11.3 CLASSIFICATION

Sponges are the most primitive multicellular, heterotrophic, pore-bearing animals. Adult sponges are always attached (sessile) and motionless. Except for about 150 freshwater species, about 5000 described species of sponges are marine animals. They abound in all seas, whereever rocks, shells, submerged timbers, or corals provide a suitable substratum. Some species even live on soft sand or mud bottoms. Most sponges prefer relatively shallow water, but some groups, including most glass sponges, live in deep water.

On the basis of different types of spicules, sponges are classified into four classes (**Berquist**, 1978): Calcarea, Hexactinellida, Desmospongiae and Sclerospongiae. Many workers consider this classification plan as artificial one; in consequence, according to **Meglitsch** and **Schram** (1991), phylum Porifera includes two subphyla: 1. **Cellularia** (cellular organization; epidermis with pinacocytes; mesoglea of collagenous matrix, amoeboid cells and skeletal elements, various choanocyte, distinct and nucleated; myocytes present). 2. **Symplasma** (symplastic or syncytial organization; epidermis lacking pinacocytes, mesoglea as thin mesolamella, collar elements enucleate connected in reticular networks to nuclear choanoblasts, has secondary reticulum about choanoderm). Subphylum Cellularia includes 3 classes: Calcarea, Demospongie and Sclerospongiale. Subphylum Symplasma includes single class Hexactinellida.

Class I. Calcarea or Calcispongiae

1. Calcareous sponges.
2. Small sized sponges, less than 15 cm in height.
3. Skeleton composed of discrete calcareous spicules of calcium carbonate. Spongin fibre absent.
4. Spicules are **monaxon** or **tetraxon**. Tetraxon spicules lose one ray to become triradiate.
5. Spicules are differentiated into microscleres and megascleres.
6. Body organization is **asconoid, syconoid** and **leuconoid** type (Fig. 11.1).
7. Body is vase-like cylindrical with bristly outer surface.
8. Choanocytes are distinct, large and nucleated. They line the spongocoel in primitive forms and restricted to flagellated chambers in others.
9. They are solitary or colonial, marine occurring in shallow waters in all oceans.

Class II. Hexactinellida or Hyalospongiae

1. They are commonly called **glass sponges.**
2. Their skeleton is composed of six-rayed (hexactine), siliceous spicules or triaxon spicules. In some hexactinellids the spicules are fused to form a lattice-like skeleton.
3. Epidermis lacks pinacocytes.
4. Mesoglea exists as thin mesolamella having collagen and spongin.
5. Spongocoel is well developed and opens to exterior by a single **osculum**. Osculum is sometimes covered by a **sieve plate**–a grate-like covering formed from spicules.
6. Glass sponges have unique structural plan. They have symplastic or **syncytial organization**. Thus, all surfaces exposed to water are covered not by pinacoderm but by a framework of syncytial strands (called **trabecular syncytium**) through which long spicules may project. Another syncytium (called **choanocyncytium**), containing flagella with collars, lines the flagellated chambers. These collar bodies lose their nuclei after being formed (Fig. 11.2).
7. Glass sponges are well-formed, vase-to-funnel-shaped individuals, attached to the substrate by a tuft of root spicules.

8. They are found in deep tropical seas (between depths of 200 to 1000 m).
9. Glass sponge may grow upto one metre.
10. Recent histological insight in glass sponges has been gained by work on *Rhabdocalyptus dawsoni* which lives in shallower waters (**Mackie, G.O.**, and **C.L. Singla**, 1983).

Class III. Demospongiae

1. This large-sized class includes about 90 per cent of sponge species.
2. Generally marine, a few freshwater forms. Marine forms range in distribution from shallow water to great depth. Body shape is irregular.
3. Colouration is brilliant because of pigment granules located in the amoebocytes.
4. Skeleton may consist of siliceous spicules or spongin fibres or a combination of both. The genus, *Oscarella* is unique in lacking both spongin and spicule.
5. Siliceous skeleton of Demospongiae differ from the Hexactinellida in that their larger spicules are monaxon or tetraxon, never triaxons (hexactines).
6. Generally with small, micro-scleres, **tissue spicules** and large, megascleres, **skeletal spicules**.
7. Body organization is **leuconoid** type.

Class IV. Sclerospongiae

1. Demospongiae-like ancient sponges, called **coralline sponges**.
2. Skeleton composed of siliceous and aragonitic (calcite) spicules, and spongin fibres.
3. Leuconoid sponges.
4. Found in caves, tunnels, crevices and deep waters overhanging on coral reefs.

Examples. Hard sponges.

