

BOOK REVIEW

ANTARCTIC MARINE PROTISTS, edited by Fiona J. Scott & Harvey J. Marchant. Published by Australian Biological Resources Study (ABRS), Canberra & Australian Antarctic Division, Hobart, 563 pp. ISBN: 0 642 56835 9 (hardcover) Price AU\$ 95.00 (price includes surface postage for overseas orders, and GST and postage within Australia). Order from ABRS, GPO Box 787, Canberra, A.C.T. 2601, Australia.

The best discoveries happen by chance. A flyer of a book entitled ANTARCTIC MARINE PROTISTS arrived in my “pigeon-hole” right in the middle of my fruitless quest for records of marine scale-bearing protists from the Southern Hemisphere. I ordered the book without delay, and when it landed in my hands it was just what I had been hoping for - a compilation of more than 560 Antarctic marine protists, more than 1300 pictures (light, and electron micrographs, and drawings), description of little-known protistan groups, and plentiful records. My next aim was, indisputably, the bibliography. And *voilà*...there they were: the much-longed-for “Southern Hemisphere” references, and many more on related subjects! ANTARCTIC MARINE PROTISTS is a very useful book. It is beautifully presented, with inviting deep-blue hard covers featuring dimly-lit underwater images of pelagic ‘armoured’ protists (diatoms, parmales, coccolithophores, dinoflagellates). The book has 15 chapters, 12 contributing authors and it has been edited by Fiona Scott and Harvey Marchant. The chapters are (1) introduction, (2) diatoms, (3) dinoflagellates, (4) silicoflagellates, (5) haptophytes (Order Prymnesiales), (6) haptophytes (Order Coccolithophorales), (7) chrysophytes, (8) prasinophytes, (9) chlorophytes, (10) cryptophytes, (11) euglenoids, (12) cyanophytes, (13) choanoflagellates, (14) ciliates, and (15) Protista *incertae sedis*. A glossary of terms, an extensive bibliography, copyright permission, and a well-organised Index complete the opus. The initiative of presenting one single list of references at the end of the book is very welcome and it makes the search for bibliographic references effortless.

Chapter 1 is the Introduction. It gives a useful overview of the biological zones in the Polar Front of the Southern Ocean, a brief description of the biology and diversity of Antarctic marine protists (cell size range, shape, presence of silica and other mineralised walls and scales, feeding strategies, etc), an historical account (although too brief - see below) of the origins of protistological research in Antarctica, and the importance of Antarctic marine protists. The section “Sample collection and processing” offers details of the different methods and techniques followed to study the diverse protist groups treated in the book. However, the section is perhaps a little misleading for the organisms shown in the book are not the outcome of a planned research programme whose results are published in the form of a single volume (“For the purpose of this volume, organisms were collected in a variety of ways from the different depths of the water column...”), but a compilation of essentially previously-published work - a task that should not be underestimated but which in my view should have been made clearer in the introduction. The chapter finishes with a list of the systematic arrangement of the 560 taxa covered by the book.

Chapter 2 is the longest - a 188-page chronicle of Antarctic diatoms. As with the majority of the remaining taxa dealt with in the book each species description includes basionym and synonyms, additional references, distribution, and in most cases a brief comparison with similar species (including Tables in some instances). This chapter is illustrated with 575 light and electron (SEM) micrographs, and 19 drawings. Chapter 3 is a 47-page detailed account of the Antarctic dinoflagellates that includes almost one hundred (mostly SEM) micrographs of these protists.

A total of 22 species (mostly of the genus *Protosperidinium*) recorded in Antarctic marine environments are not treated in the chapter, and, unfortunately, no explanation is given for their exclusion. However, to compensate such an omission, the full list and further reading is provided. The silicoflagellates form Chapter 4. These protists are well recorded in the fossil record and (as explained in the chapter) their 'skeletons' have been used as tools to study Tertiary Antarctic climates. The three extant recognised species *Dictyocha fibula*, *D. octonaria*, and *D. speculum*, are all present in Antarctic waters and are described and illustrated in the chapter.

Chapters 5 and 6 deal with the haptophyte orders Prymnesiales and Coccolithophorales (heterococcolithophores and holococcolithophores), respectively. These protists are small, they have the cell covered with scales (siliceous, organic or in the case of coccolithophores, calcite), and bear two flagella and a haptonema. Two genera of the order prymnesiales are treated in chapter 5, *Phaeocystis* (one species) and *Chrysochromulina* (21 species and morphotypes). Although the chapter claims that *Chrysochromulina* species are rarely reported from Antarctic waters it describes and illustrates 21 (8 species and 13 "types")! Bearing in mind that there are currently only 55 named *Chrysochromulina* species but probably in excess of 100 including undescribed and open-nomenclature species, a total of 21 do not seem to suggest they are species poor. Coccoliths from coccolithophores are very well known in paleoceanography and paleoclimatic research. Six of the thirteen families recognised within the Order Coccolithophorales are present in the polar region of the Southern Ocean, with eleven genera and 20 species positively identified in the region, most of which are described and illustrated (using high-quality TEM and SEM micrographs) in this book.

