Reef Watch Benthic Identification Manual

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Introduction

This manual is about the identification of benthic organisms, i.e. flora and animals that are attached to or lie on the sea floor.

There are many thousands of benthic flora and fauna species, and many of these can not be precisely identified in the field even by the experts. For this reason we focus on groups of similar species categorised into *lifeforms*, which we describe with simple codes based on their look and feel. For example, a brown, branching plant has the code "BBRANCH" ("B" for "brown", "BRANCH" for "branching").

Scientists also classify species into higher level classifications. There is an entire branch of science, taxonomy, which deals with classification of organisms based on a variety of factors – not necessarily related to the way they look or feel. There are some similarities between the Reef Watch lifeform codes and the classifications used by scientists; further information about this is included in Appendix 1. However, although there is no reason why a Reef Watch diver could not learn some taxonomy, it is not required for participation in Reef Watch.

This manual makes frequent reference to the book *Australian Marine Life – The Plants and Animals of Temperate Waters*, by Graham Edgar. There is a 1997 hardback edition from Reed Books, and a 2000 paperback edition from Reed New Holland. Page numbers are unchanged between editions. It is available at a number of libraries (including at the Conservation Council of South Australia) or can be purchased for around $50.

Reef Watch has also developed on-line resources to assist with benthic identification.

Plant, Animal, Mineral or other?

There are separate sections in this manual for the identification of plants and animals, so it is important to be able to know which section to look in first. To distinguish between marine plants and animals, consider that marine plants generally exhibit some or all of the following characteristics:

- green, brown or red/pink
- soft, flexible form
- smooth and consistent surface (no pores or other holes or colonies of smaller structures)
- branched and upright growth
- don't react to touch

There are a number of exceptions, and many marine fauna also show some of the above characteristics. Any instances of potential ambiguity between lifeform codes are highlighted in the detail of this manual.

Apart from plant and animal codes, there are some others. It should not be difficult to recognise the substrate (mineral) codes:

Code	**Description**
ROCK	Bare rock (with no encrusting organisms)
RUBBLE	Pebbles or small rocks (fist size or smaller)
SAND	Sand
GRIT	Shell grit
MUD	Mud
SILT	Silt

In addition there is a code to represent missing data (DDD). The use of this code is described in the Benthic Quadrat and Line Intercept Transect Survey Manuals.

Marine Benthic Flora

A first step in guiding identification of marine benthic flora is to clarify some of the terminology used: *plant*, *seagrass*, *algae* (and *macroalgae*) and *seaweed*.

A number of distinctly different 'plants' can be found in marine ecosystems, most of which are quite different from the ones we find on land. These include mangroves, salt marsh plants, seagrasses, algae and lichens (a symbiont of fungus and algae).

Seagrasses are the only submerged flowering plants. The majority of marine plant species are actually algae, which also use the energy of light but have much simpler structure. We generally call such algae "macroalgae" to distinguish them from the many microscopic algae that we can't see. The term "seaweed" has been used in common language to refer to both macroalgae and (incorrectly) seagrasses, but is not used by Reef Watch.

Reef Watch divers will mainly encounter seagrasses and macroalgae.

Seagrasses

Seagrasses are flowering plants that have become adapted to living in submerged marine environments. They are not actually grasses at all -the term 'seagrass' refers to their vaguely grass-like appearance and serves to differentiate them from macroalgae.

Along the Australian coastline (especially in the southern temperate region) you will find the largest and most diverse range of seagrasses in the world – with 22 species in southern Australia, almost all of which are found nowhere else.

Seagrasses are typically found on expanses of sand or mud, although small patches may occur on soft substrate within reefs. Even though a single code "GRASS" is used by Reef Watch to report all occurrences of seagrass, it is useful to know the main lifeforms:

Common name	**Scientific name (genus)**	**Examples from Edgar (*Australian Marine Life*)**
tape weed	*Posidonia*	pp. 103-106: *P. australis, P. angustifolia, P. sinuosa, P. denhartogii, P. coriacea*
wire weed	*Amphibolis*	p. 107: *A. antartica, A. antarctica* bed, *A. griffithii*
eel grass	*Zostera* or *Heterozostera*	pp. 108-109: *Z. mucruonata, Z. muelleri* p. 108: *H. tasmanica*, *H. tasmanica* with flowers,
paddle weed	*Halophila*	p. 102: *H. australis*

All use code GRASS

Further illustrations and detail on seagrass identification are available from a brochure prepared by the Department for Environment & Heritage:

http://www.environment.sa.gov.au/coasts/pdfs/seagrasses.pdf.

