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IDENTIFICATION GUIDE TO MACRO JELLYFISHES OF WEST AFRICA

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by

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PREPARATION OF THIS DOCUMENT

This identification guide was conceived and supported by the EAF-Nansen Programme "*Supporting the Application of the Ecosystem Approach to Fisheries Management considering Climate and Pollution Impacts*" of the Fisheries and Aquaculture Division (NFI), Food and Agriculture Organization of the United Nations (FAO).

The EAF-Nansen Programme bases its structure on the notion that knowledge on marine ecosystems and on the effect of fisheries and other human activities on them, including on their biodiversity and dynamics, is a fundamental element for decision-making in a situation where the use of ocean is increasing. In this context, the Programme has expanded its objectives and key research areas to improve knowledge on marine resources and ecosystems considering emerging issues, such as pollution and climate change. The Programme's science plan guides the research work and one of its Themes (Theme 3) is fully dedicated to improving understanding of the biology, diversity, and ecological role of mesopelagic fish and jellyfish.

Jellyfish are common to most marine ecosystems, and an ever-increasing number of reports suggest increased abundances and frequencies of jellyfish blooms around the world. There are indications that fisheries and climate change may be among the key drivers of this growing trend, but the knowledge base is hardly satisfactory, especially around Africa (except off Namibia and South Africa). Further, a much deeper understanding of jellyfish biodiversity, biology, ecology, and ecological role in coastal ecosystems is needed to understand how fluctuations in their biomass impact coastal ecosystems and fish populations that are already being harvested.

Accurate species identification remains a crucial point for any study in biology and ecology. However, the identification of jellyfish species can be difficult, and it is often challenging for even the more experienced researchers. This is due to the lack of identification tools, specific training in their use, and to the fact that most jellyfish species are soft-bodied and fragile and thus are easily damaged during sampling.

For this reason, the EAF-Nansen Programme decided to support the production of the first identification guide to macro (> 5 cm in diameter) jellyfish species occurring off West Africa.

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ABSTRACT

This identification guide includes 56 species of macro (> 5 cm in diameter) jellyfishes (cnidarians, ctenophores, and thaliaceans) that are known to occur off the coast of West Africa. It provides fully illustrated dichotomous keys to all taxa, an illustrated glossary of technical terms for each main group, and species accounts including the scientific name, diagnostic features, colour, size, ecology, stinging, geographical distribution, and one or more illustrations. The guide is intended for both specialists, and non-specialists who have a working knowledge of biology.

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INTRODUCTION

Jellyfish are planktonic animals whose biomass comprises about 96 percent water. This includes organisms from three phyla that are morphologically and phylogenetically very distinct, and which have very different life-histories: Cnidaria, Ctenophora, and Chordata. Aside from their pelagic lifestyle, these organisms have one thing in common: they can occur at very high densities and when that happens, they can have very profound impacts on their environment. Some can also have direct and/or indirect effects on human activities and our use of coastal waters and marine resources.

The direct negative effects of jellyfish in large numbers include the clogging of fishing nets, the contamination of fish catches, the blocking of the filters used by coastal desalination and power plants and of course, through envenomation, a reduction in the recreational use of shallow waters. Jellyfish may also negatively affect human activities indirectly, through competition with and predation on the adults and juveniles (respectively) of commercially important fish species and through an alteration of the way that materials and energy move through pelagic food webs.

But jellyfish are not just cause for concern. They have evolved within and are an integral component of pelagic marine ecosystems, where they may serve to regulate the abundance of other species that would otherwise have an overwhelming impact on the structure of the ecosystem. Through their carcasses and faeces, they provide a mechanism whereby surface production is fast-tracked to the benthos, and through their consumption in the epipelagic zone they likely play an important role in nutrient recycling there. All jellyfish feature in the diet of higher predators, such as endangered species of turtles and sunfish (*Mola* spp.) as well as more "useful" forage and bottom-dwelling fish species. Some species of jellyfish may also act as refuges for the juveniles of commercially important fishes, especially carangids, protecting them from their own predators. All species of medusae (Cnidaria) contain variable amounts of collagen in their tissues, which can be harvested for pharmaceutical purposes and some species of jellyfish can be eaten. In other words, jellyfish represent a potential resource for careful human exploitation.

There is evidence to suggest that some species of jellyfish are increasing in population size. We stress the word "suggest" here, because hard evidence of change needs to be based on hard data and unfortunately, baseline data against which to measure change is missing almost everywhere. Whilst fishers and users of the marine environment may indicate that populations have increased, memory is a fickle thing and has a definite date-stamp. That said, increases in some parts of the world have been noted, and although the reasons for these increases are probably species- and locale-specific, some of the putative drivers of change are universal: climate change, overfishing, the unintentional introduction of alien species, and a proliferation of hard substrata in the coastal zone. Cultural eutrophication (agricultural run-off and sewerage), which affects nutrient ratios, water clarity and oxygen concentrations may also be important. While our understanding of how these different factors actually impact jellyfish populations is relatively unclear, we do know that they may act synergistically, and it is likely that this synergism may vary from one system to another.