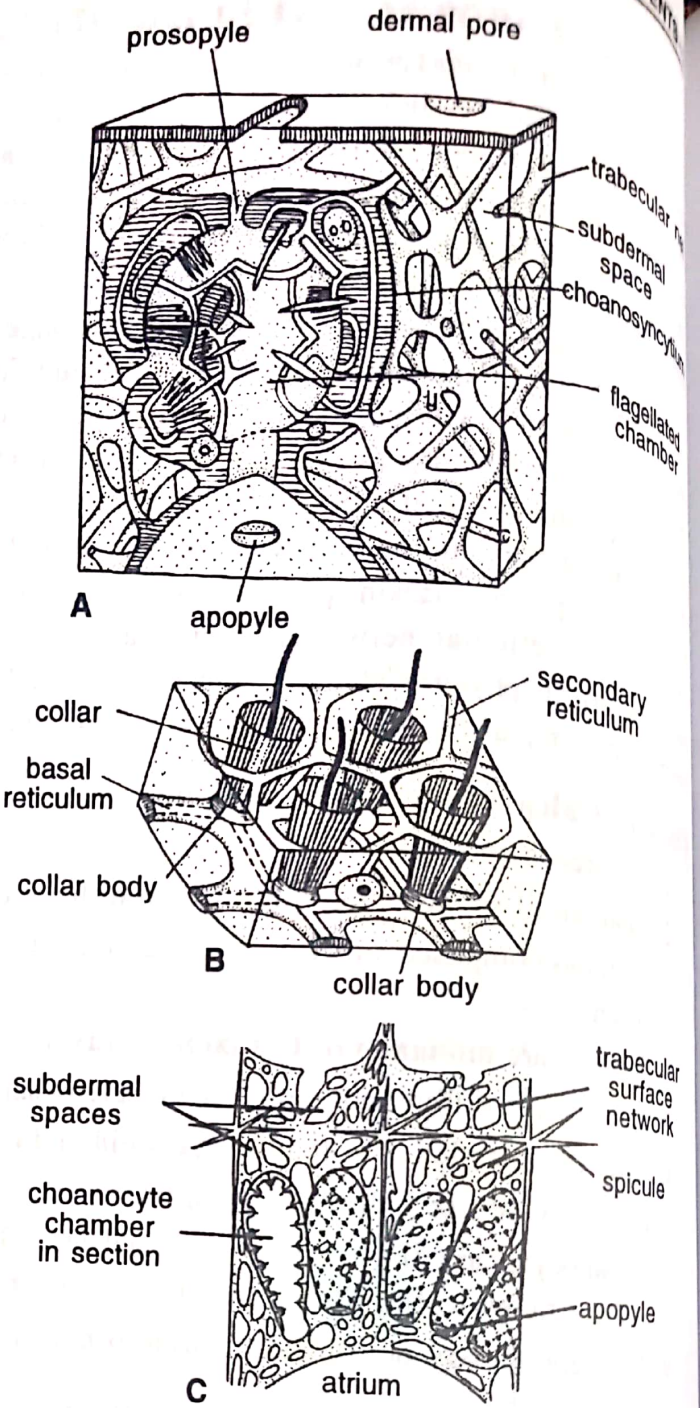

Fig. 11.2. Internal structure of glass sponge. A—Body plan of idealized hexactinellid. Water enters dermal pore, flows around trabecular net, goes through prosopyl in flagellated chambers, exits through apopyle into excurrent lacunae. B—Details of wall of flagellated chamber having secondary reticulum (internal part of trabecular system) around collars. C—Choanocyte chambers within the body wall of the *Euplectella*.

Box 11.4

Bruscа and Bruscа (2003) have suggested following classification of sponges:

Phylum Porifera

1. Class Calcarea

(*i*) Subclass Calcinea, *e.g., Clathrina, Dendya, Soleniscus.*

(*ii*) Subclass Calcaronea, *e.g., Grantia, Leucilla, Leucosolenia, Scypha (Sycon).*

2. Class Hexactinellida

(*i*) Subclass Amphidiscophora, *e.g., Hyalonema, Monorhphis, Pheronema.*

(*ii*) Subclass Hexasterophora, *e.g., Euplectella, Hexactinella, Rosella, Sympagella*

3. Class Demospongiae

(*i*) Subclass Homoscleromorpha, *e.g., Corticium, Oscarella, Plakia.*

(*ii*) Tetractinomorpha, *e.g., Chondrilla, Cliona, Tethya, Tetilla, Merila*

(*iii*) Ceractinomorpha, *e.g., Clathria, Spongia, Spongilla, Tedania.*

The subclass ceractinomorpha now contain some sponges previously assigned to the class sclerospongiae.

Class I. Calcarea or Calcispongiae

It is divided into following **two** orders:

Order 1. Homocoela

1. Sponges with radially symmetrical cylindrical bodies.
2. Body wall is thin and not folded. The spongocoel is lined with choanocytes.
3. Ascon type canal system.

Examples. *Leucosolenia*, *Clathrina*.

Order 2. Heterocoela

1. Sponges with vase-shaped body.
2. Body wall thick and folded.
3. Choanocytes are restricted to flagellated chambers or radial canals.
4. Spongocoel is lined by pinacocytes (pinacoderm).

Examples. *Scypha* (*Sycon*), *Grantia*, *Leucilla*.

Class II. Hexactinellida or Hyalospongiae

It is divided into following **two** orders:

Order 1. Hexasterophora

1. Spicules are six-rayed and star-shaped (hexasters).
2. Amphidiscs are absent.

Examples. *Euplectella* (Venus's flower basket).

Order 2. Amphidiscophora

1. Spicules in the form of "anchor-like" amphidiscs.
2. Hexasters absent.

Examples. *Hyalonema* (glassrope sponge), *Pheronema* (bowl sponge).

Class III. Demospongiae

This large-sized class is divided into following **three** subclasses: