MARINE SPONGES

Forty-six sponges of Northern New Zealand.

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INTRODUCTION.

Sponges are invertebrates and form the only phylum, Porifera, in the Subkingdom Parazoa. They are the most primitive of multicellular animals, having neither true tissues nor organs, with the cells showing considerable independence from one another.

A sponge is composed of a variety of cells supported by a skeletal network. The skeleton can be composed of spicules and/or spongin. The various cell components perform different functions. The outer surface (pinacoderm) is formed of flattened polygonal cells called pinacocytes. The interior surface (choanoderm) is lined with flagellated collar cells (choanocytes); the flagella beat to provide a current through the sponge enabling oxygen and food particles to be drawn into the sponge and wastes to be expelled. Between the pinacoderm and the choanoderm is an area (the mesohyl) formed of gelatinous material. Cells found here are the basic archaeocytes which can form into any other specialised cell.

The body form of sponges is very variable, being influenced by available space, current velocity, habitat, and the nature and slope of the substrate. Asconoid sponges have the simplest form—a tubular shape enclosing a central cavity which opens out through a single exhalant opening (osculum) with porocytes connecting directly from the pinacoderm to the choanoderm. Larger sponges require a more efficient filter system: this is achieved by folding which increases the internal surface area. Syconoid sponges are those with the first stages of body wall folding. Leuconoid sponges have the highest degree of folding, with the formation of flagellated chambers and a complex canal system, the filling in of the central cavity and numerous oscules. The majority of sponges fall into this category.

Sponges seem to be unselective feeders: their diet reflects the composition of particles available in the water current, the only criteria being particles smaller than the sieve size of the inhalent openings.

Reproduction can be by either sexual or asexual means. Some sponge species contain both male and female sex cells, other species can have different sexes on a permanent or temporary basis. In oviparous sponges eggs are extruded through the exhalent opening, or upon dissolution of the dermal membrane. Viviparous types expel tiny adult sponges or larvae. The larvae usually spend a
short time as a free swimming form before settling on the substratum. Asexual forms of reproduction are by budding or splitting. In some species asexual bodies (gemmules) are formed.

There are approximately 10,000 species of sponges recorded from around the world. These are divided into four classes.

HEXACTINELLIDA: 450 species make up this class often known as the 'glass sponges'. Their spicules are of siliceous material and are always of a type with three axes, thereby giving six end points. Often some of the spicules fuse to form a skeleton that may be lattice-like. Found in deep water (a common range being 450 to 900m) they are 10 to 30cm high on average, and tend to be pale in colour.

SCLEROSPONGIAE: This class consists of a small number of coralline sponges with an internal skeleton composed of siliceous spicules and spongin with an outer encasement of calcium carbonate. Converging exhalent canals give a star-like appearance to the numerous raised oscules. They have been recorded from tropical waters only.

DEMOPONGIAE and CALCAREA are discussed more fully in the following text pages.

The aim of this guide is to provide a reference detailing 46 species found in the Cape Rodney to Okakari Point Marine Reserve which are representative of sponges from the North-east Coast of New Zealand, yet also to provide a taxonomic guide to family and order identification. The sponges included in the guide are the more common species located within the Reserve and adjacent coastline. There are over 100 species recorded from this area, some of which have not been described. (The species list compiled to date is presented in Appendix I).

The text is laid out in taxonomic order with a descriptive introduction to each order and its families. The families of all species recorded at the Marine Reserve have been included in the descriptions. Unfortunately logistic constraints limited the scope of the guide and therefore not all species could be included. Some families, therefore, have no representative species described.

Individual species descriptions are set out in family groups. Reproductive
information has only been included where products are visible to the eye and may constitute an aid to identification. Each species description is compiled from information essential to sponge identification – colour, size, shape, texture, etc. Colour notations used in brackets are derived from the Munsell Colour Guide. Habitat and distribution characteristics are only records of observation and are not intended as exclusive categories. On the facing page to each species description is an illustration of the species, spicules, and a section of the sponge. (Refer Appendix II for spicule mounting procedure).

A glossary which includes pictorial spicule descriptions is incorporated to aid in understanding the descriptions.
THE RESERVE.

The Cape Rodney to Okakari Point Marine Reserve is situated 90km to the north of Auckland, extending approximately 5km along this portion of the north-eastern coast of New Zealand (Fig.1). The marine habitats from the mean high water mark to 800m offshore are protected. The reserve locations described in the text are shown in Fig.2.

The habitat types used throughout the text are based on those described by Ayling (1978) and followed in the N.Z.M.S. maps 312/1-3. A map showing these zones is illustrated in Fig.3.

The Subtidal.

This region lies below the mean low water mark, and in the reserve extends to a maximum depth of 40m. Habitat types are amplified below.

- Rock Flats: Flat or undulating rock.
- Sediment Covered Rock Flats: Flat, with few urchins (Evechinus chloroticus). The kelp Ecklonia radiata is sparse or absent.
- Mixed Rock and Sand: Broken rock and extensive sand patches, with moderate numbers of Evechinus and a few scattered Ecklonia.
- Ecklonia Forest: Dense Ecklonia cover on flat or undulating rock, Evechinus when present, are always in low numbers.
- Shallow Broken Rock: Large boulders and crevices with mixed brown algae on the peaks and moderate numbers of Evechinus.
- Deep Broken Rock: Very broken rock with moderate Ecklonia cover and few Evechinus.
- Deep Reefs: Moderately broken rock with few Evechinus and Ecklonia.
- Cobbles: Drifts of small loose rocks and sand.
- Sand and Gravel: Gravel and sand of varying mixes

The Intertidal.

The intertidal region lies between high and low spring tide levels. Two habitat types predominate in the Marine Reserve.

- Boulder: Block boulder cover, usually on the higher shore, with common species being the anemone Actinia tenebrosa, limpets and crustaceans.
- Rock Platforms: On the High to Mid Shore levels common species include the barnacle Chamaesipho columna, with some oysters (Crassostrea glomerata). The Mid to Low Shore is dominated by an oyster belt and the tube worm Pomatoceros caeruleus. On the Lower Shore levels the red turfing alga, Corallina officinalis, is very abundant.
Fig. 2. Locations in the Reserve.

Fig. 3. Subtidal habitat types in the Reserve.
Class: DEMOSPONGIAE.

By far the largest group with 9500 known species, it includes 150 freshwater species. These sponges have a skeletal framework composed of siliceous spicules and/or spongin fibre. When both components are present, the spicules are usually connected by, or embedded in, spongin. Megascleres are usually monactinal or tetractinal (triaxites are present in only one subclass); microscleres are of diverse forms. Colouration is frequently brilliant due to pigment granules in the amoebocytes.

Subclass: CERACTINOMORPHA.

Spongin is an almost universal element of the skeleton, absent in one family, the Halisarcidae. Megascleres are always monactinal, diactinal, or rarely tetractinal; microscleres are generally sigmoid or chelate, never asterose. Reproduction is typically viviparous, many species are known to incubate parenchymella larvae.

The orders in this subclass are Dendroceratida, Dictyoceratida, Haplosclerida, Poecilosclerida, Halichondrida, Verongiida and Nepheliospongida.

Subclass: TETRACTINOMORPHA.

The orders in this subclass show some common features but may be reassigned in future. The incompleteness of knowledge, particularly of the Axinellida and Choristida, means that grouping of these sponges is difficult. Megascleres are tetractinal, diactinal or monactinal, either found together or separately, and are frequently triaenes. They are organised into a radial, axial or plumose pattern in the skeleton. Microscleres are most commonly asterose, sigmas and rhaphides also occur. Reproduction is typically oviparous with eggs being extruded and development taking place in the sea. Incubation has been recorded in one order.

The orders in this subclass are Axinellida, Hadromerida, Spirophorida, Choristida, Lithistida and Agelasida.

Subclass: HOMOSCLEROMORPHA.

This subclass is discussed in more detail in the text below.
Order: DENDROCERATIDA.

Encrusting or erect branching sponges with a prominent dendritic, fibrous skeleton. Living specimens usually have prominent conules. They occur intertidally and subtidally in tropical to polar seas.

The fibre skeleton originates from a basal attachment. The mesohyl is provided with few collagen fibrils: this, together with the small amount of spongin fibre relative to the flesh, makes these sponges soft and fragile.

Larvae are large incubated parenchymellae with a posterior tuft of long flagella.

Family: APLYSILLIDAE

Although frequently encrusting, members of this family may be massive, lobate, branching or lamellate with a dendritic skeleton of spongin fibres. The six genera have a worldwide distribution in both intertidal and subtidal habitats.

The genus Aplysilla is of encrusting form, up to 5mm thick with a conulose surface, and is often brightly coloured. Dendrilla species are upright branching forms, usually brightly coloured and fleshy, with a markedly dendritic skeleton. The genus Chelonaplysilla is of encrusting or lobate form with a conulose surface, and has a dermis marked by prominent sandy reticulation.
Aplysilla rosea (Barrois).

ORDER: Dendroceratida (Minchin)  FAMILY: Aplysillidae (Vosmaer).

COLOUR:
- EXTERNAL: Bright pink (R4/8).
- INTERNAL: Pink.
- IN SPIRIT: Dark brown.

SIZE, ETC. DESCRIPTION AS FOR Aplysilla sulfurea BELOW.

Aplysilla sulfurea (Schulze).

ORDER: Dendroceratida (Minchin)  FAMILY: Aplysillidae (Vosmaer).

COLOUR:
- EXTERNAL: Lemon yellow (rY8/10).
- INTERNAL: Yellow.
- IN SPIRIT: Dark brown.

SIZE:
Can cover up to a metre square, up to 1cm thick.

TEXTURE: Fleshy, slimy.

SHAPE: Encrusting.

DESCRIPTION: The smooth surface is raised in conules.

SKELETON: Spongion fibre with restricted branching.

HABITAT: Intertidal, subtidal.
Low tidal in shaded positions such as crevices, always submerge:
Found on steeply sloping reefs and canyon walls (60-90°), some
specimens have been observed on less steep slopes. The sponge i
generally found below 10m.

DISTRIBUTION: RESERVE: Deep Reefs subtidally. Intertidally found at Waterfall
Reef, Boulder Beach, Echinoderm Reef.
N.Z.: East and West Coast of the North Island.
Chelonaplysilla violacea (Lendenfeld).

ORDER: Dendroceratida (Minchin).  FAMILY: Aplysillidae (Vosmaer).

COLOUR:
EXTERNAL: Dark purple (pR2/6).
INTERNAL: Dark purple.
IN SPIRIT: Black.

SIZE:
Can cover 50cm x 50cm, 0.5 cm thick.

TEXTURE:
Firm, minutely corrugated.

SHAPE:
Encrusting.

DESCRIPTION:
Sandy reticulation is a prominent feature of the conulose surface, with an overall appearance of being minutely 'pin-pricked'.

SKELETON: Spongine fibre skeleton, diffuse architecture.

HABITAT:
Subtidal.
Found at a range of depths below 5m. Observed on boulders and solid reefs at all degrees of slope, however, it seems to occur mainly in shaded areas. It is a common sponge in caves and archways.

DISTRIBUTION:
RESERVE: Deep Reefs, Sponge Garden, Sediment Flats.
N.Z.: East and West Coast of the North Island, Nelson.
**Dendrilla rosea** (Lendenfeld).

**ORDER**: Dendroceratida (Minchin)  
**FAMILY**: Aplysillidae (Vosmaer).

**COLOUR**:
- **EXTERNAL**: Bright Pink (R4/6).
- **INTERNAL**: Pink.
- **IN SPIRIT**: Dark brown.

**SIZE**:
Can be up to 30 cm tall.

**TEXTURE**:
Fleshy, slimy.

**SHAPE**:
Erect and branching.

**DESCRIPTION**:
The smooth surface is raised in conules.

**SKELETON**: Spongine fibre. Loose, diffuse architecture.

**HABITAT**:
Subtidal.
Found on steeply sloping reefs and canyon walls (60-90°), generally below 10 m.

**DISTRIBUTION**:
**RESERVE**: Deep Reefs.
**N.Z.**: East and West Coast of the North Island.
Dendrilla sp.

ORDER: Dendroceratida (Minchin). FAMILY: Aplysillidae (Vosmaer).

COLOUR: EXTERNAL: Bright pink (R4/10).
INTERNAL: Pink.
IN SPIRIT: Dark brown.

SIZE: Up to 25cm tall.

TEXTURE: Fleshy, slimy.

SHAPE: Branching, 'tree-like'.

DESCRIPTION: Large amounts of mucus are produced when the sponge is removed from the water. Branches' fleshy covering can anastomose. Can be of large erect branching or complex lamellate form. Can be confused with Aplysilla rosea and Dendrilla rosea.

FIBRE: Spongin.

SKELETON: Spongin 'trees' arising from a basal plate. Subderma cavities correspond to the concave fields at the surface. Fibre branch repeatedly but do not anastomose. The fibres have no foreign coring material.

HABITAT: Subtidal.
Found most commonly inside vertical fissures between rocks, or on shaded rock walls below about 10m.

DISTRIBUTION: RESERVE: Canyons, Deep Reefs, North Reef.
N.Z.: North-east Coast.
Order : DICTYOCERATIDA.

Usually of massive, vasiform or digitate form; often with a conulose surface. Most species are compressible and 'spongy' to the touch. A few genera have thin collagen filaments in the matrix making the sponge tough and difficult to cut. The three families which comprise this order are found most abundantly in shallow tropical and subtropical waters, intertidally and subtidally. Beige or yellow are frequent colours.

Sand grains and other foreign material may be incorporated into the centre of the fibres within the reticulated, fibrous skeleton. The large primary fibres run at right angles to the surface, often to the tips of the conules. The secondary fibres (of medium width) are only sometimes cored. In a few genera, thin tertiary fibres are also found. The dermis may contain a layer of sand, and frequently has darker pigmentation.

Larvae are large incubated parenchymallae. At the posterior end a tuft of long flagella is found. A pigmented ring free of flagella occurs at each end of the larva.

Family : SPONGIIDAE

This family comprises 10 genera found intertidally and subtidally, mainly in warmer seas with a few polar species. It includes the commercial bath sponges. The sponges have a conulose surface and are compressible and resilient except when a sand cortex is present. Incorporation of sand grains, the spicules of other sponges, and other foreign matter into the fibres is not uncommon.

In the skeleton fibre reticulation is prominent. Fibres are homogenous in cross section and lack a diffuse central pith. The small flagellated chambers are 20-40μ in diameter. Collagen fibrils are not abundant in the mesohyl. There is a tendency toward a reduction or absence of primary fibres.

Characteristics of the genus Spongia are as follows: the upper surface is often grey to black and is finely and evenly conulose; very few primary fibres are present, the reticulation being mostly composed of secondary fibres which are not cored; no sand incorporated into the dermis.

Family : THORECTIDAE

Frequently tubular and stalked in form, these sponges from 15 genera are usually found in warmer waters, few extend into the polar regions. The surface may be conulose, or reinforced with foreign materials and ridged.

Fibre reticulation of the spongilla skeleton is prominent. Some genera possess coarse collagen filaments in the mesohyl.

Ircinia species are extremely tough, often orange internally and black or orange externally, with a conulose surface. Many species have a characteristic (fetid) smell when fresh. They are quite common on soft bottom habitats. The primary fibres are fasciculated. Additional characteristics of the genus are numerous long, thin, collagenous filaments with knobbed ends which are freely dispersed.

Family : DYSIDEIDAE.

The three genera are found intertidally and subtidally, mainly in warm waters, though some species occur in temperate and polar waters. The conules vary from large and irregular to fine and evenly spaced.

The fibres are homogenous in section but do not form the massive, tough skeletons characteristic of the Spongillidae. There are relatively few collagen fibrils in the mesohyl.
Ircinia novaezealandiae (Bergquist).

ORDER: Dictyoceratida (Minchin). FAMILY: Thorectidae (Bergquist).

COLOUR:
EXTERNAL: Blackish (R-YR2/2).
INTERNAL: Dark grey (rY8/4).
IN SPIRIT: Grey.

SIZE:
10cm x 10cm, up to 2.5 cm high.

TEXTURE:
Firm but compressible, tough.

SHAPE:
Encrusting.

DESCRIPTION:
An irregularly conulose surface. Oscules are small, 1-2mm in diameter, and few in number. This sponge is often encrusted with bryozoans, other sponges and seaweed.

FIBRES: Vary from 0.02mm to 1.0mm in diameter.

SKELETON: Composed of reticulated fibres showing differentiation between ascending and connective fibres. Foreign material is occasionally present, sometimes filling the entire fibre. Collagenous filaments (0.004mm in diameter) are not common.

HABITAT:
Subtidal.
Canyon Walls, Rock Flats, on slopes ranging from horizontal to approximately 75°.

DISTRIBUTION:
Ircinia sp.

ORDER: Dictyoceratida (Minchin). FAMILY: Thorectidae (Bergquist).

COLOUR:
- EXTERNAL: Grey (Y4/2).
- INTERNAL: Pale grey (Y8/4).
- IN SPIRIT: Grey.

SIZE:
- Up to 20cm high, cup width 15cm.

TEXTURE:
- Hard, difficult to cut, rough surface.

SHAPE:
- Stalked, cup-shaped.

DESCRIPTION:
- Stalked horny sponge with a distinctive, unpleasently pungent smell. Older specimens form a cup.
- SKELETON: A spongine skeleton with collagen filaments running through it. The spongine fibres contain detritus.

HABITAT:
- Subtidal.
- Deep reef areas. It is commonly found on the sides of large boulders or on shaded or steeper slopes of the reef, often near Ecklonia stands.

DISTRIBUTION:
- RESERVE: Not common, but occurs at North Reef, Canyons, Splendi Reef, Sponge Garden.
- N.Z.: North-east Coast.
Psammocinia sp.

ORDER: Dictyoceratida (Minchin).  FAMILY: Thorectidae (Bergquist).

COLOUR:
- EXTERNAL: Dark grey (rYR2/2).
- INTERNAL: Off-white to brown (rYR6/2).
- IN SPIRIT: Grey.

SIZE:
Commonly 25 cm x 15 cm; up to 10 mm thick.

TEXTURE:
Smooth and leathery, slightly compressible.

SHAPE:
Massive.

DESCRIPTION:
Forms into ridges and lumps. Oscules are situated along ridges and are of uniform shape up to 1 mm in diameter.

SKELETON: Fine filaments run through the sponge as well as spongin fibres. In addition to a thick cortex there is a great deal of sand in the fibres. Check for large flagellated chambers as this characteristic, plus the presence of filaments, enables the sponge to be distinguished from Dysidea specimens.

HABITAT:
Subtidal.
On ridges or areas of moderate water movement with a slope of less than 60°.

DISTRIBUTION:
- RESERVE: Throughout the Reserve.
- N.Z.: East coast and New Plymouth.
Order: HAPLOSCLERIDA.

This order contains many large ramose, digitate, or encrusting forms. Identificatory characteristics are a fibrous nature, simple spiculation and, in many species, the appearance of lacking flesh. Organisation into families is difficult as the simple structure provides few diagnostic characteristics. Overall shape can be variable within many species.

Haplosclerid sponges have a well developed reticulate skeleton of spongins fibres, which often completely envelopes the spicules. A distinct tangential dermal skeleton (spicule or fibre) is developed in some families.

Megascleres are oxeas and strongyles. Microscleres are microxeas, sigmas and toxas which are frequently absent from individuals in a population and vary greatly in abundance from specimen to specimen.

Larvae are incubated parenchymellae with a bare posterior pole often fringed by a ring of long cilia and pigmented.

Family: HALICLONIDAE.

Encrusting, massive, branching or tubular in shape. This family includes some of the most widely distributed and common genera of shallow water sponges. These sponges have an ispdctic or rectangular mesh skeleton in which the spicules are always consolidated by spongins, either in the form of fibres or at the junction of spicule meshes. The spongins can become much more prominent than spicules in the skeleton.

Spicules are of uniformly small size, with microscleres typically absent. Parenchymella larvae are either completely and uniformly flagellated or have a bare posterior cap fringed by longer flagella, with or without a bare anterior cap.

The genus Haliclona has spicules of a single size category, usually oxeas. Some species have a predominantly fibrous skeleton with small incorporated diactines, as do some Callypoongia species.

Family: CALLYSPONGIIDAE.

Callypoongids are ramose (upright or repent) tube-shaped, massive, or encrusting. The surface may be raised in conules or ridges. Found around the world, they occur from intertidal mangrove habitats to subtidal depths.

All species have a predominant spongins skeleton (which may incorporate debris instead of spicules) and only sparse fleshy tissue. The diagnostic feature is the presence of a superficial fibrous skeleton arranged tangentially. This dermal reticulation can have a regular structure with primary, secondary and tertiary elements.

Megascleres are oxeas or strongyles which are usually enclosed within the spongins fibres, some genera lack spicules entirely. Microscleres, where present, are sigmas or toxas.

Callypoongia is a large genus which always has spicules present. Some species have a predominantly fibrous skeleton with small incorporated diactines, as do some Haliclona species. Dactylia species have no spicule content, the fibres instead contain an axial core of sand or spicule fragments, the superficial reticulation is always marked and regular.
Family: ADOCIIDAE.

All the sponges in this family have a tangential dermal skeleton. Many species have skeletons which emphasise the spicules rather than the fibres, thereby making them crisp or brittle in texture.

The spicules have an isodictygal arrangement, frequently in polyspicular tracts.

Oxeas and strongyles are the most common megascaleres and they can occur in a range of sizes within any one sponge, being located in discrete regions. Microscleres, when present, are sigmas and toxas, occasionally including microxenas.

Species of the genus Adocia are usually low and encrusting, occasionally tubular or lamellate, with a soft texture and are easily torn. Fibre cementing the isodictygal spicule mesh is a common pattern of Adociid skeletons.
Callyspongia latituba (Dendy).

ORDER: Haplosclerida (Topsent). FAMILY: Callyspongiidae (de Laubenfels).

COLOUR:
- EXTERNAL: Mauve (pRP6/2).
- INTERNAL: Mauve.
- IN SPIRIT: Pale brown.

SIZE:
30cm to 40cm tall.

TEXTURE:
Soft, very compressible.

SHAPE:
Branching, tube shaped fingers.

DESCRIPTION:
Branching from a solid stalk, the tube-like fingers have wide openings. Each tube wall is about 2.5mm thick. The outside surface is smooth and finely granular and the interior surface is covered with numerous minute apertures.

SPICULES: Megascleres - Oxeas (40u) short and straight, sometimes slightly curved.

SKELETON: A thick rectangular reticulation of fibres containing variable densities of spicules forms the skeleton. A web of spicules covers the surface.

HABITAT:
Subtidal. Occurs most commonly on shallow open rock flats which are predominantly covered in encrusting coralline algae (7-13m).

DISTRIBUTION:
RESERVE: Okākari Point.
N.Z.: North-east Coast.
**Callyspongia ramosa** (Gray).

**ORDER**: Haplosclerida (Topsent)  
**FAMILY**: Callyspongiidae (De Laubenfels).

**COLOUR**:
- **EXTERNAL**: Mauve (rRP6/4), pale grey with a pink tinge, or pale yellow; whitish tips.
- **INTERNAL**: Same as external.
- **IN SPIRIT**: Dull yellow to fawn.

**SIZE**:
Can stand up to 1m high, usually 20cm to 40cm high, the fingers can be up to 1.5cm at their widest but are usually 6mm - 8mm in diameter.

**TEXTURE**:
Rough, flexible fingers; compressible. The compressibility can vary, as it depends on the amounts of sand present.

**SHAPE**:
Finger sponge.

**DESCRIPTION**:
The fingers are compressed in one plane and arise from a large basal stalk. The fingers can be cylindrical or flattened. Osicles are generally flush with the surface. Osicles are usually arranged in a linear series along the margins of the fingers when located in high current areas, low current areas promote a random scatter over the surface. **Callyspongia ramosa** is occasionally found in an encrusting form with tall digitate or vasiform oscular processes. It is one of the most common offshore shallow-water sponges and the skeleton is often seen washed up on beaches. Growth form is influenced by the strength of the water current.

**SPICULES**: Megascleres - Oxeas (50 - 70u)  
Microscleres - Absent in most New Zealand specimens though toxas can occur.

**SKELETON**: Variable. Predominantly a fibre skeleton with a spicule skeleton. Typically this sponge has a rectangular reticulation of primary (multispicular) and secondary (unispicular) fibres, with a condensation of secondary fibres near the surface. The thickness of the fibres varies with the amount of spongin. The surface membrane is smooth and supports a web of spongin fibre with encased spicules.

**HABITAT**:
Subtidal.  
Commonly found on canyon ridges and reef edges, on rock promontories and on deep sediment flats where there is little sediment. The plane of the fingers is perpendicular to the direction of water movement.

**DISTRIBUTION**:
**RESERVE**: Common at Deep Reefs, also found at Sponge Garden.  
N.Z.: Spirits Bay, the Three Kings, the Offshore Islands, the Hauraki Gulf, Bream Head, Cape Brett, Cook Strait, Chatham Rise, Foveaux Strait, Carnley Harbour, Perserverence Harbour, Colville Channel, Mernoo Bank.
Order: POECILOSCLERIDA

The largest and most diverse order of Demospongiae, it is composed of 12 families which are found in all seas in both intertidal and subtidal habitats. Sponge form ranges from arborescent to massive or encrusting; deep-sea species may have unusual forms adapted to live in soft substrates.

The skeleton is always a combination of spicules and spongian fibre. It can be complex, with different categories of megascleres in the euctome and endosome; acanthostyles frequently echinate the spongian fibres, which in turn enclose megascles of another type.

Megascleres are varied but are usually chelate, sigmoid or toxiform. Megascleres are monactines or diactines with many variants, spiny spicules are common.

Parenchymella larvae are incubated, have a bare posterior pole, and sometimes have differential pigmentation on the poles. The larvae swim in counterclockwise rotation in contrast to most other Ceractinomorph larvae.

Family: BIEMNIDAE

Biemnid sponges are of encrusting, massive, cup-shaped, flabellate, clavate or branching form. They are widely distributed around the world from shallow to deeper waters.

The skeleton is of smooth styles organised into plumoreticulate tracts with small to moderate amounts of spongian. Occasionally, stalked lamellate forms show some axial condensation.

Megascleres are diverse and abundant, including sigmas, toxas, microxeas, and sometimes siliceous spheres and commas. Up to four types may occur in one species.

Family: MYXILLIDAE

Shape is encrusting, massive, digitate, or lobate. These sponges are found in intertidal and subtidal habitats.

The skeleton is of regular reticulate tracts of smooth or spined styles which may have additional echinating acanthostyles.

Megascleres are most frequently arcuate isochelae and sigmas.

The genus Iophon is often bright orange in colour; turning a dark brown a short time after being removed from the water. Megascleres are tornotes and acanthostyles. Microscleres are anisochelae and bipocilli.

Family: PSAMMASCIDAE

These sponges have a mineral and fibre skeleton which is reduced to varying degrees, being replaced with sand and spicule debris.

The genus Chroondropsis has numerous species which are often massive or lamellate. Megascleres are diactines, usually strongyles, and microscleres are sigmas. Psammopemmona species are sponges of hard texture with no true spicules, the fibres being filled with sand grains and foreign spicule fragments.
Family: CLATHRIIDAE

These sponges are of encrusting, lobate, arborescent or flabellate shape. They form an abundant, widely distributed family, found in intertidal and subtidal habitats.

The skeleton is composed of styles or acanthostyles as principal spicules. These are organised into tracts which include varying quantities of spongin, and support echinating acanthostyles. Accessory ectorosal spicules are also styles, usually finer than those in the endosome.

No diactinal megascleres are found, and microscleres are palmate isochelae and toxas.

The many species of Clathria are erect branching or lamellate sponges, which are often red in colour. Ophthitaspongia species can be encrusting to lamellate. The echinating spicules have only a few small spines, and so are very similar to those inside the fibres. Microciona species are encrusting or ramose forms. The megascleres are usually basally spined styles, smooth styles and acanthostyles. Microscleres are usually one or two sizes of palmate isochelae, and long toxas which may be wavy.

Family: DESMACIDONIDAE

These sponges have a plumoreticulate skeleton.

Megascleres are diactinal and of uniform type throughout the sponge. Microscleres can be sigmoid or chelate, sometimes of curious form.

The genus Desmacidon has oxes for megascleres and microscleres are toothed isochelae.

Family: CRELLIDAE

Crellids are massive, clavate or branched. They are widely distributed in the world's oceans from the shallows to deeper subtidal habitats.

The principal skeleton of diactinal megascleres is arranged in plumose or plumoreticulate fibrous tracts, often echinated by acanthostyles. The surface crust is a dense layer of tangentially orientated acanthostyles.

Microscleres are arcuate isochelae and sigmas, anisochelae are included rarely.

Crella species have acanthostyles and oxes for megascleres, and toothed isochelae and sigmas as microscleres.

Family: ANCHINOIDAE

Mostly encrusting to massive sponges found from shallow waters to deeper subtidal habitats in a wide distribution around the world.

The endosomal skeleton is formed of plumose to plumoreticulate columns of diactinal spicules echinated by smooth or spiny styles. Ectorosal spicules are diactines, often the same type as those found in the ectosome. There is no dermal crust and spongion fibres are not a major skeletal component; these negative features distinguish this family from Crellidae.

Microscleres are isochelae and sigmas.
Family: MYCALIDAE

Encrusting, massive, cup-shaped and lobate forms have been recorded in tidal waters and subtidal habitats. Ostia are sometimes confined to a reticulum of grooves on the sponge surface.

This family has a plumoreticulate spicule and fibre skeleton. Megascleres are styles or subtylostyles. Microscleres always include anisochelae, and may have up to seven types of sigmas, toxas, rhaphides and isochelae within one species.

The genus *Mycale* is distinguished by anisochelae usually with smooth sigmas. Some species produce a large amount of mucus.

Family: HYMEDESMIIDAE

These are encrusting sponges distributed around the world in intertidal and subtidal habitats. The surface frequently has specialised oscule and pore areas - they may be on papillae, or ostia may be grouped over the subdermal cavities.

Choanosomal spicules are vertically orientated acanthostyles attached to the base by spongins. Smaller acanthostyles stand on end amongst these. Microscleres are arcuate or unguiferate isochelae and sigmas. Other additional microscleres help characterise the genera.

Family: TEDANIIDAE

Mostly encrusting to massive, these sponges are found in all seas intertidally and subtidally. They are often red, orange or black. Almost all species can cause skin rashes.

The endosomal skeleton of styles is organised into plumoreticulate tracts. Ectosomal megascleres are diactines, usually tyloctes. There is no surface crust of spicules.

Microscleres are onychaetes, and megascleres are a mixture of diactines and monactines.
Biemna sp.

ORDER: Poecilosclerida (Topsent).  FAMILY: Biemnidae (Hentschel).

COLOUR:
- EXTERNAL: Purple (P-RP3/2).
- INTERNAL: Dirty yellow (YR-Y6/8).
- IN SPIRIT: Brown.

SIZE:
Patches of up to 20cm x 20cm, 2cm thick.

TEXTURE:
Soft and velvet-like.

SHAPE:
Massive with turrets.

DESCRIPTION:
Often the only visible portion in sandy areas is the protruding oscular tubes, which have a shaggy appearance at the tips.

SPICULES:
- Megascleres - Oxeas (400μ).
  - Styles (400μ).
  - Microscleres - Sigmas (50μ).
  - Microxeas (50μ).

SKELETON:
Tracts of dense megascleres lie perpendicular to the surface. The spicules echinate. Microscleres are abundant throughout the sponge.

HABITAT:
Subtidal.
Sandy areas or near turfing algae. It is often observed at the base of a boulder or ledge on flat regions of the reef, and seems to be most common below 8m.

DISTRIBUTION:
RESERVE: Sponge Garden, Outer Sponge Garden, Waterfall Reef, Sediment Flats, Okakari Point.
N.Z.: North-east Coast.
Iophon minor (Brøndsted).

ORDER : Poecilosclerida (Topsent).  FAMILY : Myxillidae (Topsent).

COLOUR :  EXTERNAL : Bright yellow (YR-Y7/10).
          INTERNAL : Dull yellow.
          IN SPIRIT : Purple.

SIZE :  Up to 30 cm high, can cover an area 50 cm square.

TEXTURE : Compressible; flexible, rough to the touch.

SHAPE : Irregularly branching.

DESCRIPTION : Sponge branches irregularly, anastomoses.

SPICULES : Megascleres - Tylotes (100u).
           Microscleres - Anisochelae (15u).
           Bipocilli (8u) rare.

SKELETON : A regular construction of spicule fibres perpendicular to the surface and linked by spicules in a rectangular pattern.

HABITAT : Subtidal.
          Deep, sloping reefs, usually in areas clear of macroalgae. Often located on shaded ridges.

DISTRIBUTION : RESERVE : Deep Reefs, Canyons.
                N.Z. : North Island and Nelson.
**Chondropsis kirkii** (Dendy).

**ORDER**: Poecilosclerida (Topsent).  
**FAMILY**: Psammascidae (de Laubenfels).

**COLOUR**:
- **EXTERNAL**: Apricot-grey (YR7/6).
- **INTERNAL**: Grey.
- **IN SPIRIT**: Yellowish-grey.

**SIZE**:  
Up to 8cm high.

**TEXTURE**:  
Soft, compressible but resilient.

**SHAPE**:  
Massive, sometimes with fat 'fingers'.

**DESCRIPTION**:
Low form. Short, fat fingers on a thick base, or can tend towards a crest-like lamellate form. The pores are located mainly on the elevated portions.

**SPICULES**: Megascleres - Strongyles (150u) straight, more robust in form towards the surface.  
Microscleres - Sigmas (15u) slender, small.

**SKELETON**: A diffuse array of spicule and sand particles which are frequently arranged in loose tracts running perpendicular to the sponge surface.

**HABITAT**:
Subtidal.  
Occurs on relatively flat, deep reef areas which are covered in medium to fine grained sediment about 2cm deep.

**DISTRIBUTION**:
- **RESERVE**: Sponge Garden, North Reef.  
- **N.Z.**: Spirits Bay, North Cape 20-40m; West coast of the South Island.
Axociella sp.

ORDER : Poecilosclerida (Topsent).  FAMILY : Clathriidae (Hentschel).

COLOUR :
EXTERNAL : Bright red (R4/14).
INTERNAL : Red.
IN SPIRIT : Dark brown.

SIZE :
Small patches up to 10cm in diameter, 2cm thick.

TEXTURE :
Very firm, fibrous.

SHAPE :
Encrusting.

DESCRIPTION :
Lumpy sponge with prominent oscules. The surface appears smooth and the borders are rounded.

SPICULES : Megascleres - Styles (300u).
- Tylostyle (300u) few.
Microscleres - Toxa
- Isochela (20u).

SKELETON : The styles form tracts perpendicular to the surface and are linked by a few styles lying tangentially to the main column. At the surface, the styles radiate from the tract and protrude about a third of their length. Microscleres seem to be associated with areas between the main spicule columns.

HABITAT :
Subtidal, below 10m.
Located on gently sloping reefs (10-40°) which are free of sediment and turfing algae.

DISTRIBUTION :
RESERVE : Not abundant, Deep Reefs.
N.Z. : North-east Coast.
Tetrapocillon novaezealandiae (Brøndsted).

ORDER: Poecilosclerida (Topsent).  FAMILY: Desmacidonidae (Gray).

COLOUR:  EXTERNAL: Jet black (rrp2/2).
           INTERNAL: Yellow (yr-y4/4).
           IN SPIRIT: Interior darkens.

SIZE: Mats up to 50cm x 50cm, 5mm to 10mm thick.

TEXTURE: Soft, slightly compressible.

SHAPE: Encrusting to massive.

DESCRIPTION: Smooth, irregular surface, velvety appearance.

SPICULES: Megascleres - Styles (250u).
          Microscleres - Isochelae (10u).
          - Bipocilli (37u).

SKELETON: The ectosomal region is disorganised. Toward the
dermal layer spicules become increasingly orientated at right
angles to the surface, and form loose tracts. Spicules protrude
up to a third of their length through the dermal membrane.

HABITAT: Intertidal, subtidal down to 13m.
Found in shaded positions, caves, under rock ledges and boulders,
usually submerged in low tidal situations. Subtidally, it is
found on smooth rock slopes 20-60°.

DISTRIBUTION: RESERVE: Waterfall Reef, Okakari Point, common.
               N.Z.: Takatu Peninsula, Poor Knights.
**Crella incrustans** (Hallmann).

**ORDER**: Poecilosclerida (Topsent).  **FAMILY**: Crellidae (Hentschel).

**COLOUR**:
- EXTERNAL: Brilliant red (yR5/2).
- INTERNAL: Dull red.
- IN SPIRIT: Brown.

**SIZE**:
Commonly in mats 30cm x 30cm.

**TEXTURE**:
Firm.

**SHAPE**:
Thick encrusting mat.

**DESCRIPTION**:
Smooth, irregular surface. Thickness can vary from a uniform spread of up to 2cm thick, to the formation of random lamellate projections up to 8cm high and 1.5cm thick.

**SPICULES**: Megascleres — Oxea (160u).
- Tornotes (160u).
- Acanthostyles (100u).
**Microscleres** — Isochelae (15u).

**SKELETON**: Tornotes are arranged into fibres which run through the sponge but do not pierce the dermal membrane. Large acanthostyles echinate the fibres and are found throughout the endosome, smaller ones are located at the dermal membrane.

**HABITAT**:
Intertidal, subtidal.
Under rock ledges in low tidal locations. Found subtidally on a wide range of slopes, generally on ridges or in areas of increased water movement.

**DISTRIBUTION**:
RESERVE: Boulder Beach, Echinoderm Reef, common. Splendid Reef, Canyons in particular, found throughout the Reserve.
N.Z.: On the East coast of New Zealand, and New Plymouth.
Order: HALICHONDРИDA

This order is divided into two families, both of which have representatives in the Marine Reserve.

The deeper parts of the skeleton show no organisation into fibre or spicule tracts. The superficial skeleton is ordered into a tangential dermal skeleton that is sometimes supported by ecosomal spicule brushes.
Megascleres are oxeas, styles or strongyles in many combinations.
Microscleres are absent.
Parenchymella larvae are ciliated over their entire surface.

Family: HYMENIACIDONIDAE

These sponges are of encrusting or massive form; the latter may bear erect processes. Distributed around the world, they are found in both intertidal and subtidal habitats. The surface is hispid with projecting subsurface spicules.

These sponges frequently show surface and ecosomal skeletal organisation, with spicule brushes that protrude beyond the surface. The endosomal skeleton has no organisation.

Spicules are predominantly smooth styles with oxeas as accessory spicules in some cases.

The major genus *Hymeniacidon* has only styles as spicules.

Family: HALICHONDРИDAE

Encrusting to massive specimens, found from the intertidal zone to subtidal regions around the world.
A marked system of subdermal cavities distinguishes the ordered dermal skeleton from the confused endosomal skeleton.

The principal megascleres are oxeas; only rarely are accessory styles present.

The genus *Halichondria* is in part distinguished by having no ecosomal spicule brushes. *Ciocalypta* has a dense dermal skeleton with a marked ecosomal skeleton, is frequently found on sandy bottoms, and has a massive base with digitate oscular projections or, more rarely, has a stalked, lamellate shape.
**Hymeniacidon hauraki** (Brøndsted).

**ORDER:** Halichondrida (Topsent).  
**FAMILY:** Hymeniacidonidae (de Laubenfels).

**COLOUR:**  
EXTERNAL: Pale orange to orange (R-YR6/10).  
INTERNAL: Orange.  
IN SPIRIT: Pale dull orange.

**SIZE:**  
Up to 10 cm high, 15 cm in diameter.

**TEXTURE:**  
Soft, fleshy.

**SHAPE:**  
Massive sponge.

**DESCRIPTION:**  
The body has finely serrated conulose processes giving a jagged appearance. The sponge produces great quantities of mucus when cut.

**SPICULES:** Megascleres - Styles (700μ).

**SKELETON:** The endosomal skeleton is a confused mass of styles slightly organised into ascending tracts. The dermal membrane (1 mm thick), is raised by the conules. Each conule has a core of 1-10 styles which pierce the tip.

**HABITAT:**  
Subtidal.  
Deep reef flats where sand levels do not exceed 15 cm. Found most commonly in areas of coarse sand or shell.

**DISTRIBUTION:**  
RESERVE: Common at Sponge Garden and Waterfall Reef.  
N.Z.: Kawau Island, Takatu Point.
Ciocalypta penicillus (Bowerbank).

ORDER : Halichondrida (Topsent).  FAMILY : Halichondridae (Vosmaer).

COLOUR :
- EXTERNAL : Pale yellow (YR-Y8/8).
- INTERNAL : Yellow.
- IN SPIRIT : Greyish-white.

SIZE :
- In patches up to 20 x 20 cm, the turrets are up to 5 cm high.

TEXTURE :
- Firm, minutely hispid. The base is firm but compressible, the turrets are very crisp and delicate.

SHAPE :
- Massive base with numerous, tall oscular projections.

DESCRIPTION :
- Sometimes worn down by the movement of sand. The surface is patterned with small irregular lumps which have grooves between them; this is more obvious on the turrets than on the base. Turret grooves may be up to 3 mm high, with 4-6 ridges on each turret giving a star-shaped section.

SPICULES :
- Megascleres - Styles in a wide size range.
  - Oxeas (500u) always curved.

SKELETON :
- Composed of dense columns of styles curving towards the surface, in the turrets these form a nearly solid axial core. The columns are obscured by spicules around and across them, chiefly oxeas and smaller styles. The dermal layer is composed of a dense, felted layer of oxeas.

HABITAT :
- Subtidal.
- Found in crevices which are often filled with muddy sand and shell deposits. Can operate under conditions of partial anaerobiosis.

DISTRIBUTION :
- RESERVE : Waterfall Reef, Outer Sponge Garden, Sponge Garden.
- N.Z. : Bay of Plenty, Colville Channel, Waiheke Island.
Order: AXINELLIDA.

Axinellid sponges assume a variety of shapes: branching, tree-like forms are common; other forms are massive, encrusting, fan- or funnel-shaped. Flabellate forms have inhalant pores on one surface and oscules on the reverse, while funnel-shaped species have the inhalant pores on the outer edge and the oscules open into the centre of the funnel. The texture is at least slightly compressible when a specimen is alive, and the spicules are always discrete units. The sponge surface is rough, hispid or furry, with projecting subsurface spicules. These sponges are characteristically fibrous, with either axial or basal concentration of spongia. Nine families are found in tidal and subtidal waters.

The spicule and fibre skeleton is condensed into a stiff axis from which a softer extra-axial skeleton diverges. This can be plumose or plumoreticulate and can be reinforced with spongia fibre. Zonation of the spicule categories in the sponge is a great aid in identification of Axinellida.

Spicules are often sinuous, curved, or irregular at one end. Megascleres are monactinal—oxeas, styles or strongyles in all combinations. Microscleres are often absent, but particular types categorize some families; raphides and microxeas are the most common, asterose and sigmoid forms occur, as do several unique forms.

In the few species where reproductive processes have been observed, Axinellids are oviparous and produce parenchymella larvae.

Family: AXINELLIDAE.

These sponges are frequently branching in form, but funnel-shaped, flabellate, tubular and massive forms also occur. They are found in a wide range of habitats from the tropics to the polar regions, in tidal and subtidal locations.

The main skeletal tracts are composed of megascleres enclosed in spongia fibres. The megascleres are smooth and can be monactinal, diactinal or both. Microscleres other than raphides are absent.

The genus Axinella is often digitate, with megascleres composed of styles, sometimes with oxeas. Phakellia species are usually flabellate and the megascleres are long, often flexuous strongyles. Acanthella species have a pronounced fleshy ectosome and flexed strongyles.

Family: RASPAILLIDAE.

These sponges are erect and branching, encrusting, or (rarely) massive. They are found in habitats ranging from shallow water to deeper subtidal regions.

Radial or plumose fibres extend from the (usually) condensed axis to the surface where long, terminal, projecting spicules occur. Echinating acanthostyles or rhabdostyles are found where the dermal spicule brushes (usually fine styles grouped around a long central style) supplement the skeleton. In some species the axial fibres are not noticeably condensed.

The major spicules are styles and oxeas. The minor spicules (rhabdostyles and acanthostyles) may be small, but true microscleres are absent.

The genus Raspaillia is composed of erect, ramifying, digitate sponges, often brown or orange. A dense spicule and fibre axis supports extra-axial spicule tracts which in turn support echinating accessory spicules. A special dermal skeleton is present, surrounding all parts where the extra-axial tracts pierce the surface.
Family : EURYPONIDAE.

Distributed around the world in subtidal habitats, these sponges are of encrusting form.
The principal megascleres have their bases fixed in a basal spongin plate. Ectosomal spicules are grouped in bouquets around the major ones. In some species, plumose columns of spicules arise from the base of the sponge. Megascleres are usually monactines with shorter, accessory acanthostyles. Microscleres are raphides, sigmas or (rarely) unguiferate chelae.

Family : DESMOXYIDAE.

Encrusting, massive or ramose sponges with a wide distribution around the world ranging from shallow waters to deeper subtidal depths. Megascleres are found in widely spaced multispicular fibres bearing little spongin, or show some axial condensation with extra-axial plumose fibres bearing small to moderate amounts of spongin. Microscleres are smooth or spined microxeas, often bent centrally; in addition raphides may be present either singly or in bundles.

Family : TRACHYCLADIDAE.

This family is represented by one genus of branching or massive form, found subtidally. The soft tissues tend to be crowded with short filaments of a blue-green alga, which is said to give these sponges their characteristic bright scarlet colour in life. Oscules 1 mm in diameter are scattered singly or grouped.
The skeleton consists of axially condensed, reticulate spicules enclosed in spongin. Megascleres are styles or a mixture of oxeas and strongyles. Microscleres are of extremely contort spiraster type, sometimes with additional short strongylote rhabds.
Axinella sp. (A).

ORDER : Axinellida (Bergquist)  FAMILY : Axinellidae (Ridley and Dendy).

COLOUR :
  EXTERNAL : Orange (1YR6/14).
  INTERNAL : Orange.
  IN SPIRIT : Fawn.

SIZE :
  Up to 35cm high, fingers 1cm in diameter.

TEXTURE :
  Flexible.

SHAPE :
  Branching with a single stalk.

DESCRIPTION :
  Cylindrical branches lie in one plane, orientated into a fan at right angles to the current. The branches are long and slender, branching is usually dichotomous. The stipe is always short. When dry the sponge has a hispid appearance due to projecting spicules.

SPICULES :
  Megascleres - Styles, slightly curved: large (300u); small (150u).
  - Oxeas (150u) slightly flexed, relatively rare.
  Microscleres - Absent.

SKELETON :
  The axial skeleton is comprised of a core of interlacing spongin fibres cored with styles and occasionally oxeas. Further fibres radiate from the axis to the surface. These fibres contain styles and are linked by spongin fibres in a semi-recticate pattern. Tufts of styles terminate these fibres and project up to half their length from the dermal membrane.

HABITAT :
  Subtidal.
  Deep reef flats, generally in the open. Not found where sediment levels are deeper than 1.5cm.

DISTRIBUTION :
  RESERVE : Abundant at Sponge Garden.
  N.Z. : North-east Coast.
Axinella sp. (B).

ORDER: Axinellida (Bergquist).  FAMILY: Axinellidae (Ridley and Dendy).

COLOUR:
EXTERNAL: Yellow-orange (rYR6/10).
INTERNAL: Yellow-orange.
IN SPIRIT: Pale yellow-brown.

SIZE:
Stands about 8cm high, crown diameter 8cm. Stalk 2-3cm high, 1.5cm thick.

TEXTURE:
Slimy and soft to touch, only slightly compressible.

SHAPE:
Short, 'knobbly' fingers branch from a thick stalk.

DESCRIPTION:
Frequently pock-marked (fish bites and sand scouring damage to the surface). Irregular array of short branches.

SPICULES: Megascleres - Styles (300u) curved.
          Oxeas [(300u) curved.
          Strongyles (250u) slightly curved.

SKELETON:
Spicules are loosely arranged in tracts with some transverse layers of spicules forming a 'latticework' in the sponge matrix. Styles tend to radiate from the tracts but don't pierce the pinacoderm.

HABITAT:
Subtidal.
Deep reefs; occurs in areas of coarse sand 1-2cm deep on a rock base.

DISTRIBUTION:
RESERVE: Outer Sponge Garden, not common.
N.Z.: Leigh.
**Homaxinella erecta** (Brøndsted).

**ORDER**: Axinellida (Bergquist).  
**FAMILY**: Axinellidae (Ridley and Dendy).

**COLOUR**:
- **EXTERNAL**: Dull yellow (YR6/10).
- **INTERNAL**: Dull yellow.
- **IN SPIRIT**: Yellow-white or grey.

**SIZE**:
Up to 20cm long with a diameter of up to 4cm.

**TEXTURE**:
Firm and flexible, with a very finely hispid surface.

**SHAPE**:
An erect sponge, often with only one 'finger'.

**DESCRIPTION**:
A ramose, cylindrical form; it may have thin whip-like branches. The lower basal area often appears to lack a tissue covering. The sponge is nearly always attached to a shell, commonly *Tawera spissa* or *Atrina zelandica*.

**SPICULES**: Megascleres - Styles.  
- Subtylostyles.  
  Both 200-700μ long, usually straight, wavy or curved forms common in the axial region.

**SKELETON**: Axial endosomal region composed of a dense mass of spicules organised into interlocking fibres. Spicule tracts curve outwards from the central axis to a subdermal position where they merge with a thin dermal layer. Spongic elements are present, surrounding the central fibres.

**HABITAT**:
Subtidal.  
Observed on deep reef flats covered with no more than 1cm of fine sand.

**DISTRIBUTION**:
**RESERVE**: Sponge Garden.  
**N.Z.**: East Cape.
Pararaphoxya n.sp.

ORDER: Axinellida (Bergquist).  FAMILY: Axinellidae (Ridley and Dendy).

COLOUR:  EXTERNAL: Orange (rYr6/14).
          INTERNAL: Orange.
          IN SPIRIT: Grey.

SIZE:    Up to 20 cm high, fingers 1 cm diameter.

TEXTURE: Flexible; hispid and pitted surface.

SHAPE:   Branching.

DESCRIPTION: Branches are terminally bifurcated and cylindrical in section; the tips are generally tapered to a point. Some branches anastomose. Oscules form stellate patterns on the branches. Stipe is short and thick.

SPICULES: Megascleres - Oxeas (250-700u) stout, flexed.
          - Styles (300u) less abundant than oxeas.
          - Strongyles (700u) abundant, fine.

SKELETON: Axial core of interwoven spicules (strongyles and styles) makes up three-quarters of each branch's diameter. Ectosomal spicules are oxeas with some styles. The extra-axial region is not densely packed with spicules. The dermal membrane is very fine and broken over most of the surface giving the ectosomal skeleton its hispid character.

HABITAT: Subtidal.
          Deep open reef flats where there is no more than 1 cm medium grained sediment lying over the rock base.

DISTRIBUTION: RESERVE: Abundant at Sponge Garden.
              N.Z: Leigh.
Phakellia dendyi (Bergquist).

ORDER : Axinellida (Bergquist). FAMILY : Axinellidae (Ridley & Dendy).

COLOUR : EXTERNAL : Bright orange-red (yR5/12).
INTERNAL : Dull orange.
IN SPIRIT : Pale yellow to chocolate brown.

SIZE : Stands up to 20cm high.

TEXTURE : Tough, flexible texture; hard stalk.

SHAPE : Fan-like.

DESCRIPTION : Fan, raised on a short stalk. The surface is very conulose with a fleshy appearance. Between the firm conules the surface is smooth. Spicules project through the membrane only near the tips of conules and on the hispid stalk.

SPICULES : Megascleres - Strongyles (1000u) of variable length and diameter, occasionally with stylote modifications.
- Styles (400u) usually slightly curved.
- Oxeas (400u) Can be rare in specimens, either straight or slightly curved.

SKELETON : The axis is a dense mass of interwoven strongyles with small amounts of spongin around them. Spicule tracts are definable only for short distances. The extra-axial region is very thin composed mainly of styles (and occasionally oxeas) arranged at right angles to the axis. Pigment laden cells are abundant in the ectosome, being concentrated in the dermal membrane which is 0.4mm thick.

HABITAT : Subtidal.
Deep open reefs covered with 1-2cm coarse grained sand or broken shell.

DISTRIBUTION : RESERVE : Common at Outer Sponge Garden.
N.Z. : Cape Karikari, Cook Strait, Alderman Island.
Raspailia agminata (Hallman).

ORDER: Axinellida (Bergquist).  FAMILY: Raspailiidae (Hentschel).

COLOUR:
- EXTERNAL: Black-brown (R-YR2/2).
- INTERNAL: Brown (YR3/2).
- IN SPIRIT: Red-brown.

SIZE:
20cm x 8cm, 4cm thick.

TEXTURE:
Hispid; firm but compressible.

SHAPE:
Massive, thick encrusting mat.

DESCRIPTION:
Massive specimens are somewhat conical with several finger-like lateral projections; encrusting specimens can be lobed, or conulose in patches and otherwise smooth. Projecting spicules give this sponge a silvery appearance. Oscules (1-2.5mm diameter) are sometimes situated at the apex of the conical projections.

SPICULES:
- Megascleres - Styles (1800u) long, slender, curved in the anterior third.
  - Subtylostyles similar to styles.
  - Acanthostyles (100u) strongly spined, often acanthotylote.
  - Oxeas (400u) slender, slightly curved.

SKELETON:
Compact body. Plumose arrays of subtylostyles invested with a fine layer of Spongin and echinatin by acanthostyles. Toward the surface the fibre arrangement is more plumoreticulate and echinating spicules less abundant. Terminal subtylostyles pierce the surface. Ectosomal oxeas are arranged in subdermal fans close enough to form a superficial palisade. Interstitial spicules (oxeas, styles, acanthostyles) abundant.

HABITAT:
Subtidal, intertidal. Usually lower mid-littoral, often under rock ledges in association with Codium adhaerens and solitary ascidians, or under low tidal boulders. Common on wharf piles. Never found exposed to direct sunlight. Tolerant of muddy conditions. Subtidally found on shaded canyon walls or boulder sides.

DISTRIBUTION:
RESERVE: Canyons.
Raspailia topsenti (Dendy).

ORDER : Axinellida (Bergquist).  FAMILY : Raspailiidae (Hentschel).

COLOUR :  EXTERNAL : Orange (rYR6/14).
           INTERNAL : Orange.
           IN SPIRIT : Light yellowish to pale red-brown.

SIZE :  Stands up to 30cm high, the fingers have a diameter of up to 2cm.

TEXTURE : Slightly hispid, flexible, firm, compressible.

SHAPE :  Branching 'finger' sponge.

DESCRIPTION : Fingers blunt-ended and round. Sponge raised on a small stalk.
              Dichotomously branched, some branches anastomose.

SPICULES : Megascleres - Styles (300μ) smooth, stout, often sharply curved, oxeote and strongylote modifications occur.
            - Acanthostyles (100μ) small, only spining in the posterior half, commonly flexed a third of the length away from the head. These are rhabdostyles.
            - Raphides (200μ) fine, long, slender.

SKELETON : Axial skeleton a very dense region of interlacing longitudinal spongin fibres. Extra-axial style columns pass obliquely towards the surface. The dermal region contains brushes of raphides which can vary in their number, arrangement and constitution from specimen to specimen. The acanthostyles occur throughout the sponge but are particularly abundant in the outer half of the extra-axial skeleton.

HABITAT : Deep reef flats with less than 1cm sediment cover.

                N.Z. : East of North Cape, Poor Knights, Takatu Point, Cook Strait, Mernoo Bank, Waitemata Harbour, East Coast, New Plymouth.
Order: HADROMERIDA.

This order consists of encrusting and massive specimens (some greater than one metre high), often with papillae, which can be spherical or stipate. Sometimes these sponges mould around an object, e.g. a shell or crab. The sponge surface can be hispid or furry with projecting subsurface spicules. Of the ten families in this order, half (Polymastiidae, Tethyidae, Clionidae, Suberitidae, Timidae) have representatives in the Marine Reserve.

The skeleton is radially orientated, though this may occur only at the surface with a random spicule arrangement in the interior of the sponge. Intercellular collagen fibrils are abundant, and small amounts of spongins join the megascleres together. This gives these sponges their firm but non-elastic consistency, though some can be friable.

Spiculation is relatively simple. The megascleres are usually tylostyles, subtylostyles or styles, occasionally with dactinal types. Microscleres are asterose or oxoete types when present. Spicules are always discrete units when the sponge is alive.

Reproduction, where it has been observed, is oviparous, with the eggs being extruded and development taking place in the sea. Of the few larval types described, the most common is a parenchymella larva, except in Polymastia species which produce a modified blastula larva that creeps over the substratum.

Family: TETHYIDAЕ

These sponges have an encrusting to spherical massive body with a distinctly radial composition. The cortical layer is clearly marked.

Megasclere spicules (strongyloxeas and styles) radiate in tracts from the center to the sponge surface. Microscleres, where present, are spherasters and microasters.

Two genera are found in the Reserve, Tethya and Aaptos. Tethya are the 'golf ball' sponges which usually form single spheres, but may fuse together. Spheraster microscleres are concentrated in the thick, fibrous cortex. The surface is marked by polygonal 'warts' between which are situated the ostial grooves. Sieve-like oscules occur at the summit of the sponge. They are widely distributed in tropical and warm-temperate regions in intertidal and subtidal habitats.

Family: SUBERITIDAE

Suberitids are a common sponge, usually yellow in colour and massive. Some are cup-shaped or of stalked form. The inhalant and exhalant openings are not elevated on long papillae. These sponges are often difficult to differentiate to species level. Distribution is worldwide in both intertidal and subtidal habitats.

The skeleton has a radial orientation at the surface and generally has a disordered interior, though a loose axial orientation is sometimes evident.

Megasclere spicules are tylostyles, subtylostyles and very rarely include styles. Microscleres are frequently absent, but microstrongyles can be present.
Family: CLIONIDAE

These are the boring sponges which excavate burrows in calcareous materials (e.g. coralline algae, shells, limestone and corals) using chemical agents. Only 2-3% of the calcareous chip is dissolved in the process, and in low energy reef environments these chips may make up to 30-40% of the sediment. Clionids occur in all seas, mainly in tidal and shallow waters.

Megascleres are tylostyles, and microscleres are spirasters, micro-oxeas or amphiaasters. One or more of these microscleres may be present.

Family: POLYMASTIIDAE

A massive or spreading body with elevated inhalant and exhalant papillae is characteristic of this family.

Columns of large spicules radiate from the interior to the surface, where the small spicules project, forming a dense plush. Small and medium spicules are dispersed in the choanosome between the columns.

Microscleres are generally absent, though a few acanthose micro-oxeas are occasionally present. Megascleres are tylostyles or subtylostyles, always in two or three sizes.

Family: TIMEIDAE

This family consists of encrusting sponges, often red in colour. They are common in tropical and warm-temperate waters subtidally.

Characteristic of these sponges is a cortex of densely packed euasters with a single layer of either erect tylostyles or tylostyle tracts running to the surface.

Megascleres are tylostyles, microscleres are euasters.
Aaptos aaptos (Schmidt).

ORDER: Hadromerida (Topsent).  FAMILY: Tethyidae (Gray).

COLOUR:
EXTERNAL: Red-brown (yR4/6), sometimes a grey-brown.
INTERNAL: Brownish yellow (yR6/8).
IN SPIRIT: Grey.

SIZE:
Up to 8cm high, 10cm in diameter.

TEXTURE:
Compressible with a lumpy surface when expanded, when contracted it is hard and smooth.

SHAPE:
Globular, often with a stout cylindrical stalk. Intertidally the sponge can be irregular in shape, often a low-lying hemispherical form, with stolon roots connecting adjacent individuals.

DESCRIPTION:
In the intertidal A. aaptos is found in clusters numbering from 5 to 80, with individuals having a granular, warty or smooth surface. Sublittorally, the sponge has an irregular, lumpy surface. Oscules are small and abundant over the upper half of the sponge, often occurring in groups in a single apical depression 3-4mm in diameter. The amphipod Polycheria antarctica is found in great numbers embedded in the cortex. Large buds are produced asexually (February to April) from the basal stolons and remain attached to the parent sponge. Subtidally, buds attach directly to the head of the sponge, not on stalks as in intertidal specimens. Budding is reported to be uncommon in sponges less than 2mm in diameter, and it seems that some years no buds are produced. Surface buds detach and become larvae for a short time.

SPICULES: Megascleres - Subtylostyles large (1000-2000u) and medium (200-700u).
- Tylostyles (170u) small and straight with definite tylote heads.

SKELETON: Radially arranged spicule tracts composed of styles terminating in bushes of the medium-sized styles, interdigitate with a dense, radially disposed layer of small dermal tylostyles. These project up to a third of their length through the surface.

HABITAT:
Intertidal, subtidal.

Found in the intertidal just above the brown algal level, on flat surfaces and in sheltered positions which are sometimes subjected to fast-flowing currents. Has been observed subtidally at depths of up to 45m. Occurs on flat or gently sloping reefs with low levels of sediment.

DISTRIBUTION:
RESERVE: Abundant at Sponge Garden and Sediment Flats, also found at Deep Reefs and Waterfall Reef.
Tethya aurantium (Pallas).

ORDER : Hadromerida (Topsent).  FAMILY : Tethyidae (Gray).

COLOUR :  EXTERNAL : Bright orange-yellow (rYR6/14).
           INTERNAL : Dull orange-yellow.
           IN SPIRIT : Pale yellowish-white.

SIZE :  Up to 7cm in diameter, 5.5cm high. Typically, 3.5cm diameter.

TEXTURE :  Firm, just compressible.

SHAPE :  Massive (globular), with basal rooting processes.

DESCRIPTION : Surface mammillate, often with a marked polygonal pattern. This species is very common in the intertidal, it can occur in clusters of 50 individuals or more. Sometimes subtidal specimens have a surface encrustation of polyzoans and small red algae. One form of reproduction of this species is the production of stalked buds from the basal rooting stolons; the buds then develop into adult sponges in situ.

SPICULES : Megascleres - Strongyloxeas (1200u) with variant ends, rounded at both ends or pointed at one end.
            - Microscleres - Spherasters (40u) with 16-24 sharp pointed rays.
            - Tylasters (12u) with 12-16 short rays which are always terminally roughened.

SKELETON : Radiate, the strongyloxeas run from the center to the surface. There is a distinct cortex. The microasters are organised into a dense dermal layer as well as being distributed throughout the endosome.

HABITAT : Intertidal, subtidal. Intertidally Tethya favours shaded postions, and is often found under overhangs or in the shadow of large rocks immediately above the brown algal level. It is common on coasts of all degrees of exposure, usually mid to low tidal. Subtidally it is commonly found in shaded areas on boulder or canyon walls or under ledges.

DISTRIBUTION : RESERVE : Subtidally abundant at Waterfall Reef, Sponge Garden, Sediment Flats, Deep Reefs, Canyons. Found intertidally at Echinoderm Reef and Boulder Beach.
N.Z. : Northern New Zealand, the Offshore Islands, Cook Strait, Stewart Island, Kaikoura, Dunedin, Marlborough Sounds, Chatham Rise, New Plymouth.
**Tethya ingalli** (Bowerbank).

ORDER: Hadromerida (Topsent).  FAMILY: Tethyidae (Gray).

**COLOUR:**
- EXTERNAL: Rose pink (R5/8).
- INTERNAL: Grey, or white to dull yellow (Y4R7/8).
- IN SPIRIT: Pinky-purple externally, white internally.

**SIZE:** Diameter up to 6cm subtidally, 4cm intertidally; height 5cm.

**TEXTURE:** Firm; compressible.

**SHAPE:** Massive (globular).

**DESCRIPTION:** A coarsely mamillate surface with the oscules situated between the apical tubercules. Found singly, in pairs, or in small clusters (2-5 individuals); it is common to also find 6-10 individuals located nearby. Asexual reproduction involves the incubation of complete young sponges which then slide down the parent body and move onto the rooting stolons. The dermal stalks also produce buds which detach from the parent. In northern New Zealand budding has been recorded all year round in this sponge.

**SPICULES:** Megascleres - Strongyloxea (900u) range of lengths, widths and terminations.
- Microscleres - Spherasters (35u) abundant and have 16-20 sharp pointed rays.
  - Tylasters (10u) with 4-12 stout rays.
  - Oxyasters (20u) with 4-10 thin pointed rays which may be smooth, slightly roughened or faintly tylote, rare in some specimens, choanosomal.

**SKELETON:** Radial construction very pronounced and characterises all regions of the sponge. Very dense architecture. Tylasters abundant in the dermal region, rarely found in the endosome.

**HABITAT:** Intertidal, subtidal. Favours low tidal shaded positons continually subjected to fast-flowing currents. Often found among the holdfasts of *Ecklonia radiata* and *Carpophyllum* sp. Subtidally occurs on reef flats at a range of depths.

Suberites perfectus (Ridley & Dendy).

ORDER: Hadromerida (Topsent).  FAMILY: Suberitidae (Schmidt).

COLOUR:
- EXTERNAL: Pink-brown (YR4/2), reddish yellow to dull orange.
- INTERNAL: Pinky-brown (YR6/6).
- IN SPIRIT: Dull greenish yellow.

SIZE:
Up to 4cm in diameter.

TEXTURE:
Firm and compact, just compressible.

SHAPE:
Globular.

DESCRIPTION:
Smooth surface except where raised into small oscular papillae. Oscules are small (0.6-0.9mm diameter) and circular. Small, abundant pores 40-70µ in diameter, occur in groups between the dermal spicule brushes. Sublittoral specimens are infested with the amphipod, Polycheria antarctica. Note that it is hard to tell between the amphipod burrow holes and the oscules. In fixed specimens contraction is considerable.

SPICULES: Megascleres - Tylostyles ranging to subtylostyles: large (900µ) vary in length and width, usually straight with the rare spicule sharply flexed anteriorly; small (200µ) prominent rounded heads, straight.

SKELETON: Pronounced radially disposed spicule tracts terminate in a layer of small tylostyles arranged as a series of dermal brushes. These spicules project obliquely from the sponge surface.

HABITAT:
Subtidal, intertidal.
Low tidal under shaded overhangs. Subtidally also found in shaded areas. Observed at 3m in a high current area.

DISTRIBUTION:
RESERVE: Echinoderm Reef, rare.
Suberites sp.

ORDER: Hadromerida (Topsent).  FAMILY: Suberitidae (Schmidt).

COLOUR:  EXTERNAL: Cream (YR-Y8/8).
          INTERNAL: Cream.
          IN SPIRIT: White.

SIZE:  Up to 20 cm in diameter.

TEXTURE: Very soft and smooth.

SHAPE: Massive.

DESCRIPTION: Oscules occur in small groups over the surface of the sponge. It has a fine dermal membrane.

SPICULES: Megascleres - Tylostyles, straight: large (500μ); small (200μ).

SKELETON: The bulk of the sponge is supported by a confused array of spicules through which a number of tracts may be identified. Small tylostyles pierce the dermal membrane.

HABITAT: Subtidal.
          Deep reef flats with 1 cm medium grained sand.

DISTRIBUTION: RESERVE: Outer Sponge Garden, not common.
               N.Z.: Leigh.
Cliona celata (Grant).

ORDER: Hadromerida (Topsent).  FAMILY: Clionidae (Gray).

COLOUR:
EXTERNAL: Bright yellow to orange (ryr6/14).
INTERNAL: Orange.
IN SPIRIT: Dull yellow.

SIZE:
Can cover over 1m^2. Forms that appear through the coralline surface may cover 25cm x 25cm.

TEXTURE:
Firm, rather leathery.

SHAPE:
Boring, encrusting, and then growing to become massive.

DESCRIPTION:
A sponge which bores into the substrate by using chemicals to dissolve the calcareous material in rocks and coralline algae. Adjacent pore and oscular areas in massive forms make up a polygonally grooved surface. This sponge commonly infests the shells of certain intertidal and subtidal molluscs. In the alpha stage on the intertidal only the pores and oscules are visible and the sponge is always a clear bright yellow; in the beta stage some connective material is present. The sponge is a bright orange both intertidally and subtidally in the gamma stage.

SPICULES: Megascleres - Tylostyles (330u).

SKELETON: Confused mass of spicules formed into a lax choanosome which often incorporates coarse calcareous debris, and a compact ectosomal region up to 5mm deep.

HABITAT:
Intertidal, subtidal.
Located on a calcareous substrate. Has a marked effect on reef topography as these sponges can almost completely destroy the substratum. Commonly found on the intertidal on cave roofs, under shelves and, in the early stages, on coralline paint. Subtidally found on a wide range of reef types of all slopes.

DISTRIBUTION:
LOCAL: Sponge Garden, Canyons; common everywhere. Intertidally it has been occasionally observed at Waterfall Reef, Boulder Beach, Echinoderm Reef.
N.Z.: Auckland to North Cape, Wellington, Akaroa, Foveaux Strait, Chatham Islands, East coast of the South Island.
Polymastia fusca (Bergquist).

ORDER: Hadromerida (Topsent).  FAMILY: Polymastiidae (Gray).

<table>
<thead>
<tr>
<th>COLOUR</th>
<th>EXTERNAL: Greenish to chocolate brown (YR-Y3/2).</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>INTERNAL: Dull yellow (YR-Y5/8).</td>
</tr>
<tr>
<td></td>
<td>IN SPIRIT: Very little colour change.</td>
</tr>
</tbody>
</table>

| SIZE                  | Up to 50cm long.                                  |
|                       |                                                  |

| TEXTURE               | Firm and fleshy, compressible.                    |
|                       |                                                  |

| SHAPE                 | Massive: spreading, and up to 3cm thick intertidally; hemispherical subtidally. |
|                       |                                                  |

| DESCRIPTION           | Lumpy surface lacking visible inhalant pores. The oscules are grouped in a honeycomb pattern. |
|                       |                                                  |
| SPICULES              | Megascleres - Subtylostyles of variable shape; large (700u) always straight with no terminal head but usually narrowing towards the tyloite end; medium (400u) as large; small (150u) may be either terminally tyloite or exotyloite in the same specimen, often slightly and evenly curved. |
|                       |                                                  |
| SKELETON              | Composed of stout radiating tracts of large subtylostyles. The medium and small spicules are scattered thinly through the choanosome and form a dense dermal layer, the tips of the small spicules just pierce the surface. |
|                       |                                                  |
| HABITAT               | Intertidal, subtidal.                            |
|                       | Intertidally a light tolerant species often found on the unshaded sides of crevices or between rocks on firm substrate. Subtidally it is found on the more level regions of the reef in areas of little sediment cover. |
|                       |                                                  |
Polymastia granulosa (Brøndsted).

ORDER : Hadromerida (Topsent).  FAMILY : Polymastiidae (Gray).

COLOUR :  EXTERNAL : Chrome yellow (YR-Y7/10).
           INTERNAL : Yellow/orange.
           IN SPIRIT : Pale yellow to whitish.

SIZE : Up to 30cm in diameter, although larger individuals can be found in the Far North.

TEXTURE : Smooth exterior. Soft, compressible when expanded; when contracted, remains compressed.

SHAPE : Massive; hemispherical with papillae.

DESCRIPTION : Often found in groups of three or more. It has stumpy, differentiated inhalant (short) and exhalant (long) papillae. Amphipods can be sometimes be found in the dermis. Asexual buds, 5mm in diameter, have been recorded from December to February - reproductive modes are gonochoristic, oviparity and budding.

SPICULES : Megascleres - Subtylostyles in two sizes; large (600u) straight, usually poltylostele, rarely terminally tylote; medium (300-400u) straight but not poltylostele.
           - Tylostyles, small (150u) sometimes tapering towards the head.

SKELETON : Large subtylostyles form loosely organised and poorly defined tracts radiating to the dermal layer. Small tylostyles pierce the dermal layer. Generally, spiculation is light in comparison to P. fusca.

HABITAT : Subtidal, generally below 6m.
Found on rock flats with a slope of less than 45 degrees, with no more than 0.5cm of medium-grain sand depth. Rarely found in areas covered in fine sediment or dense coralline turf.

DISTRIBUTION : RESERVE : Found throughout the Reserve, abundant at Sponge Garden, Deep Reefs and Outer Waterfall Reef.
N.Z. : Found on all the Offshore Islands, the East and West Coast of the North Island, and is not common South of Nelson.
Polymastia hirsuta (Bergquist).

ORDER : Hadromerida (Topsent).  
FAMILY : Polymastiidae (Gray).

COLOUR :  
EXTERNAL : Maroon (RP-R4/10) on papillae, yellow (rY5/2) elsewhere.  
INTERNAL : Dirty yellow (rY7/8).  
IN SPIRIT : Mauve to brown.

SIZE :  
Up to 15cm in diameter.

TEXTURE :  
Firm, just compressible; with a soft, felt-like surface made up of projecting spicules.

SHAPE :  
Massive: hemispherical with papillae.

DESCRIPTION :  
The surface is raised into turrets with involute oscules. A fine pile (0.2 to 0.4mm high) covers the surface, being formed by projecting dermal tylostyles.  
SPICULES : Megascleres - Tylostyles in three sizes; large (700u) stout, faintly tylote terminally but often with polytyloate expansions along the length of the spicule; medium (450u); small (180u).  
SKELETON : The endosomal skeleton is composed of dense masses of irregularly arranged large tylostyles with no apparent organisation into tracts. Medium spicules form the dermal pile as well as being distributed through the cortical and endosomal tissues. The small spicules are arranged into dermal radial brushes. The cortex is 1mm thick.

HABITAT :  
Subtidal, below 10m.  
Most commonly found on deep reef flats where the sediment lies 1-2cm deep.

DISTRIBUTION :  
RESERVE : Sponge Garden.  
N.Z. : Little Barrier, Leigh.
**Polymastia sp. (A).**

**ORDER :** Hadromerida (Topsent).  
**FAMILY :** Polymastiidae (Gray).

**COLOUR :**  
EXTERNAL: Pale cream, pale yellow or yellow (rY8/12) fingers.  
INTERNAL: Pinkish-yellow.  
IN SPIRIT: Pale yellow.

**SIZE :**  
Covers areas up to 20cm x 20cm, 1.5cm thick, the fingers grow up to 4cm high.

**TEXTURE :**  
Stiff.

**SHAPE :**  
Papillae raised from a mat-like base 1.5cm thick.

**DESCRIPTION :**  
Pieces of sediment are incorporated into the dermis. Finger-like papillae rise from a small, mat-like base.

**SPICULES :** Megascleres - Tylostyles; large (900μ), straight, faintly tyloite; medium (250μ) straight, slightly curved; small (100μ), also slightly curved.

**SKELETON :** Bundles of large tylostyles rise vertically to the dermal layers. The fingers are cored by 2 or 3 of these bundles. Medium tylostyles diverge perpendicularly from the central tracts and run to the finger edges, as well as connecting the main fibres. Medium and small tylostyles pierce the pinacoderm in radial tufts.

**HABITAT :**  
Subtidal.  
Deep reef flats where sediment levels are less than 1cm deep and of medium to coarse grain.

**DISTRIBUTION : RESERVE :** Abundant at Sponge Garden.  
N.Z. : Leigh, Takatu.
Polymastia sp. (B).

ORDER: Hadromerida (Topsent).
FAMILY: Polymastiidae (Gray).

COLOUR:
EXTERNAL: Burnt orange (R-YR4/10).
INTERNAL: Yellow (YR-Y5/8).
IN SPIRIT: Brown.

SIZE:
Up to 40 cm in diameter.

TEXTURE:
Tough and compressible.

SHAPE:
Massive, oval with small papillae over the entire surface.

DESCRIPTION:
Thick eptosome and non-contractile oscular fistules.

SPICULES:
Megascleres - Tylostyles; large (500u); small (200u).

SKELETON:
Large tylostyles appear in a disordered array internally. The dermal layers are thick and supported by radially arranged groups of smaller spicules.

HABITAT:
Subtidal.
Below 5 m on flat reef areas where there is little or no sediment.

DISTRIBUTION:
RESERVE: Occasionally found at Goat Island Point, Sponge Garden, Okakari Point.
N.Z.: Leigh, Takatu, North-east Coast.
Order: SPIROPHORIDA

This group consists of a single family, Tetillidae, characteristically occurring on soft-bottom deposits. Overall shape is usually spherical. The surface of these sponges is hispid and the texture is at least slightly compressible. Species are found subtidally and intertidally.

Strongly radiate skeleton with a basal mat of tangled spicules. Megascleres are triaenes and oxeas, always including prototriaenes. Microscleres are sigmaspirae.

Sexual reproduction is characterised by oviparity, followed by the direct development of young adults within the parental tissues.

Family: TETILLIDAE

Description as for order. This family is composed of 3 genera. The genus Cinachyra has noticeable, special inhalant openings (porocalyces) at the surface. Interior pigmentation is yellow, beige, orange or purple.
Cinachyra sp.

ORDER : Spirophorida (Levi).  FAMILY : Tetillidae (Sollas).

COLOUR:

- INTERNAL : Yellow (YR-Y8/8).
- IN SPIRIT : Grey.

SIZE:

Up to 20cm in diameter, 15cm high.

TEXTURE:

Compressible; shaggy, rough surface.

SHAPE:

Massive (hemispherical).

DESCRIPTION:

Sand covered surface. If the sand is removed, long projecting spicules are visible giving a 'hairy' appearance. The surface is marked by sunken porocalyces which contain both inhalant and exhalant pores, these are surrounded by a fringe of spicules.

SPICULES:

- Megascleres - Plagiotriaenes (1000u).
- Protriaenes (2000u).
- Oxeas [2000u].
- Microscleres - Sigmas (20u).

SKELETON:

Pronounced radial construction, with extending megascleres.

HABITAT:

Subtidal.

Found on the flat deep reef areas where the sediment is 1-2cm deep and is composed of a medium grain size. The sponge seems to tolerate only a limited range of sediment quality/quantity.

DISTRIBUTION:

RESERVE : Very abundant at Sponge Garden, Sediment Flats.
N.Z. : Patchy distribution on the North-east Coast.
Order: CHORISTIDA.

This order is comprised of seven families, some of which are restricted to deep water. An extremely coarse sandpaper-like texture is typical.
There is always some radial arrangement of the skeleton which is most apparent at the surface. In large sponges the spicule orientation becomes confused toward the centre of the body.
Megascleres are triaenes and oxeas. Microscleres are of diverse asterose forms, sometimes accompanied by smooth or roughened microxeas or microstrongyles. Some genera may lack either tetractinal megascleres, leaving oxeas and asterose microscleres or only oxeas as spicules. A radial architecture and coarse texture enable identification of these sponges.
Gametes have been identified in a few genera, but there is no information describing the larval stages.

Family: STELLETTIDAE

Generally of encrusting to massive shape.
In the skeleton the spicule shafts are directed toward the interior with the clads near the surface.
Megascleres are triaenes (always present) and oxeas, accompanied by euaster and sometimes microrhabd microscleres.
The genus Stelleta has asterose microscleres of two or three types while Ancorina always has tylaster microscleres and small rhabds.

Family: GEODIDAE

Shape varies from thickly encrusting to massive to bowl shaped forms.
Characterised by the presence of sterrasters, other microscleres that may be present are euasters, microrhabds and spherasters. Megascleres are long shafted triaenes and oxeas.
The genus Geodia has spicules composed of triaenes, oxeas and many forms of asters, including sterrasters.

Family: JASPIDAE

Comprises two genera of encrusting to massive form.
These sponges are distinguished from the Hemiasterellidae (Axinellida) by having a radial rather than a plumoreticular skeleton.
Triaenes are absent and oxeas are disposed radially only at the surface. microscleres are euasters or sanidasters.
Ancorina alata (Dendy).

ORDER : Choristida (Sollas).  FAMILY : Stellettidae (Carter).

COLOUR :
EXTERNAL : Grey, grey-black (Y2/2).
INTERNAL : Cream YR-Y8/4), white.
IN SPIRIT : Grey.

SIZE :
Can cover areas of more than 1m² with a height of 15-40cm. The globular specimens are commonly 5cm high and 7cm wide, and the massive specimens average 20cm high and 50cm long.

TEXTURE :
Firm, rough to the touch; compressible.

SHAPE :
Very variable - globular, lamellate, irregular or may have fingerlike projections arising from a massive round base.

DESCRIPTION :
Of very variable form, scalloped, ridged or mountainous with a hispid irregular surface. Fétid odour is also noticeable. Oscules are usually situated on the ridges, at the ends of the 'fingers' on massive specimens, and laterally on globular specimens.

SPICULES :
- Megascleres - Plagiotriænes very variable in length and width.
  - Anáatriænes variable cladi, shaft often curved.
  - Oxeæs of three forms : stout (3000u); long, thin (3000-4000u); short, fine, dermal (300u).
- Microscleres - Tylasters (9u) 4-10 rays.
  - Microrhabds (8u) abundant and variable.

SKELETON :
Megascleres lie perpendicular to the surface, the clads of the plagiotriænes forming a dermal layer. Short oxeæs lie parallel to these, but below the clad layer. Long, fine oxeæs protrude through the surface. Microscleres are scattered but are relatively more dense at the surface.

HABITAT :
Often found intertidally on the East Coast under shaded ledges, in caves and other similar positions out of direct sunlight, always in a rounded massive to lobate form. Subtidal specimens, found on the deeper more open reefs, are much more varied in form: on sloping reefs the shape generally follows a ridge lying perpendicular to the major currents; on flat reefs the shape is generally more oval.

DISTRIBUTION :
RESERVE : Common everywhere subtidally. Occasionally found intertidally at Waterfall Reef and Boulder Beach.
N.Z. : Common along the North Island coast.
Stelletta conulosa (Bergquist).

ORDER: Choristida (Sollas)  FAMILY: Stellettidae (Carter).

COLOUR:  EXTERNAL: Slate Grey (rY4/2).
          INTERNAL: Cream (rY8/4).
          IN SPIRIT: Purplish-grey; pinkish-brown internally.

SIZE: Usually up to 50cm long, 25cm wide, can grow up to 2m long.

TEXTURE: Rough, firm, just compressible.

SHAPE: Massive sponge.

DESCRIPTION: Surface peaked in conules except at the top ridge where the oscules are situated. The conules are 1-3mm apart and up to 7mm high. S. conulosa is triangular in vertical section, and ramifies along the sides of, and over the surface of, large rocks.

SPICULES: Megascleres - Plagiotriænes (900u) are stumpy and sometimes have two or four cladi.
          - Dichotriænes only rarely present.
          - Oxæas (1400u) stout, straight, evenly tapered.

          Microscleres - Oxyasters (35u) in a wide variety of sizes with a well defined centrum and 4-20 slender rays.
          - Oxyospherasters (7u) with a well marked centrum and 8-15 short conical rays.

SKELETON: Made up of radiating spicle tracts with a dermal layer of small oxyospherasters. Oxyasters are found in great numbers below each conule.

HABITAT: Subtidal, 10m - 20m. Characteristically appears along the sides of steep reefs or large rocks near a ridge.

DISTRIBUTION: RESERVE: Low abundance everywhere.
N.Z.: Takatu Point, Leigh, East Coast, Wellington.
**Stelletta crater** (Dendy).

**ORDER:** Choristida (Sollas).  
**FAMILY:** Stellettidae (Carter).

**COLOUR:**  
EXTERNAL: Orange (R-YR5/10) - (*Desmacella dendyi*).  
IN SPIRIT: Brown.

**SIZE:**  
Stands up to 25cm high, 20cm in diameter.

**TEXTURE:**  
Incompressible; sandy to the touch.

**SHAPE:**  
Massive, solid cup-like.

**DESCRIPTION:**  
Forms a cup with oscules at the base. The orange dermis is due to the encrusting sponge *Desmacella dendyi*.

**SPICULES:**  
- Megascleres - Plagiotrienes (2700u).  
- Styles (2700u).  
- Microscleres - Oxyspherasters (10u).

**SKELETON:**  
Spicules radiate to the exterior, and plagiotriene clads sometimes protrude into the investing sponge. Oxyspherasters are common near the sponge surface.

**HABITAT:**  
Subtidal.  
Found on shaded deep reef slopes in areas free from fine grained sediment. Often encountered in caves.

**DISTRIBUTION:**  
RESERVE: Deep Reefs, Sponge Garden; uncommon.  
N.Z.: North-east Coast.
Stelletta maori (Dendy).

ORDER : Choristida (Sollas)  FAMILY : Stellettidae (Carter).

           INTERNAL : Cream (YR-Y8/4).
           IN SPIRIT : Pinkish.

SIZE :     Up to 40cm x 40cm, usually about 20cm in diameter.

TEXTURE :  Finely granular, firm, just compressible.

SHAPE :    A massive, cup-shaped sponge.

DESCRIPTION : Forms a low, thick rimmed cup, though size can vary from a
              low-lying and spreading massive sponge to a cushion-like massive
              sponge up to a large vasiform sponge. The sponge surface is
              covered with very shallow grooves, and no oscules or pores are
              visible.

SPICULES : There is great variability in aster and dichotriaene
           structure.
           Megascleres - Dichotriaenes (1000u).
           - Plagiotriaenes (1000u) are rare.
           - Oxeas are large (1000u), but rarer

           smaller and stouter oxeas are also found.
           Microscleres - Oxyasters (25u) with a small centrum
           and 4 to 12 rays.
           - Oxyspherasters (12u) occasionally with
              tylote rays

SKELETON : Dermal layer of euasters. Megascleres lie
           perpendicular to the dermal layer where dichotriaene clads form a
           dermal armour. Deeper within the sponge oxeas are the
           predominant spicules.

HABITAT :  Subtidal, 3m to 40m.
           On deep reef flats where sediment lies up to 1cm deep and is
           medium to coarse in texture.

DISTRIBUTION : RESERVE : Not common, found at Sponge Garden, Outer Sponge
               Garden, Deep Reefs.
               N.Z. : Mahia Peninsula, Christchurch, Takatu Point, Spirits Bay,
                     Campbell Plateau, McMurdo Sound.
Stelleta sandalinum (Brøndsted).

ORDER: Choristida (Sollas)  FAMILY: Stellettidae (Carter).

COLOUR: External: White to grey-white (rY8/2).
        Internal: White (rY8/4).
        In spirit: Grey.

SIZE: Can cover 15cm x 15cm.

TEXTURE: Stiff, hard surface but compressible; rough, extremely hispid in places.

SHAPE: A massive, flattened, cushion-like sponge, or a vasiform sponge in deeper water.

DESCRIPTION: Surface appears hispid. No oscules are visible, the small holes occasionally found on the side of the sponge are made by a polychaete worm.

SPICULES: Megascleres - Plagiotrianes (2000u)
           - Oxeas (2000u).
           - Dichotriaenes are sometimes present.

           Microscleres - Oxyasters; large (50u) with 2-6 long pointed rays, very abundant; small (10u) 8-20 short pointed rays and a marked centrum.
           - Stronglyospherasters (6u) 8-12 short truncated rays and well developed centrum.

SKELETON: The arrangement is typical of the genus. A conspicuous feature is the crustose cortex formed by the dense layer of radially disposed plagiotriaenes. Stronglyospherasters are abundant in the dermal region and in the lining of the canal systems.

HABITAT: Subtidal.
         Commonly found growing under ledges and in caves.

DISTRIBUTION: RESERVE: Splendid Reef, not abundant, Canyons.
N.Z.: Cuvier Island, Mayor Island, Slipper Island, Leigh Reef, Poor Knights, North-east Coast.
**Geodia regina** (Dendy).

**ORDER**: Choristida (Sollas).

**FAMILY**: Geodiidae (Gray).

**COLOUR**:
- EXTERNAL: Dark grey (rYR2/2).
- INTERNAL: Dirty cream (rY4/2).
- IN SPIRIT: Grey.

**SIZE**:
Up to 60 cm high, bowl 60 cm wide, lips of the bowl 4 cm thick.

**TEXTURE**:
Hard and stone like, rough.

**SHAPE**:
Massive, cup-shaped.

**DESCRIPTION**:
Forms a huge cup on which crustose corallines frequently grow.

**SPICULES**:
- Megascleres - Dichotriaenes (4600u) spreading clad, stout, evenly tapered shafts.
  - Plagiotriaenes (4600u) same as the dichotriaenes.
  - Oxexas large (4000u) straight, stout; make up the choanosomal skeleton. Small (240u) cortical oxexas are short and slightly curved.
  - Anatriaenes (8000u) long, slender, straight shaft; short, pointed clad.
- Microscleres - Starrings (180u) with slight flattening and a distinct dimple on one surface. Developmental forms with long rays occur in the choanosome.
  - Oxyspherasters (12-48u).
  - Spherasters (5u) very small with truncate rays which are frequently absent leaving the spicules as knobs.

**SKELETON**:
Radial construction is recognisable only in the cortex and outer regions of the choanosome where the dense crust of microscleres and interlocked triaenes make up the solid surface skeleton. The dermal layers are comprised of short stout oxexas and a dense layer of starrings interlocked with triaenes, forming an extremely tough outer layer. The plagiotriaenes, dichotriaenes, anatriaenes and long oxexas run from the center toward the dermal layers.

**HABITAT**:
Subtidal.
Found on deep reefs often associated with *Ecklonia* stands, generally in high current areas.

**DISTRIBUTION**:
- RESERVE: Splendid Reef, rare. Leigh Reef.
- N.Z.: North-east Coast.
Order: Lithistida.

The sponges of this order have a megasclere type known as a desma which always has a complex branching pattern. These branches interlock to form a hard stony skeleton. Other megascleres and microscleres accompany the desmas. The sponges are typically found in deep water, and are rare.
**Lithistid. (Identified only to order at present).**

**ORDER : Lithistida (Schmidt).**

| COLOUR | EXTERNAL : White to off-white (YR-Y7/6).  
|        | INTERNAL : Off white.  
|        | IN SPIRIT : White.  
| SIZE   | Patches may cover 90cm x 90cm, with a height of up to 5cm.  
| TEXTURE| Brittle, rough to the touch.  
| SHAPE  | Turrets rising from a thick base.  
| DESCRIPTION | Many corrugated turrets rising from a thick base. The dermis is easily detached from the internal skeleton. In situ the base is covered by sand and only the turrets can be seen.  
| SPICULES | Megascleres - Oxeas in two sizes (150u and 400u).  
|          | - Desmas (600u).  
| SKELETON | The base is strengthened by interlocking desmas above which oxeas form tracts perpendicular to the surface. These tracts continue up into the turrets and spicule bundles radiate from the central axis to the dermal layer. Oxeas pierce the dermal layer with up to a third of their length protruding.  
| HABITAT | Subtidal.  
|         | Observed only on deep reef flats covered 0.5cm to 1cm deep by medium to coarse grained shelly sand.  
| DISTRIBUTION | RESERVE : Outer Sponge Garden.  
|             | N.Z. : Leigh.  

Subclass: HOMOSCLEROMORPHA.

Spicules are typically four-rayed calathros with all rays of equal size. Triactine and diactine modifications are frequent. All spicules are of small size, frequently less than 100μ in overall dimension.

Order: HOMOSCLEROPHORIDA.

Description as for subclass. Two families comprise this order.

Family: OSCARELLIDAE

A major characteristic is the multilobate surface. Thin encrusting sponges with the appearance of pigmented pimplies set in a paler jelly-like ground mass. Sponge texture is delicate.

Though lacking a mineral skeleton, fibrillar collagen is present in the mesenchyme. Asexual buds form as papillae protruding from the surface and are then pinched off. Sexual reproduction involves the formation of incubated amphiblastula larvae. The major genus is Oscarella.

Family: PLAKINIDAE

These sponges contain a mineral skeleton. The body is of simple structure with diactinal, triactinal and tetractinal spicules which often have branched ends. Eight genera are known from the Mediterranean, West Indian and Indo-Pacific regions. Common genera are Plakina or Plakortis.
Class: CALCAREA.

The sponges in this group are exclusively marine. Most calcareous sponges are small (less than 10 cm high), and of vase or low branching form, sometimes attached to the substratum by a stalk. Frequently white, grey, or pastel in colour; a few are bright yellow, pink or green. Specimens are predominantly found in shallow, coastal waters, usually in sheltered positions such as rocky overhangs, in crevices or among algae.

They have a skeleton composed of calcium carbonate spicules which are formed into types with three or four arms.

Subclass: CALCINEA.

The free larvae are hollow blastulae which can become coeloblastulae. Triradiate spicules, when present, are mainly equi-angular.

Order: CLATHRINIDA.

These sponges are of asconoid form, lined by choanocytes throughout their sponge life. There can be some inward folding but it is not accompanied by a parallel folding of the pinacoderm and mesohyl. There is no cortical development.

Order: LEUCETTIDA.

Syconoid to leuconoid construction with choanocytes restricted to the choanocyte chambers. Dermal and cortical structures are elaborated.
Leucettusa lancifer

ORDER: Leucettida (Hartman).

COLOUR:
- EXTERNAL: Off-white (yR8/4), can be pink.
- INTERNAL: Off-white.
- IN SPIRIT: White.

SIZE:
Up to 50cm high.

TEXTURE:
Brittle and hard, easily crushed.

SHAPE:
Flask-like.

DESCRIPTION:
A variable number of flasks joined at the base by a common 'mat'. The flasks are easily damaged. The surface appears to be finely stippled.

SPICULES:
- Triradiates: large (arms 700u); small (arms 140u).
- Pigmy triradiates (arms 50u).
- Reduced pigmy triradiates (arms 30u).
- Pigmy quadradiates (length 180u).

SKELETON:
Dermal layers are made up of large and medium triradiates arranged tangentially in layers. The inner areas of the sponge are made up of an array of pigmy radiates.

HABITAT:
Subtidal.
Found in deep reef areas usually in the shade of a large boulder.
It has been observed on rocks and under boulders; on rock flat reefs, and on canyon walls.

DISTRIBUTION:
RESERVE: Sponge Garden, Splendid Reef.
Clathrina sp.

ORDER: Clathrinida (Hartman).

COLOUR:
EXTERNAL: White (rY8/4), yellow, lime green.
INTERNAL: White, yellow, lime green.
IN SPIRIT: Off-white.

SIZE:
Occurs in lumps or thin crusts from 1 cm² to 25 cm².

TEXTURE:
Very brittle, crushes easily.

SHAPE:
Most frequently found in a disorganised massive shape. Sometimes forms a thin crust when small, giving a lacy appearance.

DESCRIPTION:
The sponge has a very variable shape and seems to be fairly ephemeral. It is usually found growing over ascidians or red algae in areas of high water movement.

SPICULES: Triradiates (equiangular), arm lengths 100μ.

SKELETON: Spicules form a series of tubes that make up the sponge shape. Tubes interlace giving a complicated appearance.

HABITAT:
Subtidal.
Found in shaded vertical reef/cliff wall habitats growing over other species. Usually, it seems to be found below 10 m where red algae occur. May be found under Ecklonia stands or on the sides of large boulders.

DISTRIBUTION:
RESERVE: Canyons.
N.Z.: East Coast of the North Island to Wellington.
APPENDIX I.

Species which have been recorded from the Cape Rodney to Okakari Point Marine Reserve.

Phylum : PIRIFERA.

Class : DEMOSPONGIAE.

Subclass : CERACTINOMORPHA.