Macroalgae

Macroalgae come in all shapes and sizes, all of which provide their own unique contribution to the underwater environment. Their size can range from millimetres up to metres. They form complex communities that are often made up of several different layers from encrusting up to large canopy forms. In this respect they can be likened to forest ecosystems, and similarly support large numbers of other organisms.

There are more than 1500 species of macroalgae, many of which can not be readily identified in the field even by experts. Instead of trying to identify individual species, Reef Watch uses the same classification system (set of codes) that are used by the various marine science organisations in South Australia and applied in a number of scientific reef health surveys (these reports are available from the “Reef Health Monitoring -> Reports” section of the Reef Watch website).

This classification system uses the colour as well as the size, shape and texture of the macroalgae.

Colour

Colour is critical for the scientific classification of macroalgae into groups, and Reef Watch has adopted the same three basic colour groups:

- Red macroalgae are pink to red to red-green in colour. A general rule of thumb is that if a macroalga has any red/pink/purple tinge to it, it probably is red.
- Brown macroalgae are yellow-brown to brown to brown-black in colour.
- Green macroalgae are grass green in colour and lack the red-orange tint sometimes seen in the red macroalgae

Sometimes the colour of the foliage of a macroalga does not give an accurate indication of the correct (scientific) colour grouping, but a check of the colour of its holdfast (base) can help to reveal the correct grouping. For example, the red macroalga *Osmundaria prolifera* (Edgar p. 96) commonly produces green/yellow foliage but has a red holdfast.

Size, shape and texture

A combination of the these factors has been used to develop a standard set of codes for the macroalgae that when combined with the colour codes (R,G,B) give a single lifeform code. Note that since the size of a macroalga increases as it grows, it may have different lifeform codes at different life stages.

The codes are described on the Reef Watch website ("Reef Health Monitoring -> Manuals -> Benthic" section, alginfo database http://www.reefwatch.asn.au/cgi-bin/database/alginfo.pl) and in the table below. For each code, examples are given which are:

- Typical of the lifeform code, i.e. clearly exhibit the characteristics of the lifeform;

- Less typical, but nevertheless fit into that lifeform category; and/or

- Confusing: belong in that lifeform category but look very much like lifeforms from another category (plant or animal).

All page references are to *Australian Marine Life* unless otherwise specified. Scientific names are given, but are only required to find the right picture on the specified page. (Notes: in the table below, pp = pages, spp = species)

Shape and texture	Size (cm)	R (red)	G (green)	B (brown)
ENC (encrusting) Found closely pressed against substratum, forming a covering. They are generally able to tolerate very low light conditions and are found in almost all macroalgal communities world-wide. Red encrusting members are heavily calcified and are often found growing underneath the holdfasts of other macroalgal species.	n/a	**RENC** **Typical:** unidentified species at bottom of p.88.	n/a	**BENC** **Typical:** *Ralfsia verrucosa* (not in *Australian Marine Life*).
TURF (turfing) Generally fine, "moss like" filamentous forms, soft to the touch, that establish a thin layer over the substratum. Note: for turfing macroalgae, the colour part of the code can be difficult to determine and can be omitted.	<2cm	**RTURF**	**GTURF** Typical: (if <2cm) p.29: *Enteromorpha compressa* Less typical: p. 30: *Chaetomorpha billiardieri* (forms a turf-like tangled mat)	**BTURF**

CORAL (coralline) Resembles coral in structure. Generally hard and brittle because of calcification and appear branched and spiky or fernlike.	2-7cm	**RCORAL** **Typical:** p. 87: *Metagoniolithon stelliferum* p. 86: *Amphiroa anceps* **Less typical:** p. 88: *Sporolithon durum* **Confusing:** p. 87: *Haliptilon roseum* - Looks like a FOLI in the picture, brittleness more apparent underwater.	n/a	n/a
MEMB (membranous) Membranous, sheet or sack like, with a soft texture, and sometimes slimy.	2-20cm	**RMEM** **Typical:** p. 77: *Kallymenia* spp **Less Typical:** p. 93: *Sarcomenia delesserioides* – not sheet like but has the right texture. p. 89: *Gloiosaccion brownii* – not sheet like (tubed) but has the right texture. **Confusing:** p. 73: *Porphyra* spp. Colour is a bit confusing.	**GMEM** **Typical:** p. 28*: Ulva* spp*.*	**BMEM** **Less Typical:** p. 53: *Asperococcus bullosus* not sheet like (tubed) but has the right texture. **Confusing:** p. 52: *Scytosiphon lomentaria* Looks like FOLI

FOLI (foliaceous) Bushy in nature, frequently branched and with a soft texture.	2-20cm	**RFOLI** **Typical:** pp: 80-82: *Plocamium* spp. p. 82: *Phacelocarpus peperocarpus* p. 84: *Ptilonia australasica* Confusing: p. 89: *Botryocladia obovata* – less typical form which also resembles a colonial ascidian.	**GFOLI** **Typical:** pp. 35-39: most *Caulerpa* spp. **Less Typical:** p. 43: *Acetabularia calyculus*	**BFOLI** **Typical:** p. 45: *Halopteris* spp. **p. 50:** *Perithalia caudata* **Less Typical:** **pp. 48.49: *Zonaria* spp.** **Confusing:** p. 51: *Encyothalia cliftonii* – resembles a BRANCH
LOBE (lobed) Flattened and rounded or fan shaped with a firm texture.	2-20cm	**RLOBE** **Typical:** p. 74: *Sonderopelta coriacea* **Less Typical:** p. 78: *Stenogramme interrupta*	**GLOBE** **Typical:** p. 31: *Dictyosphaeria sericea*	**BLOBE** **Typical:** pp. 47-48: *Padina* spp. p. 49*: Lobophora variegata* **Confusing:** p. 49: *Distromium flabellatum* – colour can be deceiving.

LUMP (lumpy) Lumpy or spherical in form and generally firm to the touch.	2-20cm	n/a	**GLUMP** Typical: p. 32: *Codium pomoides* p. 33: *Codium* spp. **Less Typical:** pp: 40-41: some *Caulerpa* spp.	**BLUMP** **Typical:** p. 44: *Leathesia difformis* p. 52: *Colpomenia* spp.
ROB (robust) Generally tough and leathery with either branched or leaf like forms.	<1m	**RROB** The only form likely to be seen is: p. 96: *Osmundaria prolifera*	n/a	n/a

BRANCH (branched) Robust brown macroalgae, branched and often bushy in appearance, have one or more tough, central stalks. Many species in this category also have features of FOLI (foliaceous) species. Often the key distinguishing characteristic is the size. Species may be FOLI in earlier life stages and then grow to be BRANCH.	10-100+ cm	n/a	n/a	**BBRANCH** **Typical:** p. 59: *Scytothalia dorycarpa* p. 68: *Caulocystis* spp. pp. 62-67: *Cystophora* spp. pp. 70-71: *Sargassum* spp. p. 69: *Acrocarpia* spp. **Less Typical:** p. 57: *Hormosira banksii* Confusing: see note in description (left).
LEATH (leathery) Robust, leathery brown macroalgae (generally kelps) with flattened blades. Have a well-defined stalk at the base.	10-200+ cm	n/a	n/a	**BLEATH** The only form likely to be seen north of the Murray Mouth is*:* *Ecklonia radiata* (p. 55). South-eastern kelps include: p. 54: *Macrocystis* spp. p. 57: *Durvillea potatorum* If the "feral" species *Undaria pinnatifida* (p. 56) is seen, it should be urgently reported to Fish Watch.

1. Marine benthic fauna

The marine benthic fauna described in this section applies only to invertebrates (animals without backbones), and therefore does not include fish, which are covered by the Reef Watch fish survey rather than benthic survey methods.

There are thousands of benthic marine invertebrates in South Australian waters, and very little is known about most of them. Many organisms can not be identified to the particular species, even by the experts, without the aid of laboratory equipment.

However, following a similar approach to that taken with the macroalgae, we can obtain useful and valid data through the use of lifeform codes. There are 25 lifeform codes, each illustrated with a small black and white icon (picture) that is used on the benthic slate, in this manual, and on the website. Although 25 might seem like a lot, many of them are easy to recognise and depict familiar organisms, for example the icon for code STAR (starfish).

Both in this manual and on the slate, the codes are clustered together into similar groups that share some common feature. In some cases there is a simpler "group code" which can be used instead of the lifeform code if identification to a particular lifeform code can not be made with certainty (it would be a bit like having a macroalgal code "RED" for all the red macroalgae).

Of course the best way to learn the codes is to see some examples. If you have an internet connection, you can go to the "Reef Health Monitoring" > "Manuals" > "Benthic" section and look for the links to the on-line identification guide. If you don't have the internet, then you can use the book *Australian Marine Life: the Plants and Animals of Temperate Waters* by Graham Edgar (both 1997 and 2000 editions). As with the section on macroalgae, the page references for the examples in this manual apply to this book. The species names are given only to help you find the right photo – you don't have to learn the species names!

The examples are divided into three categories:

- Typical – more or less resemble the icon
- Atypical – belong to the code but don't really look like the icon
- Confusing – look like some other flora or fauna lifeform

There are two additional categories for a few species that are part of the Reef Watch "*Feral or In Peril*" Program.

- Feral – introduced pests
- In Peril – potentially of conservation concern

Sea stars & similar organisms

General characteristics:

- Have five or more arms
- Radial symmetry – similar parts of the body (i.e. arms) are repeated around a central axis
- Note that there is no group code for these three lifeforms as they are easily distinguished from each other

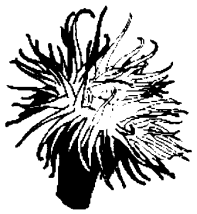
Common name	Code	Identification Notes	Examples
Sea stars	STAR 	• Usually have 5 (sometimes more, e.g. 11) stout arms that grade into the body • Underside of each arm has a groove, lined with tube feet • Mouth is positioned in the centre of the underside, no teeth • Many sea stars are brightly coloured	Typical reef examples – any few will give the idea. • p. 336-337: *Tosia* spp., *Pentagonaster dubeni* • p. 339-342: *Nectria* spp., *Asterodiscides truncatus; Petricia vernicina; Fromia polypora*, *Plectaster decanus; Echinaster arcystatus* • p. 344: *Nepanthia troughtoni* • p. 349: *Uniophora granifera* Less typical reef examples: • p. 344: *Patiriella* spp. (very short arms) • p. 347: *Coscinasterias muricata* (11 arms)
Brittle stars, Basket stars	BRIT 	• 5 arms and a distinct central disc - arms highly branched in some e.g. basket stars • No groove under the arms • Mouth underneath	Typical (brittle stars) • p. 352 *Ophiomyxa australis* • p. 355 *Clarkcoma* spp. • p. 355-6 *Ophionereis schayeri* Less typical (basket stars): • p. 352 *Conocladus australis* • p. 353 *Astroboa ernae*

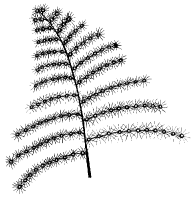
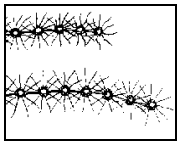
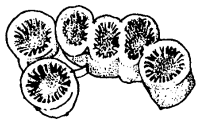
Feather stars	FEATH 	• Many arms, usually in multiples of 5 • Arms long and branched with small, sticky feathery fronds • On the underside of the body is a ring of small, jointed appendages	Typical: • p. 330-1 *Cenolia* spp. • p. 331-2 *Antedon* spp. • p. 333 *Ptilometra macronema*

Organisms with cup-shape tentacles (group code POLYP)

Group characteristics:

- Main structural body types – the **polyp** - central mouth surrounded by tentacles;
- Radial symmetry – similar parts of the body are repeated around a central axis
- Generally attached, though some crawl or roll around
- Solitary and colonial (i.e. with many polyps) forms

Common name	**Code**	**Identification Notes**	**Examples**
Anemones	ANEM 	• Radial symmetry – similar parts of the body are repeated around a central axis • Solitary polyps • Often brightly coloured • Generally live attached to rocks or shells or burrow in sand • Usually sedentary however can crawl on sucker disc or walk on their tentacles.	Typical • p. p. 126-127: *Actinia tenebrosa; Oulactis* spp., *Anthothoe albocincta* Less typical • p. 128: *Phlyctenactis tuberculosa* (picture shows tentacles but most commonly seen rolled up as a ball part of which can be seen behind the tentacles in the photo)

Hydroids	HYD 	• Polyps have stalk attaching them to stem • Plant-like in appearance, often form colonies on stems attached to rocks or plants but can be solitary  	Typical: • p. 121: *Halopteris campanula*, *Halocordyle disticha* Less Typical • p.121: *Ralpharia magnifica* • p. 122: *Solanderia fusca* Confusing • p. 120*: Gymnangium superbum* - resembles arms of a crinoid (CRIN)
Stony corals	STONY 	• Hard external skeletons into which polyps can withdraw • Occur as solitary polyps or in colonies (reef building corals are colonies)	Typical • p. 134: *Plesiastrea versipora*; *Coscinaraea* spp.; • *Culicia tenella*; *Scolymia australis* Less Typical • p. 135: *Culicia tenella*; *Scolymia australis* (solitary)

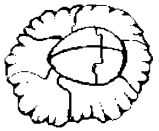
Other organisms with Polyps, including: • Zoanthids • Soft Coral • Gorgonians	COLPOL 	**General** • For anything else with polyps. • Colonial • Some forms may have sponge associated with them • large variety of forms **Zoanthids** • Clustered polyps • Soft tentacles **Gorgonians** • Often large, colourful fans in strong current areas • Horny skeleton • 8 feather like tentacles, exclusively bottom living and colonial **Soft corals** • Branching polyps • No skeleton	Typical zoanthids: • p. 131 *Zoanthus robustus* • p. 132 *Epizoanthus sabulosus* Typical soft corals: • p. 139 *Capnella* spp. • p. 140 *Carijoa* spp. Typical gorgonians: • p. 141 *Mopsella* spp.

Worms

- Note that there is no group code for these worms as the two lifeforms are easily distinguised, and there are other worms included as part of the SLUG and ENCRUST groups.

Common name	Code	Identification Notes	Examples
Fan worms	FAN 	• Construct tubes of sand grains embedded in mucous • When open resemble a fan - but quickly retract tentacles when disturbed	Typical: • p. 160-163: *Sabellastarte* sp., ?*Myxicola infundibulum* Feral: • p. 161: *Sabella spallanzani*
Other worms • All worms other than fan worms (FAN) or encrusting worms (ENCWM) or flatworms (FLATWM)	WORM 	• Wide variety of characteristics but all basically “worm like” • Bilateral symmetry(one side mirror image of the other)	Typical: • p. p. 157: *Lepidonotus melanogrammus*.

Organisms covered by a shell (Group code SHELL)

Common name	Code	Identification Notes	Examples
Barnacles	BARN 	• Hard "shell" with overlapping plates, cemented to rock, with jointed legs • Two main groups **"Acorn" barnacles** • like the big surf barnacles you find on rock platforms **"Goose" barnacles** • stalked barnacles with clearly overlapping plates	Typical acorn barnacles • p. 172 *Catomerus polymerus* • p. 173 *Tetraclitella purpurascens* • p. 175 *Elminius* spp Typical goose barnacles • p. 171 *Lepas australis*
Chitons	CHIT 	• Shell made of 8 overlapping plates • Bilateral symmetry(one side is mirror image of the other) • Found on rock surfaces in crevices and under rocks	Typical examples • All species pp. 220-226: e.g. *Ischnochiton* spp.; *Stenochiton longicymba*; *Callochiton crocina*; *Eudoxoplax inornata*. Less typical • p. 226 *Cryptoplax striata* (8 plates not so clear)

