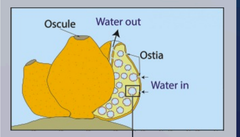
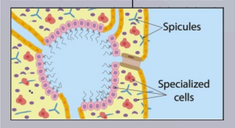
Food and Agriculture Organization of the United Nations

DEEP–SEA SPONGES OF THE INDIAN OCEAN

SPONGES (PHYLUM PORIFERA)

Sponges are common invertebrates in the deep sea, providing habitat for certain benthic fauna.
They attach to hard substrate on seamounts, hydrothermal vents, pinnacles and canyons, hard corals, or anchor in sediment.
Sponges feed by filtering sea-water to capture food particles and oxygen, but an unusual group, the 'carnivorous sponges', feed directly on small crustaceans by entanglement and direct digestion. Water flows into a sponge through small openings (ostia) that occur over the outer surface and leave the sponge through one or more, larger, exhalent openings (oscules).



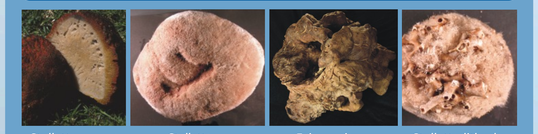


Sponges do not have discrete 'tissues'; different cell types perform the functions of digestion, excretion, reproduction and defence. A skeleton of mineral silica or calcium carbonate spicules and organic collagen provides support for these cells. The form, dimensions and arrangement of the spicules can help with their identification. Sponge chemicals are known for their potential application to human health and industry.

SILICEOUS SPONGES – CLASS DEMOSPONGIAE

Demospongiae come in an enormous variety of shapes and sizes, from thinly encrusting masses, hemispheres, spheres, tiny globes and lollipops, to large volcano-like forms several metres high. Others resemble flasks and tall tubes, or have fan and tree-like forms. Coloration is derived from carotenoid pigments (purple, magenta, blue, brown, red, pink, orange, ochre and yellow), or due to the presence of symbionts or specific metabolites. Texture reflects the underlying mineral (spicule) and organic (collagen, fibre) skeleton and may be fleshy, woody, stony or fibrous. Demosponge skeletons may include spicules, sand grains, collagen and fibre, in various combinations.

Ancorinidae species

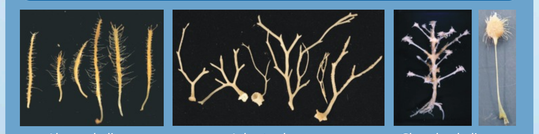


Stelletta rugosa *Stelletta* sp. *Ecionemia* sp. *Stelletta lithodes*

Size: ~ 10 to 40 cm Ø **Depth:** 1–2800 m

Massive, flattened spherical to bowl-shaped sponges, with a smooth, granular or roughened, hairy surface. Oscules usually grouped at apex. Texture usually tough, incompressible. Skeleton dominated by harsh spicules that radiate internally and project from the surface, often with a discrete 'rind.' Colour in life white, cream, tan, brown or grey.

Cladorhizidae species



Abyssocladia sp. *Asbestopluma* sp. *Chondrocladia* spp.

Size: several mm high to ~ 30 cm high **Depth:** 60–2930 m

Feather-, tree-, sunflower- or lollipop-shaped 'carnivorous' sponges, with 'sticky' filaments or balloon-shaped spheres on which living 'food' is caught. Attached by a 'root' in soft substrate or by a rounded disc to hard substrate. Texture soft, compressible or hard and twiggy, often fragile. Colour in life beige, pink.

Homaxinella species

Homaxinella balfourensis *Homaxinella* sp. Living *Homaxinella* sp.

Size: 30 to 60 cm long **Depth:** 13–2675 m

Hockey-stick shaped to branching sponges with a tough, internal, tree-like core from which emerges a soft, fuzzy or tough, leathery swelling along the upper branches. Oscules are prominent on the swollen sections and/or restricted to one side only. Attached to substrate by a tough, branching 'root'. Colour in life cream to pale yellow.

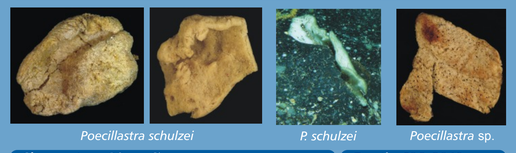
Lollipop sponges

Podospongia sp. *Stylocordyla borealis*

Size: <10 cm (*Podospongia*), up to 30 cm high (*Stylocordyla*) **Depth:** 30–975 m

Lollipop-shaped sponges with a large, bullet-shaped to oval head and a slender stem. Attached in soft sediment by a branching 'root' and to hard substrate by a rounded disc. Texture of head softer than stem, smooth or furry; stem, smooth, tough, incompressible and flexible. Colour in life grey, cream, dull yellow.

Poecillastra schulzei (fibreglass fan sponge)



Poecillastra schulzei *P. schulzei* *Poecillastra* sp.

Size: up to ~ 30 cm Ø **Depth:** 696–2040 m

Massive, thick, irregular, undulating plate or fan, attached along a broad base to hard substrate. Margins and surfaces extremely harsh with long, projecting spicules. Exhalent and inhalant openings not visible. Texture tough, flexible. Skeleton a harsh, dense siliceous network. Colour in life white with grey overlay on margins from sediment trapped by spicules.

Fibrous fan sponges

Isodictya sp. *Isodictya* sp. *Iophon* sp.

Size: up to ~ 40 cm Ø **Depth:** 3–1652 m

Massive, thin, flattened, single to multiple fans, with indented margins resembling a palm with fingers, to finger-forming sponges, with a generally smooth but microscopically roughened surface. Exhalent and inhalant openings on margins or opposite faces. Texture tough, flexible. Skeleton a dense fibrous network. Colour in life cream, tan, pale orange, deep orange.

Thenea species

Thenea sp.

Size: ~ 1 to 7 cm Ø **Depth:** 238–1153 m

Spaceship-shaped sponges with a distinctive rounded summit, separated from the base by a narrow transverse mid-section recess, providing a specialised inhalant area. Oscules may be visible on upper surface. Rooting structures project from the ventral surface. Surface fleshy, rough. Texture soft, compressible. Skeleton with harsh, long, radiating spicules. Colour beige to grey.

'Hard as rock' sponge cups

Leidermatium intermedia *Microscleroderma herdmani* *Corallistes* sp.

Size: 2 to 40 cm Ø **Depth:** 3–375 m

Massive 'hard as rock' sponges forming wavy plates, cups, tubes or ears. Oscules and ostia often separated on opposite sides of the wall, or in a concave recess (*Callipelta*). Attached by a narrow base or margin to hard substrate. Margins and upper surface often hairy. Texture stony. Skeleton a rigid mass of interlocked spicules. Colour cream, tan.

Geodiidae species

Geodia sp. *Geodia* sp.

Size: ~ 5 to 30 cm Ø **Depth:** 1–2260 m

Massive, spherical, turban- to cheese-shaped sponges, with a smooth or lobed, granular or hairy surface. Several oscules on the apex separated from grouped ostia. Texture tough, eggshell-like, incompressible; softer inside, often pulling away from shell-like 'rind'. Skeleton dominated by hard eggshell-like rind, spicules radiate internally. Colour cream, beige, tan, brown or grey.

GLASS SPONGES – CLASS HEXACTINELLIDA

Hexactinellid glass sponges are unique amongst sponges in that they lack cell membranes and their silica spicules are based on a hexagonal (six-rayed) design. Spicules may be extremely large as in a 'fishing-rod', or may be twisted into 'rope', fused into a network, or form a soggy paper or rough sack-like fabric. Glass sponges are diverse in their shape: woven baskets and tubes, big sacks, fibreglass-like matting, soft tulips on stalks, and hollow and solid coral-like sticks. Texture may be stony, softly papery, brittle, fragile; always non-elastic. Coloration is muted, being translucent, white, cream, to faint pastel pinks and blues.

Hyalonematidae species

Hyalonema spp. *Chalaronema* sp. Dredged 'glass rope'

Size: up to ~ 40 cm high **Depth:** 198–4077 m

Tulip-shaped sponges with a large, cup-shaped to elongate body on a stem of glass threads, resembling a twisted rope that roots the sponge into sediment. Glass rope often the only part collected. Texture of body soggy when wet, crisp and fibrous when dry; fragile, easily torn and detached. Colour in life tan to grey.

Monorhaphis chuni

Monorhaphis chuni

Size: 10 cm long (2 mm Ø) to 3 m long (1 cm Ø) **Depth:** 1567–2550 m

Fishing rod-shaped sponge, comprising a single, massive spicule. A papery body clings to the upper portion of the spicule that roots the sponge into soft sediment. Texture of body soggy when wet, fibrous and fragile when dry; easily detached. Colour of body cream to pale green.

