

splendid sponges of palau

Version 1, 2016

Michelle Kelly & Lori J. Bell

with Blayne Herr



about this guide

Sponges are one of the most common marine invertebrates that inhabit our reefs in Palau, and are found in the intertidal and down to the depths of our oceans. They also occur in sea grass beds and mangrove communities and are an important part of the benthic fauna in the Palau marine lakes. They are a magnificent and diverse group and we hope that you will enjoy reading about them and using this guide to help identify these fascinating creatures in the wild.

SPLENDID SPONGES OF PALAU is a fully illustrated working guide to the most commonly encountered sponges of Palau. It is designed for Palauans, residents of Palau and visitors who appreciate the ocean's marine life and want to learn more about it. It is an excellent resource for marine educators and those working on the conservation and management of marine environments.

The guide starts with a simple introduction to living sponges and how to identify them, followed by a color index, a morphology (shape) index, and a species index. These are followed by detailed individual species pages and additional supporting information. The taxonomic names in this guide are the result of identifications of numerous specimens collected under contract to the US National Cancer Institute, Washington, over a 22 year period, and from field work conducted by the authors. Each species and range extension is represented by at least one *in situ* photo: our 'best' photo may not have been taken in Palau. Photo locations are identified in the image credit section. As new species are discovered and described, new species pages will be added and an updated version of this guide will be made available online.

Each sponge species page illustrates and describes features that enable you to differentiate the species from each other. Species are illustrated with high quality images of the animals in life. As far as possible, we have used characters that can be seen by eye or magnifying glass, and language that is non-technical. Information is provided in descriptive text or quick reference icons that convey information without words. Icons are fully explained at the end of this document and a glossary explains unfamiliar terms.



Lori Bell is a founding co-director of the **Coral Reef Research Foundation** (CRRF) and has a passion for tropical sponges and their ecology. CRRF runs a marine research lab in Palau on Malakal Island, setup in 1993. CRRF was established in 1991 by a group of marine scientists dedicated to research and education on coral reefs and other tropical marine environments. It is both a California and Palau non-profit organization.



Michelle Kelly is a professional sponge taxonomist based in New Zealand and research associate of CRRF. She has a particular interest and extensive expertise in the taxonomy of Indo-West Pacific sponges, including marine lake sponges, and has worked in collaboration with CRRF for over 20 years.

<http://www.CoralReefResearchFoundation.org>

<http://www.niwa.co.nz/coasts-and-oceans/marine-identification-guides-and-fact-sheets>



Remember to check the websites for updated versions!

Max Walker de Laubenfels

1894–1960

B. A. (Oberline) 1916, M. A. (Stanford) 1926, Ph. D. (Stanford) 1929,
Professor of Zoology at Oregon State College, 1950–1958



Professor Max de Laubenfels was an American spongologist, free-thinker and artist, and is also noted as one of the earliest authors to posit that dinosaurs might have met their demise from the after-effects of an asteroid strike!

As a sponge taxonomist he was not constrained by the more formal requirements of scientific taxonomic descriptions – he had a real knack for describing sponges. At a time when most sponge taxonomists described lifeless and colourless specimens in the great museums of Europe and North America, Max spent months in the field of the Western Pacific, in a canoe with locals, wearing a top hat, using a glass viewing box, describing colour, shape and texture in such a unique way that we can still recognise his species in the field today. The resulting 320 page 1954 treatise, *The sponges of the West-Central Pacific*, is still very much in use, and treasured by us to this day.

Unfortunately many of his beautiful and imaginative taxonomic names have been subsumed and synonymised in our modern-day classification, but we have attempted to keep his legacy alive in the form of this guide which abounds in colourful descriptions and images. This guide is dedicated to Professor de Laubenfels.

a typical species page layout

taxonomic name of species

taxonomic authority
person(s) who first described this species and when

species images
inset images show variations

common name of species

species classification

life history icon
highlighting geographic distribution beyond Palau

body plan icon
highlights the key characteristic of major groups

scale bar
indicating relative size of main image

depth range
common depth range

quick id icons
highlighting shape, surface detail, habitat, and environment

information details on external and internal characters and habitat

abundance

distribution
island and continental areas where this species is found

key taxonomic references

it could also be ...
some species are difficult to tell apart without careful identification, so check the species listed here to make sure that you have the correct species

make notes of where you encountered this species and let us know if you find it at a new location

Callyspongia (Cladochalina) aerizusa Desqueyroux-Faúndez, 1984 [Return to Index](#)

beautiful teal sponge

Class Demospongiae, Order Hipposclerida, Family Callyspongiidae

morphology, surface, substrate, habitat

7 cm

depth (m) 0, 20, 40, 60, 80, 100, 120

Tubular to large fan-shaped sponge, clusters of tubes arise vertically from a basal tube or lamella loosely attached to substrate, fans up to 20 cm tall and up to 40 cm across, tubes 2–8 cm diameter, 15–20 cm tall, walls 3–5 mm thick. Fans can attain a large size, up to 1 m across. Internal surface lightly ridged, also with lines of small oscules, external surface covered in soft, tapering, evenly distributed oblique spines, 2–10 mm long, directed towards margins where spines are particularly prominent. Surface is covered by a beautiful translucent net. Texture soft, felty, spongy, tears easily but holds shape out of water. Colour in life a distinctive teal or turquoise colour, or light brownish pink under low illumination. Spines are lighter in colour.

The sponge is relatively common around Palau where it has been found on fringing reefs, reef channels and walls between 10–25 m, attached to rock in full light, but is not locally abundant. It is occasionally found in caves. It has also been found in Chuuk, Marshall Islands, Solomon Islands, Vanuatu, Papua New Guinea and Malaysia between 5–30 m depth. The species was first described from the southern New Caledonia lagoon and has since been reported from northeast Australia, Torres Straits and the Great Barrier Reef between between 10–33 m. The sponge appears to be restricted to the Western Pacific and southeast Asia.

Palau

abundance

It could also be...
Dysidea frondosa Bergquist, 1995

Levi, C. (1998) Sponges of the New Caledonia Lagoon. Edition de l'Orstom, Collection Faune et flore Tropicales n. XXXIII, Paris, 1998, 214 pp.
Collin, P.L., Arneson, C. (1995) Tropical Pacific Invertebrates. Coral Reef Press, California, 296 pp.

35

about sponges

Sponges are amongst the most common marine invertebrates on coral reefs and in the marine lakes of Palau. They are found everywhere, from the intertidal rock platforms on rock islands to subtidal coral reefs, from silty mangrove-lined islands and marine lakes, to the outer barrier reef and beyond. Most species encrust limestone rock or coral rubble, but many are embedded in sandy or muddy sediments with a root-like structure. Several species are also known to encrust other sponges or mussels!

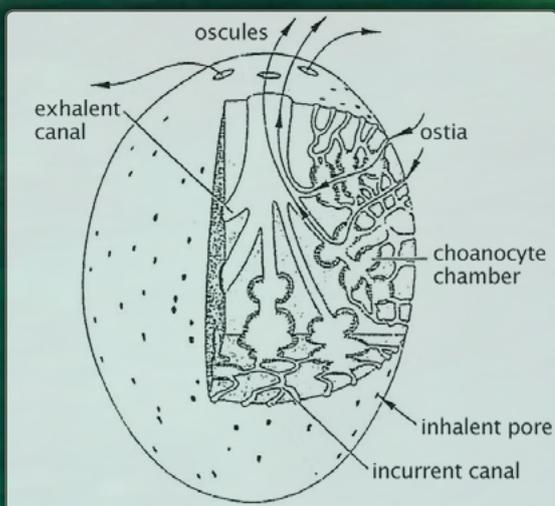


reef sponge

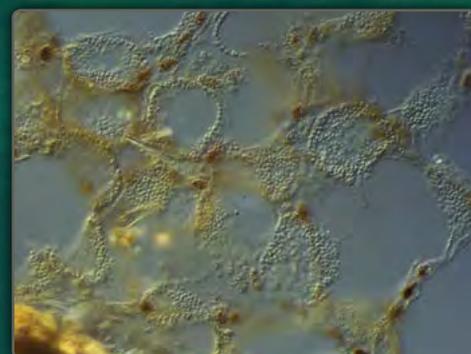


sponge encrusting mussels in a marine lake

Sponges feed by filtering water using specialised cells called choanocytes. Choanocytes use their tail-like flagella to collectively propel a unidirectional water current through the sponge body; water enters through small inhalant pores on the surface (ostia) and exits through several large exhalent holes (oscles). Food is captured in a fringe surrounding the base of the choanocyte flagella, and is passed back through the cell body to other cells that distribute it around the sponge. Excretory products exit in the water current as it leaves the body. Sponges do not have specific tissues; they have a large range of cells that have the role of feeding, digestion, secretion, excretion, reproduction, and defence. Most sponges produce a skeleton of fibre made from a special collagen called spongin, and the fibre may or may not contain sand grains or spicules. Spicules are siliceous elements made by the sponge that come in an amazing array of forms and usually characterise the species. Some sponges have only spicules and no spongin, and some have no skeleton at all.



general sponge body plan



choanocyte feeding cells in chambers



Haliclona sp. fragmenting

Sponges reproduce by the production of eggs from archeocyte cells. These are special universal cells that can transform into all other cell types in the sponge body. Sperm is made from the choanocytes which have ready-made tails. Some sponges exude their eggs in a mucus sheet on the outside of their body (ovipary), which are fertilised by male sponges that produce sperm 'smoke' in the water. Others take the sperm in, fertilise the eggs internally and incubate either larvae or tiny sponges inside their bodies (vivipary). Some sponges reproduce asexually by budding new sponges from their body. Some sponges form a tangled mass, parts of which may fragment and detach, a form of inadvertent asexual reproduction.



Tethya sp. budding



Cinachyra sp. exuding immature sponges



aquiferous 'bulb' on *Oceanapia sagittaria* breaks off to re-establish sponge

Although sponges are often regarded as simple or primitive, they are actually very talented; the first evidence for an immune system in animals became evident from early experiments with sponges. Because sponges do not move around they can also produce chemicals to defend themselves from other organisms that want to eat or settle on them. It's biochemical warfare out there in the ocean, hence the interest of the US National Cancer Institute in sponges! The great news for humans is that many of these chemicals show potent anticancer, anti-inflammatory, antibacterial, antidepressant, antifouling and pesticide biological activities.

Perhaps the most amazing discovery in sponges this century is that some are carnivorous – not filter-feeders like the rest of the group – these sponges feed on tiny shrimp down in the deep sea where normal sponge food is somewhat limited. Many live as deep as several kilometres under the ocean.

sponge classification

There are three major groups of sponges, some of which have **calcium carbonate** spicules (Class Calcarea) and some of which have **silica** spicules (Class Hexactinellida and Class Demospongiae).

calcareous sponge

Class Calcarea



Calcareous sponges are generally not as common or as diverse as the other sponge groups. They are often small fragile sponges and have pale pretty colours. They do not possess a spongin skeleton.

Glass sponges are usually found in very deep water, but are not common in Palau. They are unique amongst sponges in that they do not have cells with membranes as in the other two groups, and their spicules are based on a hexagonal (six-rayed) design.

glass sponge

Class Hexactinellida



demosponge

Class Demospongiae

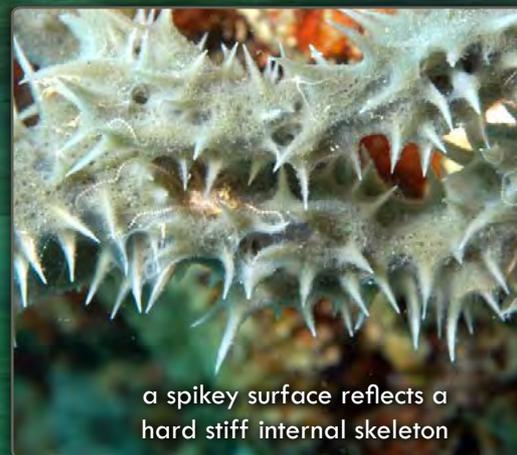


Demosponges are by far the most common and diverse sponges, and the ones that you are most likely to meet while snorkelling or diving.

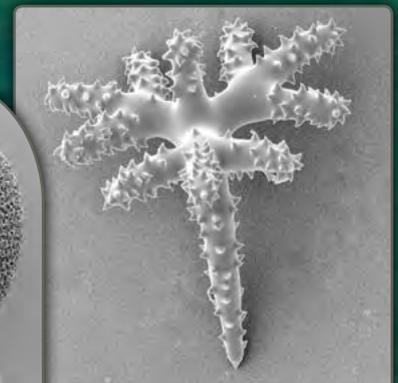
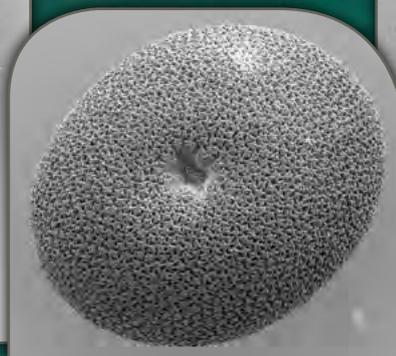
how to identify a sponge

Although DNA sequences are being used today to assist sponge classification, morphological characters are the key to the field identification of sponges. Several general characters provide the first clues to the identity of a sponge: **overall shape** (determined by the form of the skeleton), **surface features** (whether smooth, spiky, bumpy, hairy, with sieve-pores, etc), **texture** (whether fragile, crumbly, elastic, fleshy, stony, woody etc), **colour** (highly variable and often differentiated between surface and interior), and **where the sponge is found** (for example whether intertidal, subtidal, on seamounts, on the abyssal plain or under sea-ice).

However, it is the **arrangement or architecture of the internal sponge skeleton** (the nature and pattern of the skeleton) that provides definitive clues to the classification (order, family, genus and species) of the sponge. The sponge skeleton is very diverse and may consist of **organic** and **inorganic** components. The organic skeleton consists of a special sponge collagen (spongin) that can form **fibres** (clear, pithed, or cored with spicules or sand), or bands of elastic fibrils, or filaments. The nature and appearance of the fibres are diagnostic at the taxonomic level of order, family, and genus. The **inorganic** skeleton may consist of large **spicules** called **megasccleres** that, with or without fibre support, form the structural framework of the sponge. Small, highly ornamental spicules called **microsccleres** complement the megasccleres, often lining the sponge surface or internal canals. It is important to remember that several large groups of sponges do not have spicules, and that some sponges use sand and broken spicules from the sediment to create an inorganic mineral skeleton.



The **spicule complement** (what type of spicules are found in the sponge), **spicule dimensions** (typically, the length of the spicules), and the **skeleton arrangement** (the arrangement of the spicules in the sponge, whether embedded in fibre, or free in the sponge body, and whether restricted to the surface or interior, etc) gives us the most important clues to classification and identification of sponges. These spicules range in size from about 20 to 120 microns and are not visible to the unaided eye.



about the Republic of Palau

Palau is a Pacific island archipelago at the west end of the Caroline Island chain in Micronesia. Its nearest large neighbors are part of the “Coral Triangle”, the Philippine island of Mindanao 800 km to the west, and the Raja Ampat area of western New Guinea the same distance to the southwest. A chain of five small oceanic islands and one atoll, the Southwest Islands are found 650 km distant from the main group towards Raja Ampat. While not actually within the Coral Triangle, Palau still has the highest marine biodiversity of any of the Micronesian islands.

Palau is singular in having a great diversity of marine habitats located within a small, easily-accessible area, most locations are reachable within an hour’s boat ride from the main town of Koror. Its coral reefs, abundant marine life and Jellyfish Lake have made Palau a famous tourist diving destination. As the level of knowledge of discriminating underwater adventurers has increased, people have gained more appreciation of the lesser-known animals, like the sponges in this guide.

Palau is a particularly good place to learn about sponges, including some that are rarely noticed elsewhere. This guide will cover many of them across a variety of marine habitats, from oceanic outer reefs and inshore lagoon reefs to more enclosed Rock Island coves, sea grass beds, mangroves and the inland marine lakes.

A particularly good habitat for sponge viewing is the deep marine basins within the sheltering rock islands like Nikko Bay; the steep coral-covered sides below the surface are shaded from above by overhanging trees producing an other-worldly sponge habitat. Most sponges prefer areas with lower light and the shaded, calm and protected waters along the islands’ edges form a perfect habitat for sponges to go wild.

The occurrence of such basins within the islands themselves, the marine lakes, similarly provide ideal sponge habitat.

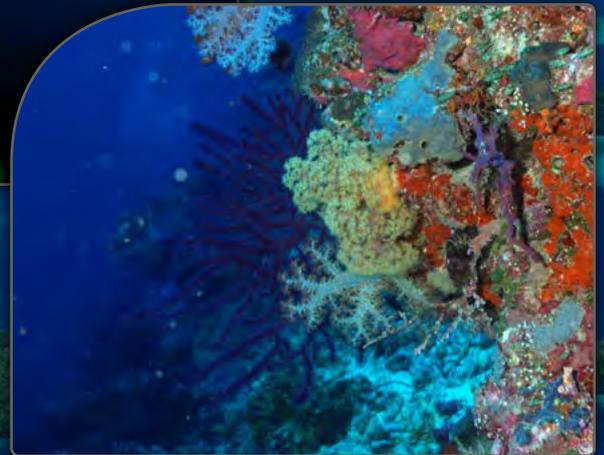


about Palau's marine habitats

We recognise six distinct habitats in Palau.

outer barrier reef

Barrier reefs and outer fringing reefs around islands in Palau tend to have steep slopes down to about 30 m with clear oceanic water. Generally the reef crest will be exposed at their shallowest points at low tide. Their exposure to light and prevailing winds and swells determines the micro-environment which thus influences the fauna that dominate the reef. Overhangs or undercut walls that provide shade will support a diverse sponge community.



lagoon reef

Palau's lagoon is found within the outer barrier reef. It is vast and complex and is Palau's largest marine habitat. Lagoon reefs range from near shore to more exposed lagoon patch reefs. Their exposure to prevailing winds and their fetch influences the biological communities. Lagoon water is not as clear as oceanic water, and contains more microscopic life and nutrients. Being filter feeders, sponges can thrive in this water but some outer reef species will not occur in the lagoon, and vice versa. As these reefs tend to have more sloped sides, they are generally high light environments and often the sponges tend to be more common below 8 m or under overhangs and in crevices.



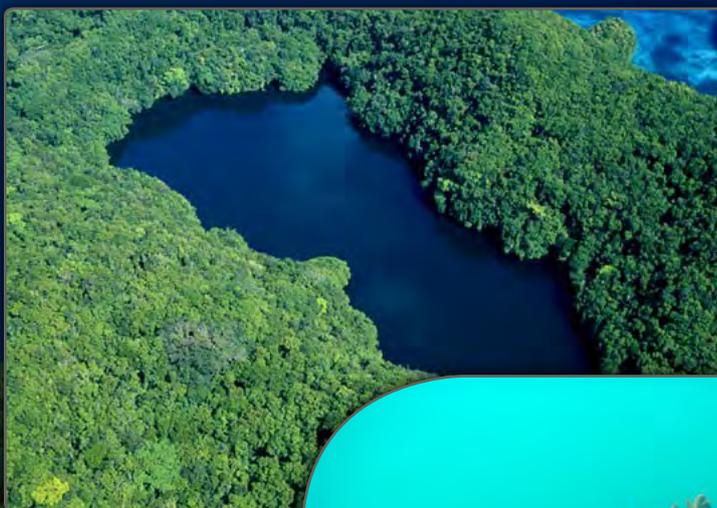
rock island reef

Palau's iconic rock islands found within the lagoon are essentially unique to Palau. Deep, steeply sloped basins within the rock islands are a continuation of the towering islands themselves. Overhanging trees and orientation to the sun provide shade for at least part of each day and waters are nutrient rich where filter feeders abound, including sponges. These basins and waterways range from rather well-connected to the open lagoon to enclosed coves hidden well within the islands that can, at times, become lake-like (see marine lakes). Sedimentation is high in the rock islands with limited visibility, but the soft-bodied sponges display a spectacular rainbow of shapes and sizes in abundant quantities, providing a uniquely Palauan experience. It is the unusual species composition and abundance of typically more cryptic species that, in part, makes these reefs so special.



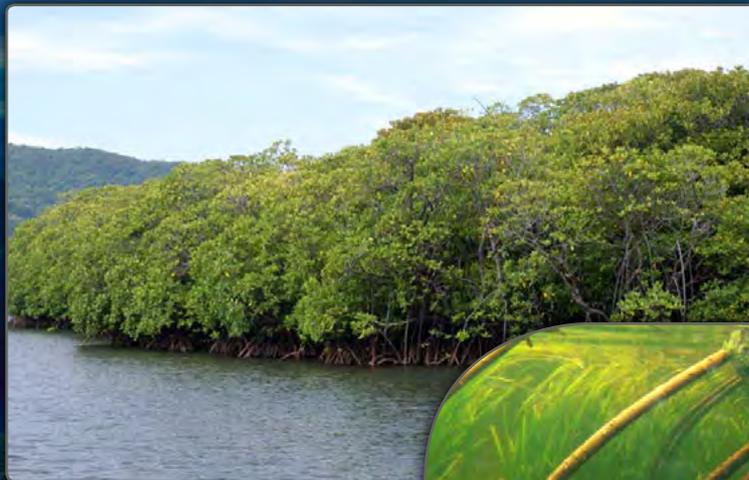
marine lakes

Palau's 57 marine lakes are isolated bodies of seawater separated from the lagoon by a surrounding land barrier. They retain connectivity to the lagoon through fissures, cracks and tunnels in the porous karst limestone, responding daily to tidal changes. Jellyfish Lake, the only lake open to the public, is isolated with mangrove-lined, shaded edges. The sessile animals and plants that live within are found in the upper layer (down to 15 m), below which there is no oxygen. Sponges occupy most available space on the mangrove roots and open bottom, and can be found in unusual wispy forms and large colonies on the often-shaded steep slopes in the still lake water.



mangroves

Mangroves are terrestrial plants that are found in intertidal areas along muddy or sandy shores of lagoon islands and estuaries. The various species can look quite distinct, but all have aerial 'roots' that are submerged at high tide and exposed to air at low tide, and can sometimes be a substrate for marine organisms such as sponges. Other sponge species might partially bury in the muddy or sandy bottom near the roots.



seagrass beds

Lagoon seagrass beds consist of flowering plants that live in the ocean, often forming dense, shallow beds on a sediment bottom, sometimes exposed at low tide. They are homes to select fishes and also provide a distinctive habitat for certain sponges. Though they tend not to have a high biomass in seagrass beds, some sponge species prefer these areas and surrounding shallow sand flats.



colour index



25

Acanthochaetetes wellsi



33

Clathria (Thalysias) cervicornis



39

Haliclona acoroides



61

Pseudoceratina arabica



54

Dactylospongia elegans



36

Chalinula milnei



55

Dactylospongia metachromia



22

Jaspis splendens



24

Cinachyrella australiensis



30

Stylissa massa



31

Myrmekioderma granulatum



43

Haliclona (Reniera) osiris



26

Spheciospongia peleia



28

Suberites diversicolor



29

Acanthella cavernosa



34

Clathria (Thalysias) reinwardti



23

Rhabdastrella globostellata



19

Leucetta avocado



56

Hyrtios erectus



52

Spongia (Spongia) matamata



27

Spheciospongia vagabunda



47

Neopetrosia exigua



40

Haliclona sp 13
(pink tangle lake sponge)



41

Haliclona sp 16
(pink tube lake sponge)

colour index



20

Leucetta microraphis



21

Theonella swinhoei



60

Aplysinella rhax



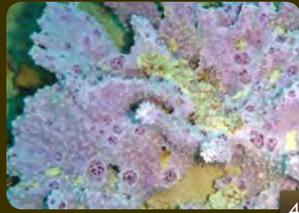
59

Chelonaplysilla violacea



37

Chalinula nematifera



48

Dysidea cf avara



49

Dysidea frondosa



44

Dasychalina melior



42

Haliclona (Reniera) fascigera



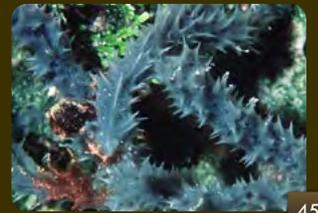
46

Niphates olemda



50

Dysidea granulosa



45

Gelliodes fibulata



38

Chalinula velinea



57

Lendenfeldia dendyi



35

Callyspongia (Cladochalina) aerizusa



51

Lamellodysidea herbacea



53

Coscinoderma mathewsi



32

Echinodictyum antrodes



58

Chelonaplysilla delicata

morphology index



52

Spongia (Spongia) matamata



53

Coscinoderma mathewsi



55

Dactylospongia metachromia



31

Myrmekioderma granulatum



43

Haliclona (Reniera) osiris



20

Leucetta microraphis



48

Dysidea cf avara



58

Chelonaplysilla delicata



59

Chelonaplysilla violacea



29

Acanthella cavernosa



23

Rhabdastrella globostellata



24

Cinachyrella australiensis



19

Leucetta avocado



56

Hyrtios erectus



30

Stylissa massa



28

Suberites diversicolor



32

Echinodictyum antrodes



42

Haliclona (Reniera) fascigera



21

Theonella swinhoei



41

Haliclona sp 16
(pink tube lake sponge)



46

Niphates olemda



49

Dysidea frondosa



57

Lendenfeldia dendyi



35

Callyspongia (Cladochalina) aerizusa

morphology index



33

Clathria (Thalysias) cervicornis



34

Clathria (Thalysias) reinwardti



44

Dasychalina melior



45

Gelliodes fibulata



54

Dactylospongia elegans



39

Haliclona acoroides



40

Haliclona sp 13
(pink tangle lake sponge)