Interestingly, the diversity of jellyfish globally is relatively low, by comparison with many other groups of, especially crustacean, zooplankton. In the case of the chordates, this diversity is probably real but in the case of Cnidaria and Ctenophora it is likely to be an under-estimate for a variety of reasons. The animals can be very delicate (Ctenophora), and they preserve poorly, which means that quality material on which to base definitive descriptions is hard to obtain. Modern descriptions of pelagic ctenophores are typically made using comprehensive photographs of living specimens, supplemented with molecular data. Key features of even more robust taxa such as some Cnidaria (tentacles, bell margins, muscular bands) tend to get damaged during collection and/or distort on fixation and preservation, which makes description and identification difficult without access to a large volume of material. And some taxa may display what we refer to as crypsis, owing to a conserved morphology. This applies particularly to species of Cnidaria (e.g. members for the genera *Aurelia* and *Pelagia*), which resemble each other very closely morphologically and are often distinguishable only using molecular methods. Whilst our understanding of jellyfish diversity at the global level may be poor, our understanding of jellyfish around Africa tends to lag behind even that. What is known is that off the coast of Namibia, jellyfish populations have increased significantly subsequent to the collapse of the small pelagic fish populations at the end of the 1960s. This has had very profound impacts on both the structure and functioning of the ecosystem and on the commercial fishing sector. Unfortunately, the species that occurs in abundance off Namibia (Cnidaria: *Chrysaora fulgida*) is not one that offers any opportunities for exploitation, especially given the role it plays in supporting the bearded goby (*Sufflogobius bibarbatus*) there, which in turn appears to be an important part of the diet of the commercially valuable hake. However, the same may not apply around the rest of the continent.

Aside from its academic value and relevance to biodiversity, information on jellyfish around Africa is important for two reasons of worth to fishers and fisheries and environmental managers. It establishes the all-important baseline against which environmental and ecosystem change can be measured, and it provides an indication of new resources suitable for potential exploitation. Both of these aims require a tool that allows for the easy identification of jellyfish: they are not all equal. Unfortunately, this literature is hard to find readily (even at a well-resourced academic institution), and so the primary aim of this guide is to provide a ready reference that can be used by anyone to identify any large jellyfish off the west coast of Africa.

We focus here on large jellyfishes (= macro jellyfishes), here defined as animals with an adult size of > 5 cm in diameter/length, because a) small jellyfish do not seem to have the same impact on the human environment and b) large jellyfish do not require sophisticated tools to identify them other than perhaps a handheld magnifier. Large jellyfish also tend to be more robust than smaller species and so should have some features that can be used to identify them (to some level) after having been hauled up in a fishing net, especially if a number of specimens are available.

The geographic focus of the guide (Fig. 1) is from the Straits of Gibraltar in the north to the southern edge of the Agulhas Bank in the south. Selected extralimital species from the Mediterranean Sea, and from the southern Indian Ocean and Agulhas Current

are included, because outflow from the former and rings from the latter will advect these largely passive animals into the region. Owing to the fact that our understanding of jellyfish diversity is incomplete, and that some species are known to be invasive elsewhere in the world, diagnostic differences with other species will also be highlighted.

Whilst the majority of the species covered in this guide occur in the epipelagic (upper 200 m of the water column), we have included some of the larger mesopelagic (200–1000 m) species because there is a growing interest in mesopelagic resources.

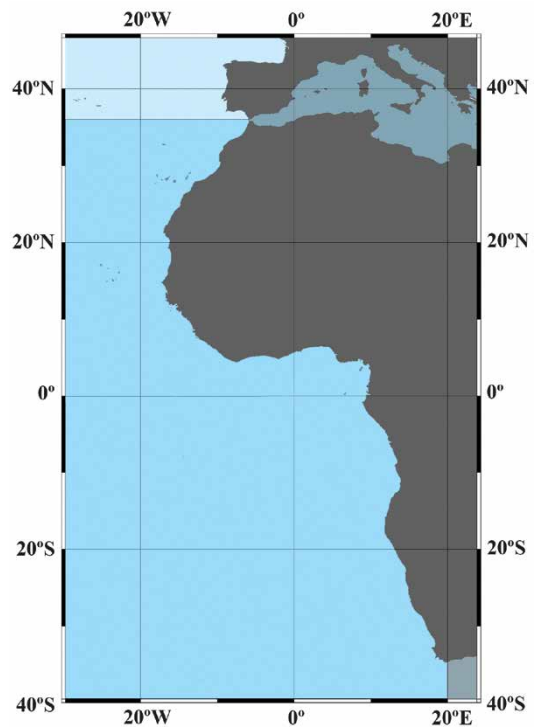


Figure 1. Geographic area covered in this guide.