Order : DENDROCATIDA

Aplysilla rosea
Aplysilla sulfurea
Chelonaplysilla violacea
Dendrilla rosea
Dendrilla sp.

Order : DICTYOCATIDA

Spongia sp.

Ircinia fasciculata
Ircinia novaezealandiae
Ircinia sp.
Psammocinia sp.

Dysidea fragilis

Order : HAPLOSCERIDA

Haliclona heterofibrosa

Callyspongia diffusa
Callyspongia latituba
Callyspongia ramosa

Adocia parietaloides
Adocia venustina

Reniera sp.
Order: POECilosclerida

Biemna sp.
Family: BIEMNIDAE

Iophon minor
Family: MYXILLIDAE

Chondropsis kirkii
Family: PSAMMASCIDAE

Chondropsis sp.

Psammascus sp.
Family: CLATHRIIDAE

Axociella sp.
Microciona coccinea
Microciona heterospiculata
Ophlitaspongia seriata
Family: DESMACIDONIDAE

Tetrapocillon novaezealandiae

Crelia incrustans
Crelia novaezealandiae
Family: CRELLIDAE

Anchinoe sp.
Family: ANCHINOIDAE

Mycale macilentia
Family: MYCALIDAE

Hymedesmia lundbecki
Hymedesmia sp.
Family: Hymedesmiidae

Tedania diversiraphidiophora

Order: HALICHOndrida

Hymeniacidon hauraki
Hymeniacidon perleve
Family: Hymeniacidonidae

Halichondria moorei
Halichondria panicea
Cirecta penicillus
Ciocalypta polymastia
Family: Halichondridae
Subclass: Tetractinomorpha.

Order: AXINELLIDA
- Axinella sp. (A).
- Axinella sp. (B).
- Homaxinella erecta
- Pararhaphoxya n.sp.
- Phakellia dendyi
- Pseudaxinella australis
- Raspailia agminata
- Raspailia topsenti
- Eurypon hispida
- Acanthoclada prostrata

Family: AXINELLIDAE

Order: HADROMERIDA
- Aaptos aaptos
- Tethya aurantium
- Tethya ingalli
- Suberites axinelloides
- Suberites culpuloides
- Suberites perfectus
- Suberites sp.
- Pseudosuberites sulcatus
- Cliona celata
- Polymastia fusca
- Polymastia granulosa
- Polymastia hirsuta
- Polymastia sp. (A).
- Polymastia sp. (B).
- Timea aurantiaca

Family: SUBERITIDAE

Order: SPIROPHORIDA
- Cinachyra sp.

Family: TETILLIDAE
Order: CHORISTIDA

Stelletta arenaria
Stelletta conulosa
Stelletta crater
Stelletta maori
Stelletta sandalinum
Ancorina alata
Ancorina sp.
Penares tylotaster

Family: STELLETTIDAE

Geodia regina

Family: GEODIIDAE

Jaspis sp.

Family: JASPIDAE

Order: LITHISTIDA

Lithistid

Subclass: Homoscleromorpha.

Order: HOMOSCLEROPHORIDA.

Oscarella lobularis

Family: OSCARELLIDAE

Plakina monolopha

Family: PLAKINIDAE

Class: CALCAREA.

Subclass: Calcinia.

Order: CLATHRINIDA.
Clathrina sp.

Order: LEUCETTIDA.
Leucetta sp.
Leucettusa lancifer

Subclass: Calcarenea.

Order: LEUCOSOLENIDA.
Leucosolenia asconoides
Leucosolenia coriacea
APPENDIX II.

SPICULE MOUNTING PROCEDURE.

Cut a small piece of sponge, making sure that you have included all portions of the sponge (from the exterior to the interior). Place on a glass slide and add a few drops of household bleach (or if available, 50% solution of nitric acid and water). Heat gently over a bunsen burner until all the tissue has dissolved. It may be necessary to add a few more drops to achieve this; do so before all the solution has evaporated, thus avoiding to some extent the formation of yellow rings which can hamper the location of microscles. Rinse by adding a few drops of distilled water and heating gently. When cool, place a few drops of mountant (Canida Balsam or DPX) to the slide and cover with a slip.

BE CAREFUL NOT TO SPILL SOLUTION ON SKIN, OR INHALE FUMES FROM DISSOLVING TISSUES. (If you do spill some on your skin wash under running water. Work in a fume cupboard, if available, during heating; if not, work in a well ventilated area; if you do inhale fumes, sit in fresh air; if severe - feeling dizzy and nauseous - call a doctor).
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GLOSSARY.

Acantho- : Addition of spines to the spicule surface.

Actine : Single ray of a spicule.

-actine : Designates the number of rays.

Amphiaster : A microsclere with spines or clads radiating from both ends.

Amphiblastula larva : Larval form which has a hollow central cavity and two distinct cell types (anterior and posterior).

Anatriaene : A triaene with the clads curved backward toward the long shaft.

Anisochelea : A chelate microsclere with uneven ends.

Arcuate chelea : Microsclere where the teeth are formed in one to three curved plates.

Ascending fibre : A synonym of Primary fibre.

Aster : 'Star-like' microsclere with more than two rays radiating from a central point.

Axial construction : Skeletal organisation in which some components are condensed to form a dense central region.

-axon : Designates the number of axes.

Bifurcate : Divides into two forks.

Bipocilli : Modified small chelae as found in Iophon, one discoid end and the other with a toothed rim or end.

Blastula larva : See Amphiblastula or Coeloblastula.

Bud : An asexual reproductive body.

Calcareous : Composed of calcium carbonate or chalk.

Calthrops : Megasclere with four equal and symmetrical rays emanating from a central point. Typical of the Hadromerida.

Centrum : The globular centre of many euasters.

Chela : Microsclere with a curved axis and various 'cup-like' terminations at each end.

Chiaster : A small euaster without a centrum and with truncate rays.

Choanocytes : Flagellate cells responsible for generating the water
current which circulates through a sponge.

Choanosome: Region of a sponge containing choanocytes.

Cilia: Minute hair-like appendages which vibrate constantly, serve as organs of locomotion.

Clad: Ray or branch, used mainly in triaene descriptions.

Clavate: Club-shaped.

Coeloblastula larva: Simple flagellated form which has a central cavity. Found in the Calcinea.

Collagen: Proteinaceous, fibrous connective tissue.

Comma: A microsclere in the shape of a straight or curved style or tylostyle.

Conule: A cone-shaped elevation of the surface membrane of a sponge, generally over a fibre end.

Cortex: A layer of the ectsosome supported by a special organic or inorganic skeleton. A characteristic of many Choristida and may comprise two or more layers distinguished by structure and/or localisation of spicule types.

Cribripor: A specialised structure where several exhalant systems combine (a sieve-like cluster) to empty into a subsurface cavity. Characteristic of the genus Cinachyra.

Dendritic: Term describing a skeleton or body form that branches repetitively with little or no anastomosis between successive branches.

Dermis: The extreme outer surface layer of a sponge, may be simply membrane or may be reinforced by spicules or sand or both.

Desma: Megascleres which have irregular branching form. Characteristic of Lithistid sponges.

Dietaine: Two rays diverge from a central point.

Dichotriane: A triaene in which the clads are bifurcate.

Echinating spicule: A megasclere which protrudes from a fibre or spicule tract. Characteristic of Axinellida and Microcionidae.

Ectosome: A superficial region of the sponge not supported by any special spicule or collagen skeleton.

Endosome: All except the ectsosomal structures of a sponge.

Euaster: Aster with a central core and diverging rays.
Extra-axial skeleton: Skeletal elements surrounding or arising from an axial region.

Fibre: A discrete column of spongin; one of the chief structural elements of the Keratosa, Haplosclerida and Poecilosclerida.

Fibril: A small fibre.

Filament: Thin and irregularly flexed with a small bulb at each end, composed of collagen. Characteristic of the genus Ircinia.

Flabellate: Fan-shaped.

Flagella: Hair-like projection from a cell.

Fusiform: Tapers regularly towards both ends.

Gamete: Egg or sperm.

Gametogenesis: Production of eggs or sperm.

Gemmules: Asexual reproductive bodies; collections of cells and spicules surrounded by a thick wall, when released by the parent form new individuals.

Gonochoric: Separate sexes.

Hastate: Sudden tapering toward the point or points.

Hispid: Projecting spicules or spicule ends form a pile.

Involute: Rolled or curled up spirally.

Isochela: Chela with both ends identical; can be either palmate with a single flattened plate at each end, or toothed with several pointed plates at each end.

Isodictyal: A type of skeletal construction where spicules and/or fibres interlock in a regular triangular pattern.

Lamellate: A thin plate or layer.

Lithistid: A demosponge with interlocking desmas forming a rigid skeleton.

Lobate: Having lobes, rounded projections.

Mamillate: Nipple-shaped.

Massive: Term used in describing sponges which grow from a spreading base to achieve some thickness, usually in excess of 5cm, but which can be quite irregular in overall form.

Megasclere: A structural spicule.
Mesobyl: The region of the sponge body enclosed between the pinacoderm and the choanosome.

Microrhabd: A collective term for monactinal microscleres.

Microsclere: A packing or reinforcing spicule, usually of small size, frequently of ornate shape.

Microxea: A microsclere in the shape of an oxea. Common in Choristida.

Monactine: Spicule with a single axis or ray, thus the two ends are dissimilar.

Monolophotriaene: A microsclere in which one ray is affected by multiple branching. Characterise Plakina monolopha.

Oscule(um): Exhalent opening of a sponge.

Ostia: Inhalent openings of a sponge.

Oviparous: Produces eggs.

Ovocytes: Female reproductive unicell before fertilisation.

Oxea: A diactinal megasclere in which both ends taper to points; may be curved.

Oxyaster: An aster in which all the rays are pointed; the centrum may be small or absent.

Oxyspheraster: A spheraster with pointed rays; an oxyaster with a thick centrum.

Palmate chela: Chela in which the side 'plates' are joined to the shaft, the central 'plate' is usually oval or triangular.

Parenchymella: Solid, ciliated larva.

Pinacocytes: Cells which line all surfaces except those of the choanocyte chambers.

Pinacoderm: A layer of pinacocytes which delineate a sponge from its external surroundings.

Plagiotriaene: A triaene with clads inclined forwards at about 45° to the shaft.

Plumoreticulate skeleton: Skeletal construction in which fibre or spicule tracts diverge in plumose fashion but have clear cross connections.

Plumose skeleton: Skeletal construction in which 'feather-like' fibre or spicule tracts diverge but do not have cross connections.

Pores: Inhalent openings of a sponge.
Porocalyces: Specialised inhalant and exhalant structures.

Primary fibre: A fibre running at right angles to the surface of a sponge in those groups lacking a mineral skeleton. Frequently contain coring material of spicules, sand or other detritus.

Protriaene: A triaene in which the clads are directed away from the shaft.

Radial skeleton: A type of skeletal organisation where the structural elements diverge from a central point toward the sponge surface. Sometimes only evident at the surface where spicules stand at right angles to the surface.

Ramose: Branching.

Raphide: A thin oxalate microsclere.

Repent: Growth predominantly horizontal. The attachment basal area is large in proportion to body bulk, though it may not be continuous.

Reticulate skeleton: Any interlocking anastomising skeleton, either fibre or spicule.

Rhabdostyle: Abruptly bent near the rounded end and often have a spined distal end.

Sanidaster: Type of aster with a straight, rod-like axis and multiple rays at each end.

Secondary fibre: A fibre disposed without marked orientation to the sponge surface, connecting primary fibres.

Sigma: A microsclere in which a single axis is curved or contorted into a 'c' or 's' shape.

Sigmaspirae: Contorted sigmas of one revolution in a spiral direction.

Siliceous: Composed of silica, a glass-like material.

Spermatocyte: Male reproductive unicell.

Spheraster: An aster with a large centrum and many short conical pointed rays.

Spicule: Skeletal element composed of silica or calcium carbonate.

Spongine: Fibrous skeletal material. Collagenous material deposited in the form of fibres or plaques which are often of large size.

Sterraster: An aster with a large spherical or ovate centrum and great numbers of fine short rays.
Stolon: Root-like processes at the base of the sponge, or filament-like attachments to the body.

Strongyle: A diactinal spicule in which both ends are rounded.

Strongylospheraster: A microsclere with a thick centrum and blunt rays.

Strongyloxea: An oxea with rounded points. Typical of the family Tethyiidae.

Style: A monactinal megasclere in which one end is evenly rounded and the other end pointed.

Subtylostyle: A monactinal megasclere which has a slight, or marked sub-apical expansion, otherwise a typical style.

Tangential: Lying at oblique angles.

Tetractinal: Four axes or rays.

Tornote: A diactinal megasclere in which the shaft end is abruptly tapered to produce points.

Toxa: A 'bow-shaped' microsclere.

Triact-: A megasclere with three axes or rays.

Triaeone: A spicule with three rays shorter than the fourth. Common in the Choristida.

Triaxon: Hexactinal configuration.

Trichites: Extremely fine siliceous spicules or fibres.

Triradiate: Calcareous spicule.

Tylaster: Type of euaster with a small centrum in which the ends of the rays are knobbed.

Tyle: Any rounded swelling or knob (other than the centrum) in a spicule.

Tylostyle: A monactinal megasclere knobbed at one end, pointed at the other. Typical megasclere of the Hadromerida.

Tylote: A diactinal spicule in which both ends are knobbed.

\[ u: \text{Micron} = 1/1000\text{mm.} \]

Unguiferate: Chelate microsclere with short discrete teeth, often more than three teeth at each end of the shaft.

Viviparous: Transfer of some material from the parent to the embryo.
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**Expected 1984:**
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  - David R. Schiel
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- Leigh Climate Report IX Wind
  - J. Augustin & J.H. Evans
- Leigh Climate Report X The Climate in 1983
  - J. Augustin & J.H. Evans
- The Mokohinau Islands A Marine Survey
  - Ed. R.G. Creese

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