50

Dysidea granulosa



60

Aplysinella rhax



61

Pseudoceratina arabica



36

Chalinula milnei



51

Lamellodysidea herbacea



37

Chalinula nematifera



38

Chalinula velinea



27

Spheciospongia vagabunda



47

Neopetrosia exigua



25

Acanthochaetetes wellsi



22

Jaspis splendens



26

Spheciospongia peleia

species index

PHYLUM Porifera	CLASS Calcarea	ORDER Clathrinida	Family Leucettidae <i>Leucetta avocado</i> <i>Leucetta microraphis</i>	19 20
	CLASS Demospongiae	ORDER Tetractinellida	Family Theonellidae <i>Theonella swinhoei</i>	21
			Family Ancorinidae <i>Jaspis splendens</i> <i>Rhabdastrella globostellata</i>	22 23
			Family Tetillidae <i>Cinachyrella australiensis</i>	24
	ORDER Clionaida	Family Acanthochaetidae <i>Acanthochaetetes wellsii</i>	25	
		Family Clionaidae <i>Spheciospongia peleia</i> <i>Spheciospongia vagabunda</i>	26 27	
	ORDER Suberitida	Family Suberitidae <i>Suberites diversicolor</i>	28	
		ORDER Bubarida	Family Dictyonellidae <i>Acanthella cavernosa</i> <i>Stylissa massa</i>	29 30
	ORDER Axinellida		Family Heteroxyidae <i>Myrmekioderma granulatum</i>	31
		Family Raspailiidae <i>Echinodictyum antrodes</i>	34	
ORDER Poecilosclerida	Family Microcionidae <i>Clathria (Thalysias) cervicornis</i> <i>Clathria (Thalysias) reinwardti</i>	32 33		

species index

PHYLUM
Porifera

CLASS
Demospongiae

ORDER Haplosclerida	Family Callyspongiidae	
	<i>Callyspongia (Cladochalina) aerizusa</i>	35
	Family Chalinidae	
	<i>Chalinula milnei</i>	36
	<i>Chalinula nematifera</i>	37
	<i>Chalinula velinea</i>	38
	<i>Haliclona acoroides</i>	39
	<i>Haliclona</i> sp 13 (pink tangle lake sponge)	40
	<i>Haliclona</i> sp 16 (pink tube lake sponge)	41
	<i>Haliclona (Reniera) fascigera</i>	42
	<i>Haliclona (Reniera) osiris</i>	43
	Family Niphatidae	
	<i>Dasychalina melior</i>	44
	<i>Gelliodes fibulata</i>	45
<i>Niphates olemda</i>	46	
Family Petrosiidae		
<i>Neopetrosia exigua</i>	47	

ORDER Dictyoceratida	Family Dysideidae	
	<i>Dysidea cf avara</i>	48
	<i>Dysidea frondosa</i>	49
	<i>Dysidea granulosa</i>	50
	<i>Lamellodysidea herbacea</i>	51
	Family Spongiidae	
	<i>Spongia (Spongia) matamata</i>	52
	<i>Coscinoderma mathewsi</i>	53
	Family Thorectidae	
	<i>Dactylospongia elegans</i>	54
	<i>Dactylospongia metachromia</i>	55
	<i>Hyrrios erectus</i>	56
<i>Lendenfeldia dendyi</i>	57	

ORDER Dendroceratida	Family Darwinellidae	
	<i>Chelonaplysilla delicata</i>	58
	<i>Chelonaplysilla violacea</i>	59

ORDER Verongiida	Family Aplysinellidae	
	<i>Aplysinella rhax</i>	60
	Family Pseudoceratinidae	
	<i>Pseudoceratina arabica</i>	61

avocado sponge



3 cm

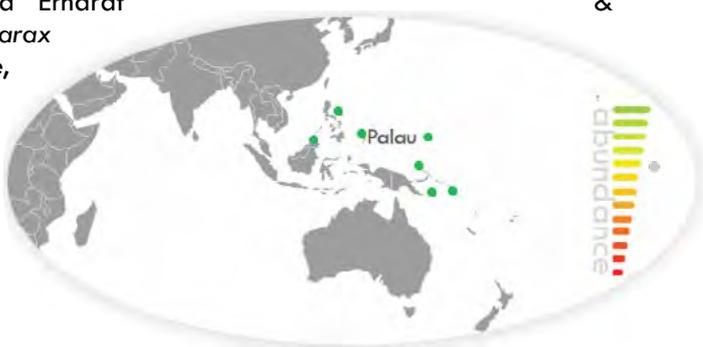
morphology		surface			substrate		habitat	



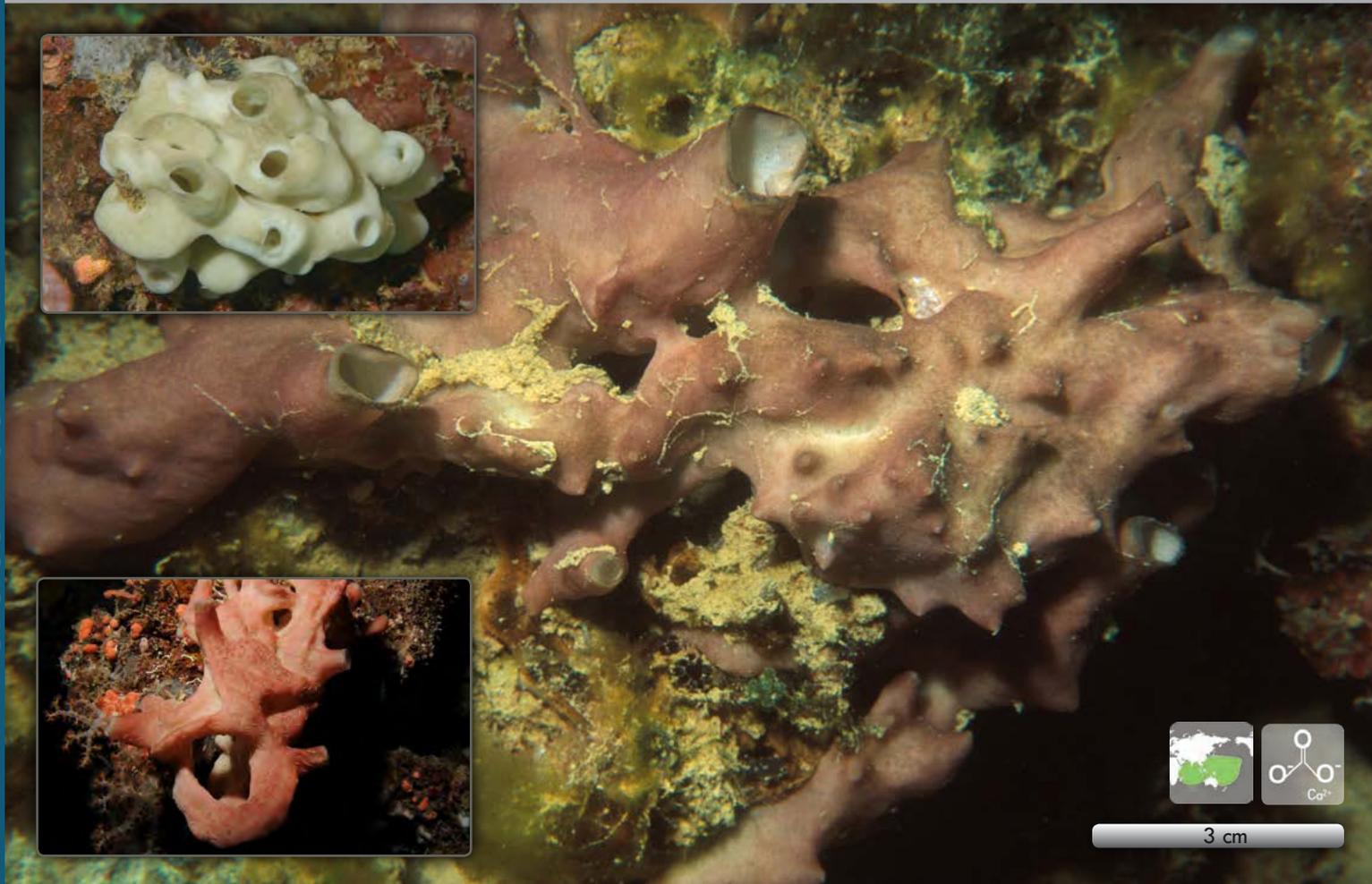
Volcano to sack-shaped sponge, hollow, billowy, several may join basally, typically 4–5 cm diameter, 15 cm high, wall 3–5 mm thick, may get large in sheltered waters, up to 150 cm diameter. Surface smooth, deeply furrowed, indented. Interior atrium deep, voluminous, with a thin, sharp rim, small oscules line atrium. Texture slightly compressible, tearable, finely granular to the touch. Colour in life golden olive to dark green with a characteristic dark mesh surface pattern, internal colour vivid neon green when exposed on reef top, yellow in deeper, shaded areas.

Known from Palau, Chuuk lagoon and Kuop Atoll, where it can be conspicuous on the tops of reefs, typically 5–30 m depth. Also known from East Malaysia, Philippines, Papua New Guinea, Solomon Islands. When first described in 1954 from Kuop Atoll (Chuuk) and Komebail (Omebail) lagoon northwest of Koror, Palau, the species was fairly abundant in the lagoon at 2 m and 5 m respectively. Today it is found on lagoon reefs, outer reef walls and rock island reefs down to 30 m. The appearance of this sponge is often evocative of the avocado fruit, hence Max de Laubenfel's choice of the specific name.

Colin & Arneson (1995), Gosliner et al. (1996) and Erhardt & Baensch (2000) misidentified *Leucetta avocado* as *Pericharax heteroraphis* which differs in having a rough, firm surface, thicker body, sharp ridges that form a honeycombed surface, mustard brown externally, bright yellow internally with large fiberglass-like spicules, and lacks the surface mesh pattern. *Pericharax heteroraphis*, recently renamed *P. orientalis*, has not been recorded from Micronesia.



De Laubenfels, M.W. (1954) The sponges of the West-Central Pacific. Oregon State Monographs Studies in Zoology, 7, 1–306.
 Colin, P.L., Arneson, C. (1995) Tropical Pacific Invertebrates. Coral Reef Press, California, 296 pp.

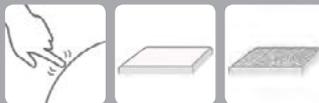


3 cm

morphology



surface



substrate



habitat



Hollow, irregular, convoluted mass of volcano-shaped fused tubes, or bubble-shaped encrusting lumps. Typically 5–20 cm wide, 1–3 cm thick, 2–8 mm thick walls. Surface smooth, undulating. Oscules apical with a thin, sharp rim, 5–10 mm diameter. Texture barely compressible to firm, sandpapery to the touch. External colour in life brownish pink to rose when illuminated, creamy white in shade, creamy white interior, sometimes with a greenish tinge. Oscule rims pale. External colour seems to vary geographically; specimens from PNG to Indonesia are pink/rose coloured while those in Palau are more brownish pink. This may be due to the presence of different symbionts.

Known in Palau from the outer reef to lagoon reefs, rock islands and marine lakes, and Chuuk lagoon on WWII shipwrecks down to about 30 m. Also known from Tanzania, Réunion, East Malaysia, Philippines, Guam, Papua New Guinea, Solomon Islands, Pohnpei. This species has an Indo-Pacific distribution. *Leucetta microraphis* was first described from the Mediterranean, West Indies and Red Sea, and has since been recorded with question from Australia, South America, and Heard Island.

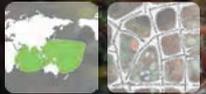
In a recent publication Dr Rob van Soest elevated the varietal name *microraphis*, in *Leucetta primigenia* var. *microraphis*, to full species status despite admitting that the species was unrecognizable as originally described by Haeckel in 1874 and its type locality is unknown. Although this species is in urgent need of further taxonomic revision, it is generally easily recognisable in the field by its pinkish brown colouration and giant spicules.



De Laubenfels, M.W. (1954) The sponges of the West-Central Pacific. Oregon State Monographs, Studies in Zoology, 7, 1–306.

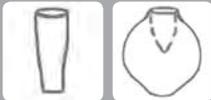
Colin, P.L., Arneson, C. (1995) Tropical Pacific Invertebrates. Coral Reef Press, California, 296 pp.

corrugated barrel sponge



9 cm

morphology



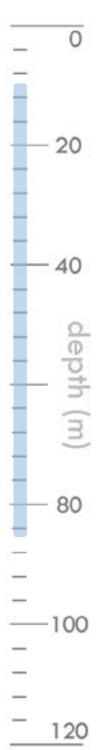
surface



substrate



habitat



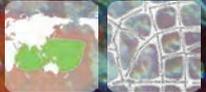
Large broad tubular to barrel-shaped sponge with a deep, broad oscular atrium, surrounded by a relatively thin rubbery rim. Ranges from about 25–50 cm high, about 12 cm diameter, wall 4 cm thick, atrium 4–8 cm wide. Surface knarled, deeply pitted, indentations 5–8 mm wide. Small oscules line the inner surface of the atrium. Texture is compressible, interior dense and varies amongst individuals from slightly fleshy to crumbly to like sandstone, surface smooth, fleshy, rubbery to the touch. Colour in life maroon to brick red with a beige interior, pinkish cream in deeper habitats. May have epiphytes on surface.

Known from Palau and Papua New Guinea, where the sponge is typically found on the outer reef, on slopes, walls and under overhangs, from about 10 to 85 m. This species has a broad Indo-Pacific distribution and has been reported from the Red Sea, Western Indian Ocean (East Africa, Seychelles, Madagascar), India, and the South China Sea.

Colin & Arneson (1995) and Gosliner et al. (1996) misidentified *Theonella conica* (Keischnick, 1896) as *Theonella swinhoei* which differs in having a very smooth, non-pitted surface, is a light chocolate brown colour, and is typically much taller and thinner than *T. swinhoei*. *Theonella conica* also grows in clumps whilst *T. swinhoei* is always solitary.



orange chimney sponge



5 cm

morphology



surface



substrate



habitat



Thickly encrusting sponge up to 50 cm wide and 1–3 cm thick with chimney-shaped tubes or digits up to 8 cm high and 2–3 cm wide arising from the surface. Occasionally forms plates 5–7 mm thick and up to 40 cm long. Surface roughly conulose and ridged, appears inflated in life. Oscules are 3–10 mm wide in life surrounded by a rubbery sphincter-like membrane in digitate sponges. Texture is spongy, felty, fleshy, easily torn, almost crumbly, surface slightly rubbery to the touch. Colour in life bright fiery orange to paler orange. Typically encrusting or plate-forming in open water, thick encrusting digitate in quieter waters.

The sponge is common throughout Palau and Micronesia including Pohnpei, Kosrae, Yap and Chuuk where the sponge is found on lagoon reefs and silty mangrove-lined channels around 3–15 m depth. It is also found on lagoon and outer reef slopes and walls from about 5–45 m. This species has a broad Indo-Pacific distribution and has been reported from the Western Indian Ocean (Zanzibar, Mauritius, Maldives), Indonesia, Sabah Malaysia, Philippines, Papua New Guinea, New Caledonia, Solomons, Vanuatu, Fiji, and Tonga.

Colin & Arneson (1995) and Lévi (1998) refer to this species as *Dorypleres splendens*, its original name given by Max de Laubenfels to describe its beautiful appearance.

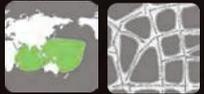
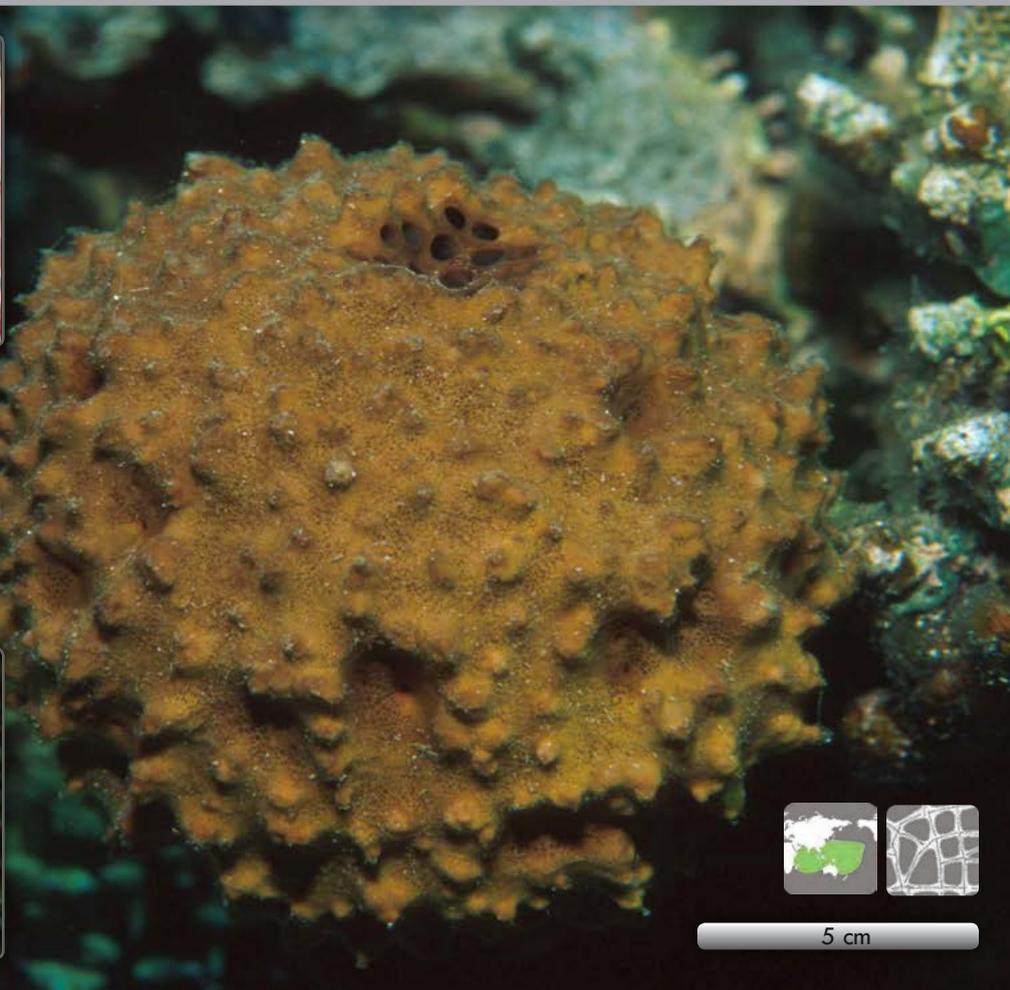


De Laubenfels, M.W. (1954) The sponges of the West-Central Pacific. Oregon State Monographs Studies in Zoology, 7, 1–306.

Colin, P.L., Arneson, C. (1995) Tropical Pacific Invertebrates. Coral Reef Press, California, 296 pp.

Lévi, C. (1998) Sponges of the New Caledonia Lagoon. Edition de l'Orstom. Collection Faune et flore Tropicales n. XXXIII. Paris, 1998, 214 pp.

yam sponge



5 cm

morphology



surface



substrate



habitat



Spherical to slightly elongate sponge, 5–25 cm diameter and 5–15 cm wide, pumpkin-shaped with a shallow apical depression, tough interior, thin 1–2 mm thick leathery 'skin'. Surface is smooth, slightly uneven with bumps and ripples, granular to the touch. Multiple (net) oscules clustered in a depression at the top of the sponge, about 3 cm wide. Texture is compressible and is not hard to tear, felty, slightly rubbery to the touch. Colour in life bright burgandy to brown with a fluorescent dark yellow interior; external colour can be quite pale in deep water specimens.

The sponge is common throughout Palau on fringing and outer reefs from 5–85 m and from Apra Harbor in Guam. It has a broad Indo-Pacific distribution and has been reported from the Western Indian Ocean (Zanzibar, Mauritius, Seychelles), Indian Ocean (Andaman and Nicobar Islands, Sri Lanka), Malacca Strait, Malaysia, Philippines, Papua New Guinea, Australia, New Caledonia, Vanuatu, Fiji, and Tonga, where it is commonly found growing on exposed reef platforms, fringing reefs and reef slopes in the lagoon from the intertidal to 50 m.

depth (m)



Baine, M., Harasri, D. (2007) The marine life of Bootless Bay, Papua New Guinea. Motupore Island Research Centre, University of Papua New Guinea, Port Moresby, 146 pp.

Carter, H.J. (1883) Contributions to our knowledge of the Spongida. Pachytragida. Annals and Magazine of Natural History, (5) 11 (65), 344–369, pls XIV–XV.

Lévi, C. (1998) Sponges of the New Caledonia Lagoon. Edition de l'Orstom. Collection Faune et flore Tropicales n. XXXIII. Paris, 1998, 214 pp.

orange golfball sponge



3 cm

morphology



surface



substrate



habitat



Perfectly spherical to subspherical sponge, 3–12 cm diameter, typically 8 cm diameter, known up to 30 cm diameter, with a broad shallow apical depression and porocalyces 3–6 mm wide and deep, internally strictly radiating. Surface is conspicuously hairy or fuzzy with projecting spicules that trap sediment and sand between them, often covered with greenish to maroon brown epiphytes. Multiple 'net' oscules clustered in a depression at the top of the sponge, about 1–2 cm wide. Texture compressible, difficult to tear, very siliceous internally. Colour in life yellow to gold to orange externally, grey when sediment present and/or green to reddish brown from encrusting epiphytes. Bright yellow to gold internally, visible in the porocalyces.

The sponge is relatively common in Palau on fringing reefs down to 20 m. It has a broad Indo-Pacific distribution, having been reported from the Western Indian and Indian Oceans, Malay Peninsula, East Malaysia, Philippines, Papua New Guinea, Australia, and Vanuatu, where it is commonly found growing on silty fringing and lagoon patch reefs, in seagrass beds, harbours and channels from about 1–20 m. It is particularly common in marine lakes in Palau and West Papua.

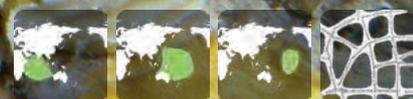
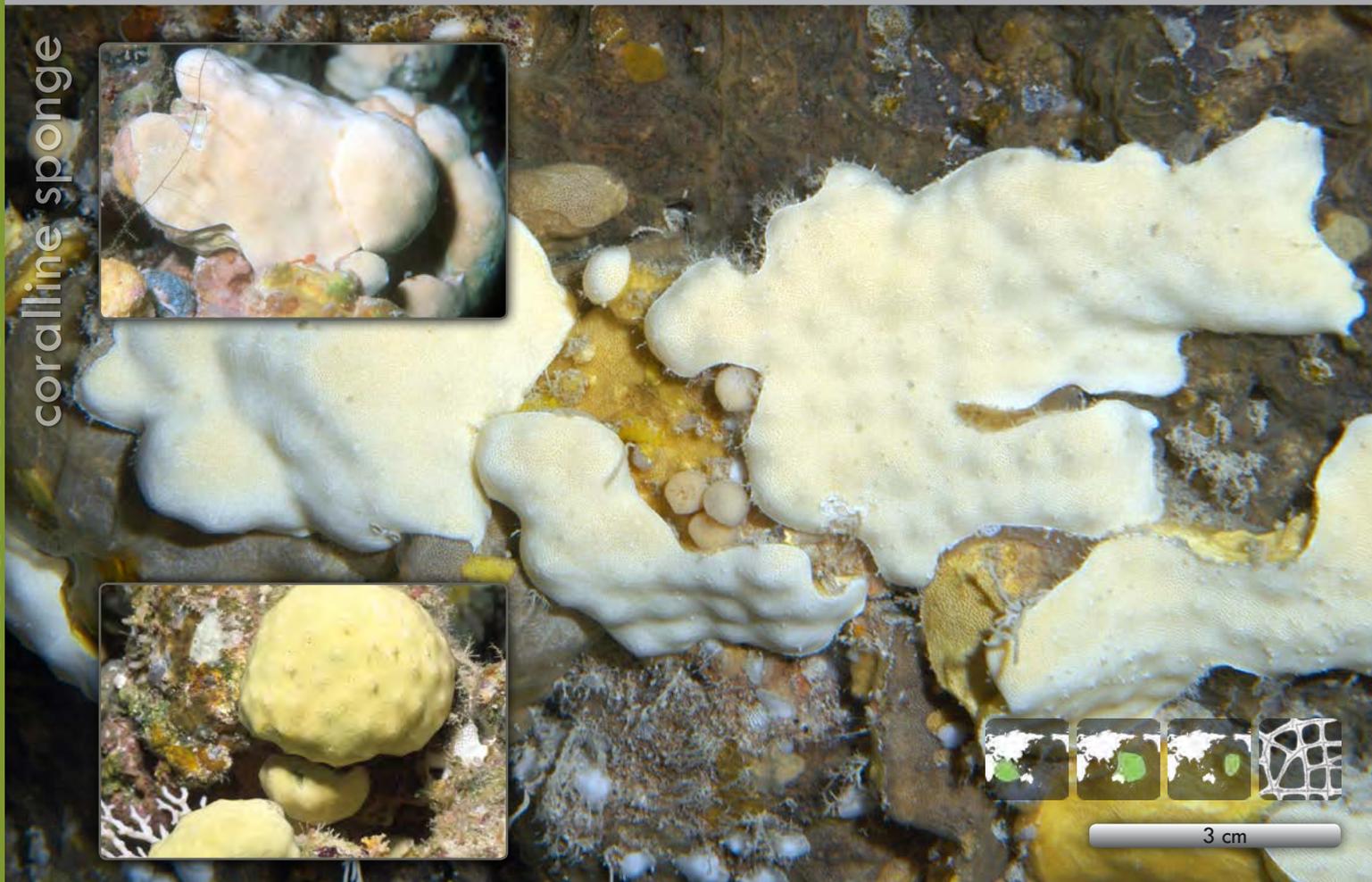
Many Indo-Pacific field guides illustrate specimens of what may look like *Cinachyrella australiensis*, but which can not be identified fully without recourse to a spicule preparation in order to identify the diagnostic spicules (roughened oxaeas).