Source: Authors' own elaboration, conforms to UN.

[Map of the World](#), 2021.

Presentation and format

The identification of jellyfish species can be difficult, and it is often challenging for even the more experienced researchers. In order to facilitate the identification process, the authors agreed that the main groups (phyla, classes and subclasses) should be identified by means of a pictorial key (p. 13) displaying ink drawings of representative species from these groups. Once the main group is determined, users should go to the indicated page.

The identification of the lower taxonomic levels (order to species) is entirely based on fully illustrated dichotomous keys. These keys present relevant information in a structured form and often allow users to skip over the many taxa that do not possess certain characters. Moreover, they are useful by telling users what to look for. "Dichotomous" means divided into two parts, and therefore the dichotomous keys always present pairs or couplets of contrasting characteristics. Users should read both couplet options, and then select the option that reflects the characteristics shown by the organism they are trying to identify and proceed either to the next couplet or to the correct taxon.

In the example that follows (Fig. 2), users have to decide whether the specimen they are trying to identify has either "less than 20 tentacles" or "more than 20 tentacles" In the former case (1a), users would have identified the correct species, *Atolla russelli*. In the latter case (1b), they would be directed to couplet 2, and so on until the correct taxon is reached.

Key to species of *Atolla* occurring in the area

- 1a. Tentacles less than 20 (Fig. 1) *Atolla russelli*
- 1b. Tentacles 20 or more (Figs. 2-5)..... ▶ 2
- 2a. Exumbrella with warts/papillae on lappets (Fig. 2) *Atolla chuni*
- 2b. Exumbrella without warts/papillae on lappets. ▶ 3

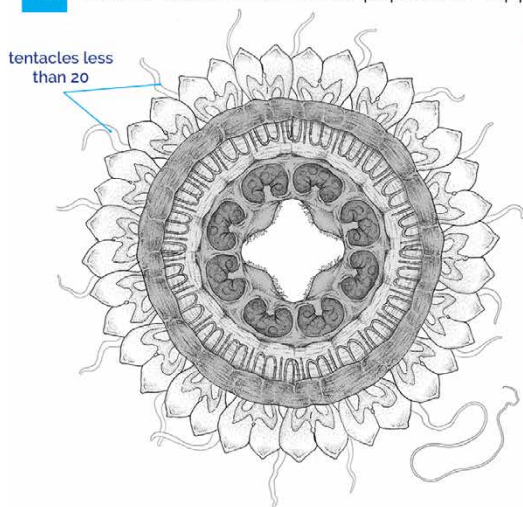


Fig. 1. *Atolla russelli* (oral view)

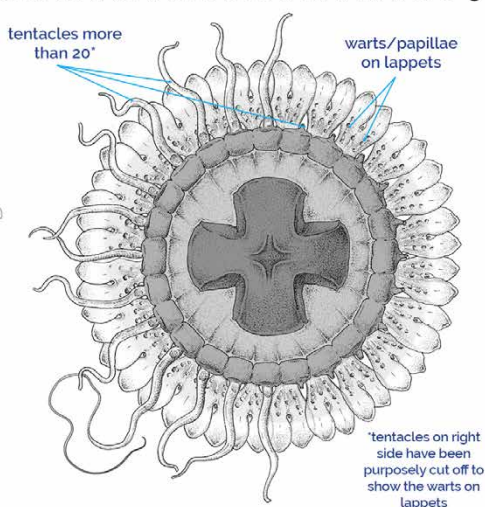


Fig. 2. *Atolla chuni* (aboral view)

Figure 2. Example of a dichotomous key.
Source: Authors' own elaboration.

Each class (with the exception of the Hydrozoa) is accompanied by a number of schematic illustrations of the main body parts of typical representative species and some measurements and technical terms of general use.

Text for each species contains information on name (scientific name with authorship and family to which it belongs), diagnostic features, coloration, maximum known size (expressed usually as bell diameter [BD], bell width [BW], and bell height [BH]), ecology, a distribution map based on known occurrences, remarks (where available), and one or more illustrations. In the diagnostic features section, the characters that are used in the keys to separate the species from the other similar-looking ones are highlighted in **red**. Users who require more detailed information on specific terms and characters used throughout the guide can consult the glossary (p. 179). Finally, a selection of relevant bibliography can be found at p. 185.

Sample fixation, preservation and image collection

Although this guide is intended to assist scientists in the identification of large jellyfish *in situ*, it may be necessary to collect specimens for more detailed study in the laboratory at a later date. Such endeavours could be aimed at confirming identification or enriching local collections, or they may be focused on aspects of individual biology. Regardless of their purpose, the protocols are similar and are outlined below.