Sea snails (Gastropods)	SNAIL 	• Coiled shell, may have a hard structure (operculum) to use as a "door" • Not a valid "SNAIL" if it is empty • If it contains a crab it is code "HERMIT"	Typical: • pp. 237-238: *Clanculus* spp. • p. 242: *Phasianella* spp. • pp 242-243: *Turbo* spp. • p. 257: *Dicathais orbita* • p. 260: *Pleuroploca australasia* • p. 265: *Ericusa fulgetra* Less Typical: • Cone shells, e.g. p. 263: *Conus anemone* (p. 263); • Cowries – pp 250-253. e.g *Cypraea friendii* (Also an "In Peril" species) • Abalone: pp. 227-230 *Haliotis* spp. Confusing: • p. 230 *Scutus antipodes* (mantle makes it look like a big nudibranch – code NUDI) • Limpets – p. 233 *Cellana* spp.; pp. 267-268 *Siphonaria* spp., (resemble barnacles – code BARN) • Also see note on empty (dead) shells & HERMIT)

Bivalves	BIV 	• two similar shell halves hinged together	Typical reef species: • Scallops – p. 292: *Chlamys asperrimus* • Mussels –p. 286-287) various species e.g. *Brachidontes* spp.(example of encrusting mussels) • Hammer oyster, p. 290 *Malleus meridianus* (other scallop species and cockles are also commonly known bivalves, but like most bivalves tend to be found in soft bottom habitats rather than on reef)

Crabs

- There is no group code as the two lifeforms are easily distinguished.

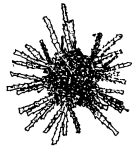
Hermit crabs	HERMIT 	• Crabs living inside remant shells of dead SNAIL • Generally orange in colour	Typical • p. 198- 199: *Paguristes frontalis*
Crabs	CRAB 	• 10 walking legs • Head and thorax fused together, covered by carapace (shell) on the outside.	Typical: • p. 215: *Plagusia chabrus* • p. 209 *Ovalipes australiensis* – typical but more common on sand Less typical: • p. 207 spider crab *Leptomithrax gaimardii*

Slug like (Group code SLUG)

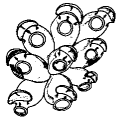
Common name	Code	Identification Notes	Examples
Nudibranchs (sea slugs) Sea Hares	NUDI 	• Nudibranchs are slug-like in form, and have plumes of gills on their backs (nudibranch = naked gills) • Sea hares have tentacles in front of their head that resemble nostrils and others behind their head that resemble the ears of a hare.	Typical • p. 271 *Sagaminopteron ornatum* • p. 278 *Neodoris chrysoderma* • p. 279 *Ceratosoma brevicaudatum* • p. 277 *Tambja verconis*
Flatworms	FLATW 	• Soft flattened bodies • Symmetrical about central line	Typical: • p. 152 *Pseudoceros lividus*

Miscellaneous

Common name	Code	Identification Notes	Examples
Sea cucumbers	CUCUM 	• Sausage like • Mouth and anus at separate ends • Radial symmetry	Typical: • p. 370 *Stichopus mollis* • p. 371 *Holothuria hartmeyeri*

Urchins	URCH 	• Nearly always globular/spherical in shape • Have a hard shell or 'test' under the outer layer • Numerous spines, vary greatly in shape and size	Typical: • p. 360 *Phyllacanthus irregularis* - "pencil" type urchin • p. 362 *Amblypneustes ovum* – "velcro ball" type urchin • p. 360 *Centrostephanus tenuispinus* – "spiny" type urchin
Lace Corals (Lacy Bryozoans)	LACE 	• Colonies of small, box-like animals • hard brittle texture • Mostly lattice form • Some branching forms, which look a little like macroalgae.	Typical • p. 325: *Triphyllozoon* spp. • p. 324: *Adeona grisea* Less typical • p 322: *Steginoporella chartacea* (also known as *Biflustra perfragilis* in edition 1) • p. 325: *Celleporaria* sp. • p. 326: *Orthoscuticella ventricosa* Confusing • p. 323: *Bugula dentata* – plant like appearance but is distinctively bushy blue-green

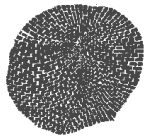
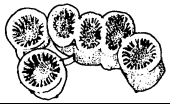
Attached organisms (group code ATTACH)

Common name	Code	Identification Notes	Examples
Sea squirts / ascidians	SOLASC 	• Two openings (one for inhaling, one for exhaling) which contract on touch • May have a stalk • Fleshy tunic	Typical unstalked • p. 374 *Phallusia obesa* • p. 378 *Herdmania momus* Typical stalked ("sea tulips") • p. 378-379 *Pyura* spp.
Compound / colonial ascidians	COLASC 	**Colonial ascidians** • Smaller individual ascidians sharing a stalk or base **Compound ascidians** • Multiple small inhalant openings and share a communal exhalant opening. • Often gelatinous in appearance, made up of many fused individuals	Typical attached colonial ascidians: • *Clavelina* spp.; p. 382-3 *Pycnoclavella* spp. • p. 376 *Amphicarpa meridiana* Typical attached compound ascdians: • p. 376-377 *Botrylloides* spp. • p. 384 *Sycozoa cerebriformis* • p. 385 *Polycitor giganteus* Less typical compound species: • p. 383 *Sigillina australis* • p. 387 *Riterella pedunculata* (see also examples of encrusting compound ascidians)

Sponges	SPONGE 	• "Spongy", meaning not hard or brittle, but also not gelatinous. • Visible openings • Lack of movement or reaction to touch • Come in a range of shapes and colours. Some are spherical, but most are irregular in shape and exhibit an array of forms.	Attached forms: p. 113: *Sycon* sp. p. 114: *Tethya bergquistae* p. 115: *Holopsamma laminaefavosa* p. 116: *Carteriospongia caliciformis* p. 117: *Dendrilla rosea* (See also Encrusting Sponges)

Encrusting organisms (group code ENCRUST)

Common name	**Code**	**Identification Notes**	**Examples**
Compound / colonial ascidians	COLASC 	• Encrusting forms of COLASC in the attached organisms table above	Typical compound encrusting species • p. 386-387 *Aplidium* spp. • p. 386 *Synoicum* spp. • p. 387-388 *Didemnum* spp. Potentially confusing: • E. p . 388 *Didemnum spongioides* – often mistaken a sponge. (see also examples of attached compound / colonial ascidians)

Sponges	SPONGE 	• Encrusting forms of SPONGE in the attached organisms table above	Typical • p. 115 *Chondrilla australiensis* • p. 117 *Dendrilla rosea* (encrusting form)
Bryozoans	BRY 	• Encrusting form of LACE in the miscellaneous organisms table above	Typical • p. 322: *Membranipora mebranacea*
Stony corals	STONY 	• As for STONY in polyp organisms table above	As for STONY in polyp organisms table above
Encrusting worms	ENCWM 	• Live in sandy or chalky tubes which encrust the substrate. • Tentacles can be coloured, retract when disturbed	Typical: • p. 162 *Filograna implexa* • p. 162 *Galeolaria caespitosa*

Appendix 1

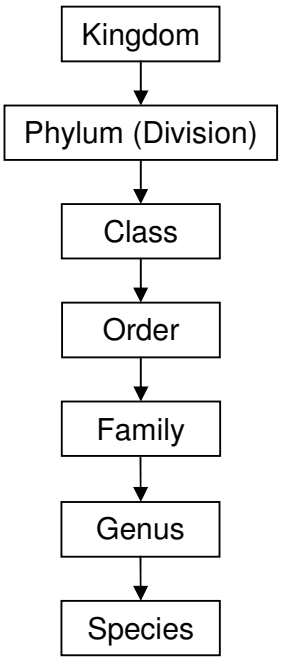
We need to give names to the things around us as it helps us to communicate to each other about them. Often we will put two or more descriptive terms together to give a sense of association, for example: traffic light; front door; corn chips; red wine. This system works well locally but tends to become complicated because common objects are often given different names by different people. Just to make things more confusing, the same word may have a different meaning to others. By the time you bring in different languages and dialects the whole thing has got quite messy.

To address this problem, scientists decided to adopt a standardised naming system that provided a unique name for every organism. This system works in similar way to the way we name ourselves. We each have a surname and a given name, and similarly every organism has a genus name and a species name. However the scientific naming system goes a bit further to state that no two different organisms can have the same name.

