

Canal system in sponges

The sponges are definitely animals with definite organ systems. Their body is perforated by a large no. of pores leading into channels through which a current of water flows and ultimately passes out through one or more openings called oscula.
 All these pores and channels constitute 'canal system', a feature characterises of sponges.

This system is analogous to the circulatory system of higher animals in the sense that water current brings in oxygen and food and takes out waste products.

Three types of canal systems are recognized in sponges: -

- (1) Asconoid (2) Syconoid (3) Leuconoid.

1. Asconoid type

- (1) Simplest type a form is known as ascon of coelom (e.g. - Leucosolenia) having a vase-like body enclosing a central spongocoel opening on the top by a single osculum.
 - (2) Body wall is composed of 3 layers: -
 - (a) an outer dermal epithelium of a single layer of flat pinnaecytes.
 - (b) an intermediate mesenchyme of gelatinous nature with spicules and amoebocytes, and
 - (c) an inner layer of choanocytes, lining the spongocoel.
 - (3) Body wall is perforated by numerous inhaled-pores called ostia, leading directly into spongocoel.
- Course of circulation Exterior - Ostia - spongocoel - Exterior

2. Syconoid type

- (1) Derived from asconoid type by folding of the body wall resulting in the formation of outwardly blind outpocketings, radial canals, lined by choanocytes and alternating with inwardly blind incurrent canals lined by dermal epithelium.
 - (2) Opening between incurrent- and radial canals are called prosopyle, and those between radial canals and spongocoel - apopyle.
- Water route Exterior, dermal pores (ostia) - incurrent canal - prosopyle - radial canals - apopyle - Spongocoel - osculum. Exterior.

types of features

- (A) alternate incurrent and radial canals.
 - (B) Limitation of choanoflagellates to radial canal.
- Syconoid type occurs in two forms

- (1) Simple Syconoid - (1) External surface made of blind outer side of radial canal.
- (2) dermal ostia opens directly into incurrent-canal
Ex - Sycon.
- (2) Complex Syconoid - epidermis and mesenchyme spread over outer surface in the form of a cortex
ostia leads into branching and anastomosing incurrent canals. Ex - Grantiaopsis

3. Leuconoid type

- (1) Can be derived from further folding of radial canal and subsequent-formation of small flagellated chambers lined by choanoflagellates.
 - (2) Mesenchyme fills the space around chambers, spongy and obliterated.
 - (3) Ostia leads into sub-dermal space into branching incurrent-canal opening into flagellated chambers by prosopyle.
 - (4) Flagellated chamber opens into incurrent-canal through apopyle.
 - (5) Excurrent passages unite to form larger and stiffer layers tube, the layer of which opens through osculum.
- Thus leuconoid system has 3 parts - incurrent system, flagellated chambers and ex-current systems.

Leuconoid type occurs in three forms: -

- (1) Bumpytous - flagellated chamber opens directly into excurrent channel through wide apopyle; receive water through prosopyles from excurrent-system.
- (2) Aphodal - apopyles elongate to form a tubular apophodus, intervening between flagellated chamber and excurrent-canal.
- (3) Diplodal - Apopyle forms apophodus; prosopyle elongate to form prosodus intervening between incurrent canal and flagellated chamber.

Special features :-

- (a) Limitations of choanocytes to small chambers.
- (b) Great development of mesenchyme
- (c) Complexity of excurrent and incurrent passages.

Water route - Exterior - Ostia - Subdermal space and incurrent channel - Prosodus (Prosopyle) - flagellated chamber - apodus (apopyle) - excurrent channel - layer channel - Oscule - Exterior.

All these three types of Canal systems occur in the calcareum.

A special type intermediate between sycanoid and leucanoid types and are called Sytleibid type occur in some Calcareum, e.g. - Lenticilla.

Hexactinellida - osculum covered by a sieve plate; Exterior surface and spongocoel lined by trabecular net. a continuous row of elongated flagellated chambers opening into spongocoel or excurrent channels
Ex - Euplectella

Demospongia - Canal system always leucanoid but derived from a group known called Rhagon.