REQUIRED MATERIALS

Recognize the purpose of your collection in advance, as it will dictate any preparations you need to make. Jellyfish are usually very fragile and so care must be taken in handling them both before and after fixation to prevent damage. In general, this means handling them as little as possible out of the water. You mustn't forget that, many jellyfish are quite large, and you will need to ensure that you have appropriately sized containers to store them in and that you have sufficient fixative to completely cover the specimen. All containers need to be completely sealable (the favoured fixative is toxic) and they need to be robust because it is likely that they will be stored on deck or in a well-ventilated space. Remember that conditions at sea can sometimes be very rough. Should you wish to collect material for DNA, then you will need to make sure that you have access to 96 percent ethanol (ETOH) and again, suitable containers. If you also want to collect material for stable isotope (^{13}C or ^{15}N) analysis, then you will need tin foil, and either a drying oven set to 60 °C or a freeze-dryer.

FIXATION AND PRESERVATION

It is conventional to fix and preserve material for morphological examination in 5 percent buffered formalin (Fig. 3), though 10 percent buffered formalin may be used for large specimens with a thick mesoglea*. Formalin (100 percent) is generally purchased as a saturated solution of the gas formaldehyde (~40 percent by volume), and it must be handled with extreme caution: always wear gloves and always operate in a very well-ventilated space. It is preferable *not* to make up stock solutions of 5 percent formalin in advance, rather dispense when needed. Remember, jellyfish are ~96 percent water, and so

you need to include their volume in your calculations of the amount of formalin to use. For example, if you are using a 5 L container in which to preserve a specimen, first fill the

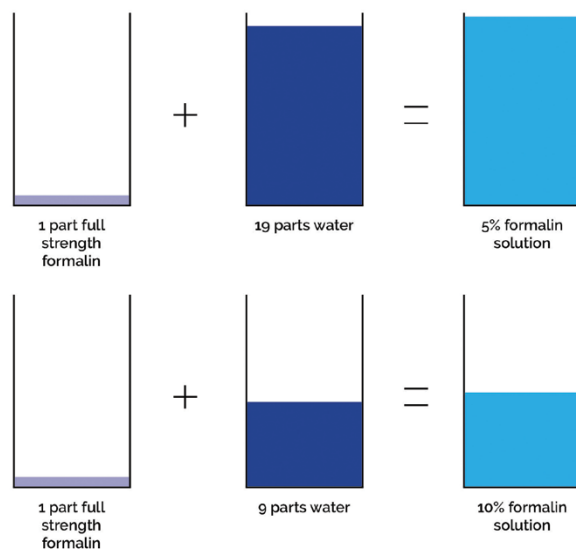


Figure 3. Buffered formalin preparation.
Source: Authors' own elaboration

*Ten percent formalin can be replaced by 5 percent after a couple of months in preservation, if desired. Regardless, any material preserved at a final concentration other than 5 percent needs to be labeled as such, so that future users are aware of the increased care that needs to be taken in its handling and possible disposal.

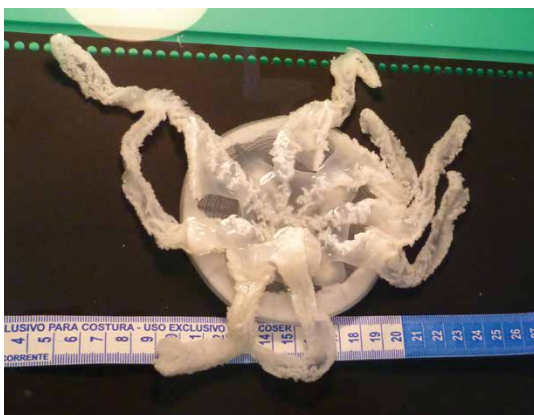
container with seawater, then add the specimen. The volume in the container (jellyfish plus remaining seawater) is still 5 L, and you would need to add 250 ml of formalin in order to achieve a final concentration of 5 percent. If you removed 1 L of water from that container (plus jellyfish), the final volume would be 4 L, in which case it would be necessary to add 200 ml formalin in order to achieve a final concentration of 5 percent. Agitate gently, but thoroughly, in order to ensure a thorough distribution of formalin, though the rolling motion of the sea is likely to do this for you in most situations.

