Canal System in Sponges

The sponges are sedentary animals without any definite organ system. 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 outlets called Osculs.

All these pores and channels constitute 'canal system', a feature characteristics 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 recognised in sponges:-
(1) Ascanoid (2) syconoid (3) Leuconoid.

1. Ascanoid type

(1) Simplest type a found in ascons of calcare (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 pinacocytes.
(b) an intermediate mesenchyme of gelatinous matrix with spicules and amoebocytes, and
(c) an inner layer of choanocytes, lining the spongocoel.

(3) Body wall is perforated by numerous inhalent pores called Ostia, leading directly into spongocoel.

Course of circulation: Exterior — Ostia — spongocoel — Exterior

2. Syconoid type

(1) derived from ascanoid type by folding of the body wall resulting in the formation of outwardly blind outpushings, radial canals, lined by choanocytes and alternately 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 pore (ostia) — incurrent canal — prosopyle — radial canals — apopyle — spongocoel — osculum — Exterior.

Special feature

(a) Alternate incurrent and radial canals.
(b) Limitation of choanocytes to radial canal.

Syconoid type occurs in two forms

(1) simple syconoid - (1) External surface made of blind outer ends of radial canals.
(2) dermal ostia opens directly into incurrent-canals
Ex - Sycon

(2) complex syconoid - epidermis and mesenchyme spread over outer surface in the form of a cortex
ostia leads into branching and anastamosing incurrent canals. Ex - Grantiopsis

3. Leuconoid type

(a) Can be derived from further folding of radial canals and subsequent formation of small flagellated chambers lined by choanocytes.
(b) Mesenchyme fills the space around chambers. Spongocoel obliterated.
(c) Ostia leads into sub-dermal spaces into branching incurrent-canals opening into flagellated chambers by prosopyle.
(d) flagellated chamber open into incurrent-canals through apopyle
(e) Excurrent passages unite to form layer and this layer tube, the layer of which opens through osculum.

Thus leuconoid type system has 3 parts incurrent system, flagellated chambers and Excurrent systems.

Leuconoid type occurs in three forms :—

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

Special features :-
(a) limitations of choanocyts to small chambers.
(b) great development of mesenchyme
(c) Complexity of excurrent and excurrent passages.

Water route - Exterior - Ostia - Subdermal space - Incurrent channels - Prosodus (prosopyle) - flagellated chamber - aphodus (apopyle) - Excurrent channel layer channels - Osculum - Exterior.

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

A special type intermediate between syconoid and leuconoid type and are called Syleibid type occurs in some Calcarea, e.g - Leucilla, Hexactinellida. Osculum covered by a sieve plate, External surface as spongocoel lined by trabecular net.

a continuous row of elongated flagellated chambers opening into spongocoel or excurrent channels
Ex. Euplectella

Demospongia - Canal system always leuconoid but derived from a group plan called RHAGON

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

(2) sponsophore with a layer of flagellated chambers opening externally by prosopyle and internally by apopyle into spongocoel lined by epithelial cells.