Structure of Rhagon - (1) Tapering body with a broad base (hypopore), a thick vertical wall (spongopore) and a conical apex with Osculum.

(2) spongopore with a layer of flagellated chambers opening externally by prosopyles and laterally by apopyles into spongocoel lined by epithelial cells.

Several types of Canal systems are derived from Rhagon

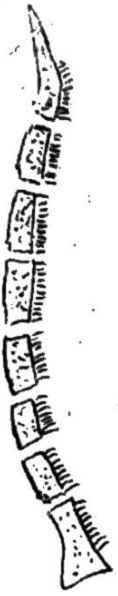
(a) Oscule type - spongopore becomes folded to form incurrent and excurrent chambers. flagellated chamber eurytylous. Ex - Oscule

(b) Simple Tetilla type - Dermal epithelium with many ostia enclosing a subdermal space; Canal in spongopore
Ex - Primitive Tetractinellida.

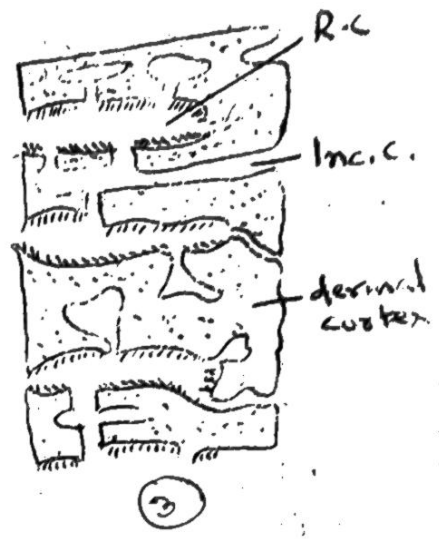
(c) Complex Tetilla type - irregular, ectosome with ostia separated by trabeculae; Ex - Platocoria

(d) Spongilla type - spongopore of complex Tetilla type; further folded to form diverticula. Ex - Spongilla

Aphodal and diploidal arrangements also occur in the Demospongia.