De Laubenfels, M.W. (1954) The sponges of the West-Central Pacific. Oregon State Monographs Studies in Zoology, 7, 1–306.

Bergquist, P.R. (1965) The sponges of Micronesia, Part 1 The Palau Archipelago. Pacific Science, 19, 123–204.

coralline sponge



3 cm

morphology

surface

substrate

habitat



Hemispherical to loaf-shaped cave-dwelling sponge, 0.5–3 cm diameter but up to 10 cm diameter and 1–3 cm thick, that resembles *Porites* coral at first glance. When immature, the sponge is flattened with a visible margin and a short peduncle or stalk. As the sponge matures it becomes more globular and the stalk is hidden. Surface microscopically pitted, macroscopically covered in regularly spaced low mounds from which radiate star-shaped aquiferous canals at the centre of which is a tiny oscule 0.1 mm wide. Texture is tough and stony, granular and sandstone to the touch. Colour in life clear orange to yellow. A 'calcified sponge' or 'sclerosponge', this species has a massive calcareous base with siliceous spicules embedded in spongin on the surface.

The sponge appears to be widespread throughout the western Pacific, and can be locally abundant in caves and caverns on outer barrier reefs particularly around Palau, Marshall Islands, Chuuk, and the northern Marianas region (Guam, Saipan), from depths of 30 m. The species has also been recorded from American Samoa, Fiji, New Caledonia, the Great Barrier Reef of Australia, and the Maldives down to 30 m.

This species can be mistaken for *Astrosclera willeyana*, an orange sclerosponge with prominent star-shaped canals that dominate the flat surface (see Allen & Steene, 1994).



Colin, P.L., Arneson, C. (1995) Tropical Pacific Invertebrates. Coral Reef Press, California, 296 pp.

Lévi, C. (1998) Sponges of the New Caledonia Lagoon. Edition de l'Orstom. Collection Faune et flore Tropicales n. XXXIII. Paris, 1998, 214 pp.

madame pele's boring sponge



2 cm

morphology



surface



substrate



habitat



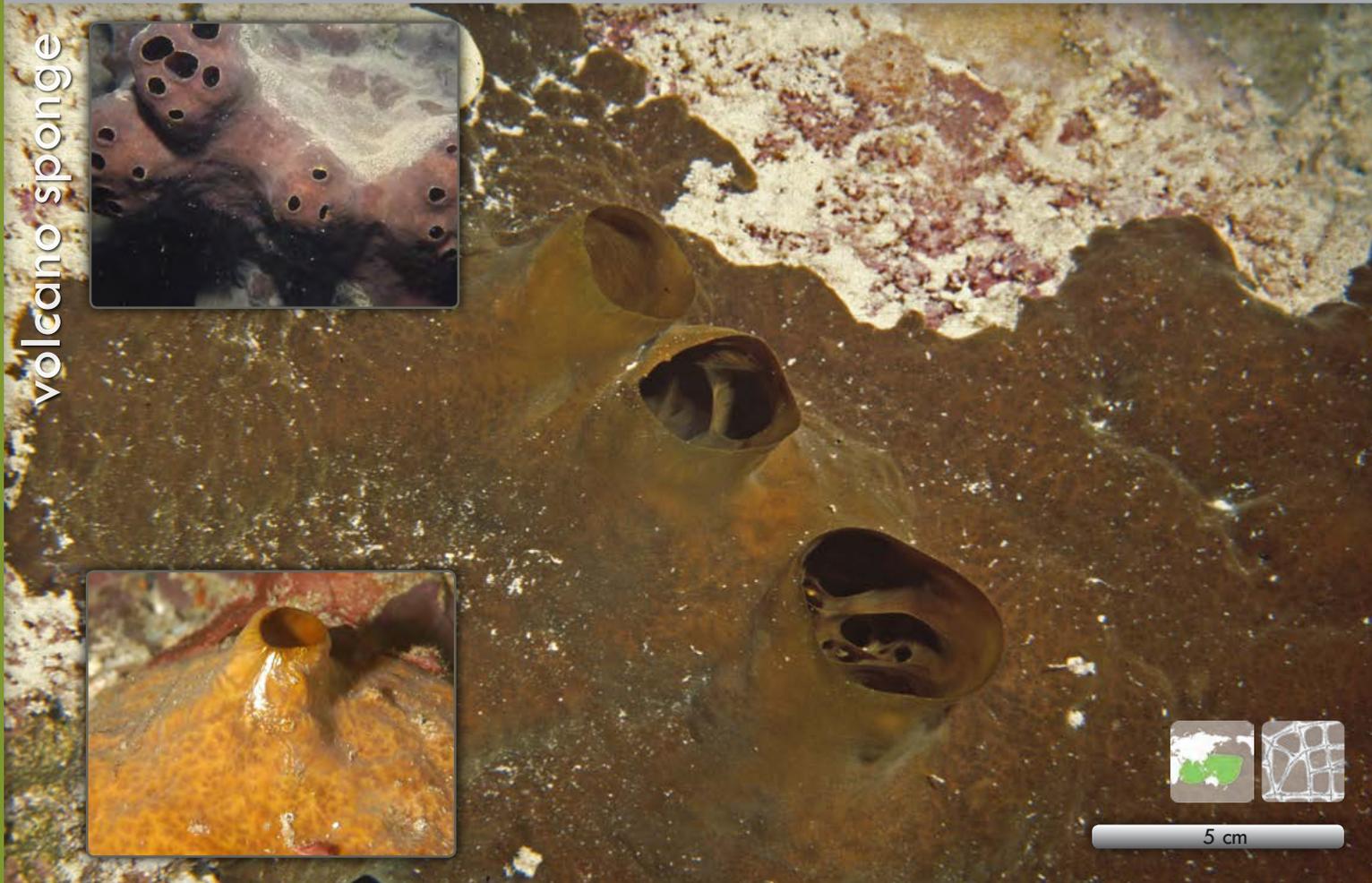
Boring sponge that grows in 7–15 cm wide patches, excavating a large cavern below the surface of limestone rock substrate, up to 12 cm wide and down to 10 cm deep, filled with soft golden sponge tissue. Broad thick blunt tube oscules, about 3–20 mm wide, are flush with, or protrude well beyond the surface, typically by about 0.5–1.5 cm, but up to 12 cm high (especially in marine lakes). Numerous areolate porefields surround oscules; these are low, concave, flattened structures, or mushroom-shaped with a distinct net covering, sometimes with undulating margins. External texture is slightly compressible, rubbery, fibrous, hard to tear and sandpapery to the touch, sponge in excavation is gelatinous and falls apart when handled. Colour in life pink to salmon-colored externally, golden to mustard internally. Porefields are pink edged with yellow.

The sponge is relatively common along the shallow rock island reefs and in marine lakes in Palau, West Papua and Berau (East Kalimantan), and has also been recorded from mangrove channels in Yap and Zanzibar, and in seagrass beds in Manado, Indonesia.

The sponge was named by Max de Laubenfels after Madame Pele, the Fire Goddess of the Big Island of Hawaii, because of its crater-like appearance.



volcano sponge



5 cm

morphology



surface



substrate



habitat



A thinly to thickly encrusting sponge with single, raised, volcano-shaped oscules with thin margins. Encrusting specimens tough, corky, woody, usually 3–4 cm thick, up to 10 cm thick, spreading 25–50 cm across. A second form is common in Papua New Guinea and New Caledonia (upper inset), but has not been found in Palau. It is a massive loaf-shaped sponge with oscules grouped on blunt raised turrets, frequently aligned across dominant currents, up to 100 cm wide and 50 cm high. Texture of massive specimens is inflated underwater, felty, almost rubbery, hard to tear, and sandpapery to the touch.

Colour of encrusting specimens commonly olive brown or mustard with lighter canals visible through the surface, frequently lighter around oscules and almost always several shades lighter internally; colour of massive specimens in life dark reddish brown, olive brown, walnut brown, mustard, yellow, deep purple-blue to blue-black. Both forms are capable of excavation in the earliest stages of growth when only a small oscule is visible above the surface of the substrate. The two forms have no obvious spicule or skeletal differences that support their separation as different species.

This species is one of the most common across the Indo-Pacific, frequently abundant on limestone rock and patch reefs in lagoons, on outer reefs and fringing reefs to about 35 m. Listed as *Spirastrella vagabunda* in most Indo-Pacific field guides, the species was more correctly placed in *Sphaciospongia*, a genus capable of boring into calcareous substrate, at least in the early stages of growth.



Colin, P.L., Arneson, C. (1995) Tropical Pacific Invertebrates. Coral Reef Press, California, 296 pp.

De Laubenfels, M.W. (1954) The sponges of the West-Central Pacific. Oregon State Monographs Studies in Zoology, 7, 1–306.

Kelly-Borges, M., Bergquist, P.R. (1988) Sponges of Motupore Island, Papua New Guinea. Indo-Malayan Zoology, 5, 121–159.

felty lake sponge



6 cm

morphology



surface



substrate



habitat



Highly variable morphology including thickly encrusting with repent, erect, fused blunt lobes, 4 cm diameter, up to 30 cm long and 15 cm thick in marine lakes, or loaf-shaped in other non-lake locations, 4 cm thick, or finery lobes and masses, or stalked. Oscules tend to be apical on lobes, 1–2 per lobe, about 0.5–2 cm diameter. Highly inflated under water, deflates and shrinks markedly out of water. Surface very felty and smooth, may be slightly felty/conulose. Texture soft and compressible, felty, fleshy, easily torn. Colour in life bright orange, dark coral red, rust, gold, mustard, blue, bright green, olive green with purple tints externally, yellow-gold to mustard internally. Aquiferous canals clearly visible through outer 'skin'.

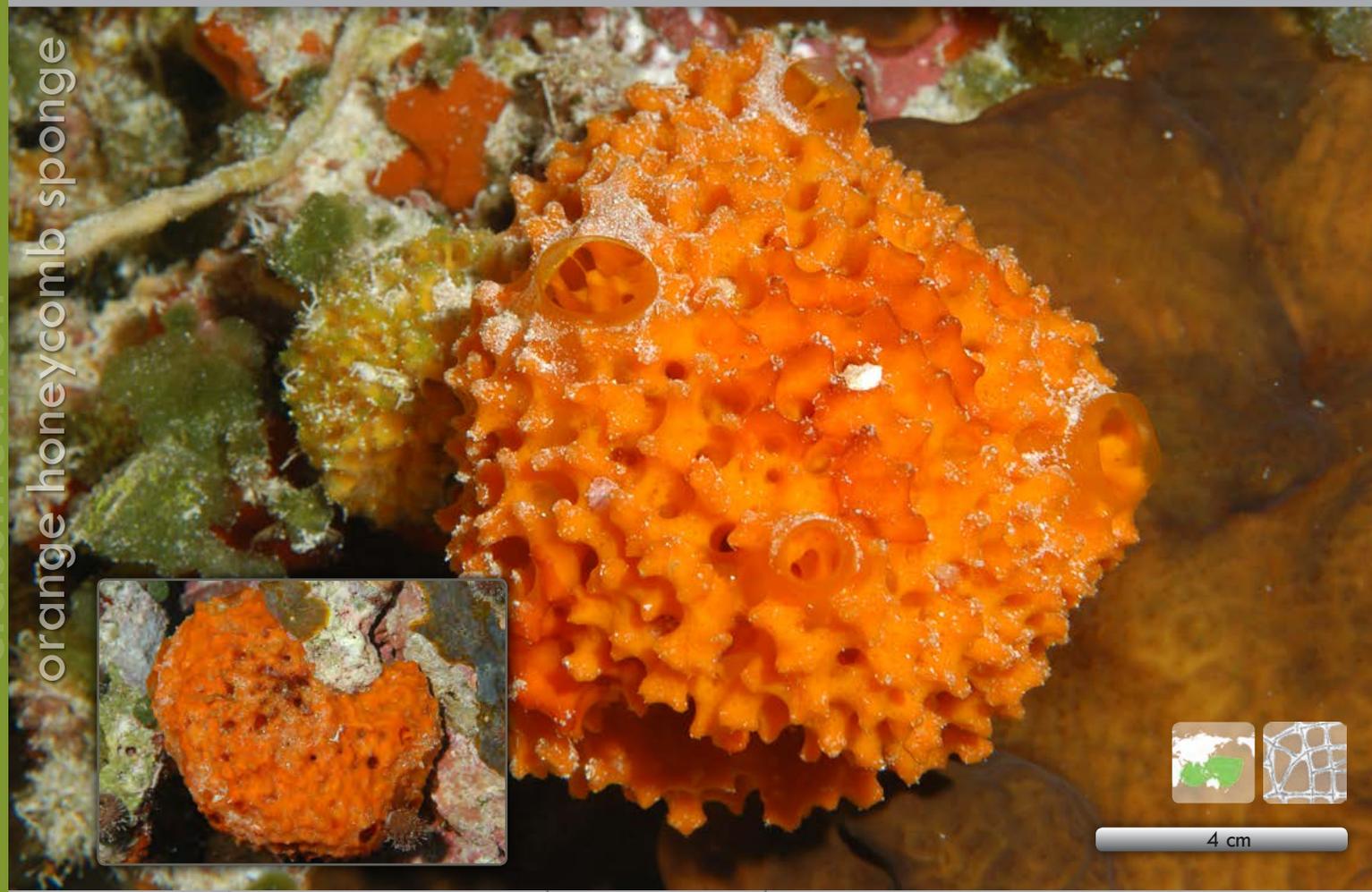
The sponge is common in isolated marine lakes throughout Palau, Berau (Kakaban, Maratua) and West Papua, Indonesia and Ha Long Bay, Vietnam, growing on all substrates including rock, rubble, sand and mangrove roots, in depths of 1–4 m, but can be found to 21 m on deep tunnel walls leading to marine lakes. It has also been recorded from silty reef locations throughout Indonesia including Malacca Strait, Gulf of Tonkin, Celebes Sea and Darwin, Australia.

It could also be.....
Stylissa massa (Carter, 1887)



Class Demospongiae Order Subarida Family Dictyonellidae

orange honeycomb sponge



4 cm

morphology		surface			substrate		habitat	



Small spherical to lobate bush up to 20 cm high, 8–10 cm thick, attached to substrate by a short thick stalk or point of attachment. Interior extremely cavernous. Oscules scattered over the flattened apex of the sponge, about 3–5 mm diameter. Surface has holes or 'windows' into the interior formed between the buttress-shaped fibrous spicule tracts. Surface covered with prominent sharpish conules of even height; surface looks knobbed. Texture compressible, slippery, rubbery, slightly cartilaginous, sometimes difficult to tear. Colour in life bright dark orange with a sheen. Sponge may have epiphytes on surface.

This species is well known from the West Central Pacific including Palau, Chuuk, Solomon Islands, Vanuatu, Cook Islands, Tonga, Malaysian Borneo, Northwest Australia and Southeast Asia (Vietnam, Indonesia) and has been reported from Maldives, Seychelles, eastern Africa and the Sahul Shelf to the north of Australia. Found on reef habitats down to 40 m.

It could also be.....
Haliclona (Reniera) osiris (de Laubenfels, 1954)



Colin, P.L., Arneson, C. (1995) Tropical Pacific Invertebrates. Coral Reef Press, California, 296 pp.
 Kelly, M. (2011) Phylum Porifera Sponges. Pp. 116–127 in Richmond, M.D. (Ed.) A field guide to the seashores of Eastern Africa and the Western Indian Ocean Islands. Sida/WIOMSA, 464 pp.

mango sponge



6 cm

morphology



surface



substrate



habitat



Conspicuous, single to multilobed sponge, may be compressed into a thick sheet or column, club-shaped, up to 75 cm high and 3–20 cm wide, 4–9 cm thick, often slightly restricted at the base of attachment. Oscules 5–10 mm diameter, prominent, membranous, but often closed, appearing sunken. Surface with a thin 'skin' from which spicules protrude, fleshy with low, soft conules; surface looks lightly ridged or slightly tufted. Texture compressible, like soggy bread, looks and feels like the flesh of a ripe mango, can be fibrous towards the base. Colour in life fluorescent orange, in shaded areas the colour pales to golden orange. Has a milky orange exudate.

This species is one of the most common and conspicuous sponges on shallow fringing reefs, lagoon patch reefs, in seagrass beds and on intertidal reef platforms in Palau (inset). It has been recorded in marine lakes in Palau and West Papua and is known from Zanzibar in the west to Tonga in the east Pacific.

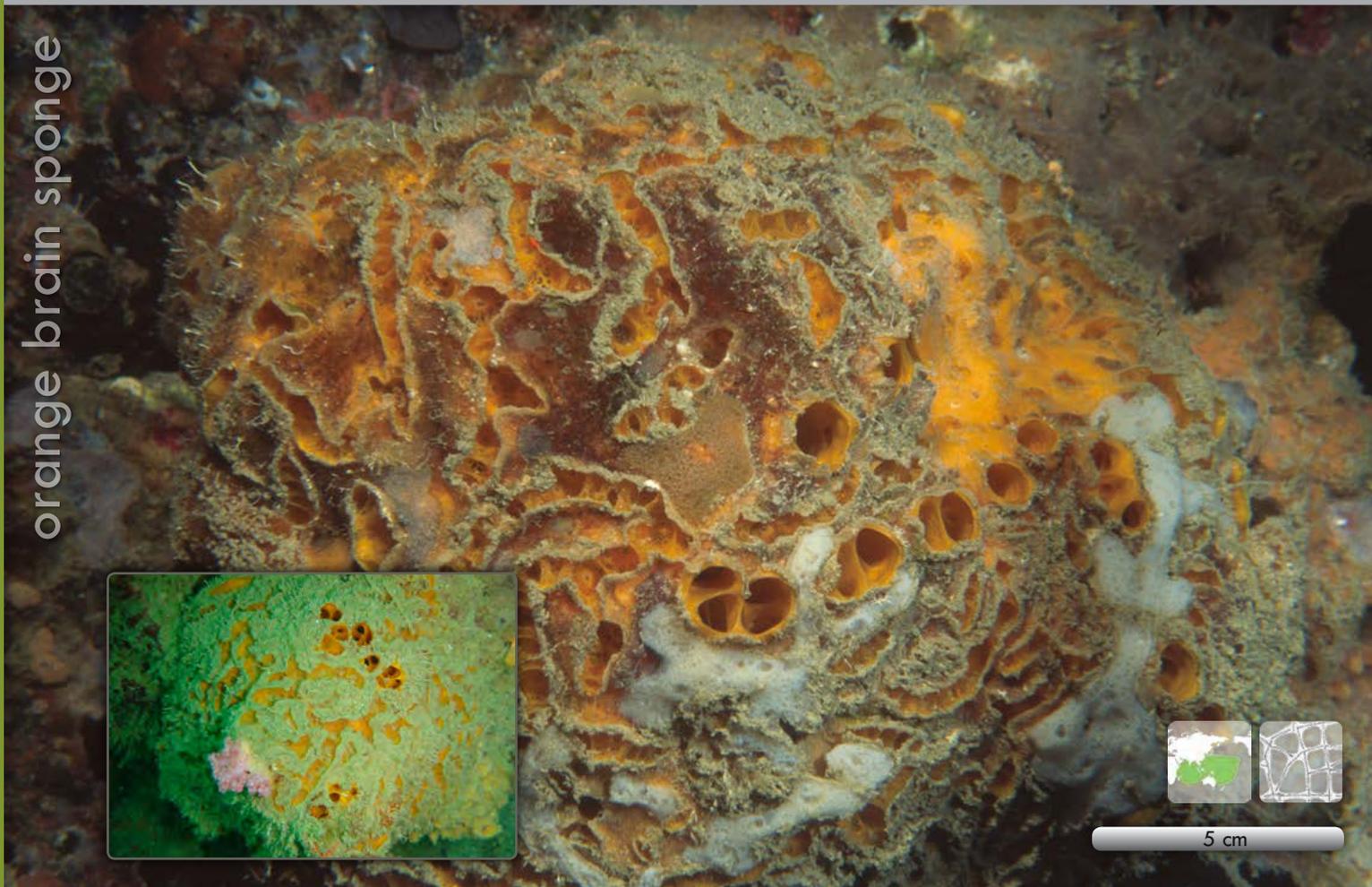
This species is known variously in regional fieldguides as *Stylotella aurantium* or *Stylissa aurantium*, but is now correctly known as *Stylissa massa*.

It could also be.....
Suberites diversicolor Becking & Lim, 2009



Kelly-Borges, M., Bergquist, P.R. (1988) Sponges of Motupore Island, Papua New Guinea. *Indo-Malayan Zoology*, 5, 121–159.
 Kelly, M., Hooper, J., Paul, V., Paulay, G., van Soest, R., de Weerd, R. (2003) Taxonomic inventory of the sponges (Porifera) of the Mariana Islands. *Micronesica. The Marine Biodiversity of Guam and the Marianas, Supplement 6*, (35–36), 100–120.

orange brain sponge



5 cm



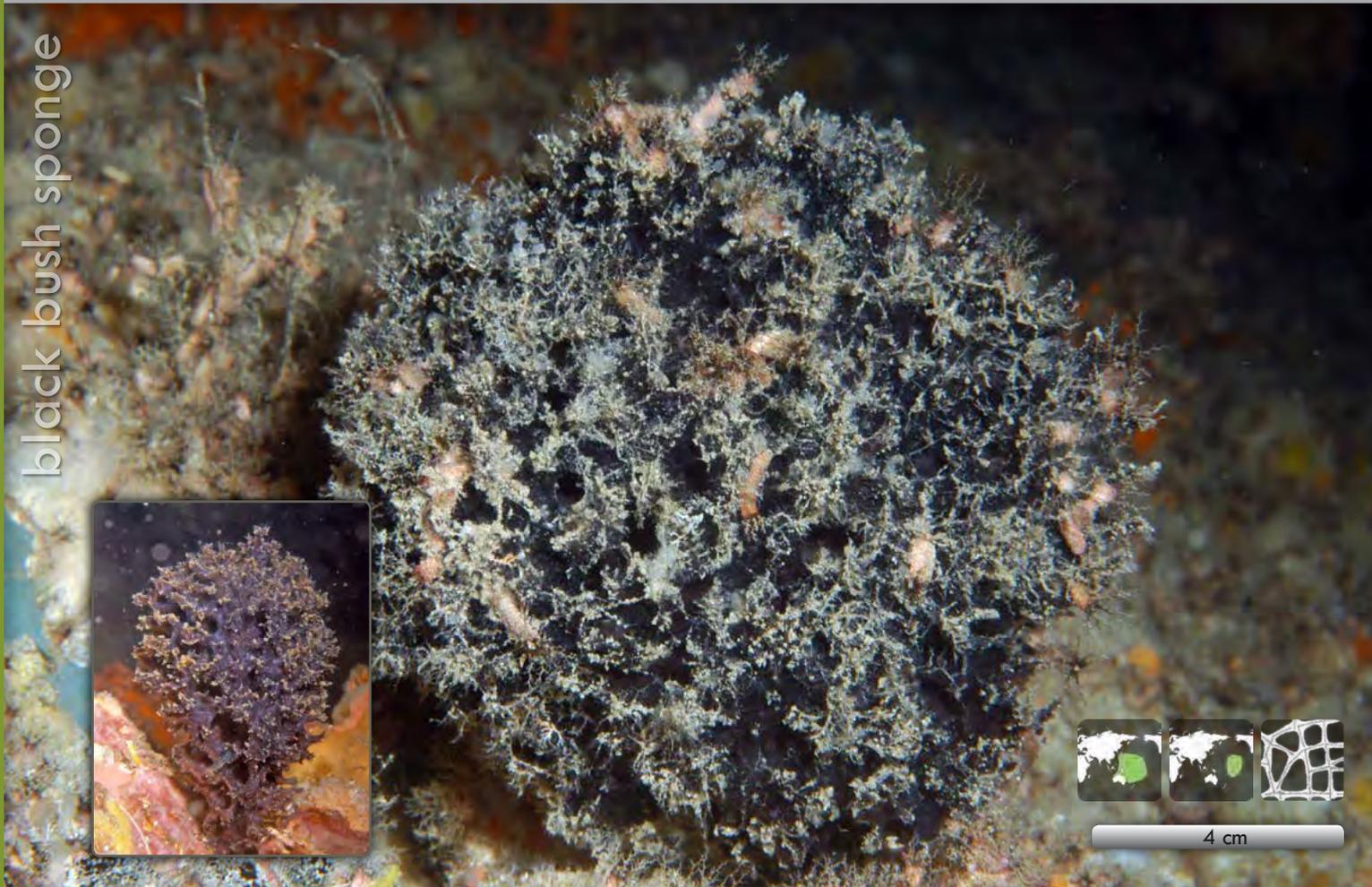
Massive loaf-shaped to amorphous sponge 35–85 cm long, 20–60 cm wide, 16–40 cm thick, sometimes encrusting in the interstices of coral rubble. Sponge can reach up to 1 m diameter. Surface has a characteristic pattern of polygonal plates surrounded by shallow fissures or grooves (sieve-plates) that reveal the bright orange internal colouration. The surface appears 'crusty' with a sand and silt covering trapped in a fine pile of projecting spicules. Large groups of membraneous oscules, up to 5 cm diameter, and deep sieve-plates, are situated apically in deep meandering channels. External texture firm but compressible, internal texture soft, somewhat fleshy, crumbly and mucous. Colour in life light orange brown to bright yellow to bright orange internally, almost always with a dull grey sandy coat. In open reef habitats the surface between fissures is a deep maroon brown overlaying the bright orange surface. The sponge produces heavy mucus when torn.