Several types of Canal System are derived from Rhagon

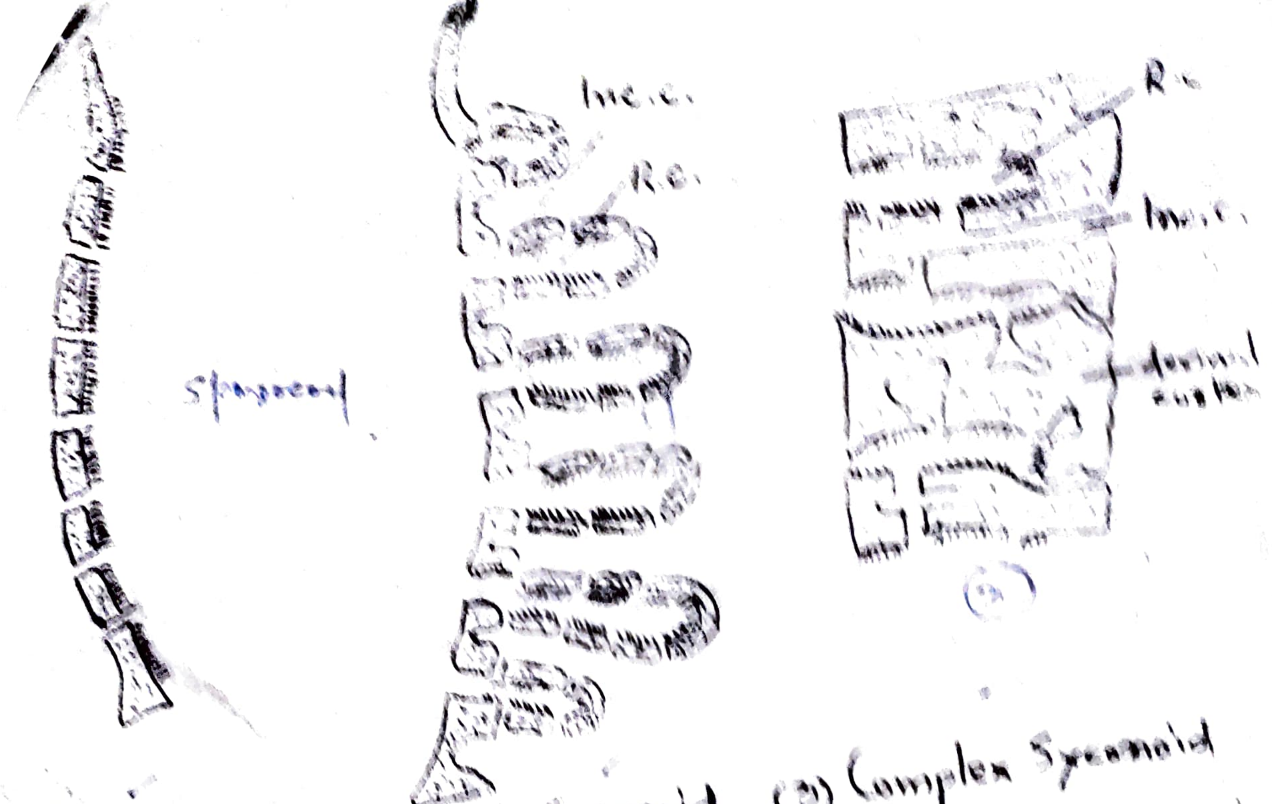
(a) Oscarella type - sponsophore becomes folded to form incurrent and excurrent chambers. flagellated chamber eurypylous. Ex - Oscarella

(b) Simple Tetilla type - Dermal epithelium with many ostia enclosing a sub dermal space; Canals in sponsophore Ex - Primitive Tetractinellida.

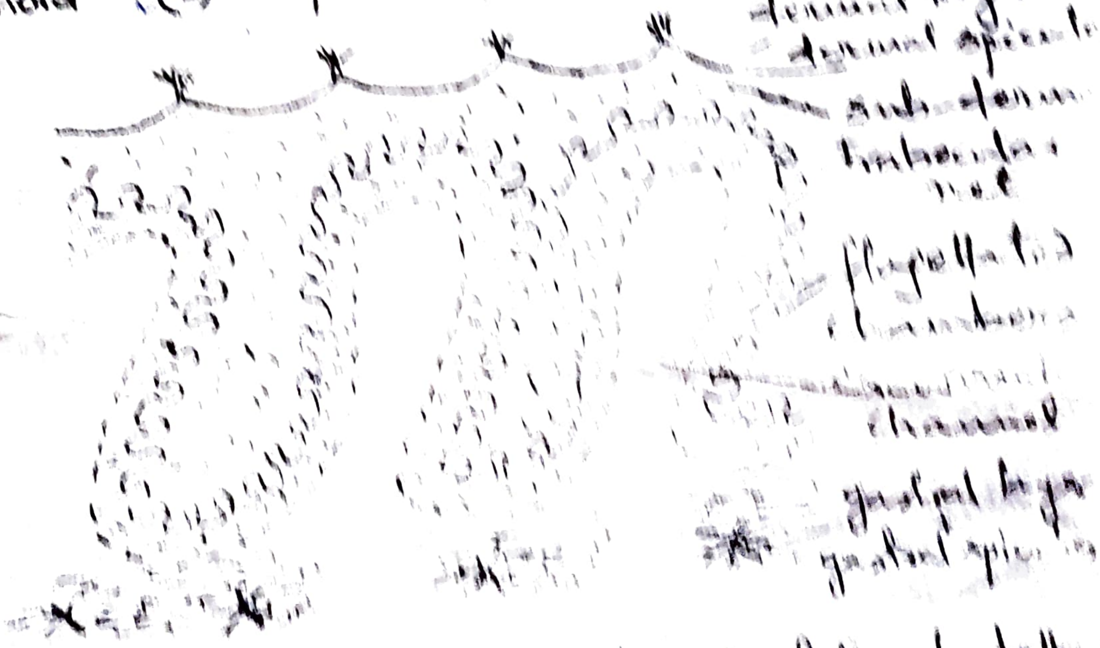
(c) Complex tetilla type - irregular, ectosome with ostia supported by trabeculae; Ex - plakortis

