic skills and knowledge that are nowadays very scarce. Critical reference texts, keys and other relevant information are sometimes

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difficult to find. Many of the species monographs and papers required are out of print and access to these is often restricted to a few libraries. Since revisions of taxonomic groups and general taxonomic changes may be published at any time, it is important for up-to-date information to be accessed. There is a general requirement, therefore, not only to consolidate and preserve expertise, but also to provide accessible, up-to-date information on zooplankton taxonomy (Harris et al., 2000). There is a specific need for an accessible and authoritative taxonomic guide to marine zooplankton, suitable for use by scientists and students working with marine zooplankton samples, in government laboratories, university research departments and other marine institutes in the UK and Northern Europe.

An electronic system for the identification of zooplankton could offer a range of distinct benefits to marine ecologists. These include greater accessibility, clarity and flexibility (for revision and updating), as well as providing a platform for the sharing of information and expertise. However, a web-based zooplankton guide would, by necessity, be generalised in nature. As such, it should be considered to support, rather than replace traditional paper-based formats, particularly in highly specialised taxonomic studies.

Here we describe a National Environment Research Council (NERC)-funded Knowledge Exchange project that aimed to prepare an illustrated, electronic media-based manual containing taxonomic descriptions and illustrated explanations of the diagnostic features necessary to identify zooplankton species, along with life-cycle stage descriptions for key species, plus brief notes and key references on ecology, abundance and distribution. The aim was to make the manual clear and user-friendly for both specialists and non-specialists, whilst also being suitable for training purposes.

9.2 ZIMNES website

The marine area covered is the northeast Atlantic, from surface waters to 200 m depth. A list of c. 250 key zooplankton species was selected for inclusion. Criteria for inclusion include occurrence in the study area, abundance, ecological importance and availability of specimens and data. Material from plankton specimen collections held at participating institutes was used to prepare diagrams and photographs along with text on morphology, distribution, abundance and general ecology. The main sources of information utilised were published literature, personal materials, bench manuals and additional materials (photographs/drawings).

As draft species accounts were collated and compiled, the material was adjusted to fit standardised presentation formats. This should ultimately be available as both online pages and PDF files, ready for web-based publication and easily translated into hard copy.

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The ZIMNES website was developed with open-source tools and offers a model which could be made available for people interested in developing hierarchical information websites (code-structure and database, not actual content).

The website system is database driven (MySQL) to allow for continued updates and new content to be added, and the front-end design is developed through a template system that separates the code (php) from the visual design (HTML and CSS). The central information is a list of taxonomic 'entities' (ranging from phyla to species), which are interlinked in a flexible table structure. Currently no rules on linkage are enforced as the primary use of the moment is for applied sample analysis, but users familiar with the php language can easily add such a feature.

All additional information is connected to this entity list, and allows the addition of information such as literature, images and text at any taxonomic rank using the same editing tools. This modular structure should allow other users of the platform to develop their own tools or modules to link directly into a species list.

The website structure is built to be utilised without having to register users or logging in to access information. Editors and administrators can edit pages directly through a permission-based editing system directly when navigating the site. Registered users who are not editors or administrators cannot edit any content directly on the site.

At present, the ZIMNES website[1] has 1013 interlinked entities (372 species, 267 genera), and descriptive text for c. 200 entities is available. A set of c. 400 images has been uploaded. Some work has been undertaken on debugging and optimising usage of the system. Additional features listed include a glossary, news system, help pages and web links.

It is planned to establish linkage between texts and glossary, improve the tree-structure for navigation and create a user discussion forum. Other ideas that may be developed in future include the possibilities of providing video demonstrations, a user 'virtual microscope', physiological/ecological rates and measures of important species and more defined geographical ranges.

The ZIMNES project is currently unfunded and the authors welcome suggestions for, and collaboration in, future developments.

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[1] http://www.zimnes.org

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