TAKING MEASUREMENTS

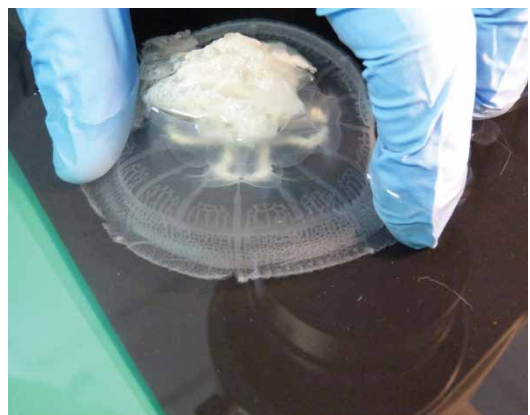
Before you preserve any material in formalin or ETOH, you need to measure the bell diameter of the selected specimen. This is necessary because animals will shrink when initially fixed and preserved, though this stabilizes after about 60 days.

TAKING PHOTOGRAPHS

Photographs act as a record of living colour and of pigmentation patterns because specimens fixed and preserved in either formalin or ETOH will lose their colour very quickly. When taking photographs, ensure that you include a measure of scale such as a ruler or a recognizable coin, and avoid using a direct flash, because the specimen's wet surface will often cause glare. The use of a dark or clear background is also welcome, because it will highlight different structures. Using natural light is advisable, but if not possible use multiple sources from different angles to avoid glare. A photograph of the whole specimen is a must, in both oral and aboral views, as too are close-up images of the bell margin (lappets, tentacle bases and rhopalia), oral arms and manubrium, gonads and any other details that call your attention (like warts, oral arms appendages, gastric cavity organization). It should be remembered that once a specimen is preserved, it may suffer considerable damage due to rough treatment at sea or in transit, and delicate features may get lost. Focus on such characters in your images (Fig. 4).



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Figure 4. Examples on how to take photos.

COLLECTION OF TISSUE FOR GENETIC ANALYSIS

Jellyfish have a generally conserved morphology, and cypsids within some genera (e.g. *Aurelia*) is widespread. The retention of a morphological specimen in itself may therefore

not be enough to establish identity and there is an increasing tendency to use a suite of characters in identification and taxonomy. One of these is DNA.

Unless the specimen is very small and can be preserved whole, it is customary to remove pieces of tissue for DNA analysis (Fig. 5). The best material to harvest for this purpose is gonadal tissue, as it is richest in DNA, though small pieces of any part of the animal can be used.

Ideally, excised material should be rinsed in freshwater and then dabbed dry before placing in a suitably labelled container with 96 percent ETOH. Only a single specimen should be included in each vial to avoid cross-contamination and whatever implements are used to excise the selected tissue should be rinsed thoroughly between specimens. The ratio of tissue to ETOH should be about 1:10. The preserved tissue should then be placed in a freezer or other dark, cool place and it is very important that the ETOH be replaced three times within a 24 h period. This latter process is VERY important, because with each successive ETOH change, progressively more of the water contained within the specimen is removed. If space allows, it is recommended that the specimen continues to be stored in a deep freezer, but it is not essential.



Figure 5. A scientist collecting tissue for DNA analysis.

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COLLECTION OF TISSUE FOR STABLE ISOTOPE ANALYSIS

If you are collecting material for stable isotope analysis, you are strongly advised to process the material on board ship immediately. Unlike fish, or indeed most other organisms, you cannot freeze jellyfish – they will simply disintegrate owing to their very high water-content and lack of hard tissues. That means you cannot take them home with you to process at a later stage. It should be realized that different tissues have different values of ^{13}C and ^{15}N and you need to determine at the outset what you will focus on. Bell-tissue is typically used. Selected pieces of bell tissue need to be removed, rinsed in fresh water, wrapped loosely in tin foil (or placed in another appropriate container) and dried in an oven at $60\text{ }^{\circ}\text{C}$. We recommend using an oven here simply because it is generally more difficult to access a freeze-dryer at sea, though should you be fortunate to have the latter available, go for it! Remember – jellyfish tissues are ~96 percent water and you will need a minimum of 5 mg (dry weight) for proper analysis down the line, and given that the material will stick to the foil it is better to prepare more than less. Once the sample has been dried, it should be kept in the freezer until analysis to avoid decomposition.

LABELLING

Labels are critical and should be written on appropriate material and placed on both the outside and inside of specimen containers. They need to include details of where, when

and how the sample was collected, the depth from which it was collected and its bell diameter. Information on any subsamples taken for DNA and/or stable isotopes need to be logged and of course, everything has to be linked to any photographs taken.

EXAMINATION OF SPECIMENS FOLLOWING FIXATION AND PRESERVATION IN FORMALIN

Given the toxic nature of formalin, it is vital that specimens be thoroughly rinsed before being inspected in the laboratory. It is usual to remove the preserved specimen from the formalin in a well-ventilated space (preferably outside in the open air), using gloves, and immerse it in an excess of fresh water for at least 24 h. If it is possible to replace the water several times over that period, then you are encouraged to do so. The specimen can then be rinsed one last time and examined. DO NOT lose the label during the rinsing process!