This species is found on deep algal flats, oceanic reef slopes and walls, fringing reef slopes, heavily sedimented fringing reef platforms and pools, growing on limestone rock and dead coral rubble down to about 40 m depth. Also commonly found in caves. It has a broad Indo-Pacific distribution having been recorded from the Western Indian Ocean east to the Chesterfield Islands and southern Lagoon of New Caledonia.



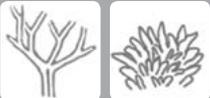
De Laubenfels, M.W. (1954) *Neoprosopa atina*, Pp. 190, in The sponges of the West-Central Pacific. Oregon State Monographs Studies in Zoology, 7, 1–306 .
 Colin, P.L., Arneson, C. (1995) Tropical Pacific Invertebrates. Coral Reef Press, California, 296 pp.

black bush sponge



4 cm

morphology



surface



substrate



habitat



Spherical, cavernous bush-shaped sponge composed of fused vertical chimneys, with a narrow stalk, up to 30 cm high, 18 cm thick, with a wiry, springy fibrous skeleton forming prominent surface spikes. Surface harshly conulose, 'draped' with thin, membranous tissue, oscules 5–15 mm diameter. Texture firm, slightly compressible, springy, fibres tough but elastic. Colour in life jet black to very deep purple, interior mustard gold. Deep purple exudate stains hands. Surface frequently covered in light sandy sediment.

The sponge is relatively common throughout Palau on inshore reefs and deep algae beds, in marine lakes and in shallow seagrass beds. Found in Pohnpei, Guam, Chuuk in mangrove channels, seagrass and algal flats, on docks, ship wrecks, lagoon patch reefs, fringing and open reefs and slopes, between 1–32 m depth, but commonly down to 15 m. Also recorded from East Malaysia, Papua New Guinea, American Samoa, Tonga and Fiji. Max de Laubenfels appropriately named this species from the Greek word meaning 'cavernous.'

Echinodictyum antrodes is very similar to *E. asperum* Ridley & Dendy, 1886, first described from Papeete Harbour, Tahiti, but differs in being jet black rather than chocolate brown. *Echinodictyum antrodes* also has longer oxeas and smaller acanthostyle spicules.

There is considerable micro-variation between specimens of *E. antrodes* but all are morphologically indistinguishable and consistently jet black. The range of *E. antrodes* presented here overlaps significantly with that of *E. asperum*, suggesting a future comparison is necessary. Until then, our specimens are identified as *E. antrodes*.



De Laubenfels, M.W. (1954) The sponges of the West-Central Pacific. Oregon State Monographs Studies in Zoology, 7, 1–306.

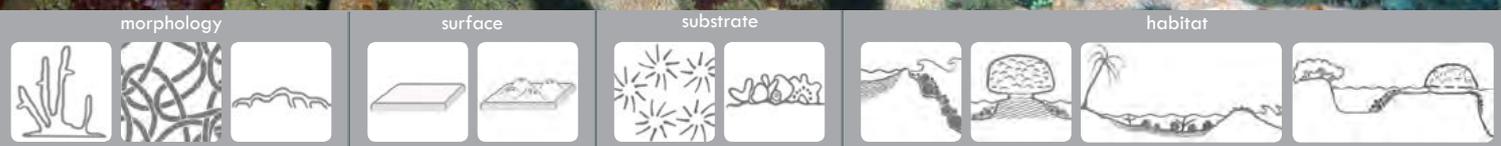
Colin, P.L., Arneson, C. (1995) Tropical Pacific Invertebrates. Coral Reef Press, California, 296 pp.

Class Demospongiae Order Poecilosclerida Family Microcionidae

tangled orange sponge



4 cm



Sprawling ramose sponge, long repent cylindrical branches giving rise to shorter tapered side branches, frequently anastomosing to form a tangled mass. Branches may be entirely free of side structures, or may have low rounded lobes or nodules on the surface. Branch diameter 6–10 mm, branch length commonly 30 cm, but can reach up to 70 cm. Surface billowy, inflated underwater, with large membraneous oscules aligned along the branch giving the impression of octopus legs, oscules 3–5 mm. Subsurface aquiferous canals conspicuous, ends of branches tapering, occasionally bifurcate. External texture soft and velvety, internal texture stiff, incompressible due to the fibrous internal skeleton, elastic. Surface smooth, micro-velvety, fuzzy. External colour in life is pale brownish orange, peach, salmon, caramel, with a brilliant vermillion to brick red internal colouration visible through the oscular openings. Surface dullness is due to a coat of sand that renders the surface opaque and whitish. Surface also has a sheen due to projecting brushes of spicules.

This species has a West Pacific and South East Asia distribution (Malaysia, Palau, Chuuk, the Torres Straits and Solomon Islands) and is often found on lagoon patch reefs, marine lakes (Palau, West Papua), sunken ship hulls, and outer reef slopes and walls of atolls, from 3–25 m depth. It has also been recorded from the northern section of the Great Barrier reef and Indonesia.

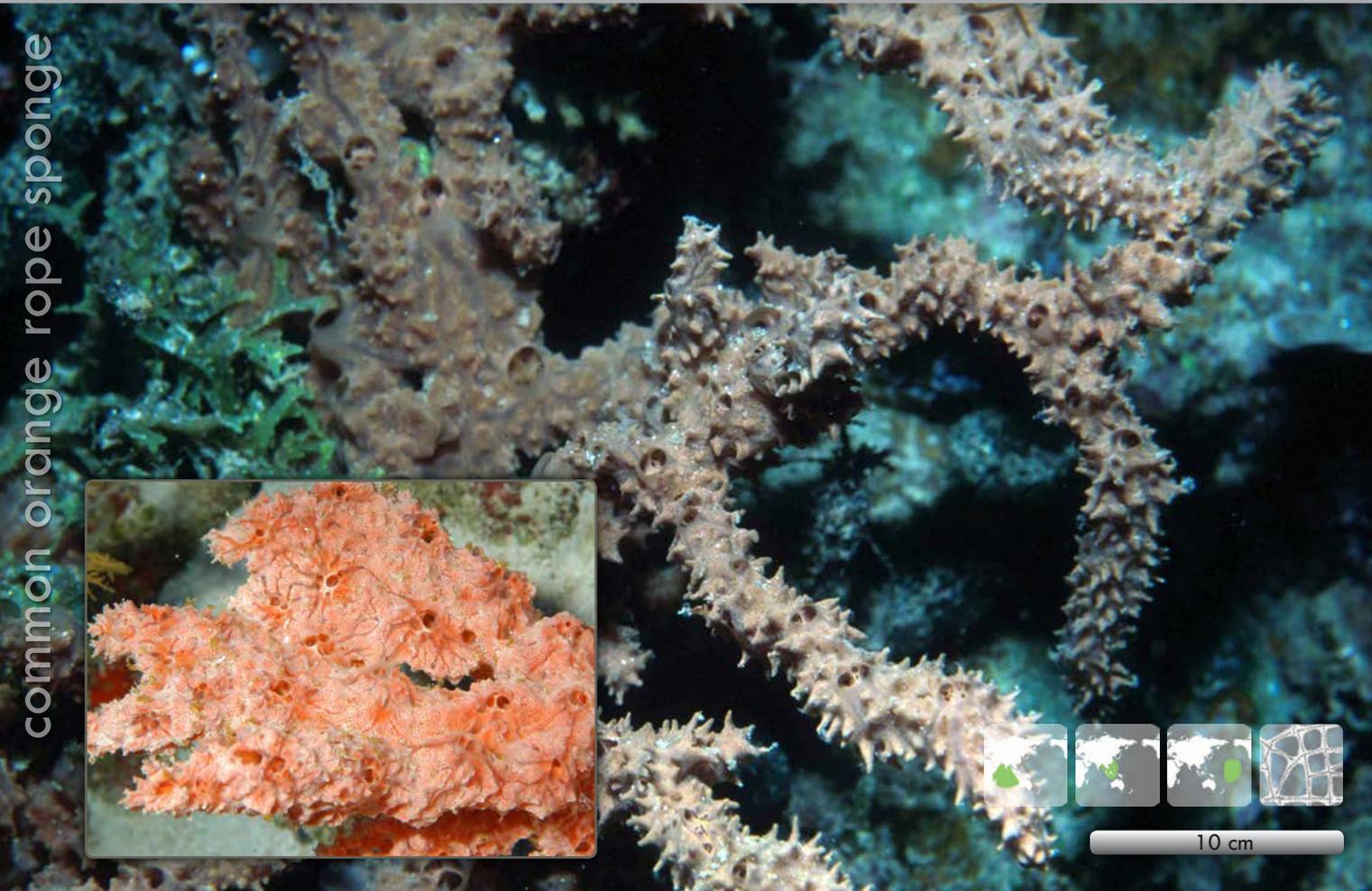


It could also be.....
Clathria (Thalysias) reinwardti Vosmaer, 1880

De Laubenfels, M.W. (1954) The sponges of the West-Central Pacific. Oregon State Monographs Studies in Zoology, 7, 1–306.
Bergquist, P.R. (1965) The sponges of Micronesia, Part 1 The Palau Archipelago. Pacific Science, 19, 123–204.

Class Demospongiae Order Poecilosclerida Family Microcionidae

common orange rope sponge



10 cm



Sprawling, gnarled, repent to erect sponge, medium-length compressed primary branches giving rise to shorter erect cylindrical fingers or fans, often anastomosing to form a tangled net. Other sponges form short thick clubs. Branches are irregular in profile and covered in sharp multiple conules. Branch diameter ranges from 1–3 cm, and can be up to 30 cm long. Surface billowy underwater in sections but gnarled fibers are clearly visible. Dilated subsurface aquiferous canals converge on central oscules about 1–5 mm diameter. Texture soft and velvety externally, internal texture compressible, semi-brittle. Surface smooth, micro-velvety, fuzzy. Four distinct colour morphs exist in life: 1) Externally pale greyish orange, internally yellowish red; 2) Externally red, internally red to mustard brown; 3) Externally bright orange, internal brick brown; 4) Externally grey, internally yellow to orange brown. Surface 'frostiness' is due to a coat of sand that renders the surface opaque and whitish. Surface also has a sheen due to projecting brushes of spicules.

This is a very common shallow-water species throughout Micronesia (Palau, Chuuk, Kosrae, Guam) and the Western Pacific in particular (northern Australia and Torrest Straits, Papua New Guinea, Solomon Islands). It is also known from southeast Asia and India. The sponge is found on intertidal reefs, *Halimeda* and seagrass beds, silty lagoon patch reefs, silty mangrove channels and open reefs, from 0.5 to about 18 m depth. It is usually abundant where it is found, most likely due to the sponges ability to remain viable as a fragment with subsequent reattachment.



It could also be.....
Clathria (Thalysias) cervicornis (Thiele, 1903)

Colin, P.L., Arneson, C. (1995) Tropical Pacific Invertebrates. Coral Reef Press, California, 296 pp.
Kelly-Borges, M., Bergquist, P.R. (1988) Sponges of Motupore Island, Papua New Guinea. Indo-Malayan Zoology, 5, 121–159.

beautiful teal sponge



7 cm

morphology



surface



substrate



habitat



Tubular to large fan-shaped sponge, clusters of tubes arise vertically from a basal tube or lamella loosely attached to substrate, fans up to 20 cm tall and up to 40 cm across, tubes 2–8 cm diameter, 15–20 cm tall, walls 3–5 mm thick. Fans can attain a large size, up to 1 m across. Internal surface lightly ridged, also with lines of small oscules, external surface covered in soft, tapering, evenly distributed oblique spines, 2–10 mm long, directed towards margins where spines are particularly prominent. Surface is covered by a beautiful translucent net. Texture soft, felty, spongy, tears easily but holds shape out of water. Colour in life a distinctive teal or turquoise colour, or light brownish pink under low illumination. Spines are lighter in colour.

The sponge is relatively common around Palau where it has been found on fringing reefs, reef channels and walls between 10–25 m, attached to rock in full light, but is not locally abundant. It is occasionally found in caves. It has also been found in Chuuk, Marshall Islands, Solomon Islands, Vanuatu, Papua New Guinea and Malaysia between 5–30 m depth. The species was first described from the southern New Caledonia lagoon and has since been reported from northeast Australia, Torres Straits and the Great Barrier Reef between between 10–33 m. The sponge appears to be restricted to the Western Pacific and southeast Asia.

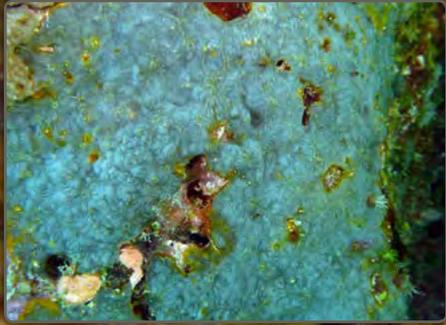
It could also be.....
Dysidea frondosa Bergquist, 1995



Lévi, C. (1998) Sponges of the New Caledonia Lagoon. Edition de l'Orstom. Collection Faune et flore Tropicales n. XXXIII. Paris, 1998, 214 pp.

Colin, P.L., Arneson, C. (1995) Tropical Pacific Invertebrates. Coral Reef Press, California, 296 pp.

Milne's encrusting sponge



3 cm

morphology



surface



substrate



habitat



Thinly encrusting sponge, <1–3 mm thick, up to 1 cm thick, spreading in patches up to 50 cm diameter, or free ribbons/ropes 15 cm long, 7 mm wide, covering substrate. In locations that promote exceptional growth sponge elevates above substrate to form abundant thin leafy fans. Surface even with small, regularly distributed keyhole-shaped oscules, 0.3–6 mm diameter, and prominent subsurface transparent aquiferous canals that radiate in a starburst from each oscule. Texture soft, fibrous, tears very easily, feels felty, sticky. Colour in life a characteristic bright dark olive green to chocolate brown with a rusty tint, overlaid with a beautiful shimmery pale cerulean blue-green sheen. Notable field characters are a marked stickiness, turning milk chocolate brown when touched or removed from water, and a wine-red exudate that turns hands brown.

The sponge is common throughout Palau, Chuuk, Marshall Islands and Papua New Guinea where it is found encrusting limestone rock on rock island and open reefs between 1–18 m. Restricted Western Pacific distribution.

This beautiful species was originally described as *Katiba milnei* by Max de Laubenfels. The genus name honours Katib, the 'eminent native inhabitant of Ebon Atoll, capable of extraordinary feats of underwater swimming and diving, in appreciation of his untiring and efficient help in securing the collection' upon which most of de Laubenfels (1954) treatise was based. The species name *milnei* honours two 'outstandingly capable' cousins in the well known Marshallese Milne family, both named James Milne.

It could also be.....

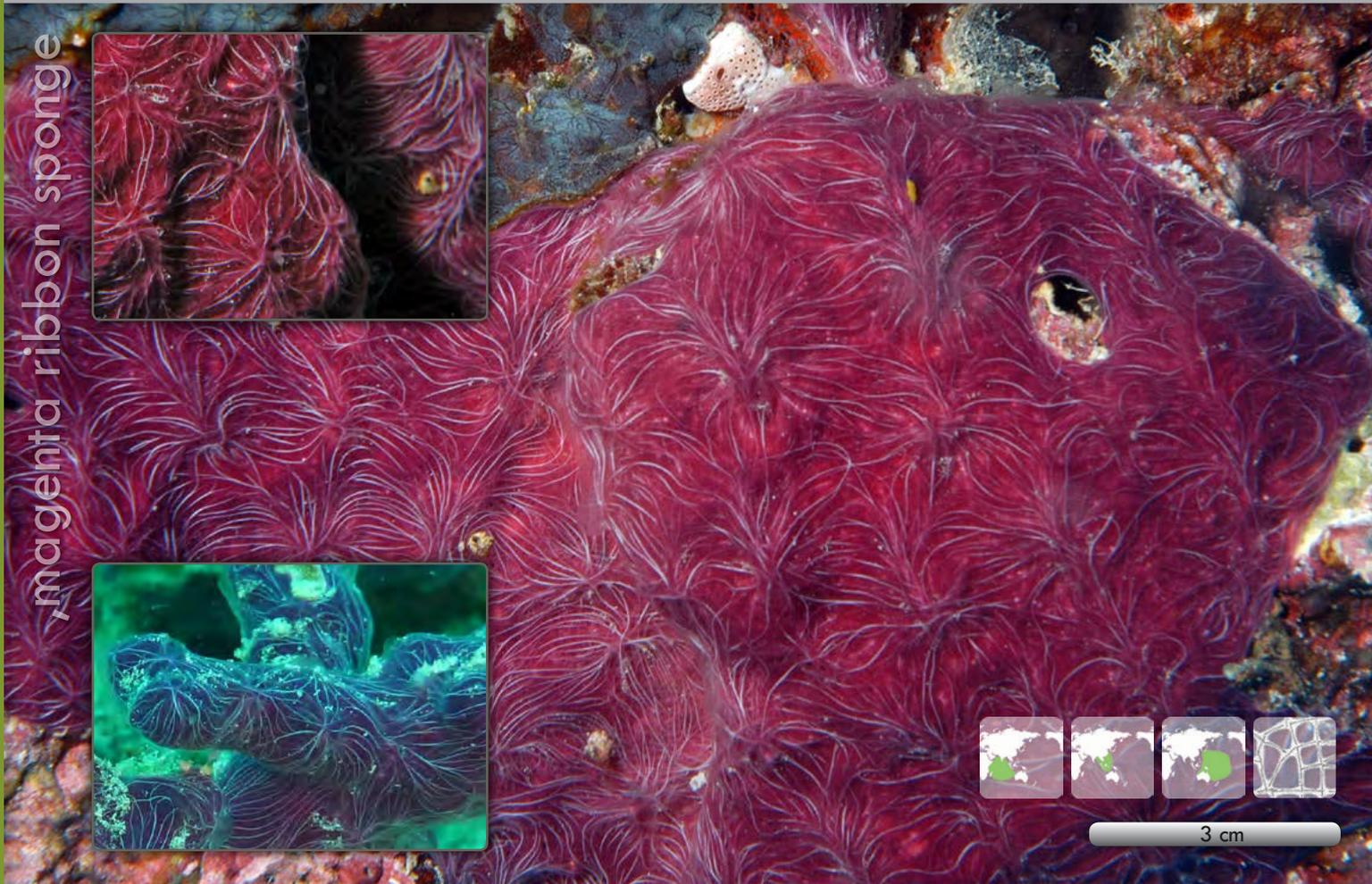
- Neopetrosia exigua* (Kirkpatrick, 1900)
- Dactylospongia elegans* (Thiele, 1899)



Colin, P.L., Arneson, C. (1995) Tropical Pacific Invertebrates. Coral Reef Press, California, 296 pp.

Kelly-Borges, M., Bergquist, P.R. (1988) Sponges of Motupore Island, Papua New Guinea. Indo-Malayan Zoology, 5, 121–159.

magenta ribbon sponge



Thinly encrusting sponge, <1 mm thick, spreading laterally to cover coral rubble or limestone rock substrate, and frequently covers staghorn coral completely. Surface smooth, shiny, inflated and translucent in life, oscules are not readily apparent but visible as transparent membranes in profile. A highly conspicuous field character is the presence of pale white ribbons or threads of collagen, 50–150 μm thick, that radiate unevenly underneath and through the oscular area, splitting into 2–3 threads, and swirling in starbursts throughout the sponge. Texture is extremely soft and delicate and the sponge emits copious slime when scraped off the surface or pulled apart. Colour in life bright translucent magenta.

The sponge is very common throughout Palau and Micronesia including Chuuk and the Marshall Islands, where it is found encrusting coral rubble on lagoon patch reefs, fringing and open reefs between 3–20 m. It is also known from southern Papua New Guinea, Great Barrier Reef, Philippines, and the Maldives. This species has a restricted Indo-Pacific distribution.

The majority of field guides refer to this species by its original name *Nara nematifera*. Yet whatever the name, this species is highly recognisable due to the presence of white threads that meander through the thin body, after which the species was named (Greek for 'containing threads').



De Laubenfels, M.W. (1954) The sponges of the West-Central Pacific. Oregon State Monographs Studies in Zoology, 7, 1–306.
 Colin, P.L., Arneson, C. (1995) Tropical Pacific Invertebrates. Coral Reef Press, California, 296 pp.

pale blue sticky sheet sponge



5 cm

morphology

surface

substrate

habitat



Thinly encrusting sponge, about 3–10 mm thick, spreading laterally and indefinitely to cover limestone rock substrate, or coral and other organisms such as gorgonians and tube molluscs. Surface appears very smooth but is slightly velvety, numerous regularly-spaced small oscules, 3 mm diameter, with slightly raised collars are scattered over the surface. Texture is softly spongy, tears easily, slightly slimy and very elastic. Colour in life light greyish blue to beige in areas that are without direct illumination, and internally. Conspicuous field characters for this species are the soft, elastic body and sticky texture in combination with the pale blue colouration, the regularly dispersed, raised oscules, and that it can be pulled from the substrate in a sheet.

The sponge is relatively common in Palau, Chuuk, and other Micronesian locations including the Marshall Islands, where it is found encrusting coral rubble or limestone rock on lagoon patch reefs, fringing reefs and on open reefs walls between 10–20 m. It is also known from the Philippines, Sarawak, Papua New Guinea and the Great Barrier Reef. This species has a restricted Western Pacific and southeast Asia distribution.



De Laubenfels, M.W. (1954) The sponges of the West-Central Pacific. Oregon State Monographs Studies in Zoology, 7, 1–306.

Colin, P.L., Arneson, C. (1995) Tropical Pacific Invertebrates. Coral Reef Press, California, 296 pp.

orange tendrill sponge



2 cm

morphology



surface



substrate



habitat



Irregular cylindrical to laterally compressed sponge, 1–3 cm thick, giving rise to tapering branches or masses of dividing, anastomosing branches, 5–10 mm diameter, that taper to a fine point, typically 5 mm diameter, 15 cm long, forming a tangled mass of tendrils up to 30 cm wide. Surface irregular, ridged, slightly hispid, velvety, large oscules with a raised membranous collar, 2–7 mm wide, arrayed on one side and ends of branches. Thickest branches often hollow with terminal oscules, subsurface aquiferous canals visible. Forms large delicate masses in quiet conditions such as in marine lakes. Texture extremely delicate, easily torn, very softly spongy, collapses out of water. Colour in life melon yellow to dull orange.

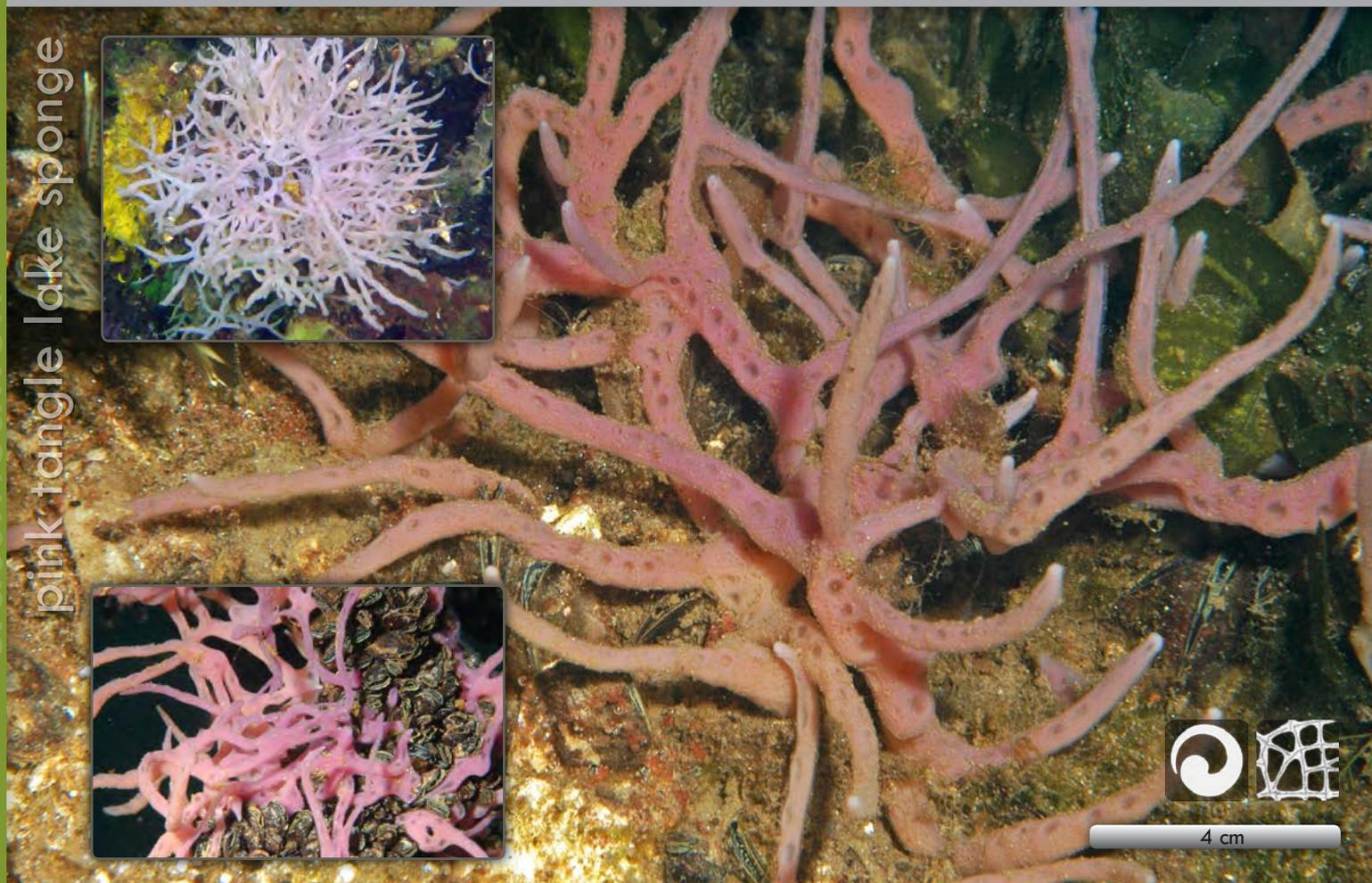
The sponge was first described from seagrass beds in southern Papua New Guinea but has since been identified from Kosrae, Palau, Guam and Solomon Islands, and in various marine lakes throughout Palau, Berau (Kakaban) and West Papua, Indonesia, growing on limestone rock, rubble, sand and mangrove roots, in depths of 0.5–3 m. The species has a restricted Western Pacific and Southeast Asian distribution.

In Palau marine lakes this species is usually found in 'mixed' lakes that are well connected to the sea. However, in the more isolated, 'stratified' Jellyfish Lake, this species takes on an unusual haystack form (upper inset) not seen elsewhere, possibly because of the unusual lake conditions of extremely still water and low salinity and pH. We also think that it is a non-native species that has been introduced into Jellyfish Lake.



Kelly-Borges, M., Bergquist, P.R. (1988) Sponges of Motupore Island, Papua New Guinea. Indo-Malayan Zoology, 5, 121–159.

Patris, S.W., Dawson, M.N., Bell, L.J., Martin, L.E, Colin, P.L., Ucharm, G. (2012) Ongeim'l Tketau: Jellyfish Lake. Coral Reef Research Foundation & Etpison Museum, Palau. 44 pp.



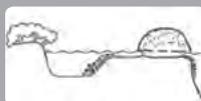
4 cm

morphology

surface

substrate

habitat



Regular cylindrical stringy sponge, 5–8 mm diameter, giving rise to tapering branches or tangles of dividing and anastomosing branches up to 20 cm long, often forming a hanging, lightly tangled mass. Soft with smooth surface, numerous oscules in arrays along upper sides of branches, sunken, membraneous, 2–4 mm diameter; these are the identifying characteristic of this sponge. Forms large delicate tangles in very quiet conditions such as in Jellyfish Lake. Texture soft, mushy, tears very easily, collapses out of water. Colour in life lavender to pink to beige, tips of branches lighter in colour.

This sponge is only known from Jellyfish Lake in Palau where it grows on all substrates including limestone rock, mussels, mangrove roots and submerged logs, at depths of 0.5–4 m. It has not been found in other marine lakes in Palau or elsewhere, nor in Palau's rock islands or lagoon.



It could also be.....
Haliclona sp. 13 (pink tube lake sponge)



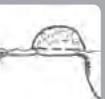
9 cm

morphology

surface

substrate

habitat



While common in all isolated marine lakes in Palau, in Jellyfish Lake the predominant form of this sponge is a meandering tube arising from an encrusting base forming elongate or compact fused tubular branches 0.5–1 cm diameter, 20 cm long, walls 1–2 mm thick, growing to form a light bushy structure up to 10 cm wide. In other marine lakes in Palau the shape ranges from single or fused encrusting rounded tubular lobes 1–2 cm long and 1 cm thick, to a mass of stumpy fused chimney-shaped tubes up to 10 cm thick and 20 cm wide, all with terminal oscules and sometimes subterminal or branch oscules. Oscules membranous with fibre terminations visible, 3–8 mm diameter, occasionally tendrils emanate from the tops of the tubes up to 8 cm long. Oscules also occasional on the upper sides of tubes, 2–3 mm diameter. Surface often covered with a smooth shiny transparent membrane, or with fine projecting spicules. Feels felty with a soft texture, tears very easily, slick and mushy when squeezed and collapses out of water. Colour in life fuchsia, pink, lavender, or cream under low illumination.

This species is predominantly known from isolated stratified marine lakes in Palau where it grows on mangrove roots, submerged wood, mussels and limestone rock, in depths of 0.5–5 m. It has also been found in West Papua marine lakes and in one shallow mangrove channel outside those lakes. Restricted West Pacific distribution.

It could also be.....

Haliclona sp. 13 (pink tangle lake sponge)



Poseidon's sponge



8 cm

morphology



surface



substrate



habitat



Fragile, floppy tubular to vase-shaped sponge, clusters of tubes arise vertically from a common base, 1–4 cm diameter, 10–35 cm tall, walls 1–3 mm thick while vases attain considerable size, 10–30 cm wide, 50 cm tall, margins often wavy. Surfaces have light concentric ridges, tiny oscules visible on internal surface. Margins membraneous, translucent. Texture soft, flimsy, felty, crushable, tears easily, collapses out of water. Colour in life distinctive teal or turquoise, or soft rose-lavender. Produces light mucus and a milky teal exudate when squeezed. Conspicuous field characters are the light concentric ridges, tissue-paper thinness, soft felty texture, and the overall delicate beauty of these colourful tubes and vases.

Relatively common around Palau on open reef slopes between 5–30 m, typically 10–20 m, but known from channels and fringing reefs as well. Also recorded from Chuuk, Pohnpei, Solomon Islands, Indonesia, Philippines, Papua New Guinea, and Tanzania. The species has a wide Indo-Pacific distribution but is not regionally abundant. Also known from the Kenyan coast and Mozambique Channel.

Though it became a synonym of an earlier name, Max de Laubenfels named this beautiful species *Kallypidion poseidon*. The genus name *Kallypidion* was derived from the Greek word for 'beautiful hat' or cap; de Laubenfels felt that the sponge bore a 'striking resemblance to a brimless cap such as a man might wear.' The species name *poseidon* refers to the Greek deity Poseidon (and Roman god Neptune) suggesting that 'such sponges as these might have been used by this sea god as a head gear!'

It could also be.....

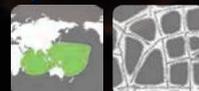
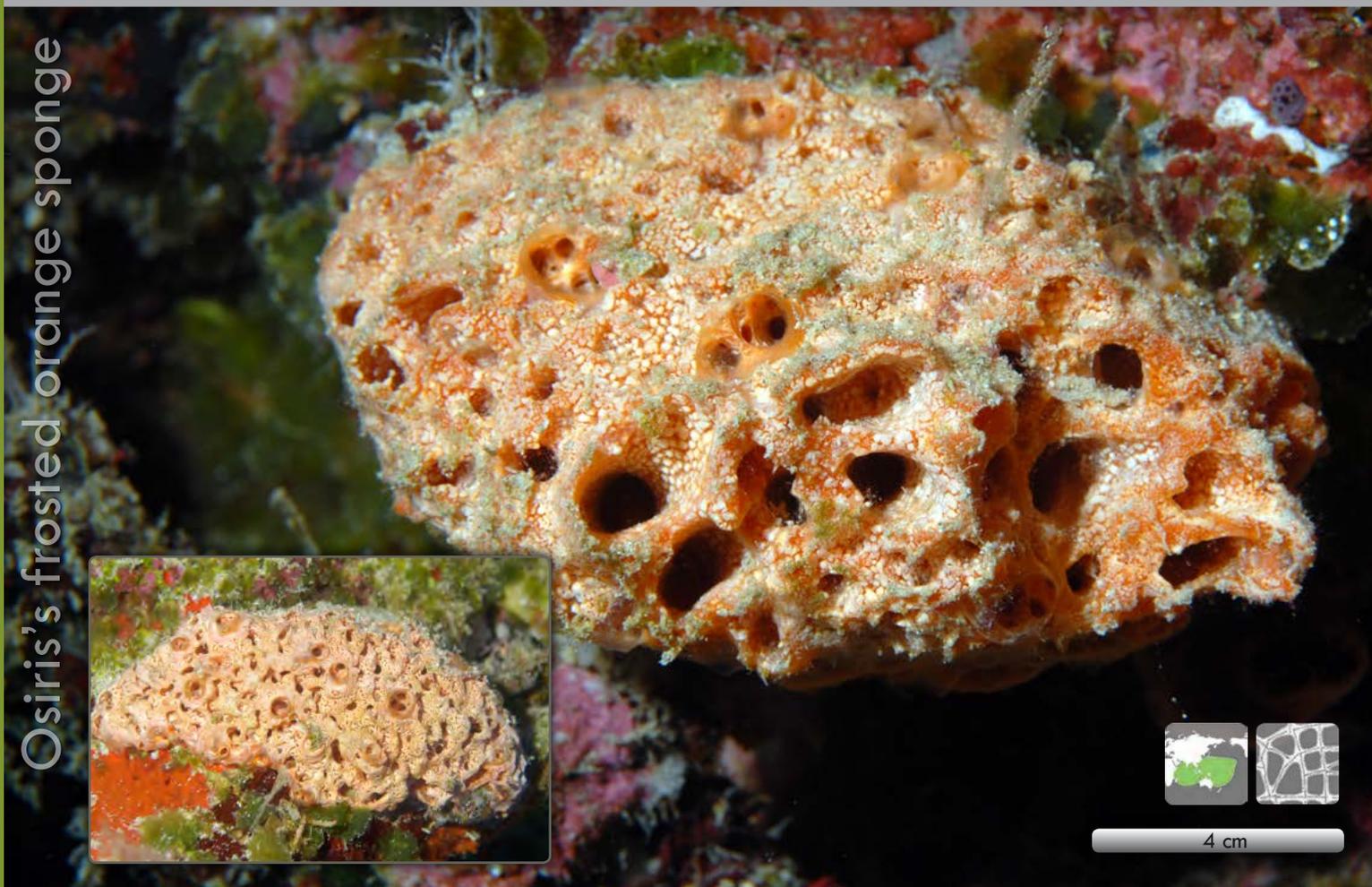
Callyspongia (Cladochalina) aërizusa Desqueyroux-Faúndez, 1984



De Laubenfels, M.W. (1954) The sponges of the West-Central Pacific. Oregon State Monographs Studies in Zoology, 7, 1–306.

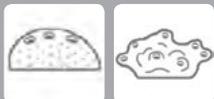
Colin, P.L., Arneson, C. (1995) Tropical Pacific Invertebrates. Coral Reef Press, California, 296 pp.

Osiris's frosted orange sponge



4 cm

morphology



surface



substrate



habitat



Spherical or elongate, lobate to thickly encrusting sponge, typically about 8–10 cm high, 15–30 cm wide, interior extremely cavernous. Surface is rough and irregular with tubercles and numerous holes that deeply enter the interior, sponge almost honeycombed in appearance. Oscules are large, raised on mounds, thickly collared and scattered over the top of the sponge, about 5–10 mm diameter. A key field character is the patchy 'frosted' appearance due to sand being incorporated into polygonal surface tubercles. Tubercles are outlined by grooves clear of sand through which the bright orange interior is visible. Texture very soft, tears very easily, almost crumbly, mushy, collapses out of water, surface felty and feels like soggy bread. Colour in life bright to dirty orange frosted with a light sandy coat, interior sometimes very light gold.

This species is common in Palau, Chuuk, Vanuatu and the Kingdom of Tonga where it is frequently attaches to coral and limestone rock on walls, slopes and overhangs on open and fringing coral reefs between 7–33 m depth. It has also been collected from the Maldives, East Malaysia, Papua New Guinea, Solomon Islands and Fiji.

The species was named by Max de Laubenfels for the Egyptian deity Osiris who was usually identified as the god of the afterlife, the underworld and the dead.

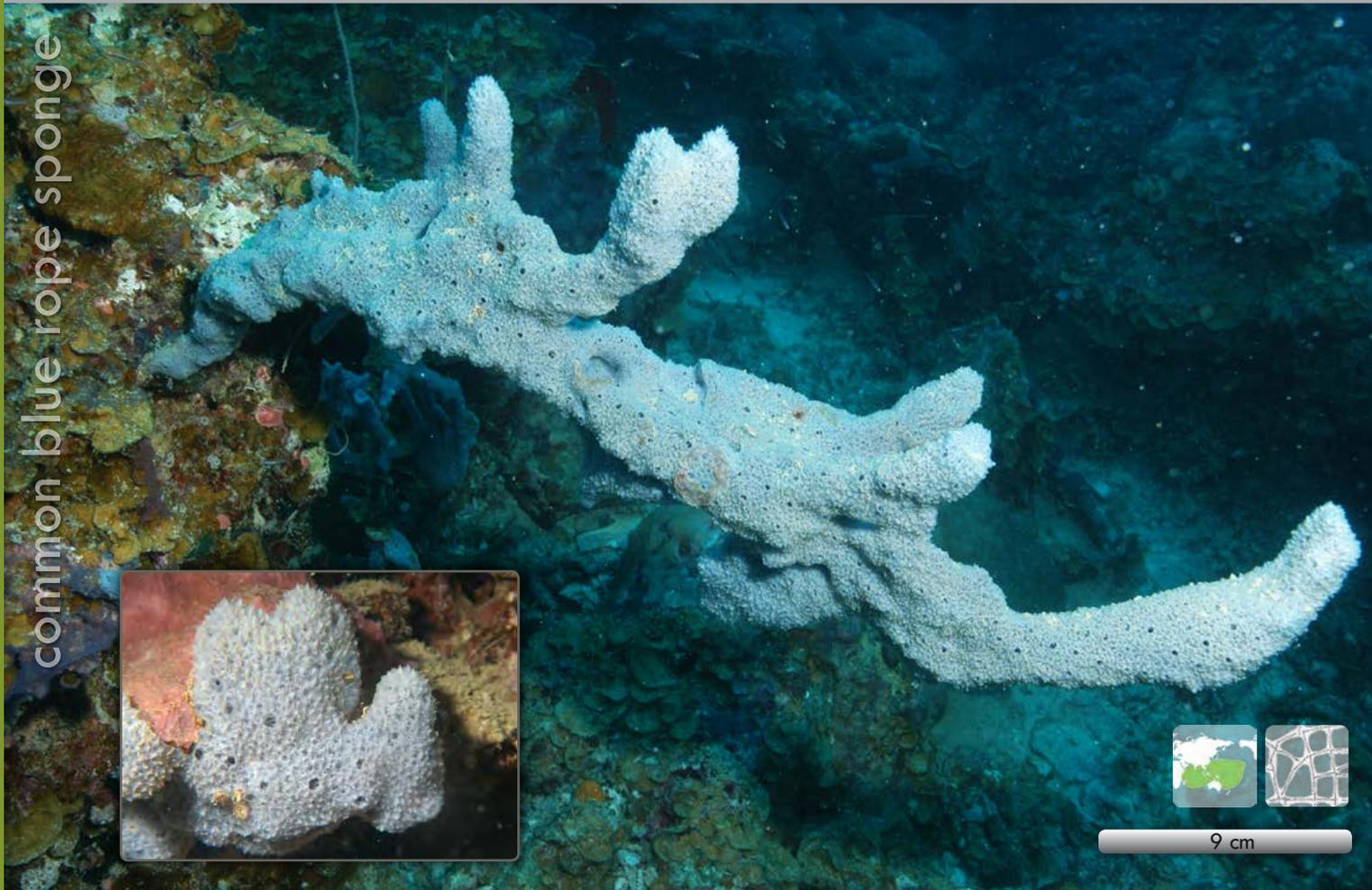
It could also be.....
Acanthella cavernosa Dendy, 1922



De Laubenfels, M.W. (1954) The sponges of the West-Central Pacific. Oregon State Monographs Studies in Zoology, 7, 1–306.
Colin, P.L., Arneson, C. (1995) Tropical Pacific Invertebrates. Coral Reef Press, California, 296 pp.

Class Demosporigae Order Haplosclerida Family Niphatidae

common blue rope sponge



9 cm

<p>morphology</p>				<p>surface</p>			<p>substrate</p>		<p>habitat</p>		
-------------------	--	--	--	----------------	--	--	------------------	--	----------------	--	--



Sprawling rope sponge, repeat to erect branching or palmate, most often forming a tangled mass. Branches compressed laterally, giving rise to shorter branches, often anastomosing to form a tangled net. Branches 1–2 cm diameter, up to 50 cm long, irregular in profile. Other forms include short thick clubs to palmate fans (inset), or thick encrustations. Surface relatively smooth to roughened with low fibrous conules clearly visible through a translucent ectosome. Numerous oscules with a raised translucent collar scattered all over or on top side of branches, or one side of palmate sponges, about 2–5 mm diameter. Texture firm to spongy, fibrous, relatively easy to tear. Colour in life typically ice blue to slate grey with tinges of lavender and turquoise, may be tan internally and on undersides away from direct illumination. Generally produces slimy, sticky mucus when squeezed and may have a pungent fishy to garlic odour.

This species is most common in sheltered lagoons on rock island reefs, but is also found on outer reefs in Palau between 2–10 m. It is particularly abundant around Papua New Guinea on steep fore-reef slopes and walls of the open reef, between 5–30 m, and has been found in a deep barrier reef cave at 45 m. The species has also been collected from the Philippines and Zanzibar and has a broad but disjunct Indo-Pacific distribution.

It could also be.....
Gelliodes fibulata (Carter, 1881)
Dysidea granulosa Bergquist, 1965



Ridley, S.O., Dendy, A. (1886) Preliminary report on the Monaxonida collected by H.M.S. 'Challenger'. Annals and Magazine of Natural History (5) 18, 325–351, 470–493.

blue cactus sponge



4 cm

morphology



surface



substrate



habitat



Large, erect or repent, meandering prickly rope sponge, long single branches, bifurcating occasionally, often meandering and anastomosing to form a light tangled mass. Branches 1–4 cm wide, commonly 50–100 cm long. Some sponges form short thick clubs or thick encrustations with short branches; these are common under overhangs. Surface covered with numerous sharp, rigid, slender spines of varying length, 3–20 mm long, primary spines may be covered in smaller secondary spines. Ectosome translucent and sponge appears cavernous and fibrous internally. Oscules scattered over branches, 1–5 mm diameter, not readily visible. Texture tough, incompressible, spiky, spines needle-like and sharp. Branches flexible along their length and relatively easy to tear lengthwise, slightly brittle. Colour in life icy translucent turquoise-blue to greyish-blue, spines are lighter in colour on the tips.

This species grows on the sides and tops of reefs between 10–30 m depth, typically between 5–12 m, and is widespread and abundant in silty lagoon reefs and on outer barrier reefs across the western Pacific and southeast Asia; it is particularly common in southern Papua New Guinea. It has also been recorded from the Philippines, New Caledonia, the northern Great Barrier Reef, Torres Straits, Indonesia and Vietnam.

It could also be.....
Dasychalina melior Ridley & Dendy, 1886



Colin, P.L., Arneson, C. (1995) Tropical Pacific Invertebrates. Coral Reef Press, California, 296 pp.

Kelly-Borges, M., Bergquist, P.R. (1988) Sponges of Motupore Island, Papua New Guinea. Indo-Malayan Zoology, 5, 121–159.

olemed sponge



6 cm

morphology



surface



substrate



habitat


 0
20
40
80
100
120
depth (m)

Large single or multiple tube sponge, tubes arising from a common base, separate or conjoined laterally, rarely branching, also cup- or funnel-shaped. Tubes about 5–6 cm diameter, but up to 10 cm diameter, typically 30 cm high, but may be up to 40 cm high, tube walls about 4–10 mm, but up to 20 mm thick. Surface has broad concentric ribs on the external surface, longitudinal lines of oscules 3–5 mm diameter clearly visible on the internal surface of each tube. Surface looks smooth from a distance but is covered with regularly spaced tubercles representing the ends of blunt fibres projecting from the surface. Margins rounded, often tapering inwards, with a translucent heavy membrane on the very outer edge. Texture very spongy, compressible, heavily fibrous, tears with difficulty. Colour in life clear beautiful very pale greyish blue. Produces heavy mucus and very sticky when squeezed; has a glue-like effect on the hands being difficult to remove. Conspicuous field characters are the broad concentric ripples, heavy sticky mucus production, spongy texture, pale grey blue and general heaviness.

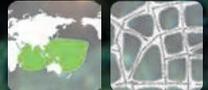
Relatively common around Palau and in Chuuk, in the lagoon and on open reef slopes between 6–30 m. Typically attached to limestone rock but also found on artificial substrates and black coral trees. Also known from Malaysia and Tanzania; the species has a wide but disjunct Indo-Pacific distribution and is not regionally abundant.

Max de Laubenfels used an iteration of the local Palauan word 'olemed,' meaning a sponge for cleaning, as the species name for this conspicuous sponge.



De Laubenfels, M.W. (1954) The sponges of the West-Central Pacific. Oregon State Monographs Studies in Zoology, 7, 1–306.

Colin, P.L., Arneson, C. (1995) Tropical Pacific Invertebrates. Coral Reef Press, California, 296 pp.



3 cm

morphology



surface



substrate



habitat



Thick encrusting to massive sponge with short round or flattened fingers or leaves, sprawling ramose over substrate; encrusting forms about 0.5–1 cm thick, spreading in patches up to 50 cm diameter. May form single or fused columns or vertical buttresses. Surface smooth with mounds, dimples, shallow depressions, oscules regularly distributed over surface, about 1–3 mm diameter. Texture stiff, barely compressible, crumbly like hard cake or biscuit and breaks, surface sticky. External colour light golden to dull milk chocolate brown to olive, burgandy or purple, colour present to about 1 mm deep inside the sponge. Internal colour is cream, tan to beige.

The sponge is extremely common throughout Palau, Pohnpei, Chuuk, Papua New Guinea and the Great Barrier Reef where it is found encrusting on intertidal reefs, in crevices, on rubble in seagrass beds, on patch reefs, and encrusting coral heads on silty fringing reefs in lagoons and on the outer barrier reef crest, between 1–30 m depth, typically around 2–10 m. This species has a broad Indo-Pacific distribution.

This species is highly variable in shape and thickness, varies in colour between specimens in different locations and frequently also within the same sponge. Despite this, the species is clearly recognisable and by far one of the most common sponges in the Palau and Pacific region generally. It has been described under several different names in the genus *Xestospongia*, but all now come under the name *Neopetrosia exigua*, first described from Christmas Island in the Indian Ocean.

It could also be.....

- Chalinula milnei* (de Laubenfels, 1954)
- Dactylospongia elegans* (Thiele, 1899)



De Laubenfels, M.W. (1954) The sponges of the West-Central Pacific. Oregon State Monographs Studies in Zoology, 7, 1–306.

Colin, P.L., Arneson, C. (1995) Tropical Pacific Invertebrates. Coral Reef Press, California, 296 pp.

lavender garlic sponge



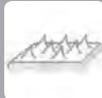
5 cm

morphology

surface

substrate

habitat



Massive lobate to fingery clump, or fan-shaped cavernous sponge, single or conjoined digits up to 15 cm high, 1–2 cm wide, encrustations up to 5 cm thick, thick fan-shaped sheets up to 20 cm high, 40 cm wide. Surface coarsely conulose, conules well separated, 6–10 mm apart, 2–3 mm high, with the sponge ‘draping’ between conules. Oscules prominent and surrounded by a pink rubbery membrane, about 5–10 mm diameter. Texture soft, compressible, collapses out of water, skeleton a harsh fibre reticulation embedded with sand grains. Slightly crunchy when squeezed due to sandy fibres, tears easily. Colour vivid violet or dull lavender, sometimes light pink, darker internally. Surface is mostly opaque with a dull whitish cast from sand-grains embedded in the surface. Smells strongly of garlic when out of water.

This species is common on silty shallow lagoon reefs, on the outer reef and in channels in Palau, growing on limestone rock or coral heads from 1–27 m depth. Also known from Chuuk down to 30 m, Pohnpei, Guam, Indonesia, Sabah, and Papua New Guinea on open reefs and mangrove channels.

Dysidea avara was originally described from the Adriatic Sea and is known from European waters including the Mediterranean and the United Kingdom. Because species of *Dysidea* have very few characters that can be used to reliably differentiate species, it is considered unlikely that the specimens described as *D. avara* by Max de Laubenfels from Palau are this same species. This is rather, a well known Pacific species that requires a new species name.

It could also be.....
Dysidea frondosa Bergquist, 1995



De Laubenfels, M.W. (1954) The sponges of the West-Central Pacific. Oregon State Monographs Studies in Zoology, 7, 1–306.

