Chapter 8 Phylum Bryozoa (= Ectoprocta = Polyzoa)

Bryozoa, or moss-animals, is a small group of tiny organisms that live interconnected in a colony. The colony consists of fine branching tubes and is plant-like in form. Most bryozoans are sessile and immobile. They grow on all types of hard substrates or on sediments in standing water, streams and rivers. There are about 5,000 living species, and most are marine. The freshwater forms include about 50 species (Dudgeon, 1999) and most are members of the class Phylactolaemata.

General structure and function

An individual bryozoan is called a zooid. One zooid consists of the **polypide** (or organ system) and the **cystid** (or body wall or house). A polypide is composed of the **lophophore**, stomach, gonad, nerve ganglia and musculature. The mouth opens into a U-shaped gut, the anus is located outside the lophophore. The epidermis secretes the **zooecium**, or non-living part of the body wall. The epidermis and zooecium produce the cystid. Polypides have three main structures: lophophore, retractor muscles and **funiculus** (Fig. 1b). The lophophore is a crown of ciliated tentacles arranged around a central mouth, and it functions by capturing suspended food particles. It can be withdrawn into the cystid for protection and protruded through the opening of the cystid (the orifice) for gas exchange and feeding. The funiculus is a thin strand of tissue where **statoblasts** are formed and spermatogenesis takes place. Colonies have two types of zooecia: a mass of cuticular branching tubes or a mass of gelatinous zooids. Tubular zooids are fixed and form an encrusting colony spread out over rocks and other substrates. The gelatinous zooecia usually have zooids embedded in the jelly and the colony is not fixed to the substrate.

Bryozoans are filter feeders. Food particles mostly are small microorganisms, including protozoans, diatoms and unicellular algae. Food particles are trapped by lophophore, and then swallowed through a pharynx to the stomach. Digestion occurs within the stomach and it involves both extracellular and intracellular phases. They have no excretory organs. Waste products are collected by coelomic amoebocytes, consolidated, infused with mucus in the intestine, and then ejected as a fecal pellet through the anus.

Respiratory and circulatory systems are absent. Gas exchange occurs through the body surface. There is a ganglionic mass and a nerve ring around the pharynx, but no sensory organs.

Phylactolaemate bryozoans can reproduce both sexually and asexually. Asexual reproduction is by budding, fragmentation or statoblast formation. Statoblasts are an encapsulated resistance bud that may be seen within the zooecium. In general, mature statoblasts consist of two regions: the central and peripheral regions. The central region is a thick capsule containing a mass of undifferentiated germinative cells. The peripheral region (called the annulus or float) is a relatively thin area containing air cells. Sometimes the peripherial region bears spiny, barbed, or hooked processes. There are three major types of statoblasts:

annulate floatoblasts (Fig. 1c) which are free or can floating after the zooecium disintegrates; sessile sessoblasts (Fig. 1d) which are cemented or fixed to the zooecium wall; and the piptoblasts (Fig. 2b), which sink to the bottom when the zooecium disintegrates. The statoblast remains dormant for some time and germinates and forms a new zooid when conditions are favorable. Statoblasts are important in species identification. In sexual reproduction, sperms develop in conspicuous masses on the funiculus of certain zooids. They are released through the lophophore. Eggs develop as a cluster on the peritoneum ventrally within the zooid. They usually have cross-fertilization in the coelom. Zygotes develop into ciliated larvae that are free-swimming before settling onto the substrate to become a sessile adult.

Bryozoans can encrust pipes or grow into pipes and clog water intakes. Many marine bryozoans produce a remarkable variety of chemical compounds, and some are being tested for use as medicines.

Classification

There are 3 Classes: Phylactolaemata, Gymnolaemata and Stenolaemata. Stenolaemata and most Gymnolaemata are marine, while Phylactolaemata is exclusively freshwater. *Plumatella* is a common genus in tropical countries.

The following key to families of freshwater Bryozoa is modified from Pennak (1989) and Wood (2001).

