



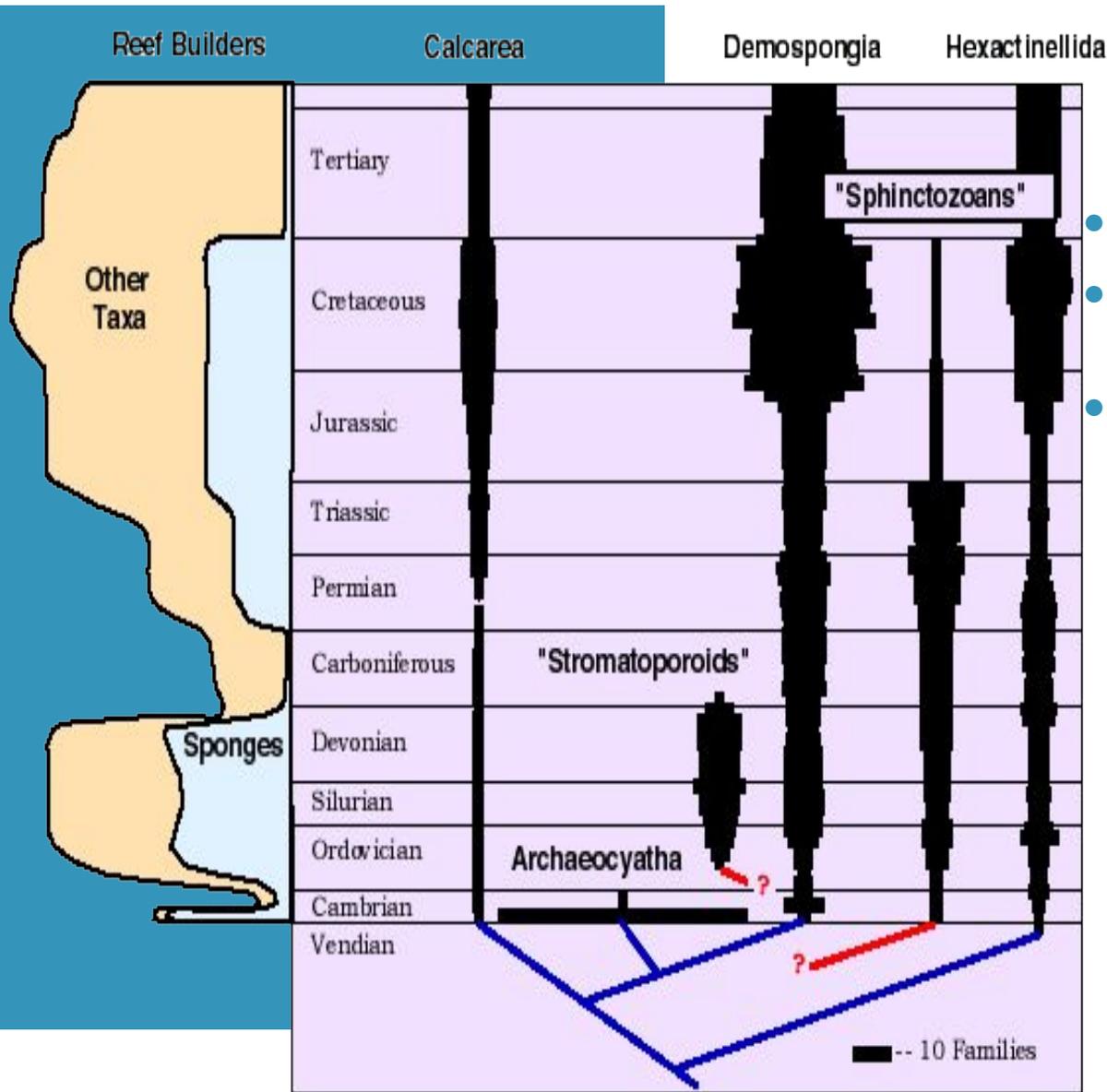
PORIFERA-General Characters

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Online Lecture, Semester I

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Poriferans' origin

Poriferans are commonly referred to as sponges. An early branching event in the history of animals separated the sponges from other metazoans.



- Sponges have been numerous in the seas since the Precambrian.
- Throughout most of the Phanerozoic, sponges have been major contributors to reef formation.
- Sponges probably achieved their greatest diversity during the Cretaceous.



General features

HABITAT OF SEA SPONGES



□ Examples of common reef sponges include the fan sponge (*Phyllospongia lamellosa*), the azure vase sponge (*Callyspongia plicifera*) and the tube sponge (*Callyspongia vaginalis*).



Phyllospongia lamellosa



Callyspongia plicifera



Callyspongia vaginalis

- The Porifera may be defined as an asymmetrical or radially symmetrical multicellular organism with a cellular grade of an organization without well- definite tissues and organs; exclusively aquatic.
- It was Robert Grant who coined the term Porifera which in Latin means pore bearing animals (L. Porus=pore; ferre=to bear).
- Huxley and Sollas first proposed the separation of sponges from eumetazoans. It is believed that sponges might have evolved from the colonial choanoflagellate protozoans. Sponges represent an evolutionary blind offshoot.
- Sponges come in an incredible variety of colors and an amazing array of shapes.

HABITAT OF SEA SPONGES



□ An example is the barrel sponge (*Xestospongia muta*), roughly the same shape and size as a barrel and often big enough to hold a person.



Xestospongia muta

HABITAT OF SEA SPONGES

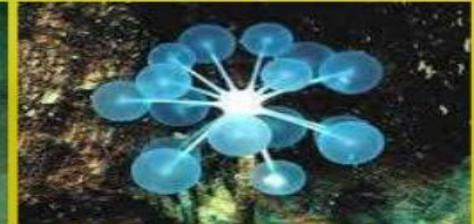


Deep Sea

□ ~~Sponges~~ sponge (*Chondrocladia lyra*) and the ping-pong tree sponge (*Chondrocladia lampadiglobus*) are examples of carnivorous sponges.



Chondrocladia lyra



Chondrocladia lampadiglobu

➤ Porifera characteristic

- Sponges are primarily **marine**, (less than 2% of all sponge species are found in freshwater).
- They are cellular - level organization:
 - Cells are specialized (functional).
 - Cells are not organized into tissue.
 - **Parazoans** (tissue are not true)
 - No systems for reproduction, digestion, respiration, sensory, excretion.
- **Radially symmetrical or asymmetrical.**

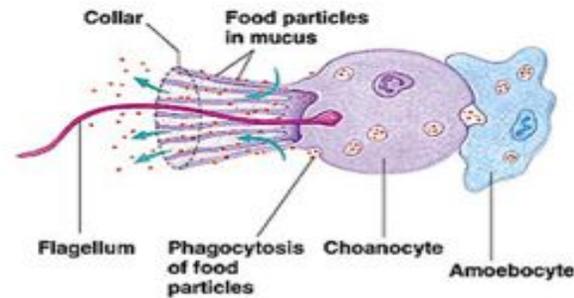


➤ Structure of sponges

- A sponge is a rigid perforated bag.
- The empty space of this bag is called the **spongocoel**.
- It has three layers :
 - **Inner layer** : It is lined with flagellated cells called **choanocytes or collar cells**.

Functions of the collar cells :

- They generate currents that help maintain circulation of seawater within and through the sponge.
- They capture small food particles.
- They capture incoming sperm for fertilization.



Salient features

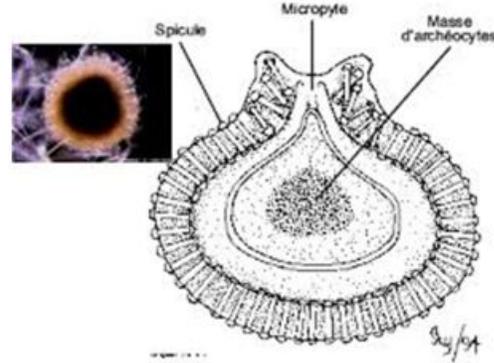
- The members of the phylum Porifera are commonly known as 'sponges'. All are aquatic and mostly marine
- ▶ These animals bear pores on their body surface
- ▶ They represent the first step towards multicellularity
- ▶ Sessile, sedentary and they spend their lives anchored to a rock or ocean bottom
- ▶ Have choanocytes(flagellated cells)
- ▶ They have a peculiar canal system through which water current flows and conveys food and oxygen
- ▶ Body shape is vase or cylinder-like, asymmetrical or radially symmetrical
- ▶ The body surface has numerous pores called ostia and a large opening called osculum
- ▶ Cellular level of body organisation and diploblastic