A WORD ON NEW SPECIES

You need to remember that this is a **guide** to identification – emphasis on guide. It is not *The Definitive* work on large jellyfish off the west coast of Africa, because our knowledge about regional jellyfish is far from comprehensive. Indeed, together with parts of southeast Asia, the African medusofauna is perhaps the most poorly documented in the world: a fact that reflects the absence of significant expertise on the continent. While the present guide incorporates all known species from the region, it is very possible that you will find a specimen that you cannot identify using it. Don't blame us and don't be deterred. Rather - get excited! You may have stumbled across a species from a genus that has not previously been described from West Africa, in which case one of the resources suggested in the bibliography may help you to get some sort of identification. But either way, the possibility that you have stumbled across a new species is high. And that is why it is vitally important you have good morphological and molecular samples, which have been properly photographed, fixed and preserved.

Jellyfish sting treatment

All jellyfish have venomous tools to catch prey, and some of these can also harm humans. These tools are minute organelles called nematocysts, which consist of a venom-containing bag with a coiled, inverted, mostly barbed injection tube, resembling a harpoon: imagine a venom-filled balloon with a very long spiky neck, where the neck is pushed back inside the body of the balloon and then sealed with a cap or operculum. A sensory barb is connected to this capsule, which when touched or otherwise stimulated causes the operculum to pop open and the coiled tube to shoot out (it everts) in a split second, penetrating the body of the prey or the unprotected skin of a human, thereby injecting the venom. Although millions of these nematocysts can be found clustered on the tentacles and mouth arms of jellyfish, they are also scattered over the whole body in many species. And while the mechanism is the same in all species, the venoms and their potencies differ according to the jellyfish group. This means that the sting treatments have to be differentiated, in much the same way that we treat different snake bites differently.

The stings and sting treatments can be split into **three major groups**:

- Scyphozoa, Blue-bottles/Portuguese Man-of-War (*Physalia* spp., Hydrozoa), and other Hydrozoa, which cause mild to moderate reactions.
- Box jellyfishes (Chirodropida, e.g. *Chironex* spp., *Chirodropus gorilla*, *C. palmatus*), which have large cuboidal bells and multiple tentacles at one pedaliu at each lower corner, which cause severe reactions.
- Irukandji box jellyfishes (some Carybdeida: *Alatina* spp., *Carybdea* spp., *Tamoya* spp., see guide below), which are much smaller and have a single tentacle on one pedaliu at each lower corner and are known, or suspected, to produce an "Irukandji syndrome" (see below).

TYPES OF JELLYFISH STINGS

The type of sting and how severe it is will depend on how much of (e.g.) the tentacle touches the skin and the species of jellyfish. Mild jellyfish stings usually cause minor pain, itching, and, in some cases, a rash. More serious jellyfish stings can cause the following symptoms and medical help should be consulted as soon as possible:

- difficulty breathing;
- chest pain;
- muscle cramps;
- skin blistering;
- numbness or tingling;
- nausea or vomiting;
- difficulty swallowing;
- worsening redness, rash or pain if a sting gets infected.

Scyphozoa, Blue-bottles/Portuguese Man-of-War (*Physalia* spp., Hydrozoa), and other Hydrozoa

Jellyfish stings of Scyphozoa, bluebottles and other hydrozoans are the most common

ones, and a rash may develop on the contacted skin. While they may be painful at first, there is no need to see a doctor in most cases as the inflammation tends to disappear quite quickly. It needs to be remembered that different people will react differently to jellyfish stings, in much the same way that different people react differently to bee stings, so if symptoms persist then medical attention should be sought.

Blue-bottle stings leave a whip-like, red welt on the skin from the tentacle. These stings cause intense pain, sores or swellings in the stung area of skin. The pain is immediate but generally decreases or stops after one to two hours and the soreness fades after a few days. Allergic reactions are possible.

If the pain persists, becomes more intense or allergic reactions develop, see a doctor.

Box jellyfishes (Chirodripida)

The venom of this group is very potent and although the bell of most species does not support body scattered nematocysts, the tentacles are long and likely to come into contact with large areas of the skin. Any contact with the tentacles will cause immediate (severe) pain and a red or purple whip-like lesion will appear, which may progress to local skin destruction. It takes days to weeks to heal the lesions and a scar will remain in most cases. A sting from several metres of tentacles can cause respiratory problems and cardiac arrest within a few minutes, and death may follow shortly thereafter. To date, about 80 such deaths have been attributed to *Chironex fleckeri* off Australia. It goes without saying, therefore, that any contact with tentacles of these jellyfish is very dangerous, and medical help should always be sought.

