



# Porifera

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Sponges are by far the simplest multicellular animals and are very different from all the others. They have no fixed body shape, no plane of symmetry and are covered in holes. All sponges live in water, nearly all in the sea. The cells are uncoordinated, cell differentiation is entirely reversible and cells may wander about in the background jelly. A whole sponge can be regenerated from a few separated cells. Sponges can almost be regarded not as individuals but as colonies of separate cells; almost but not quite, as most have a skeleton made of spicules that supports the body. These very simple animals are nonetheless very successful and widespread: since the early Cambrian they have covered most of the suitable surfaces on the shore and in the shallow sea: the latest survey found 15 000 living species. How is it that such simple animals can do so well? What has there been for natural selection to work on in this phylum? How fundamentally do they differ from other animals and what are their evolutionary and ecological relationships with them To address these questions, we must study the basic structure and the different kinds of sponges, and indicate the ways in which they make a living. Sponges are sessile and immobile, having neither nerves nor muscles. There may be slight contractility round the larger pores but it is very restricted. Sponge cell types are the distinctive collar cells or ‘choanocytes’ . the ‘pinacocytes’ that make an outer layer and the ‘amoebocytes’ wandering through the central jelly or ‘mesohyl’. This jelly is needed for support; in contrast to other animals, neighbouring cells are not



bound together by a basement membrane Sponges have remarkable powers of regeneration: they can be strained through a fine mesh yet the cells will come together, aggregate and divide to reconstitute the sponge. Cells from different species will not aggregate. In the sponge body asexual reproduction by budding occurs readily: it is hard to distinguish from growth. Some freshwater sponges bud off parts of the body to form 'gemmules', stages resistant to adverse environments that regenerate when conditions are favourable. In sexual reproduction, gametes are formed in the mesohyl by dedifferentiation of other cells. Most sponges are hermaphrodites, but cross-fertilised. When sperm of the same species enters through an ostium, it is engulfed by a choanocyte which loses its flagellum and moves through the jelly until it finds an egg, a procedure very different from that of other Metazoa. Sessile adult animals always need free-swimming larvae for dispersal. Sponges have simple flagellated larvae, usually developing in the parent body and then freed to swim and settle in suitable sites. Some species achieve further dispersal by asexual fragmentation followed by release of larvae from the dispersed fragments. Once the larva has settled the cells move and become rearranged in a process which corresponds to the gastrulation (see Glossary) of other Metazoa and is controlled by similar genes. The larva now has differentiated cells patterned along an axis this pattern becomes less clear at metamorphosis. In some sponges the outer flagellated cells are lost at gastrulation, but in the Calcaria they dedifferentiate into multipotent cells. The cells, whatever their derivation, then move, divide and differentiate.