Colin, P.L., Arneson, C. (1995) Tropical Pacific Invertebrates. Coral Reef Press, California, 296 pp.

lavendar fan sponge



4 cm

morphology



surface



substrate



habitat



Fan- to plate-shaped, translucent, delicate sponge with flattened 'leaves' or short fingers or chimneys arising from a spreading base up to 30 cm wide. Fans up to 12 cm high, walls 5–10 mm thick. May form hollow tubes. Surface regularly conulose with low delicate conules 1–2 mm high that have rounded tips. Slightly transparent tissue draped between conules creating a tent-like structure, outlined by a delicate tracery of sand grains. Oscules on one side only, 3–6 mm diameter, flush with the surface. Texture soft, cavernous, flexible, compressible, easily torn, skeleton consists of fibres embedded with sand grains, visible at the ends of conules. Slightly crisp or crunchy when squeezed due to sandy fibres. Colour clear pinkish purple, lavender, fuchsia externally, with a whitish cast from sand-grains embedded in the surface; conule tips lighter. Tan internally. Sometimes has a strong medicinal smell.

This species is relatively common in Palau, Chuuk and Pohnpei under overhangs and crevices on open reef slopes and channels between 8–30 m depth. It was first described from New Caledonia but has since been recorded from Fiji, southern Papua New Guinea, Vanuatu, and Indonesia. The species has a West Pacific and southeast Asia distribution.

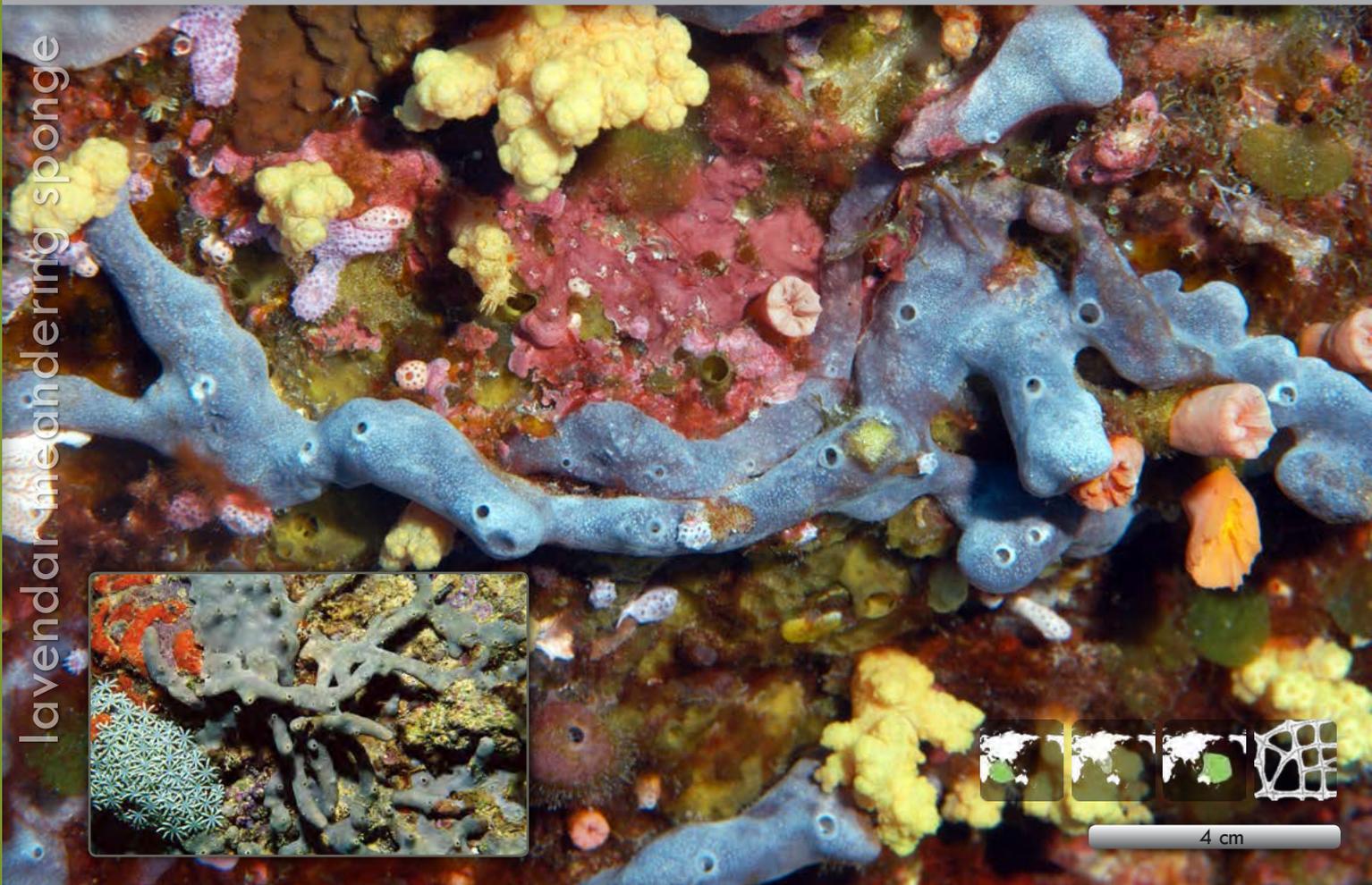
It could also be.....
Dysidea cf avara (Schmidt, 1862)



Bergquist, P.R. (1995) Dictyoceratida, Dendroceratida and Verongioda from the New Caledonia lagoon (Porifera: Demospongiae). *Memoirs of the Queensland Museum* 38 (1), 1–51.

Lévi, C. (1998) Sponges of the New Caledonia Lagoon. Edition de l'Orstom. Collection Faune et flore Tropicales n. XXXIII. Paris, 1998, 214 pp.

lavendar meandering sponge



4 cm

morphology



surface



substrate



habitat



Thick encrusting sponge giving rise to irregular mounds, short incipient branches and long, cylindrical branches that sprawl repeat over substrate. Encrustation about 0.5–1 cm thick, spreading in patches 10 cm by 10 cm, branches 4–10 mm diameter but can be up to 15 mm, up to 20 cm long. Surface covered with fine conules or pimples. Oscules are widely scattered or raised on low mounds or on the tips of fingers and have a light membraneous collar, sometimes white, about 1–2 mm diameter. Texture compressible, flexible, slightly rubbery, tears easily, surface texture finely granulate, internally finely fibrous. External colour greyish lavender to dirty grey to light brown. Internal colour beige. Light purple to pinkish exudate when handled.

The sponge is relatively common throughout Palau, Chuuk, Guam, Yap, Marshall Islands, northern Papua New Guinea, Solomon Islands, and has been collected from the Maldives, Thailand and Vietnam where it is found on open reef faces, slopes, walls and overhangs from 3–30 m depth. This species has a broad but disjunct Indo-Pacific distribution.

Species in the genus *Dysidea* are quite difficult to differentiate at the species level as they have no spicules. Sand grains core the spongin fibres and there is usually a sprinkling of sand grains in the surface tissues. Shape and colour are important in the differentiation of species in this genus. *Dysidea granulosa* is distinguished from other Palau species by the consistently ropey shape and finely conulose surface.



Bergquist, P.R. (1965) The sponges of Micronesia, Part 1 The Palau Archipelago. Pacific Science, 19, 123–204.
 Colin, P.L., Arneson, C. (1995) Tropical Pacific Invertebrates. Coral Reef Press, California, 296 pp..

algae mimic sponge



9 cm

morphology



surface



substrate



habitat



Encrusting plate sponges that form a thick rubbery sheet with vertical leaf-shaped ridges, short fingers or chimneys arising from a spreading base up to 30 cm wide, vertical ridges reaching a maximum height of 4–5 cm typically in the centre of the sponge. May form erect fans with flanges, subsurface channels extend out to the fan margins. Fans up to 12 cm high, walls 5–10 mm thick. Surface smooth, granular with low nubbins, mounds and meandering, labyrinthine or aligned ridges, 1–5 mm high, with rounded margins. Surface opaque with sand grains, subsurface canals sometimes visible in fan-shaped sponges. Oscules deep and obvious with no membrane, 3–6 mm diameter, flush with surface or elevated on chimneys. Texture soft, slippery, slimy, fleshy, compressible and easily torn. Colour typically clear bright pea green to yellow green, olive or dull lilac grey with a whitish cast from sand-grains embedded in the surface.

This species is common in Palau, Chuuk, Guam and Fiji on mangrove reefs, lagoon patch reefs, seagrass beds, back reef, reef flat and crest, fringing reef, on outer reef walls and slopes down to 30 m, most commonly under 5 m depth. It has also been collected from the Solomon Islands, Vanuatu, Papua New Guinea, Malaysia, Philippines, and the Maldives. It was first described from the Red Sea and has since been recorded from various sites across the Indo-Pacific from East Africa to South and Southeast Asia, the Great Barrier Reef and New Caledonia.

It could also be.....
Lendenfeldia dendyi (Lendenfeld, 1889)



Bergquist, P.R. (1965) The sponges of Micronesia, Part 1 The Palau Archipelago. Pacific Science, 19, 123–204.

Colin, P.L., Arneson, C. (1995) Tropical Pacific Invertebrates. Coral Reef Press, California, 296 pp.

matmat bath sponge



6 cm

morphology

surface

substrate

habitat



Spherical to hemispherical lobate sponge up to 15 cm diameter and 20 cm wide, spherical when immature, becoming lobed and dimpled with maturity. Surface finely conulose, conules grouped between narrow subsurface canals. Surface covered by a glistening fleshy 'skin', slightly rubbery to the touch. Large inflated oscules on the tops of lobes, 5–10 mm diameter but up to 3 cm. Texture very spongy, easy to tear. Colour in life jet black, dark brown, dark grey, tan externally, cream interior and undersides of sponge.

The sponge is abundant throughout Palau and the Marshall Islands on intertidal reef flats, shallow lagoons, seagrass beds, open reef slopes, channels, walls and overhangs, from 0–40 m depth. Also known from Yap, Chuuk, Pohnpei, Papua New Guinea, Solomon Islands, Vanuatu, Philippines and Indonesia. The species has a West Pacific and restricted southeast Asia distribution.

Max de Laubenfels considered this to be a 'silk' sponge of the finest commercial quality, very closely related to those in the Mediterranean Sea. It makes a beautiful facial sponge; in Micronesia it is grown commercially by local farmers under the guidance of the Marine Environmental Research Institute of Pohnpei.

The sponge is prepared for sale by exposure to air for several hours then soaking in seawater for a few weeks, leaving only the fibre skeleton. Sponges are cleaned by washing them twice in a household washing machine with mild detergent before air drying. The species name *matamata* is derived from the local Marshallese word (matmat) for sponge.

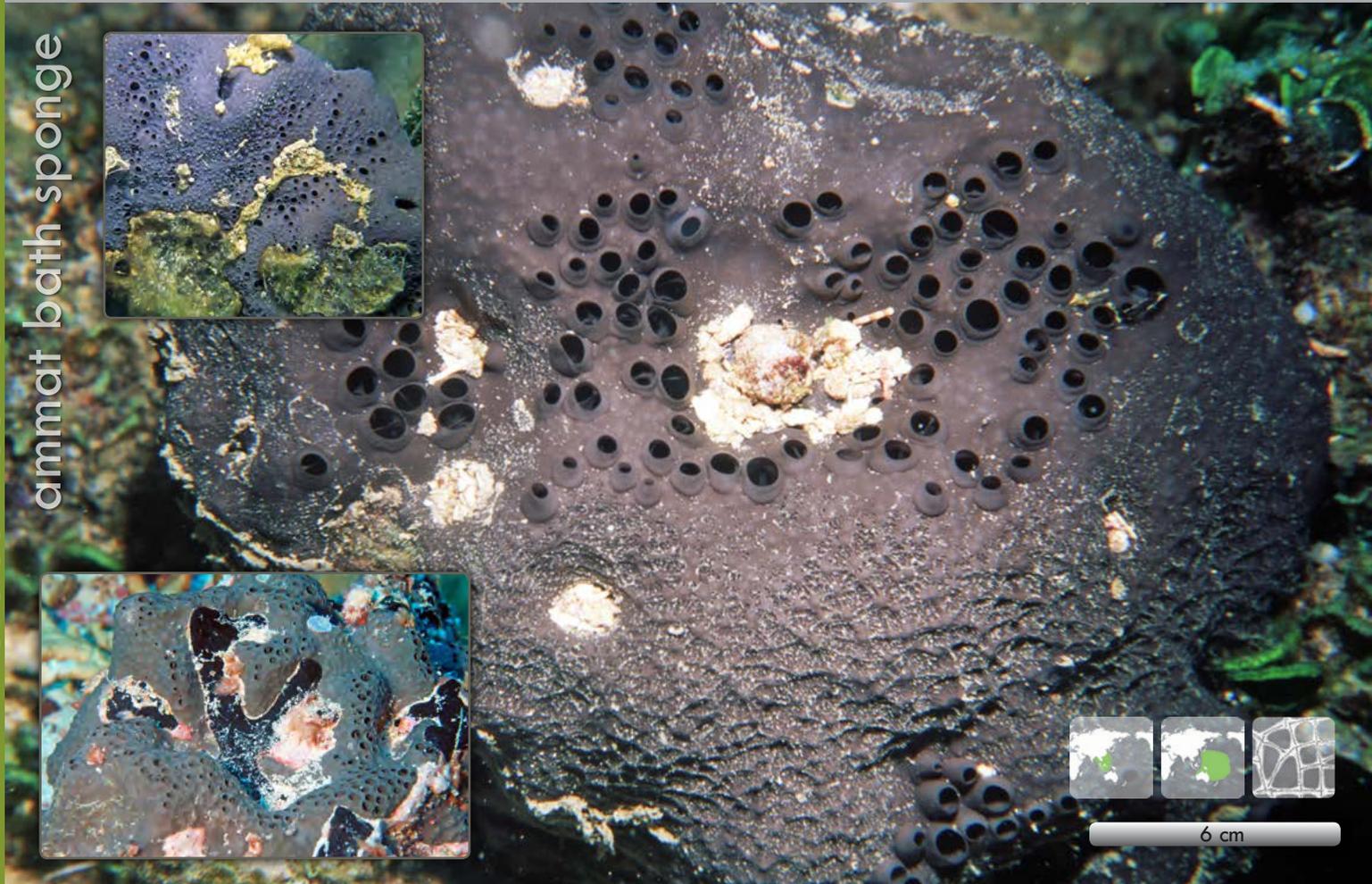
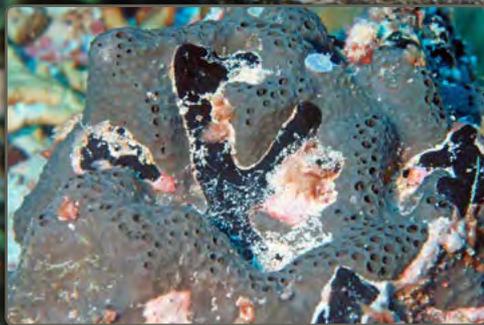


It could also be.....
Coscinoderma mathewsi (Lendenfeld, 1886)

De Laubenfels, M.W. (1954) The sponges of the West-Central Pacific. Oregon State Monographs Studies in Zoology, 7, 1–306.

Colin, P.L., Arneson, C. (1995) Tropical Pacific Invertebrates. Coral Reef Press, California, 296 pp.

ammata bath sponge



6 cm

morphology



surface



substrate



habitat



Massive hemispherical to lobate sponge with a depressed apex, occasionally vase-shaped, up to 30 cm diameter, 40 cm wide. Surface markedly conulose with blunt star-shaped ridges emanating from each conule creating a honeycomb pattern. Surface 'skin' extremely tough and rubbery, oscules grouped on the top and sides of sponge, 2–6 mm diameter. Texture extremely soft, spongy and compressible but impossible to tear, difficult to cut even with a sharp knife. Colour in life dark to light lavender grey, black, brown, cream or tan, cream interior.

The sponge is locally abundant in Palau, Pohnpei, Chuuk, and Yap, Guam, Philippines, Papua New Guinea, Solomon Islands, Vanuatu, New Caledonia and Fiji, and it can generally be found growing on limestone rock at the base of fringing and outer reefs, and in reef channels from about 7–30 m depth.

The taxonomic history of *C. mathewsi* is interesting. A dried specimen was first given to Dr R. von Lendenfeld by Mr G. T. Mathew of the Royal Navy, who had collected it in Pohnpei in the late 1800s. Lendenfeld named it after Mr Mathew, but as a species of *Spongia*, noting that the sponge was used as a bath sponge in the Caroline Islands. In 1954, Max de Laubenfels identified a relatively common sponge we think is the same species from Chuuk and Pohnpei, but named it *Hippospongia communis* subspecies *ammata*, *H. communis* being the name of the common West Indies commercial bathing sponge, and the word *ammata* meaning 'sponge', or 'to soak up' in the Chuukese language. Today, *C. mathewsi* is grown commercially by local farmers under the guidance of the Marine Environmental Research Institute of Pohnpei.

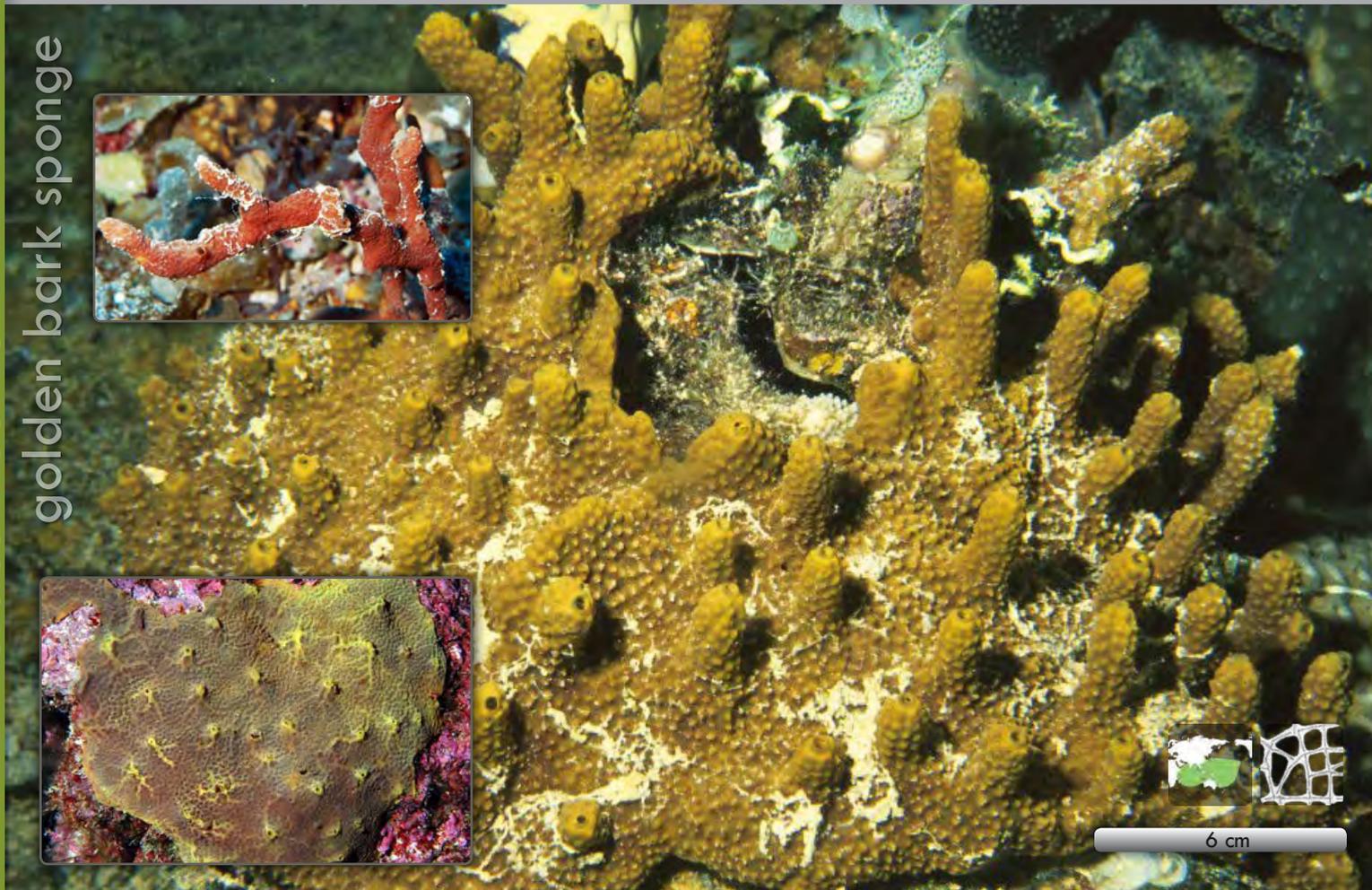
It could also be.....
Dactylospongia metachromia (de Laubenfels, 1954)



De Laubenfels, M.W. (1954) The sponges of the West-Central Pacific. Oregon State Monographs Studies in Zoology, 7, 1–306.

Lévi, C. (1998) Sponges of the New Caledonia Lagoon. Edition de l'Orstom. Collection Faune et flore Tropicales n. XXXIII. Paris, 1998, 214 pp.

golden bark sponge



6 cm

morphology



surface



substrate



habitat



Thick encrusting sponge, typically 5–10 mm but up to 4 cm thick, spreading in patches 10–30 cm diameter in surge zones, forming chimneys 10 mm diameter, up to 5 cm high. Forms thin repent to erect anastomosing ribbons/ropes, up to 3–5 mm thick, 5–15 mm diameter, just over 30 cm long, in quieter deeper environments. Surface with conules aligned in rows along ribbons and branches, between which the dermal membrane is stretched. Rows separated by prominent deep subsurface canals, conules blunt, squarish, rounded like pebbles, up to 5 mm long, 2 mm wide and 2 mm high. Canals converge on oscules up to 5 mm diameter scattered irregularly over the surface (refer lower inset image) Texture extremely fibrous, tough like gum or cartilage, flexible. Surface fibres confer a pebbly texture or sponge looks like rough bark. Colour in life dark rusty golden brown with olive or maroon tinges, gold interior. Pungent garlic smell. Darkens on exposure to air, turns ethanol preservative pink. Slight foamy, gold slippery mucus sometimes extruded when squeezed.

Specimens typically encrust limestone substrate in high wave action surge zones on the reef crest, or on walls and overhangs on outer reef slopes, and are often found on patch reefs and algal flats between 0–33 m depth but typically found from 1–15 m. The sponge is common throughout Palau, Chuuk, Guam, American Samoa, Vanuatu, Papua New Guinea, Philippines, Vietnam, and recorded from wharf pilings, Mahe Island, in the Seychelles and other locations. The species has a disjunct Indo-Pacific distribution.

It could also be.....
Chalinula milnei (de Laubenfels, 1954)
Neopetrosia exigua (Kirkpatrick, 1900)



Bergquist, P.R. (1965) The sponges of Micronesia, Part 1 The Palau Archipelago. Pacific Science, 19, 123–204.

Colin, P.L., Arneson, C. (1995) Tropical Pacific Invertebrates. Coral Reef Press, California, 296 pp.



6 cm

morphology



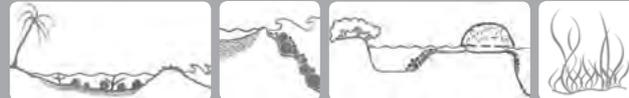
surface



substrate



habitat



Massive hemispherical to spherical sponge with depressed apex, 8–15 cm, sometimes 30 cm diameter, 8 cm thick, to thick encrusting, 1–2 cm thick, spreading to 20 cm diameter. Surface markedly conulose with large fuzzy fibrous tufts 3 mm high. Star-shaped ridges emanate from each conule creating a honeycomb pattern. Surface 'skin' rubbery, shiny, covering extensive subdermal cavities, oscules grouped in apical depression, 2–6 mm diameter. Texture stiffly spongy, barely compressible, very difficult to tear. Exterior colour in life buttercup yellow with greenish-olive to mustard tinges, interior bright yellow. Gradually turns dark purple on exposure to air. Some have surface epibionts. Strong garlic odour, often emits heavy mucus on cutting or tearing.

The sponge has a broad Indo-Pacific distribution, being found in Palau, Guam, Philippines, Indonesia, Fiji, Maldives, Mauritius, and Tanzania, where it grows in a variety of environments including shallow seagrass beds, caves, tunnels, channels, fringing reefs, and overhangs on barrier reef walls, from about 1–65 m depth.

In 1954, Max de Laubenfels identified this as a new species of *Hippospongia*, comparing it to the common West Indies commercial bathing sponges, *Hippospongia communis* and *H. lachne*, but noting that the fibres of the Palau species were too tough and stiff to have any commercial value. He noted two other characters that today define the genus *Dactylospongia* as exemplified by *D. elegans* in this guide: there are no primary fibres and the sponge gradually turns purple in air. The species name *metachromia* reflects this colour change; the common name kalakala is PNG Tokpisin for 'many colours'.



It could also be.....
Coscinoderma mathewsi (Lendenfeld, 1886)

De Laubenfels, M.W. (1954) The sponges of the West-Central Pacific. Oregon State Monographs Studies in Zoology, 7, 1–306.

Colin, P.L., Arneson, C. (1995) Tropical Pacific Invertebrates. Coral Reef Press, California, 296 pp.

Class Demospongiae Order Dictyoceratida Family Thoreciidae

mela sponge



6 cm

morphology

surface

substrate

habitat



Thick encrusting, lobate, club-shaped, fan- or plate-shaped, digitate, erect or repent branching from an encrusting base, single or anastomosing sponges, erect or sprawling ramose over substrate, single or fused columns that form buttresses. Encrusting forms about 4–10 cm thick, up to 50 cm tall but typically about 30 cm. Surface finely and regularly conulose, conules tiny, 1–2 mm high, 2–4 mm apart, surface is often speckled with silt where it catches on conules, oscules scattered over surface with a raised rubbery membrane, 2–4 mm diameter. Thin rubbery 'skin' drapes from conule forming a star-burst pattern between conules. Texture firm, barely compressible, brittle, snaps easily, very sandy interior. External colour jet black to dark chocolate brown to dark grey, internal colour mustard to rusty brown, to tan.