Irukandji box jellyfish (some Carybdeida)

Contact with the tentacles of this group of jellyfish rarely leaves a red mark on the skin, in part because the animals are small and so the welt is hard to see and in part because the venom is injected into deeper tissue. However, contact with these jellyfish can cause so-called "Irukandji syndrome", where a stung person develops extreme pain in their body, not necessarily at the sting site some five to 40 (typically 20 to 30) minutes after being stung. This delayed reaction complicates first aid because the symptoms might not be realized as those of a jellyfish sting. This type of sting can also be dangerous and requires emergency medical treatment.

Irukandji-like symptoms include:

- severe generalised pain in the body (back, tummy, chest and muscles), often cramping in nature;
- increased heart rate (tachycardia);
- anxiety, difficulty breathing and sweating;
- nausea and vomiting;
- restlessness and a feeling of "impending doom";
- in rare cases, fluid in the lungs (pulmonary oedema), hypertensive stroke;
- in rare cases, damage to the heart, heart failure;
- systemic manifestations over several months: pain far from the sting site, arthralgia (pain in joints), paresthesia, hyperesthesia (e.g. *Carybdea marsupialis*).

JELLYFISH STING TREATMENT

Generally, keep the victim at rest, calm and under constant observation. Do not allow rubbing of the sting area because this may cause further nematocyst discharge. Skin sores can be treated by topical treatment with a cream containing methylprednisolone.

Scyphozoa, Blue-bottles/Portuguese Man-of-War (*Physalia* spp., Hydrozoa), and other Hydrozoa

- Wash the sting site with sea water. Do not use fresh water as it may increase nematocyst discharge.
- Remove any tentacles using tweezers.
- Rinse/immerse the sting site in hot water for 20 minutes. While the water should be as hot as possible (45°C), be careful not to burn the patient: a hot shower is also okay.
- If there is no hot water, an ice pack may help to relieve the pain and help with the swelling.
- **Vinegar should not be used** for blue-bottle and scyphozoan stings and may in fact serve to increase a victim's pain because the nematocysts are triggered to discharge due to chemical reaction.

Box jellyfishes (Chirodropida)

Call an ambulance or any medical help and start the following first aid:

- Flush the sting site with plenty of vinegar (4 to 6 percent acetic acid). This stops any further nematocyst discharge in box jellyfish but does not provide any pain relief from the venom already injected. If vinegar is not available, wash with sea water.
- Carefully remove the tentacles from the skin with tweezers (do not use bare hands).

If the person is unconscious, perform cardiopulmonary resuscitation (CPR).

Irukandji box jellyfish (some Carybdeida)

Call an ambulance or any medical help and start the following first aid:

- If the sting site can be recognised, flush with plenty of vinegar.
- Carefully remove the tentacles from the skin with tweezers (do not use bare hands).
- Skin sores can be treated by topical treatment with a cream containing methylprednisolone.
- It is possible to relieve the pain with opioids, but paracetamol is ineffective.

JELLYFISH STING PREVENTION

Some things you can do to help prevent jellyfish stings include the following:

- Do not touch any jellyfish in the water or on the beach with unprotected hands.
- Avoid swimming in the sea when warning signs about jellyfish are displayed.
- Avoid swimming in the sea in an area that is known for high numbers of jellyfish.
- If you do swim, wear a full-body wetsuit of neoprene or lycra and put on waterproof footwear. Even a pair of tights (nylon) or leggings can provide some protection for the legs because the injection tubes of nematocysts cannot penetrate through clothing.

Additional information is available in Bordehore *et al.* (2015), Carrette & Seymour (2013), and at: <https://www.healthdirect.gov.au/jellyfish-stings> and https://resus.org.au/?wpfb_dl=41