In the same way that our surname gives people a clue that we maybe (but not necessarily) related to others with the same surname, closely related species have the same genus name. In the scientific system, this naming arrangement continues up for many levels linking groups of similar organisms together.

For example take your common house cat its scientific name is *Felis silvestris*. Now look at some other types of cat eg the Chinese desert cat (*Felis bieti*), and the jungle cat (*Felis chaus*). Note they are all in the same genus (*Felis*) meaning they are closely related. To go a bit further lets see the names of some other cat like creatures eg the Serval (*Leptailurus serval*), Cheetah (*Acinonyx jubatus*), and the Lion (*Panthera leo*). While they all have different genus names, they all belong to the same "Family" known as Felidae because they have many characteristics in common. Similarly there are a number of families including Felidae (cats), Canidae (dogs), and Otariidae (seals) that all belong to the same "Order" Carnivora that share common features. If we keep going up we find that the carnivores along with many other orders make up the "Class" called Mammalia – the mammals.

There are seven main levels of classification they are Kingdom, Phylum (Division), Class, Order, Family, Genus and Species. In general scientists try and use names that are descriptive of the members contained within each group, hence it would be reasonable to assume that the Order Carnivora was made up of carnivorous (specialised meat eating) animals.



The reason that most of the names sound strange is that they are not English but Latin. There are two reasons for this, firstly not all scientists are English speakers and secondly over time a language like English will evolve, such that many works will over time change their meaning. To avoid this possibility scientists use Latin because it is a 'dead' language i.e. because it is not widely spoken words are unlikely to change in meaning. Note that *Felis* is the Latin word for cat and *Canis* for dog.

While working with Reef Watch focus species you will seldom need to refer to the scientific names as the fish and some invertebrates have common names and the rest have simple lifeform codes. However you should still be aware of them as you will encounter them from time to time.

The following table shows the close relationship between scientific classifications (at Kingdom and Phylum level) and Reef Watch codes.

Phylum/Subphylum	**Class**	**Code**
Kingdom Protista		
Chlorophyta (green macroalgae)		GTURF, GMEM, GFOLI, GLOBE, GLUMP
Phaeophyta[1] (brown macroalgae)		BENC, BTURF, BMEM, BFOLI, BLOBE, BLUMP, BBRANCH, BFLAT
Rhodophyta (red macroalgae)		RENC, RTURF, RCORAL, RMEM, RFOLI, RLOBE, RROB
Kingdom Plantae		
Magnoliophyta (flowering plants)		GRASS
Kingdom Animalia		
Porifera (sponges)		SPONGE
Cnidaria	Hydrozoa (hydroids)	HYD
	Anthozoans	ANEM (anemones)
		STONY (stony corals)
		COLPOL (colonial polyps, e.g zoanthids and soft corals)
Platyhelminthes (flatworms)		FLATW
Nemertea (worms)		WORM
Nematoda (worms)		WORM
Annelida (segmented worms)	Polychaeta	WORM, ENCWM (encrusting worm), FAN (fan worm)
Arthropoda/Crustacea	Cirripadia (barnacles)	BARN
	Malacostraca (crabs, shrimps, prawns)	CRAB, HERMIT
Mollusca	Chitons	CHIT
	Gastropoda	SNAIL, NUDI (nudibranch/sea slug)
	Bivalvia	BIV
Bryozoans		BRY (encrusting bryozoans), LACE (lace corals)
Echinodermata	Crinoidea (feather stars)	FEATH
	Asteroidea (sea stars)	STAR
	Ophiuroidea (brittle/basket stars)	BRIT
	Echinoidia (urchins)	URCH
	Holothurians (sea cucumbers)	CUCUM
Chordata	Ascidiacea	SOLASC (solitary ascidians), COLASC (colonial/compound ascidians)
	Osteichthyes (bony fish)	See Reef Watch fish slate
	Chondrichthyes (cartilaginous fish)	
	Class Reptilia (reptiles)	Marine turtles, seabirds, seals, whales and dolphins are not covered by the Reef Watch monitoring programs, but further information is available from the Links page on the website www.reefwatch.asn.au
	Class Aves (birds)	
	Class Mammalia (mammals)	

[1] Recent taxonomic revisions have renamed the division Phaeophyta into division Heterokontophyta, class Phaeophyceae