Saccocalyx pedunculatus

Saccocalyx pedunculatus

Size: up to ~ 70 cm high **Depth:** 890–2760 m

Bubbly cup-shaped sponge with a long, slender, hollow, thin-walled stem, attached to hard substrate by a disc. Concave apex has large perforations, external surface has udder-like structures. Texture of body very soft, flimsy, collapses out of water. Crisp and fragile when dry, stem easily broken and body torn or detached. Colour in life white.

Rossellidae chalice sponges

Caulophacus spp. *Crateromorpha* sp.

Size: up to ~ 40 cm high **Depth:** 240–4714 m

Tulip, mushroom, or chalice-shaped sponges with a large, open, cup-shaped body on a stiff, coral-like or soft, flexible, tubular stem. 'Glass sponge sticks' often the only part collected. Texture of stem stony to fibrous, slightly compressible, body soggy when wet, crisp and fibrous when dry; fragile, easily detached. Colour in life tan to pink.

Rossellidae sack sponges

Hyalascus sp. *Acanthascus* sp. *Rhabdocalyptus* sp.

Size: may reach 1 m Ø **Depth:** 100–2000 m

Large vase or floppy, sack-shaped sponges resembling mushy paper when wet. Often collected as bits of 'sacking'. Outer walls smooth or conulose; inner walls smooth with exhalent perforations. Attached to substrate by a basal plate or into soft sediment with a 'beard' of glass spicules. Texture soft like sacking or felt. Colour in life tan.

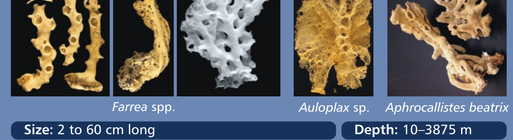
Pheronema annae and other Pheronematidae

Pheronema annae *Pheronema* sp.

Size: up to 40 cm Ø **Depth:** 502–3480 m

Spherical to oval sponges with a large exhalent opening on the upper surface and a 'beard' or 'fringe' of glass spicules that roots the sponge into sediment. Surface smooth, covered in a distinctive, detachable network, with tufts of long spicules in some species. Internally cavernous. Texture tough, fibrous and slightly compressible. Colour in life tan.

Honeycomb lace sponges (Hexactinosida, Aulocalycoida)



Farrea spp. *Auloplax* sp. *Aphrocallistes beatrix*

Size: 2 to 60 cm long **Depth:** 10–3875 m

Rigid honeycomb sponges in vase, bush, or feathery, tree-like shapes, with a distinctive tubular or flaring morphology, walls a regular or irregular perforated 'netting' with larger perforations in some groups. Surface smooth, undulating or ridged. Attached to hard substrate by a basal plate. Texture brittle, delicate, pumice-like when dry. Colour in life white, cream.

Euplectellidae species

Euplectella spp. *Regadrella* spp.

Size: up to ~ 40 cm **Depth:** 172–4744 m

Vase-shaped sponges with a distinctive colander-like sieve-plate over the apex. Walls resemble basket-weave. Attached to hard substrate by a hard basal plate or into soft sediment with a 'beard' of glass spicules. Surface softly ridged around perforations or forms a beautiful tangential network. Texture floppy and fabric soft or stony crystalline. Colour in life tan.

SIMILAR LOOKING GROUPS

Tiny 'carnivorous' demosponges resemble more robust sea fans; sea-fan octocorals have polyps. 'Hard as rock' demosponges look like stony corals, hydrocorals and lace corals (bryozoans), but these are tree-shaped and often glass smooth and the lace corals are composed of tiny visible box animals. Lollipop demosponges look like stalked sea squirts, but these form gelatinous 'purses' with two openings.

Similar looking groups to Class Demospongiae

Gorgonian octocorals (sea-fans) Bryozoan (lace coral) Ascidians (sea squirts)

Hexactinellids forming lacy networks look like perforated lace corals, but lace corals are composed of tiny visible box animals. Hexactinellids forming rigid, hollow 'trees' or solid 'sticks' look like gorgonian corals, but these are flexible and have polyps.

Similar looking groups to Class Hexactinellida

Bryozoan (lace coral) Stony coral Stylasterid hydrocorals Ascidians (sea squirts)

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