Key to Families of Freshwater Phylactolaemata Bryozoan

1 Lophophore circular or elliptical; zooecium a tubular colony (Fig. 2a), no floatoblasts; piptoblasts are free and lack an annulus (Fig. 2b)..... Fredericellidae

1′ Lophophore U-shaped (Fig. 1b); zooecium branching and tubular, or gelatinous; floatoblasts and/or sessoblasts 2

2 Zooecium of branching tubes (Fig. 1b); floatoblasts present (Fig. 1c); sessoblasts usually present (Fig. 1d) ..... Plumatellidae

2′ Zooecium a gelatinous mass; free statoblasts..... Lophopodidae

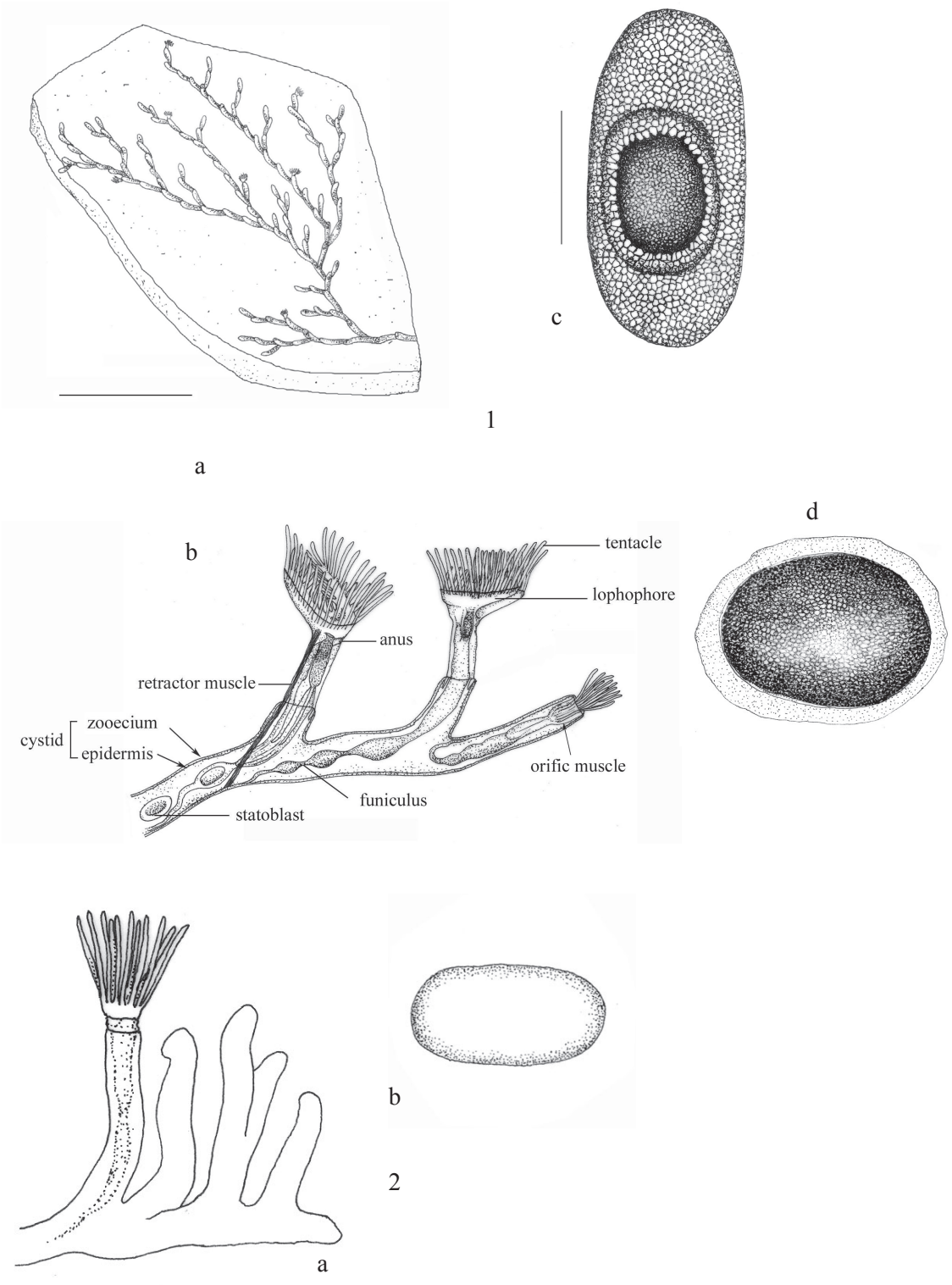

Fig. 1-2 1. Colony (a), enlarged part of colony (b), floatoblast (c) and sessoblast (d) of *Plumatella* sp. (1d redrawn from Pennak, 1989, fig. 1A); 2. Part of colony (a) and piptoblast (b) of Fredericellidae (modified from Pennak, 1989, fig. 10, 18B). Scale: (1a) 2 mm; (1c) 50 μm.