Chapter 7, on the chrysophytes, includes the little-known parmales - all profusely illustrated. With the exception of the latter, only two genera of chrysophytes are covered in this chapter, i.e. *Paraphysomonas* and *Meringosphaera*. At this point, a (probably unintentional) incomplete list of geographical records of some of the species needs to be brought to attention, for *Paraphysomonas antarctica* has also been reported from the Baltic, Danish Wadden Sea, and tropical waters [see Vørs N. (1992) Heterotrophic amoebae, flagellates and heliozoa from the Tvärminne area, Gulf of Finland, in 1988-1990. *Ophelia* **36**: 1-109].

The Prasinophytes are described in Chapter 8. These protists are solitary or colonial forms that have the cell and the flagella covered with organic scales - characters that are impressively illustrated in the EM figures of the chapter. Chapter 9 is one page long and it deals with only one chlorophyte species, *Polytoma papillata*. The author does not specify whether this is the only species of chlorophyte ever found in Antarctic sea water. The next Chapter is devoted to the autotrophic cryptophytes. As in the previous chapter, it is brief and deals with one known species (*Geminigera cryophila*) and with another species that, although not given a binomial name, is probably a new genus, the main characters of which are superbly illustrated in the SEM pictures.

Euglenoids (excluding kinetoplastids, which are treated as *incertae sedis* protists in the last chapter of the book, Chapter 15) and cyanophytes make up Chapters 11 and 12, respectively. There are not many records of marine euglenoids in Antarctica, and only three known species and a *Eutreptiella* sp. are described and illustrated in the chapter. The cyanophytes in Chapter 12 are represented by *Synechococcus* sp. Chapter 13 focuses on the choanoflagellates, with 32 marine species described and illustrated (SEM and/or TEM micrographs, many of which are the author's originals).

The ciliate chapter (Chapter 14) is a compilation of the author's observations in addition to other records of ciliates from Antarctic marine habitats, both pelagic and non-pelagic. The general introduction to the biology, morphology, and ecology of ciliates is very good and informative. The chapter describes and illustrates an impressive 161 species. However, perhaps a little criticism can be tolerated insofar as there is a distinct lack of micrographs of live forms and silver-impregnated specimens. In contrast, the number of drawings (many of them the author's originals) exceed 350.

The last chapter of the book is dedicated to Protista *incertae sedis*. Some protists included in this section currently enjoy a better taxonomic status than the one given by the title of the chapter but the authors chose to deal with them as of uncertain status as the aim of the book is to present a compilation of Antarctic protists rather than judge the validity of taxonomic schemes or recent results of molecular tools applied to such organisms. Protists included in this section are (in order of appearance) naked and testate amoeba spp., foraminifera, heliozoa, kinetoplastids, bisocoecids and other heterokonts, and heterotrophic flagellates. Amongst all these groups the heliozoa and the heterotrophic flagellates are the ones given most attention. As the book deals mainly (although not

exclusively) with pelagic protists, only one foraminiferan is described, i.e. *Neogloboquadrina pachyderma*, apparently the only foraminiferal morphospecies recorded so far in Antarctic plankton. As the book is on Antarctic marine protists this section should undoubtedly have included some account of “other” foraminifera. There is a big literature on Antarctic benthic foraminifera going back to the 1840’s with Ehrenberg’s (1844) examination of samples returned from the *Terror* and *Erebus* expeditions of James Clarke Ross (both expeditions are alluded to by the authors in Chapter 1) and further subsequent expeditions and geological research as well as the introduction of box and multiple coring have greatly expanded knowledge of Antarctic benthic foraminifera [see Cornelius N. and Gooday A. J. (2004) “Live” (stained) deep-sea benthic foraminifera in the western Weddell Sea: trends in abundance, diversity and taxonomic composition in relation to water depth. *Deep-Sea Research II* **51**: 1571-1602]. In my view, a brief reference to the rich diversity of Antarctic benthic forams with a few key bibliographic citations should have been incorporated in this chapter.

But minor shortcomings do not cast a shadow on the book. ANTARCTIC MARINE PROTISTS is a “must have” - well presented, packed with very useful information, species descriptions, bibliographic references and breath-taking micrographs. These are Antarctic protists as you have probably not seen before.

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