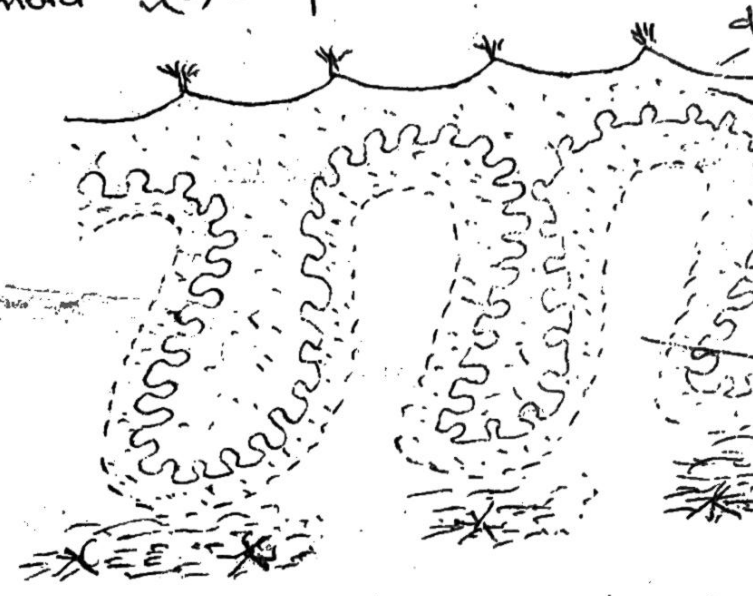
Spongocaul



✓ (1) Asconoid

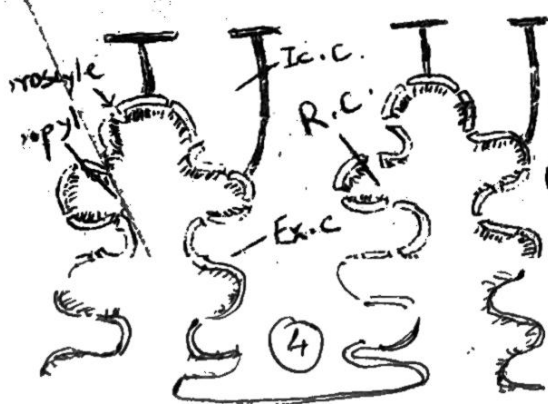
✓ (2) Simple Syconoid

(3) Complex Syconoid

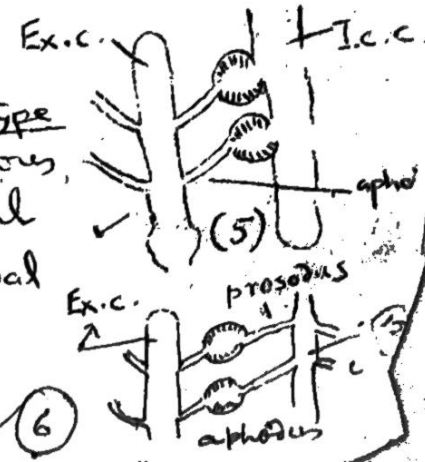


- dermal layer with dermal spicules
- sub-dermal trabecular net
- flagellated chambers
- excurrent channel
- gastral layer
- gastral spicules

(8) Euplectella type: Section thr' wall of Euplectella

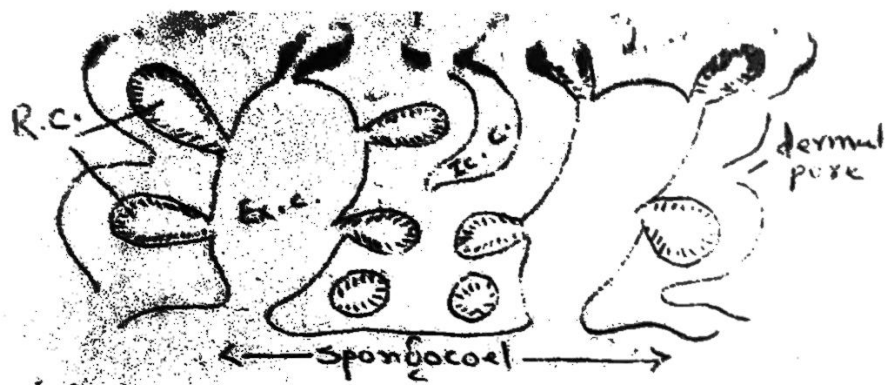


- Leuconoid type
- (4) euypylous
 - (5) aphodal
 - (6) diploidal

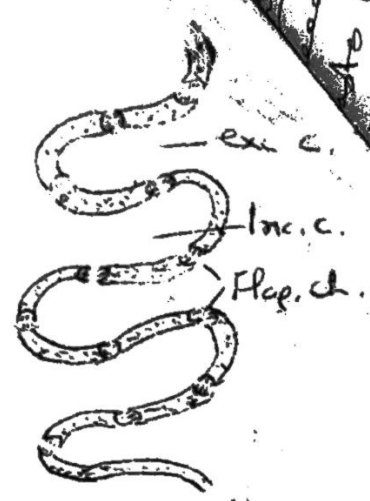


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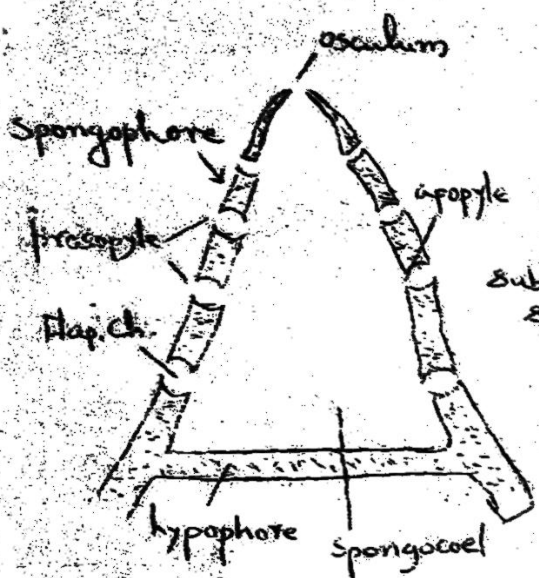
✓ (6)