- The interior space of the body is either hollow or permeated by numerous canals lined with choanocytes
- ▶ Skeleton consisting of either fine flexible sponging fibres, siliceous spicules or calcareous spicules
- ▶ Mouth absent, digestion intracellular
- ▶ Excretory and respiratory organs absent
- ▶ Nervous and sensory cells are not differentiated
- Hermaphrodite, reproduction by both asexual and sexual methods
- ▶ Asexual reproduction by buds and gemmules
- ▶ Sexual reproduction by ova and sperms, fertilization is internal but cross-fertilisation as rule
- ▶ Cleavage is holoblastic, development is indirect through a free-swimming ciliated larva called amphiblastula or parenchymula
- ▶ Organization ascon type, scontype and leuconoid type

➤ Reproduction in sponges:

1. Asexual :

- **Internal buds.**
- **Regeneration:** can regenerate from broken pieces.
- **External buds (Gemmules) :** Produced in winter as dormant bodies ,coat and supportive cells protects from freezing and desiccation.



2. Sexual:

- It takes place in in the **mesohyl**.
- usually hermaphroditic with male and female gametes , formed by **amoebocytes**.
- most hermaphroditic species produce eggs and sperm at different times so they do not self fertilize.
- sperm is released into environment via osculum and is brought in by another sponge via **Ostia**.
- Sperm captured by collar cells, which then lose there collar & transform into specialized **amoeba-like** cells that carry sperm to the egg.
- Fertilized egg develops into blastula , which is release into water (in most)
- The larvae may settle directly & transform into adult or may be planktonic for a time
- Larvae are lecithotrophic = use stored yolk

USEFULNESS OF SPONGES



From Sea Sponge to HIV Medicine

- ❑ *Tectitethya crypta* (formerly known as *Cryptotheca crypta*) is a large, shallow-water sponge found in the Caribbean. It was first studied for medical purposes in the 1950s when few scientists or doctors thought to look for medicines in the ocean.
- ❑ But in the sponge, scientists isolated two chemicals—aptly named spongothymidine and spongouridine—which were used as models for the development of a number of anti-viral and anti-cancer drugs.

From Sea Sponge to HIV Medicine



Credit: Sven Zea (<http://www.spongeguide.org>)

- ❑ These include the HIV drug AZT, a breakthrough in AIDS treatment in the late 1980s, anti-viral drugs to treat herpes, and an anti-leukemia drug. The latter was approved in 1969 and was the first marine-drug approved for cancer treatment.

<http://ocean.si.edu/ocean-photos/sea-sponge-hiv-medicine>

Sea Sponge Drug Boosts Breast Cancer Survival?

By Jenna Lacurci

Nov 03, 2014 08:22 PM



- ❑ A certain drug developed from sea sponges could possibly boost breast cancer survival in women, according to a new study.
- ❑ Researchers led by Professor Chris Twelves, based at the University of Leeds and Leeds Teaching Hospitals NHS Trust, looked at 1,800 women with breast cancer that had started to metastasize, or spread, to other parts of the body. They found that when treating patients with the cancer drug eribulin, specifically those with advanced triple negative breast cancer, they lived on average an extra five months.

Study Abstract



Efficacy of eribulin in patients with metastatic breast cancer (MBC): a pooled analysis by HER2 and ER status

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Conclusion



- ❑ Eribulin significantly improved OS vs standard therapies in MBC patients with HER2- and TNBC; in patients with HER2+ disease the difference did not reach statistical significance but numbers were smaller.

Source:

<http://www.natureworldnews.com/articles/10043/20141103/sea-sponge-drug-boosts-breast-cancer-survival.htm>



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