(d) Sycon type - sponsophore of Complex Tetilla type; folded to form diverticula. Ex - Sycon

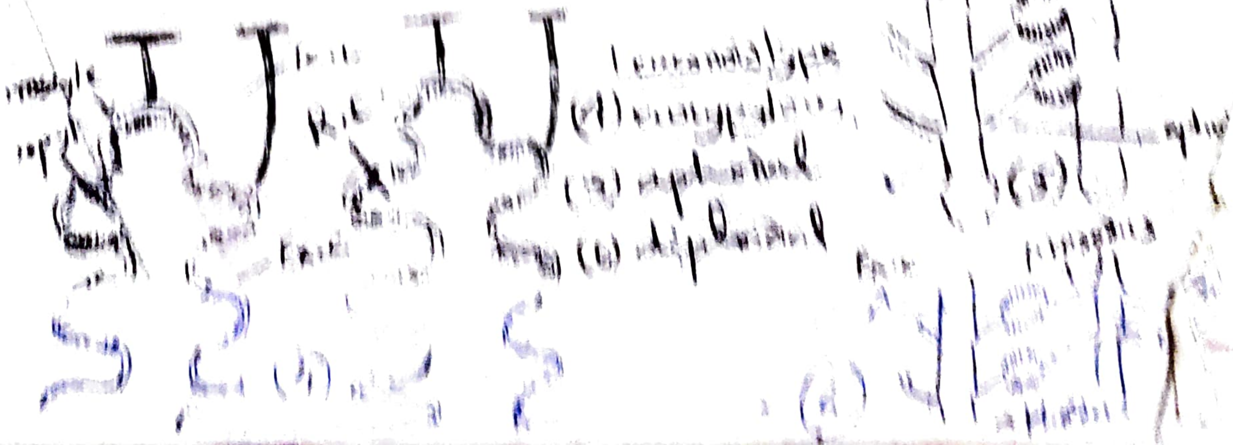
Aphodal and diplodal arrangements also occur in Demospongia.

