Marcin Pliński
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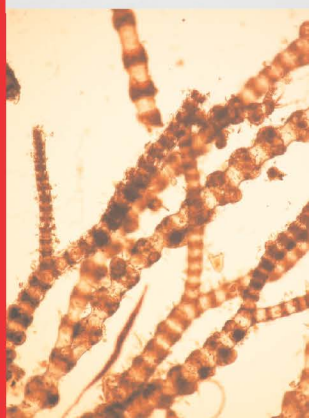
Brown and red algae from the Southern Baltic Sea

A key to the identification of the species



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Introduction

This book covers algae from two very specific and phylogenetically distant divisions, namely brown algae (Phaeophyceae) and red algae (Rhodophyta) occurring in the southern Baltic Sea, especially in the area of the Gulf of Gdańsk. The species belonging to these divisions are characteristic of the marine environment and there they show a large morphological diversity, ranging from simple forms, whose thallus is composed of a small number of spherical cells, through crusted, single-row and multi-row filamentous, lamellar forms, to ribbon-like, leathery, sometimes highly branched, reaching large sizes. Brown algae are yellowish-brown to dark brown in colour and show a great variety of shapes and sizes. Among them there are species with microscopic thallus, as well as those that reach enormous sizes, their length can reach 100 or even 300 m. Red algae thallus are characterized by great richness of shapes and colours of various shades of red.

The flora of the brown and red algae of the Southern Baltic Sea, and in particular of the Gulf of Gdańsk, is specific due to its species poverty compared to the flora of other seas, and to the thallus pauperization. This is obviously the effect of the low salinity of the Baltic water. According to the data of Lakowitz (1929), as salinity decreases, the number of species of brown algae and red algae is clearly noticeable. It is possible that the low diversity of these algae on the Polish coast is also influenced by the nature of the bottom, which in this region of the Baltic Sea is almost entirely sandy and therefore mobile, which hinders the deposition of algae. Certainly not without significance is the increase in pollution of coastal waters recorded for several decades. The small number of species of brown and red algae recorded from the Polish coast may also result from the poor recognition of this flora. In the flora of the red algae and brown algae of the Gulf of Gdańsk, species with various degrees of extinction risk have been recorded (Siemińska et al. 2006). The red alga *Bangia fuscopurpurea* is one of the slightly endangered species. Red algae species threatened with extinction are: *Hildenbrandia rivularis*, *Ceramium virgatum (= C. rubrum)*, *C. circinatum*, *C. tenuicorne*, *C. tenuissimum*, *C. strictum*, *C. diaphanum* and *Vertebrata fucoides (= Polysiphonia nigrescens* and *P. violacea)*, *Carradoriella elongata (= Polysiphonia elongata)* and *Rhodomela confervoides*, and *Furcellaria fastigiata* is considered. Of the brown algae, *Fucus vesiculosus* is vulnerable to extinction. All species that

fall into the category of endangered species are under the species protection legislation in Poland.

This book lists the species of brown- and red-algae recorded in the waters of the southern Baltic, the gulf of Gdańsk and Puck Bay (Lakowitz 1907, 1929; Heitzmanówna 1923; Marchewianka 1925; Bursa 1935, 1937, 1938; Bursa et al. 1939; Kornaś et al. 1960; Biernacka 1967, 1968, 1970; Starmach 1977; Pliński 1982; Pliński & Giebułtowska-Mindak 1976; Pliński & Florczyk 1990; Pliński & Jóźwiak 2004; Pliński et al. 1992, 1996; Modzelewski & Pliński 1992; Pankow 1971; Ringer 1985; Kruk-Dowgiałło 1998; Kruk-Dowgiałło & Opioła 2001; Andrulewicz et al. 2004). Species occurring in the other parts of Baltic (Nielsen et al. 1995), especially those of the north-east regions, have been considered as a potentially for the algal flora in the southern Baltic.

The editorial scheme used in this book is typical for this type of publication and consists of several parts. The first part – the introduction – presents the thematic scope of the content of the book, and also included a glossary of professional terms used throughout the book. The detailed part is written in the form of identification keys for individual taxonomic units, starting from the most general ones, i.e. classes, through orders, families, genera and finally species. All essential diagnostic features are included in the keys relevant to a given taxonomic level, while the identification key for species provides data on size measurements for given species. These data are presented in two blocks and refer to the individual two groups of algae, to the brown and red algae respectively. Each block begins with an introduction on the characteristics of a given group of algae with a description of views on the taxonomic system of this group and the taxonomic system for the genera included in this book is presented below. The most important part of this handbook is the tables with drawings and images of species. The work is provided with original photographs of selected taxa from samples collected in the Gulf of Gdańsk and adjacent regions of the Baltic Sea.

Glossary of terms used in the handbook

Apex – the top or anterior end.

Apical growth – growth occurring at the apex of an axis or branch.

Aplanospore – a nonmotile spore formed from all or part of the protoplast of a vegetative cell and having a wall distinctly different from that of the parent cell.

Ascocyst – an elongated cylindrical or pear-shaped form found between the hairline filaments in some brown algae.

Asexual – reproduction not involving sexual fusion or meiosis, generally via monospores, propagules or fragmentation.

Auxiliary cells – cells that nourish the carposporophyte; the thallus cells with which the sporogenic filaments join before the formation of carpospore.