The sponge is locally extremely abundant and widely distributed throughout the Indo-Pacific, being amongst the most commonest of sponges. It is known from Palau, Pohnpei, Chuuk, Kosrae, Yap, Marshall Islands, Guam, Papua New Guinea, Solomon Islands, Vanuatu, American Samoa, Northern Australia and the Great Barrier Reef, Malaysia, Maldives, Tanzania, Indonesia and the Red Sea, where it is found in silty mangrove/seagrass habitats, silty lagoon patch reefs and fringing reefs, fore reef slopes, walls, overhangs, and reef channels, between 1–33 m depth, typically around 5–12 m. This species is abundant and has a broad Indo-Pacific distribution.

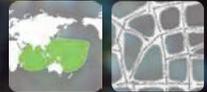
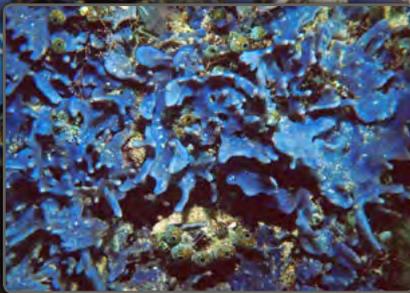
Max de Laubenfels was mistaken when he named Micronesian specimens of *H. erectus* as *H. mela* (de Laubenfels, 1954). The correct name is *H. erectus* but we still honour Max's choice by using 'mela' in the common name, which is derived from the Greek word for 'black'.



De Laubenfels, M.W. (1954) The sponges of the West-Central Pacific. Oregon State Monographs Studies in Zoology, 7, 1–306.

Colin, P.L., Arneson, C. (1995) Tropical Pacific Invertebrates. Coral Reef Press, California, 296 pp.

iridescent leaf sponge



7 cm



Encrusting, rubbery, loosely attached sheet sponge, up to 15 cm wide, giving rise to ear-shaped 'leaves' and stacked inclined fans with smooth or undulating fingery margins, up to 5 cm wide, 6 cm high, walls 2–3 mm thick, may be lettuce-shaped overall. Leaves often bear secondary lamellae on the outer surface and often intersect to form pouches, especially in shallow intertidal specimens. Surface smooth or slightly wrinkled with low nubbins and mounds, the free margins of which are rounded, undulating, indented, fingery, tendrilled, smooth or ridged. Tiny 0.2 mm high conules are evident in preserved material particularly, less visible in inflated living specimens. Distinct deep oscules scattered over surface, about 1 mm diameter, flush with surface. Subdermal channels are sometimes visible through the dermal membrane. Texture fleshy, soft, slippery, slimy, shiny, compressible, elastic, easily torn. Colour iridescent bright clear aquamarine blue, lavender, purple, lime green or greyish green to purplish grey-brown. May have a garlic odour.

In Palau this species is found in mangrove or rock island channels between 0–3 m depth, in some open marine lakes and on clear reef slopes down to about 28 m. It is found in similar habitats in Yap, Guam, Papua New Guinea, Australia and Malaysia. It has also been recorded from the Western Indian Ocean including Maldives and Mauritius. In Zanzibar it is common in seagrass beds and sandy lagoons. The species has a broad Indo-Pacific distribution.

It could also be.....
Lamellodysidea herbacea (Keller, 1889)

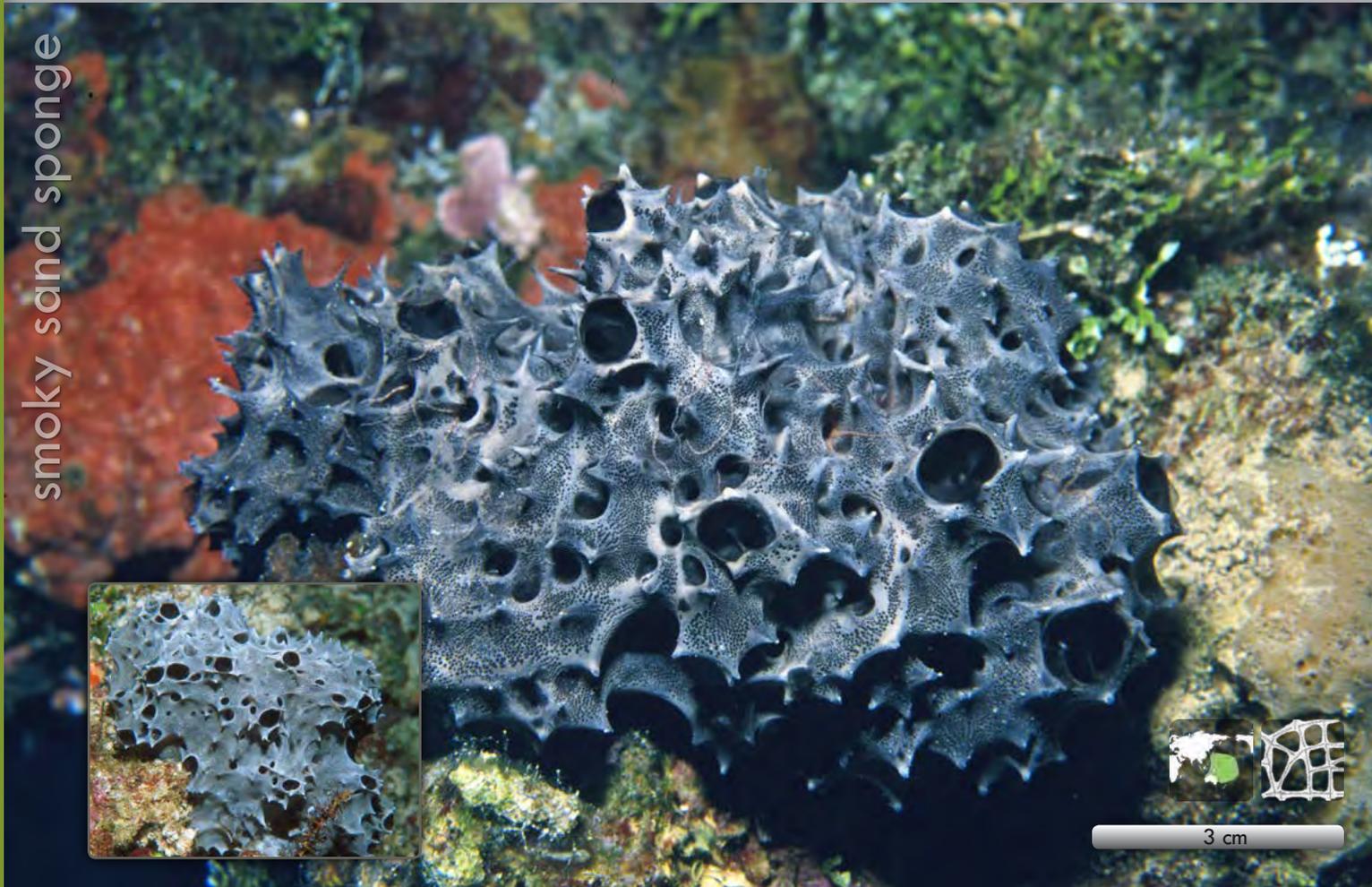


Bergquist, P.R. (1965) The sponges of Micronesia, Part 1 The Palau Archipelago. Pacific Science, 19, 123–204.

Kelly, M. (2011) Phylum Porifera Sponges. Pp. 116–127 in Richmond, M.D. (Ed.) A field guide to the seashores of Eastern Africa and the Western Indian Ocean Islands. Sida/WIOMSA, 464 pp.

Class Demospongiae Order Dendroceratida Family Darwinellidae

smoky sand sponge



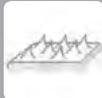
3 cm

morphology

surface

substrate

habitat



Spherical or elongate, lobate to thickly encrusting sponge typically about 10 cm high, 10–15 cm diameter, attached lightly to substrate by short thick fibres. Interior extremely cavernous. Surface coarsely conulose, conules large, prominent, sharp but soft, 7 mm high, well separated, between which the sponge tissue and delicate surface skin drapes like a tent. Numerous holes deeply enter the interior. Oscules are large, prominent, surrounded by a black rubbery membrane, about 5–10 mm diameter. Surface is encrusted with a lacy network of sand-grains and spicule fragments that surround groups of inhalant pores. Texture soft, delicate, compressible, slippery, springy, hollow, collapses and flattens out of water, skeleton composed of large golden twiggy fibres visible when torn. Colour smoky black with golden fibres internally. Always with a dull smoky cast from sand-grains embedded in the surface.

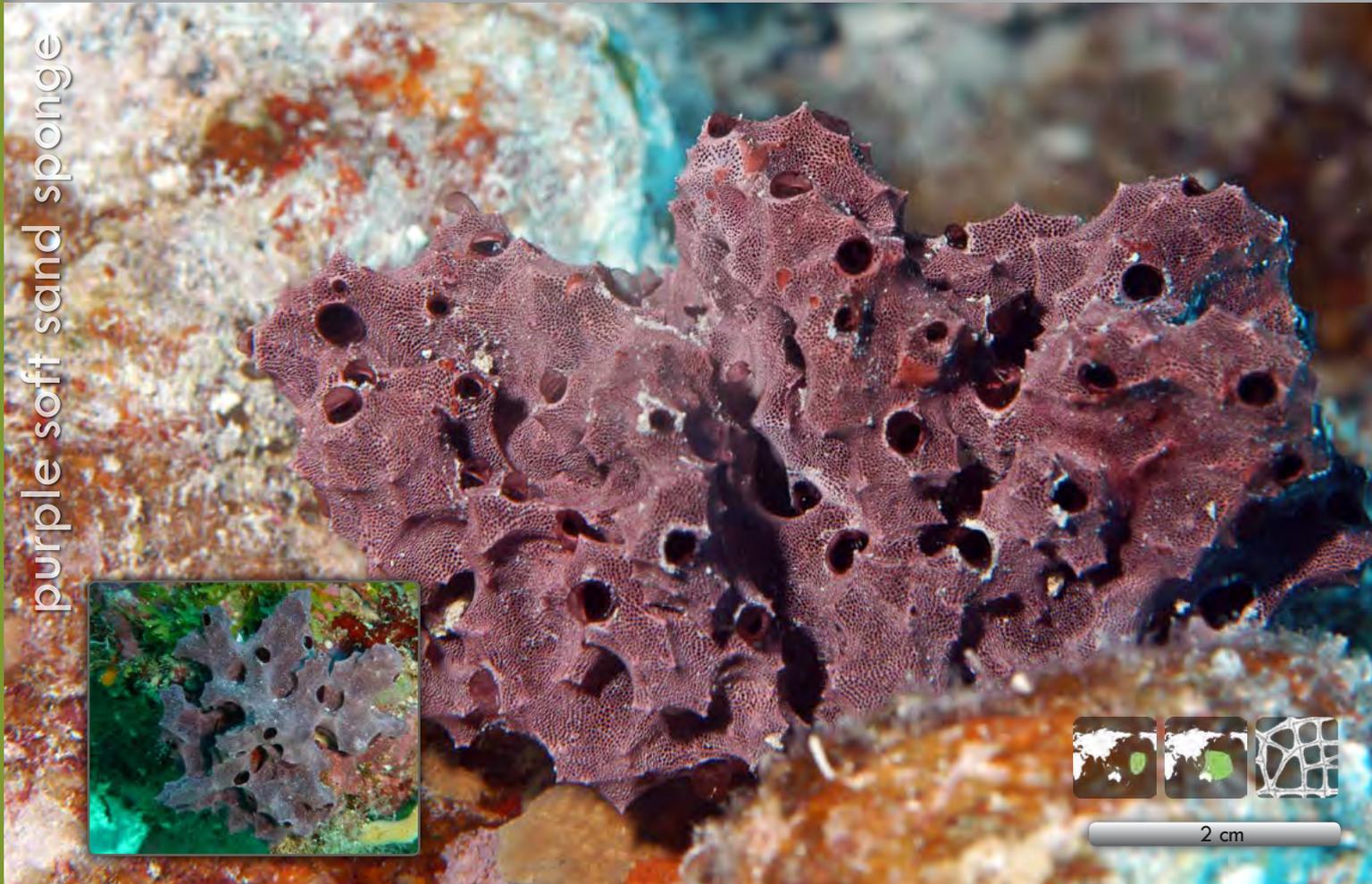
This species is known only from Palau, Guam, Chuuk and northern Papua New Guinea where it is found on lagoon reefs and outer reefs in overhangs from 10–30 m deep. It has a restricted West Pacific distribution.



Pulitzer-Finali, G., Pronzato, R. (1999) Horny sponges from the north-eastern coast of Papua New Guinea, Bismark Sea. Journal of the Marine Biological Association of the United Kingdom 79(4), 593–607.

Colin, P.L., Arneson, C. (1995) Tropical Pacific Invertebrates. Coral Reef Press, California, 296 pp.

purple soft sand sponge



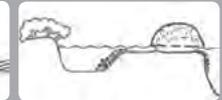
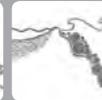
2 cm

morphology

surface

substrate

habitat



Thickly encrusting, lobate, slightly branching sponge, typically 0.5–10 cm thick, 3–15 cm diameter, attached lightly to substrate by short thick fibres. Interior extremely cavernous, inflated underwater. Surface coarsely conulose, conules 4 mm high, well-separated, made of deep violet fibre between which the sponge tissue and delicate surface skin drapes like a tent. Oscules large, prominent, surrounded by a light sandy membrane, about 5 mm diameter. Surface encrusted with a delicate regular lacy network of sand-grains and spicule fragments that surround the inhalant pores. Texture soft, flexible, collapses out of water but fibres remains springy, tissue soft, thick, mushy. Colour deep violet to lighter maroon with deep violet fibres internally, purple exudate. Always with a dull whitish cast from sand-grains embedded in the surface.

This species is found in marine lakes of Palau and West Papua in small patches where it grows on mangrove roots, wood, mussels and limestone rock, and in mangrove channels in the latter. It is also known from forereef slopes in Palau, Guam and American Samoa between 5–30 m depth, and from Honolulu, Hawai'i. The species is reported from Fiji and northern Papua New Guinea, Solomons, Australia and New Zealand, and has a West and central Pacific distribution.

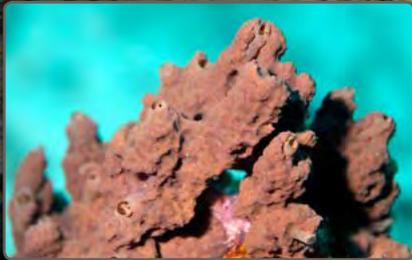
There are numerous references to encrusting and lobate dark purple species of *Chelonaplysilla* around the world, but Bergquist (1996) concluded that the most likely species name for the Pacific specimens that she encountered is *violacea*. Tropical specimens differ from temperate specimens by the more frequent production of lobes and branches.



Bergquist, P.R. (1996) The marine fauna of New Zealand: Porifera: Demospongiae Part 5. Dendroceratida and Halisarcida. New Zealand Oceanographic Memoir 107, 1–53.

Colin, P.L., Arneson, C. (1995) Tropical Pacific Invertebrates. Coral Reef Press, California, 296 pp.

grape sponge



5 cm

morphology

surface

substrate

habitat



Inflated encrusting sponge with nodular lobes 0.5–6 cm thick, 8 cm wide, nodules formed by branching dendritic fibres that bind abundant calcareous debris internally. May form layered plate-shaped projections and repent nodular branches. Surface lobate with distinctly truncate, nodular or 'pebbly', whitish sand-filled truncate conules, 2 mm high, 3–4 mm apart. In life oscules are large, raised, billowy, inflated, membraneous, about 5 mm wide and high. Rubbery 'skin' drapes between nodules. Texture delicate, soft, cheese-like, dense, easily sliced, slightly crunchy when squeezed from calcareous material in fibres. Colour in life highly distinctive being regularly dull maroon purple to blueish externally with white speckles, but dull green to yellow green internally, rather like a ripening grape. The inflated membraneous oscules are the same as the internal colour, a beautiful satiny pale grey-green with a pinkish sheen. Turns oak brown on exposure to air and preservative.

The sponge is common throughout Palau, Guam, Chuuk, Pohnpei and the Marshall Islands growing in lagoons, on fringing reefs and the outer barrier reef, between 2–33 m depth. It has also been recorded from East Malaysia, Papua New Guinea, Solomon Islands, Tonga and the central southern Great Barrier Reef. This species has a wide West Pacific and limited southeast Asia distribution.

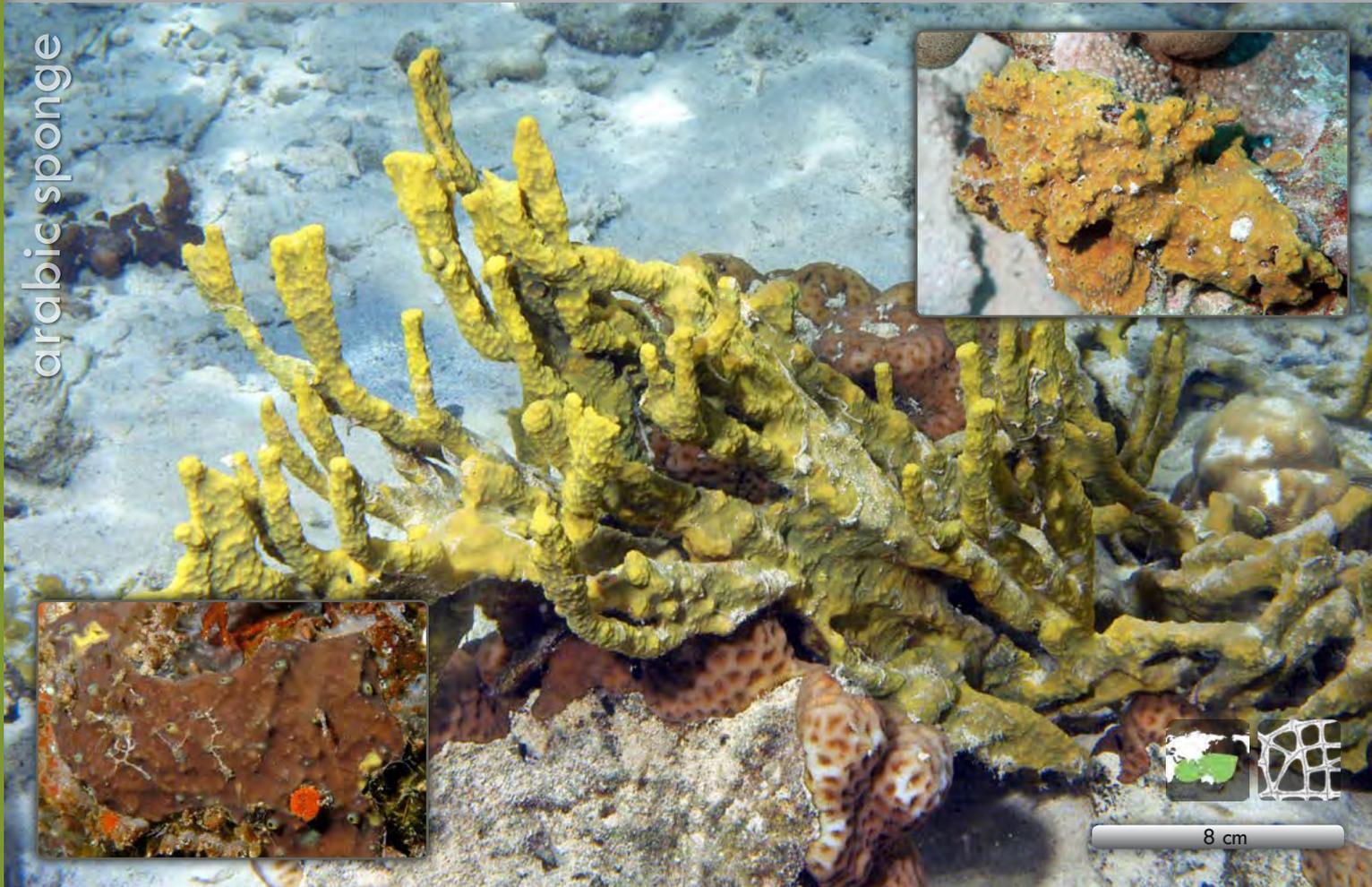
The beautiful colouration of this sponge caught the eye of Max de Laubenfels who named it *rhax* after the Greek word for 'grape', varieties of which have purple skins and light green flesh.



Colin, P.L., Arneson, C. (1995) Tropical Pacific Invertebrates. Coral Reef Press, California, 296 pp.

De Laubenfels, M.W. (1954) The sponges of the West-Central Pacific. Oregon State Monographs Studies in Zoology, 7, 1–306.

arabic sponge



8 cm

morphology



surface



substrate



habitat



Thick encrusting, lobate, labyrinthine, to sprawling ramose sponge, typically 1–8 cm thick, 25 cm across, giving rise to long thin repeat ropey sculpted branches, frequently anastomosing, 5–20 mm diameter, 10–15 cm long, up to 35 cm. Surface covered in regularly closely spaced blunt, rounded conules. Conules pale due to sand incorporated into fibres. Slick shiny dermal ‘skin’ stretches in a tent-like structure between blunt conules. Oscules uncommon, 2–3 mm diameter, scattered irregularly over surface, raised, membranous. Texture dense, cheesy, rubbery, flexible, shiny, usually difficult to tear, barely compressible. External colour in life ochre brown to greyish green in deeper environments, internally bright yellow. Reddish-brown externally in some shallow marine lakes. Turns royal blue on exposure to air with a milky yellow exudate when squeezed.

This species is found in Palau and West Papua open marine lakes, and on fringing reefs, silty lagoons and reef environments from 1.5–30 m depth in Palau, Yap, Kosrae and Pohnpei. It is also common on fringing and open reefs down to about 40 m in Fiji, Tonga, Rarotonga, Solomon Islands, American Samoa and Vanuatu. The species was first described from the Red Sea and is now known to have a very wide Indo-West Pacific distribution. It is relatively common in Tanzania and the Seychelles where it is found in shallow sandy lagoons and seagrass beds.

The sister species, *Pseudoceratina purpurea* (Carter, 1880), is bright lemon yellow with pea green tinges; it has pith fibres that lack the calcareous debris that core the pith fibers of *P. arabica*.