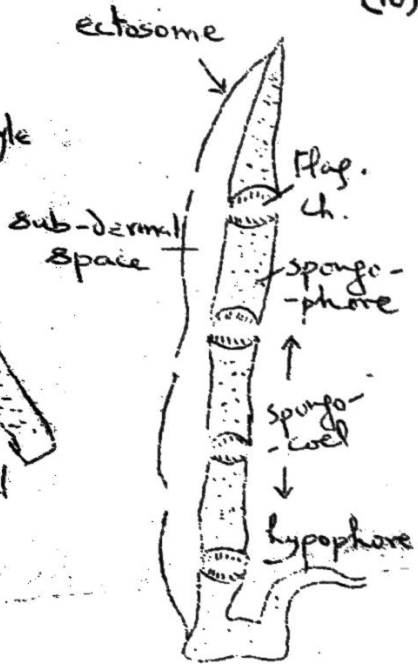
(7) Syllid type as in Leucilla (calcareous).



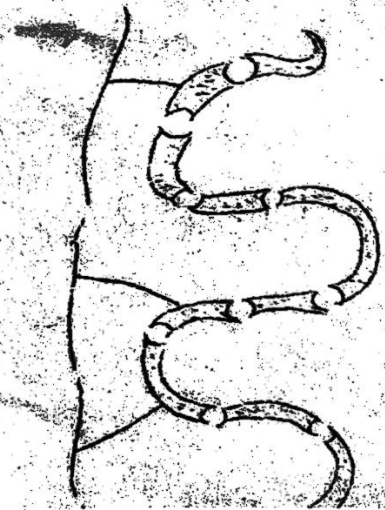
(10) Oscarella type
Ex. Plakina



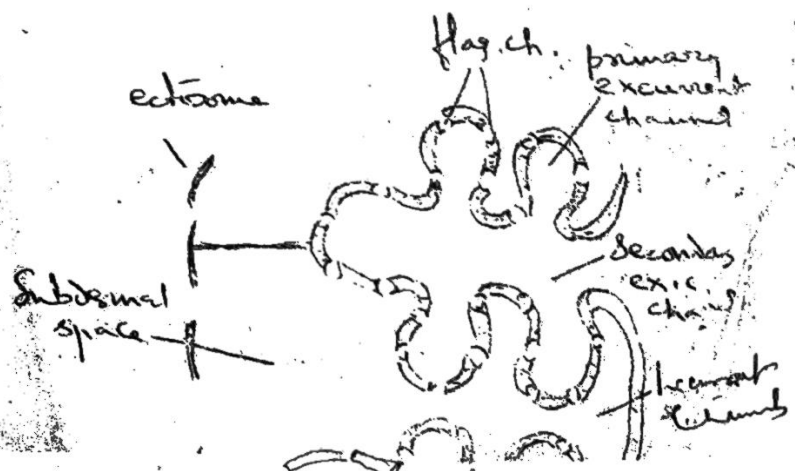
(9) L.S. RHAGON



(11) Simple Tetilla type ✓



Complex Tetilla type
Ex - plakostis



spongilla type

Functions of Canal System

feeding (1) Respiration (2) Removal of CO₂ and metabolites (3) discharge of sperm (4) Fertilization (5) increase in external surface area (6) escape of larvae (7) shells (8)

Types of Canal System and efficiency

The Ascum type is less efficient - as the flagella have to move a large mass of water through spongy. There is a quick flow of water.

The leucorhynchid system is the most efficient, because water flows in narrow and narrow channels and therefore, stays in the sponge body for some time to facilitate food capture and gaseous exchange.

Again, the water current - then flows from narrow to large channels and it flows out with great speed.