Axial – pertaining to the axis or central core of a branch.

Bifurcate – divided into two parts or branches.

Bispore – a two-celled spore.

Carpogonial filaments (carpogonial branch) –special filaments or branch of few or several cells in red algae; the terminal cell of which serves as the female sex organ – the carpogonium.

Carpogonium – the female sex organ (gametangium) with an elongated sperm-receiving organ (trichogyne).

Carpospore – a spore formed at the top of sporogenic filaments in gonimoblasts.

Carposporangium – sporangium in which diploid carpospores are formed.

Carposporophyte – sporophyte, i.e. the diploid generation on which carposoprangium is formed.

Cortical – pertaining to filaments or cells that make up the cortex.

Cortication – the outer layer of cells in the axial, multicellular thallus.

Cystokarp – a fruit-like structure that develop after fertilization with gonimoblasts and carpospors.

Dichotomous – divided or branched into two parts; branched.

Discoid – disc-shaped.

Eye-spot – a small pigmented photosensitive body in certain flagellated algal cells.

Flagellum, flagella – a fine long threadlike structure, projecting from a cell, used for locomotion.

Fusiform – spindle-shaped.

Gamete – a sex cell.

Gelatinous – having a jellylike or mucilage-like texture or appearance.

Gametophyte – a plant that produces sexual organs (gametes).

Gonimoblast – a cluster of sporogenic filaments growing from a fertilized carpogonium in red algae, forming carposporangium; when the parent axis grows faster than the side shoots – monopodial gonimoblast, when the side shoots grow faster than the parent axis – sympodial gonimoblast.

Intercalary – between or inserted between cells.

Internode – a section of a filament lying between two nodes; a node is a place on the thallus from which branches grow.

Isogamy – sexual union of two flagellated or non flagellated gametes of equal size.

Mucilage – a thick, watery substance.

Oogamy – sexual union of a small motile male gamete (sperm) with a large nonmotile female gamete.

Oogonium – a cell whose contents divide up into egg cells, which may remain within the oogonium or be released.

Ovate, ovoid – oval; egg-shaped.

Paraphysis (pl. paraphyses) – a nonreproductive filament that occurs among sporangia and gametangia.

Parenchyma (adj. parenchymatous) – a thallus composed of a cushion-like mass of cells all about the same size and shape.

Parenchymal sheath – a compact layer of filaments surrounding the gonimoblasts.

Pinnate – with laterals, ramuli or segments arranged along opposite sides of an axis or branch.

Pit plug (pit connection) – plug located in the openings of the walls of adjacent cells in red algae.

Plasmodesmata (s. plasmodesma) – protoplasmic connections between adjacent cells.

Procarp (= procarpium) – the carpogonial branch and its associated auxiliary and sporogenous filaments.

Procarpial cells – cells from which developed filaments that surround the gonimoblasts.

Pseudoparenchyma (adj. pseudoparenchymatous) – a form of thallus composed of interwoven, continuous filaments.

Rhizoid – an accessory, attaching or absorptive structure, single- or few-celled; narrow medullary filaments produced from cells of component axes.

Serrate – marginally toothed, with the teeth pointing forwards.

Sheath – a covering, envelope, or tube that is composed of mucilage.

Spermatangium (pl. spermatangia) – a male reproductive structure that produces spermatia in red algae.

Spermatium (pl. spermatia) – immobile male gamete in red algae.

Sporogenous threads (sporogenous filaments) – threads growing from a fertilized carpogonium forming a gonimoblast.

Stalk – a supporting structure, generally mucilage, affixed to a substrate.

Tetraspore – a haploid spore formed in a tetrasporangium on a diploid sporophyte in red algae.

Tetrasporophyte – a diploid generation that creates tetrasporas in the alternation of generations in red algae.

Thallus (pl. thalli) – the algal's body which is not differentiated into tissues, without separated leaves, stem and root; in more diversified forms it has an axial structure, i.e. branches depart from the main axis; if there is one axis then it is a uniaxial thallus, and if there are several axes then it is a multi-axis thallus.

Trichogyne – the slender, hair-like extension from the carpogonium to which spermatia become attached and which conveys the male nucleus to the carpogonium.

Uniaxial filament – a filament-like thallus composed of one row of cells, in contrast to filamentous thallus composed of many rows of cells (multiaxial filament).

Unilocular sporangium – with one chamber, the contents of which divide, usually meiotically.

Zoospore – a flagellated, asexually formed spore.

Zygote – a cell resulting from the union of two gametes or gametic nuclei.

This handbook will be a very useful tool for people interested in marine macroalgae (Rhodophyta and Phaeophyceae), especially for those from the Southern Baltic and the Gulf of Gdańsk. Baltic Sea with its low salinity and its dominant sandy bottom hosts very interesting communities and species whose identification will be eased with the keys, drawings and pictures. The glossary will also help to understand the botanic terms needed for the accurate description and identification of the species and the references will help to complete contextualization. The environmental characteristics of this peculiar sea explain the low diversity of the algae communities in this area and the pauperization observed in thalli. The experience in algae research of the authors eases the approach to the phycological knowledge of these communities. This work fills the gap of these kind of books which are essential for approaching amateurs, beginners and researchers to regional floras of algae contributing to people implication in citizen science and environmental monitoring which may be important for instance for control of invasive or endangered species.

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