It could also be.....
Dactylospongia elegans (Thiele, 1899)



icons

body plan		calcareous sponge	sponge with spicules made of calcium carbonate (CaCO ₃) in the form of calcite, often three-rayed, Class Calcarea
		glass sponge	sponge with silicon dioxide (SiO ₂) spicules occurring as long fine hairs, free or woven into a fused scaffold, free spicules often six-rayed, Class Hexactinellida
		common sponge	sponge with silicon dioxide (SiO ₂) spicules, and/or sand, and/or fibrillar collagen, and/or fibrous (spongin) collagen, Class Demospongiae

life history		Indo-Pacific		Indian Ocean		Southeast Asia
		Western Pacific		Central Pacific		Palau endemic

morphology		amorphous	without definable shape, often with lobed surface, potato or tuber-shaped, massive		cup/vase	bowl-shaped with a restricted or broad base
		ball	spherical, globular		fan	thin, flattened in one plane with or without stem, flabellate, foliaceous
		boring	bores basally into calcareous substrate		fingers	finger-like, often arising from an encrusting or restricted base, digitate
		bowl	shallow cavity with a restricted base, turbinate		hand	thick fan flattened in one plane with indented margins, palmate
		bulb	single or conjoined, with a central exhalent cavity (atrium) into which oscules empty, bulbous		loaf	rounded elongate, hemispherical
		club	solid erect cylinder, column-shaped, taller than wide, wider at top, clavate		meandering	wandering along and above substratum attached at intervals, repent

icons

morphology		plate	thick fan flattened in one plane, margin often folded, ear-shaped		thin encrusting	spreading over substratum, less than about 5 mm thick
		shrubby	bushy with irregular branches and short stem, arborescent		tree	tree-like with a stem giving rise to branches that divide, often with a condensed axis, arborescent
		strappy	tree-like, giving rise to flattened pliable branches much wider than they are thin, usually without a condensed axis		tube	hollow erect cylinder
		tangled branches	long ramose branches forming tangles		tube cluster	cluster of hollow erect cylinders with a common base
		thick encrusting	spreading over substratum, more than about 20 mm thick			

surface		bumpy	bearing small, rounded bumps		hard	hard to the touch, not compressible, rigid
		cavernous	filled with cavities or hollow spaces, porous		lobed	bearing large rounded projections, lobate
		corrugated	bearing irregularly parallel ribs and grooves		porocalyces	spherical inhalent pits in surface
		granular	surface feels like fine sandpaper		rough	irregularly pitted and ridged surface, often tough
		hairy	coarse stubble or prickly bristles formed by long projecting spicules (typically 5–20 mm long), hirsute		shaggy	bearing ragged conulose brushes of underlying spicules or fibres

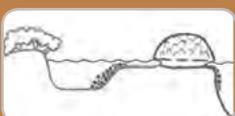
icons

surface		sieve-pores	bearing button- or mushroom-shaped clusters of inhalant pores in a sieve-like structure, areolate porefields
		smooth	even, hairless, silky, can be slightly undulating
		soft	soft to the touch, easily compressible, elastic

	spiky	surface bearing peaks raised by underlying fibre or spicule skeleton
	warty	bearing small flattened bumps or tubercles

substrate		coral limestone	hard substrate comprised of limestone from dead coral
		coral rubble	dead broken coral

	mangrove roots	wood substrate
---	----------------	----------------

habitat		indents	underwater caves, shelves and overhangs, organisms may experience wave surge, subdued illumination, or near darkness
		lagoon reef	reefs within a shallow to deep body of water behind the outer barrier reef
		marine lake	isolated body of seawater separated from the ocean by a surrounding land barrier retaining its connection to the sea by tunnels and fissures
		mangrove forest	salt tolerant terrestrial plants growing intertidally on muddy to sandy shores

	outer barrier reef	outer barrier coral reef separating land or lagoon from the open ocean
	rock island reef	rock islands in lagoon forming a series of deep basins and waterways
	seagrass beds	meadows of marine plants growing on a sandy substrate

glossary

agglutinate	incorporates sand grains into the sponge body sticking them together as a mass
algal beds	areas of sea floor with coralline algae, sea-grass or multiple seaweed species
amorphous	without definable shape, often with lobed surface, potato or tuber-shaped, massive
anastomose	a cross connection between two tubes or branches
apex	top of a structure (tube, mound), apical
apical	see 'apex'
arborescent	see 'shrubby', and 'tree-shaped'
areolate porefield	see 'sieve-pores'
artificial substratum	anything man-made such as mooring blocks, mussel lines, wharf piles
atrium	chamber or cavity in the middle of the sponge into which oscules open, communicating with the exterior via an apical opening
ball	spherical, globular
bark and pith fibre	fibre with compact laminated bark-like spongin surrounding a softer granular collagen pith in verongid sponges
benthic	pertaining to living on or in the seabed as opposed to floating or swimming in the ocean above
benthos	organisms that live on or in the seabed at the bottom of the sea
blunt	not sharp, rounded
bowl	shallow bowl with a restricted base, turbinate
brain-shaped	hemispherical with brain-like corrugations
brittle	fragile but rigid, breaks apart easily
bulb	single or conjoined, with a central exhalent cavity (atrium) into which oscules empty, bulbous
bumpy	bearing small rounded bumps
calcareous sponge	sponge with spicules made of calcium carbonate (CaCO ₃) in the form of calcite, often three-rayed, Class Calcarea
caliculate	see 'cup'
calyx	see 'cup'
candelabra	a large branched 'candlestick' with 'holders' arising from lateral branches
cartilaginous	having the texture of cartilage, firm and tough yet flexible
cement	cementing together sedimentary substrate (sand and shell) to provide support, agglutinating
choanocyte	sponge cell type used for feeding and propulsion of water current through sponge body
choanoderm	part of the interior of a sponge that contains choanocyte cells
clavate	see 'club-shaped'
club-shaped	solid erect cylinder, column-shaped, taller than wide, wider at top, clavate
commensal	an association between two organisms in which one benefits and the other derives neither benefit nor harm
common sponge	sponge with silicon dioxide (SiO ₂) spicules, and/or sand, and/or fibrillar collagen, and/or fibrous (spongin) collagen, Class Demospongiae
compressible	easily squeezed
concave	having a surface that curves inwards like the interior of a circle or sphere
concentric	circles arranged with one inside the other
conules	sharply pointed structures rising from the surface, conulose
conulose	surface bearing peaks raised by underlying fibre or spicule skeleton
corky	tough, feels almost waxy to the touch
corrugated	bearing irregularly parallel ribs and grooves
cryptic	difficult to see (habitat) or difficult to detect differentiate from other species
cup	bowl-shaped with a restricted or broad base, calyx, caliculate
dendritic	branching, tree-like
diameter	the distance across the widest point of a circle
dichotomous	of branching, where the axis is divided into two branches
digitate	finger-like
doughy	soft, easily depressed but does not return to shape, remains compressed
egg-shaped	body centrally thickened, usually with root-like tufts or rhizomes buried in sediment, ovate
elastic	returns to shape after compression or deformation, springy, flexible, resilient
endemic	naturally occurring in Palau, but not elsewhere
environment	physical, chemical, ecological, behavioural, and other conditions experienced by an organism
epiphytic	living or growing on the external surface of a seaweed
epizoic	living or growing on the external surface of an animal
exhalent	excurrent stream or water current from inside of sponge to outside through the oscules
fan	thin fan flattened in one plane with or without stem, flabellate, foliaceous
fibrous	flexible strands of spongin protein forming the supporting skeletal network that may be cored with silica spicules or sand

fingers	finger-like, often arising from an encrusting or restricted base, digitate
firm	requires some pressure to compress
fistulose	see 'turrets'
flabellate	see 'fan'
flagella	a slender threadlike or whip-like appendage on many protozoa, bacteria, spermatozoa, that enables them to swim. In the case of sponge choanocytes the flagella enables the cell to propel a water current
flagelliform	like a flagella; see 'whip' and 'flagella'
fleshy	feels like skin or edam cheese, dense
foliaceous	see 'fan'
fragile	easily torn, squashed, broken
friable	easily crumbled
fuzzy	fine pile formed from short projecting spicules (usually about 1–2 mm long), velvety, downy, hispid
gelatinous	jelly-like, slippery
glass sponge	sponge with silicon dioxide (SiO ₂) spicules occurring as long fine hairs, free or woven into a fused scaffold, free spicules often six-rayed, Class Hexactinellida
globular	ball-shaped, rounded
granular	surface has a sand-papery texture due to calcareous or siliceous minerals in the surface of the sponge
habit	the way an organism grows on the substrate
habitat	the environment and local situation in which an organism lives
hairy	coarse stubble or prickly bristles formed by long projecting spicules (typically 5–20 mm long)
hand	thick fan flattened in one plane with indented margins, palmate
hard	solid to the touch, not compressible, rigid
hirsute	see 'hairy'
hispid	see 'hairy'
honeycomb	surface with ridges in a honeycomb pattern
inhalant	incurrent stream or water current from external ostia to inside of sponge
intertidal	exposed shoreline zone between high and low tides, including rock flats, pools, overhangs, crevices, organisms exposed to wave action, temperature extremes, full illumination, and desiccation
jiggly	wobbles almost like jelly when touched, resilient, gelatinous
lacy	tiny sand grains or spider-web like fibres form a network in or just below the skin (ectosome) of the sponge giving the surface a lace-like appearance
lagoon reef	reefs within a shallow to deep body of water behind the barrier reef and reef crest
lamellate	see 'plate'
laminated fibre	fibre with conspicuous laminated (stratified) concentric layers in cross-section, without a central pith
leathery	texture like thick, hard skin, tough, flexible, slightly elastic
limp	feels soft and yields to pressure, remains compressed when squeezed, flaccid
loaf	rounded elongate, hemispherical
lobe	raised surface mound
lobed	bearing large rounded projections, lobate
mangroves	salt tolerant terrestrial plants growing intertidally on muddy to sandy shores
margins	edge of a surface
marine lake	isolated body of seawater separated from the ocean by a surrounding land barrier retaining its connection to the sea by tunnels and fissures
meandering	wandering along and above substratum attached at intervals, repent, ramify
megasclere	large spicules that form the structural framework of the sponge
membranous	thin, translucent, flimsy, like a membrane
microsclere	small spicules of intricate shape and ornamentation that line the sponge surface of aquiferous canals
morphology	form and structure, shape
mottled	variable, blotchy, patterning of several colours
mud	very fine and silty sediments derived from terrigenous carbonate or limestone rock
native	naturally occurring around Palau, endemic
net	internal fibre skeleton forms a cavernous 2 or 3 dimensional network, reticulate
opaque	impenetrable by light
ornamented	an otherwise plain structure that is altered or adorned by embellishment, decorative
oscles	large pores in the sponge wall where the inhaled water current exits
ostia	tiny pores in the sponge wall where the water is inhaled
outer	barrier reef coral reef separating land or lagoon from open ocean
ovate	see 'egg-shaped'
palmate	shaped like an open hand
pedunculate	see 'lollipop'
plate	thick fan flattened in one plane (plate-like), margin often folded (foliose), may be ear-shaped, lamellate
plumose	having many fine filaments or branches which give a feathery appearance
porocalyce	specialised inhalant structure unique to Family Tetillidae
punctured	surface perforated with tiny holes, punctate

radiate	silica spicules radiate towards the surface from deep within the choanosome, perpendicular to the surface
ramify	forming branches or offshoots along or above substrate, meandering
ramose	having branches, branched
refuge	safe place to hide from predators
repent	see 'meandering'
reticulate	fibre three-dimensional network of fibres
rock	hard substrate such as mudstone, sandstone, basalt, compressed carbonates
rock island reef	rock islands in lagoon with fringing reefs forming a series of deep basins and waterways
rough	irregularly pitted and ridged surface, often tough
rubbery	feels dense, springy, elastic, and resilient to the touch, collagenous
rubble	shell, stone, and pebble rubble
rugose	see 'rough', and 'bumpy'
sand	small coarse grains of worn limestone, rock, and shell
sandpapery	feels scratchy or slightly abrasive like sandpaper to the touch, granular
seagrass bed	meadows of marine plants growing on a sandy substrate
shaggy	bearing ragged conulose brushes of underlying spicules or fibres
shrubby	bushy with irregular branches and short stem, arborescent
sieve-pores	bearing button- or mushroom-shaped clusters of inhalant pores in a sieve-like structure, areolate porefields
siliceous	made of silica
sinuous	wavy pattern
slippery	feels slimy and slippery from smooth clear, often stringy mucus exudate
smooth	even, hairless, silky, can be slightly undulating
soft	easily compressible
spicule	component of the mineral skeleton, typically composed of silica or calcium carbonate
spiky	bearing regular, sharp, stiff or soft peaks, raised by underlying fibre or spicule skeleton, conulose
spined	surface covered with prickly bundles of very long spicules projecting from surface of the sponge
spiny	prickly or spiky bundles of very long projecting spicules (up to 10 cm)
spiral	radiate silica spicules diverge strictly radially, and sometimes spiral radially from the centre of the sponge towards the surface
spongin	a form of collagen, fibrillar or fibrous, unique to sponges
spongy	cavernous and springy
sticky	feels tacky from thick gooeey, often opaque, exudate
stipe	a stalk or stem, especially the stem of a seaweed or sponge
stipitate	see 'lollipop'
stolon	tissue that extends from body, for attachment, or to produce a terminal bud
stony	incompressible like a stone, rigid
strappy	tree-like, giving rise to flattened pliable branches much wider than they are thin, usually without a condensed axis
stratified marine lake	isolated marine lake that is poorly connected to the lagoon with a layered water column, with bottom layers lacking oxygen.
substrate	an underlying substance such as rock, sand, mud, or another organism that the organism lives on
subtidal	zone below the low tide, including rock flats, slopes, walls, crevices, overhangs, boulder fields, organisms exposed to wave surge and currents, and subdued illumination
surface	patterning or ornamentation on the surface of the sponge, often related to skeleton beneath
symbiotic	found in close physical association with other organisms such as sponges, molluscs, crabs, typically to the advantage of both
tasselled	buds on the end of filaments in the genus <i>Tethya</i>
thick encrusting	spreading over substratum, more than about 20 mm thick
thin encrusting	spreading over substratum, less than about 5 mm thick
tidepool	indentation in rock, filled with water, intertidal zone
tough	requires considerable pressure to compress sponge, difficult to tear, tough as old boots
tracts	groups of silica spicules emerge from the base of the sponge, diverging at the surface to form brushes
tree-shaped	tree-like with a stem giving rise to branches that divide, often with a condensed axis, arborescent
tube cluster	cluster of hollow erect cylinders with a common base
tube hollow	erect cylinder
tubercles	see 'wart'
turbinate	see 'bowl'
turrets	bearing hollow cones, turrets or fistules, which can be blind (inhalant) or open (exhalant)
twiggy	main skeleton tendril-like with short twiggy branches that do not re-join, dendritic
wall	underwater cliffs and slopes, organisms exposed to wave surge and currents, and subdued illumination
warty	bearing small flattened bumps or tubercles
whip	erect and tapering, usually with a condensed axis, flagelliform
widespread	species recorded globally

acknowledgements

Specimens and data collected under the US National Cancer Institute's (NCI) marine collections contract to the Coral Reef Research Foundation (CRRF) are the basis for the production of this guide. Multiple NCI contracts allowed the collection and taxonomic identifications over a broad geographic area between 1992 and 2014. Dr. David Newman served as the NCI 'Project Officer' for 22 years and his unlimited support, interest and vision in areas outside of chemistry is gratefully acknowledged.

We would also like to thank the David and Lucille Packard Foundation for supporting our work in the Palau marine lakes since 2006, resulting in a huge and important contribution to Palau's marine biodiversity knowledge. Additional funding for other programs that indirectly contributed to our knowledge of sponges in Palau was provided by the US National Science Foundation and the Con-Amor Foundation. The preparation of this guide was primarily funded by NIWA under the Pacific Rim programme providing scientific advice and building local capacity in the Asia-Pacific region to support environmental, infrastructure and economic decision-making and development (2014/1015 SCI). Support to MK was also provided by NIWA under Coasts and Oceans Research Programme 2 Marine Biological Resources: Discovery and definition of the marine biota of New Zealand (2014/2015 SCI).

Sponges are never easy to identify and a book such as this would not be possible without the contributions of many. The present and previous staff of CRRF have all made essential contributions to the CRRF collection upon which this volume is based and include (in alphabetical order): Emilio Basilius, Patrick L. Colin, Michael N Dawson, Laura E. Martin, Mathew Mesubed, Sharon Patris, Larry Sharron and Gerda Ucharm. Other collaborators or facilitators who contributed to the NCI work allowing so many range extensions of these species include Bill Allison, Belinda Alvarez, Don DeMaria, Marion Henry, John N.A. Hooper, Prasat Kittakoop, Marivene Manuel, Nicolas Pilcher, and Katy Soapi. The majority of photographs in this guide are by Patrick L. Colin, Director of CRRF; additionally, most photographs from the marine lakes are by Laura E. Martin. The Palau National Government and Bureau of Marine Resources, along with the Koror State Government and other state governments, have been supportive of our collection activities over the years and are gratefully acknowledged. We thank Palau Automated Land and Information System (PALARIS) for use of the Palau map which has been modified for our purposes. We hope this book will open up a new world to Palauans to learn about the 'other' animals in their ocean- the ones that no one eats.

image credits

species	main image	inset image 1	inset image 2
<i>Acanthella cavernosa</i>	Patrick L. Colin, Pulo Anna, Palau	Patrick L. Colin, Helen Reef, Palau	
<i>Acanthochaetetes wellsi</i>	Patrick L. Colin, Palau	Patrick L. Colin, Palau	Patrick L. Colin, Chuuk
<i>Aplysinella rhax</i>	Patrick L. Colin, Chuuk	Patrick L. Colin, Helen Reef, Palau	Patrick L. Colin, Helen Reef, Palau
<i>Callyspongia (Cladochalina) aerizusa</i>	Patrick L. Colin, Palau	Patrick L. Colin, Palau	Patrick L. Colin, Palau
<i>Chalinula milnei</i>	Patrick L. Colin, Palau	Lori J. Bell, Palau	Patrick L. Colin, Palau
<i>Chalinula nematifera</i>	Patrick L. Colin, Palau	Patrick L. Colin, Palau	Patrick L. Colin, Palau
<i>Chalinula velinea</i>	Sharon Patris, Helen Reef, Palau	Patrick L. Colin, Palau	Patrick L. Colin, Helen Reef, Palau
<i>Chelonaplysilla delicata</i>	Patrick L. Colin, Chuuk	Patrick L. Colin, Papua New Guinea	
<i>Chelonaplysilla violacea</i>	Patrick L. Colin, Helen Reef, Palau	Lori J. Bell, Palau	
<i>Cinachyrella australiensis</i>	Patrick L. Colin, Sonsorol, Palau	Patrick L. Colin, Palau	Michael N Dawson, Ngchas Lake, Palau
<i>Clathria (Thalysias) cervicornis</i>	Patrick L. Colin, Palau	Patrick L. Colin, Palau	
<i>Clathria (Thalysias) reinwardti</i>	Patrick L. Colin, Papua New Guinea	Patrick L. Colin, Palau	
<i>Coscinoderma mathewsi</i>	Patrick L. Colin, Fiji	Larry Sharron, Yap	Patrick L. Colin, Palau
<i>Dactylospongia elegans</i>	Patrick L. Colin, Chuuk	Patrick L. Colin, Palau	Patrick L. Colin, Solomon Islands

species	main image	inset image 1	inset image 2
<i>Dactylospongia metachromia</i>	Patrick L. Colin, Palau	Patrick L. Colin, Palau	Patrick L. Colin, Palau
<i>Dasychalina melior</i>	Patrick L. Colin, Palau	Patrick L. Colin, Palau	
<i>Dysidea avara</i>	Lori J. Bell, Palau	Patrick L. Colin, Helen Reef, Palau	
<i>Dysidea frondosa</i>	Patrick L. Colin, Palau	Patrick L. Colin, Palau	Patrick L. Colin, Palau
<i>Dysidea granulosa</i>	Patrick L. Colin, Palau	Larry Sharron, Yap	
<i>Echinodictyum antrodes</i>	Laura E. Martin, Mekeald Lake, Palau	Laura E. Martin, Ngeruktabel Lake, Palau	
<i>Gelliodes fibulata</i>	Patrick L. Colin, Helen Reef, Palau	Patrick L. Colin, Palau	
<i>Haliclona (Reniera) fascigera</i>	Patrick L. Colin, Palau	Patrick L. Colin, Palau	
<i>Haliclona (Reniera) osiris</i>	Patrick L. Colin, Solomon Islands	Patrick L. Colin, Pulo Anna, Palau	
<i>Haliclona acoroides</i>	Patrick L. Colin, Papua New Guinea	Lori J. Bell, Jellyfish Lake, Palau	Laura E. Martin, Mekeald Lake, Palau
<i>Haliclona</i> sp 13 (pink tangle lake sponge)	Lori J. Bell, Jellyfish Lake, Palau	Lori J. Bell, Jellyfish Lake, Palau	Lori J. Bell, Jellyfish Lake, Palau
<i>Haliclona</i> sp 16 (pink tube lake sponge)	Lori J. Bell, Jellyfish Lake, Palau	Laura E. Martin, Ngermeuangel Lake, Palau	Laura E. Martin, Ngermeuangel Lake, Palau
<i>Hyrrios erectus</i>	Patrick L. Colin, Helen Reef, Palau	Lori J. Bell, Palau	Larry Sharron, Yap
<i>Jaspis splendens</i>	Patrick L. Colin, Palau	Patrick L. Colin, Helen Reef, Palau	Patrick L. Colin, Palau
<i>Lamellodysidea herbacea</i>	Patrick L. Colin, Palau	Patrick L. Colin, Palau	Patrick L. Colin, Palau
<i>Lendenfeldia dendyi</i>	Patrick L. Colin, Merir, Palau	Patrick L. Colin, Maldives	Larry Sharron, Long Lake, Palau
<i>Leucetta avocado</i>	Patrick L. Colin, Chuuk	Patrick L. Colin, Palau	Patrick L. Colin, Helen Reef, Palau
<i>Leucetta microraphis</i>	Patrick L. Colin, Papua New Guinea	Patrick L. Colin, Palau	Patrick L. Colin, Solomon Islands
<i>Myrmekioderma granulatum</i>	Patrick L. Colin, Philippines	Patrick L. Colin, Solomon Islands	
<i>Neopetrosia exigua</i>	Patrick L. Colin, Guam	Lori J. Bell, Palau	
<i>Niphates olemda</i>	Patrick L. Colin, Palau	Patrick L. Colin, Palau	Patrick L. Colin, Palau
<i>Pseudoceratina arabica</i>	Patrick L. Colin, Palau	Patrick L. Colin, Helen Reef, Palau	Laura E. Martin, Mekeald Lake, Palau
<i>Rhabdastrella globostellata</i>	Patrick L. Colin, Papua New Guinea	Patrick L. Colin, Sonsorol, Palau	Patrick L. Colin, Sonsorol, Palau
<i>Sphaciospongia peleia</i>	Laura E. Martin, Ngermeuangel Lake, Palau	Laura E. Martin, Ngeruktabel Lake, Palau	
<i>Sphaciospongia vagabunda</i>	Patrick L. Colin, Chuuk	Patrick L. Colin, Papua New Guinea	Laura E. Martin, Ngchas Lake, Palau
<i>Spongia (Spongia) matamata</i>	Patrick L. Colin, Helen Reef, Palau	None	
<i>Stylissa massa</i>	Patrick L. Colin, Palau	Lori J. Bell, Palau	Patrick L. Colin, Palau
<i>Suberites diversicolor</i>	Patrick L. Colin, Jellyfish Lake, Palau	Lori J. Bell, Jellyfish Lake, Palau	Lori J. Bell, Jellyfish Lake, Palau
<i>Theonella swinhoei</i>	Patrick L. Colin, Helen Reef, Palau	Patrick L. Colin, Palau	Patrick L. Colin, Helen Reef, Palau

further reading

- Allen, G.R., Steene, R. (1994) Indo-Pacific Coral Reef Field Guide. Tropical Reef Research, Singapore, 378 pp.
- Baine, M., Harasri, D. (2007) The Marine Life of Bootless Bay, Papua New Guinea. Motupore Island Research Centre, University of Papua New Guinea, Port Moresby, 146 pp.
- Becking, L.E., Lim, S.C. (2009) A new *Suberites* (Demospongiae: Hadromerida: Suberitidae) from the tropical Indo-West Pacific. *Zoologische Mededelingen Leiden*, 83, 853–862.
- Bergquist, P.R. (1965) The sponges of Micronesia, Part 1 The Palau Archipelago. *Pacific Science*, 19, 123–204.
- Bergquist, P.R. (1978) Sponges. Hutchinson & Co Ltd, London, 268 pp.
- Bergquist, P.R. (1995) Dictyoceratida, Dendroceratida and Verongida from the New Caledonia lagoon (Porifera: Demospongiae). *Memoirs of the Queensland Museum* 38 (1), 1–51.
- Bergquist, P.R. (1996) The marine fauna of New Zealand: Porifera: Demospongiae Part 5. Dendroceratida and Halisarcida. *New Zealand Oceanographic Memoir* 107, 1–53.
- Coleman, N. (2000) Marine life of the Maldives, Atoll Editions, 328 pp.
- Colin, P.L. (2009) Marine Environments of Palau. Indo-Pacific Press, California, 414 pp.
- Colin, P.L., Arneson, C. (1995) Tropical Pacific Invertebrates. Coral Reef Press, California, 296 pp.
- Davie, P.J.F. (1998) Wild Guide to Moreton Bay. Queensland Museum, Brisbane, 408 pp.
- De Laubenfels, M.W. (1954) The sponges of the West-Central Pacific. *Oregon State Monographs Studies in Zoology*, 7, 1–306.
- Erhardt, H., Beansch, H.A. (1998) Meerwasser Atlas 4. Wirbellose. Mergus Verlag, Melle, Germany, 1214 pp.
- Etpison, M.T. (1998) Portrait of Paradise. NECO Marine, Koror, Palau, 251 pp.
- Etpison, M.T. (2004) Palau – Natural History. Tkel Corp., Koror, Palau, 274 pp.
- Gosliner, T.M., Behrens, D.W., Williams, G.C. (1996) Coral Reef Animals of the Indo-Pacific, Sea Challengers, Monterey, California, 314 pp. .
- Kelly, M. (2011) Phylum Porifera Sponges. Pp. 116–127 in Richmond, M.D. (Ed.) A field guide to the seashores of Eastern Africa and the Western Indian Ocean Islands. Sida/WIOMSA, 464 pp.
- Kelly, M., Hooper, J., Paul, V., Paulay, G., van Soest, R., de Weerd, R. (2003) Taxonomic inventory of the sponges (Porifera) of the Mariana Islands. *Micronesica. The Marine Biodiversity of Guam and the Marianas, Supplement 6 (35–36)*, 100–120.
- Kelly-Borges, M., Bergquist, P.R. (1988) Sponges of Motupore Island, Papua New Guinea. *Indo-Malayan Zoology*, 5, 121–159.
- Lévi, C. (1998) Sponges of the New Caledonia Lagoon. Edition de l'Orstom. Collection Faune et flore Tropicales n. XXXIII. Paris, 1998, 214 pp.
- Patris, S.W., Dawson, M.N., Bell, L.J., Martin, L.E, Colin, P.L., Ucharm, G. (2012) Ongeim'l Tketau: Jellyfish Lake. Coral Reef Research Foundation & Etpison Museum, Palau, 44 pp.
- Pulitzer-Finali, G., Pronzato, R. (1999) Horny sponges from the north-eastern coast of Papua New Guinea, Bismark Sea. *Journal of the Marine Biological Association of the United Kingdom* 79(4), 593–607.
- Ridley, S.O., Dendy, A. (1886) Preliminary Report on the Monaxonida collected by H.M.S. 'Challenger'. *Annals and Magazine of Natural History* (5) 18, 325–351, 470–493.
- Van Soest, R.W.M, Boury-Esnault, N., Hooper, J.N.A., Rützler, K., de Voogd, N.J., Alvarez de Glasby, B., Hajdu, E., Pisera, A.B., Manconi, R., Schoenberg, C., Janussen, D., Tabachnick, K.R., Klautau, M., Picton, B., Kelly, M., Vacelet, J., Dohrmann, M., Díaz, M.-C., Cárdenas, P. (2015) World Porifera database. <http://www.marinespecies.org/porifera>.