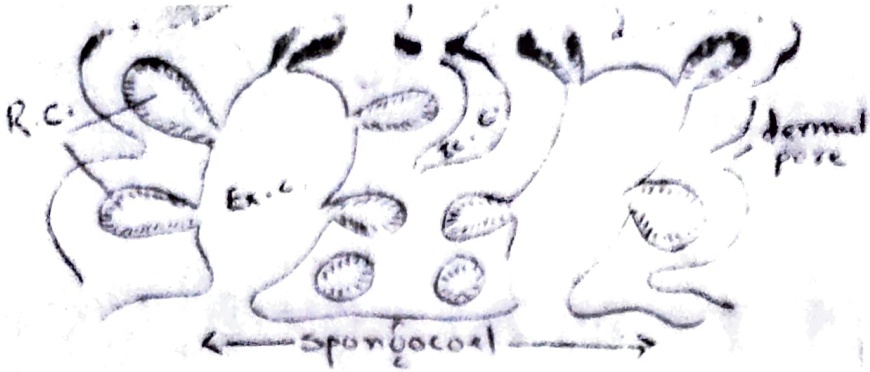


(1) Asconoid (2) Simple Sycanoid (3) Complex Sycanoid

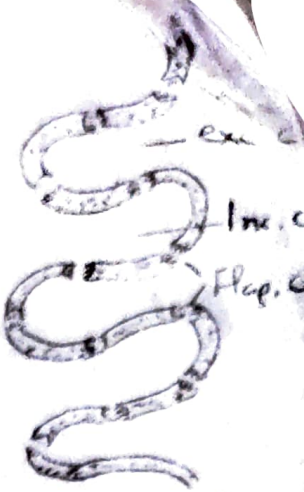


(4) Euplectella type: Section thru wall of Euplectella

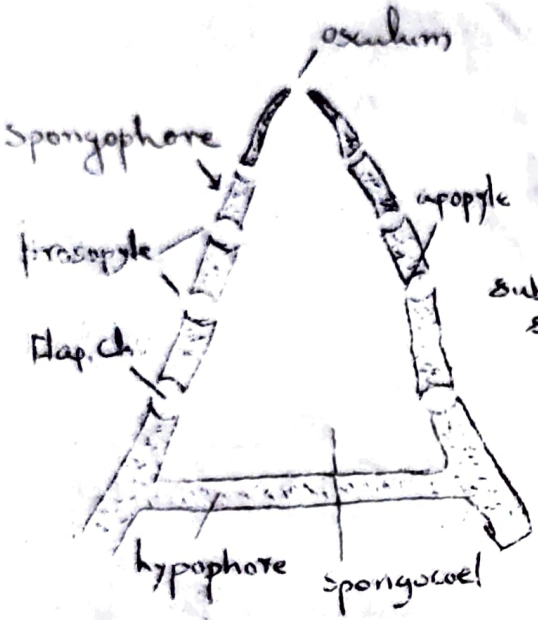




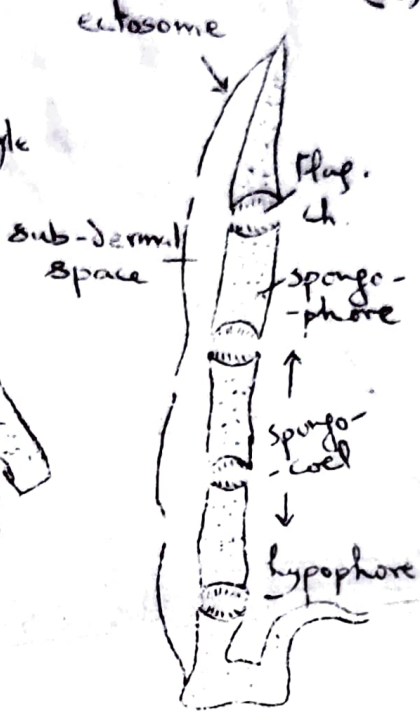
(7) Sylleibid type as in Leucilla (calcarea).



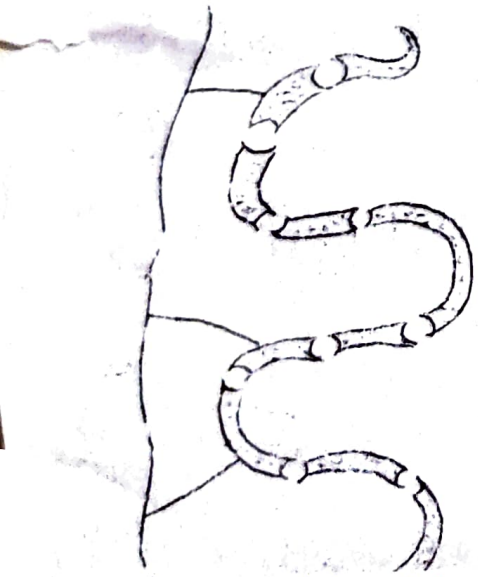
(10) Oscarella type
Ex. Plakina



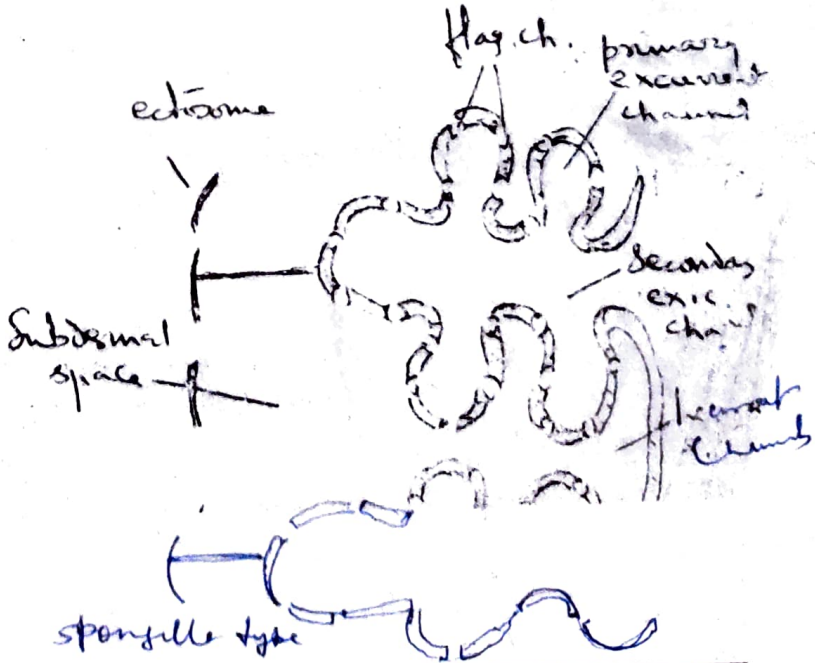
(9) L.S. RHAGON



(11) Simple Tetilla type



Complex Tetilla type
Ex - plakortis



...s of Canal System

...eding (2) Respiration (3) Removal of CO_2 and metabolic ...ste (4) discharge of sperms (5) fertilization (6) increase in internal surface area (7) escape of larvae (8) shelter for parasites.

Types of canal systems and efficiency

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

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

Again, the water current then flows from narrower to larger channels and it flows out with great speed.