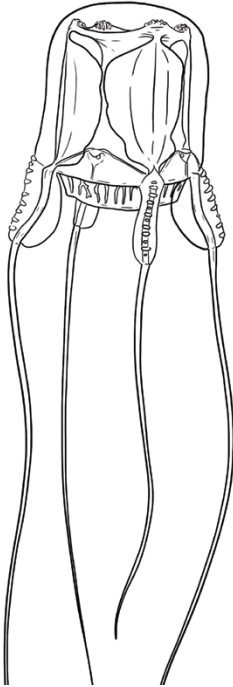
PICTORIAL KEY TO MAIN JELLYFISH GROUPS

PHYLUM CNIDARIA

p. 19

Class Cubozoa

p. 21



Carybdeida



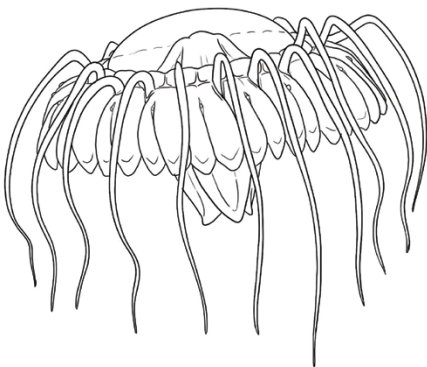
Chiropoda

Class Scyphozoa

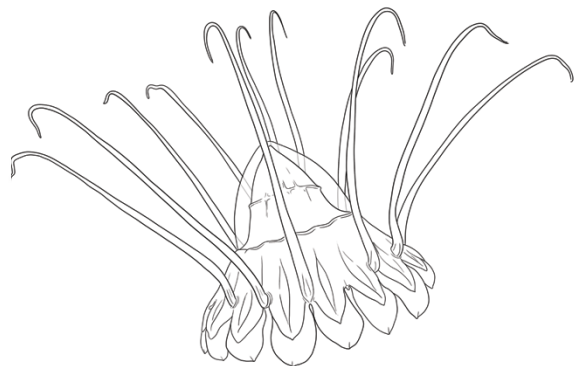
p. 49

Subclass Coronamedusae

p. 59



Atollidae



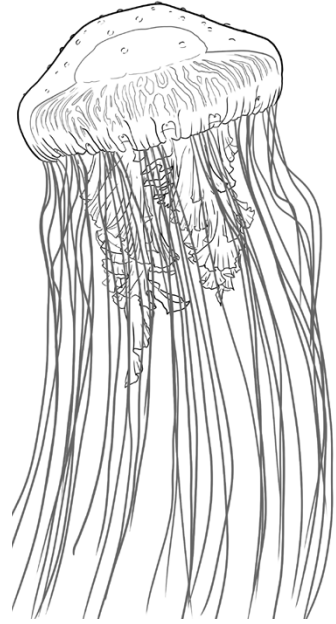
Periphyllidae



Cyaneidae



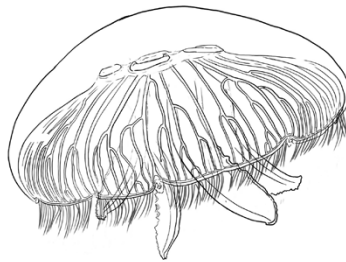
Drymonematidae



Phacellophoridae

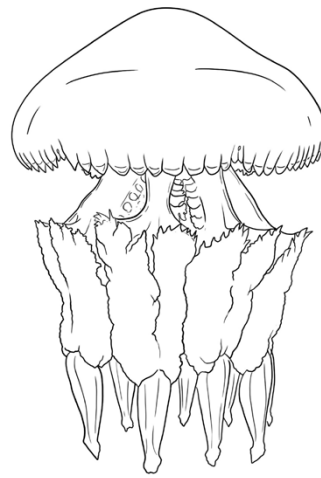


Pelagiidae

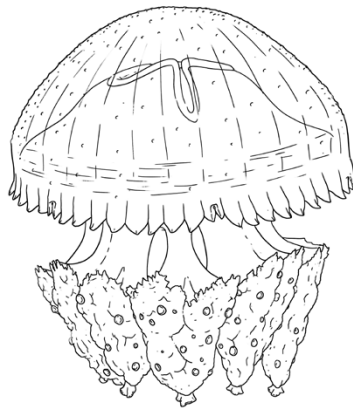
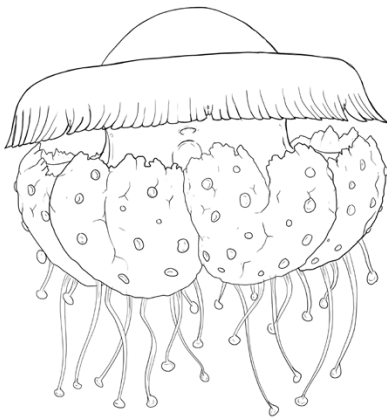


Ulmaridae



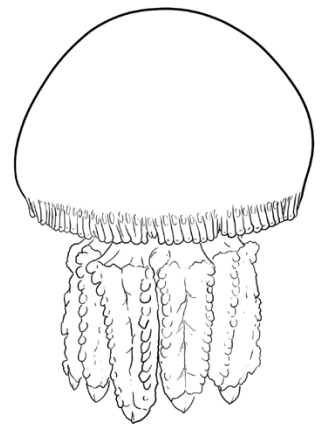
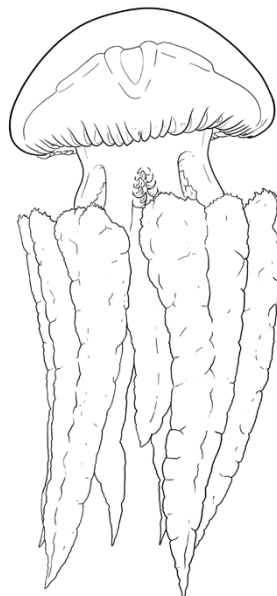


Rhizostomatidae



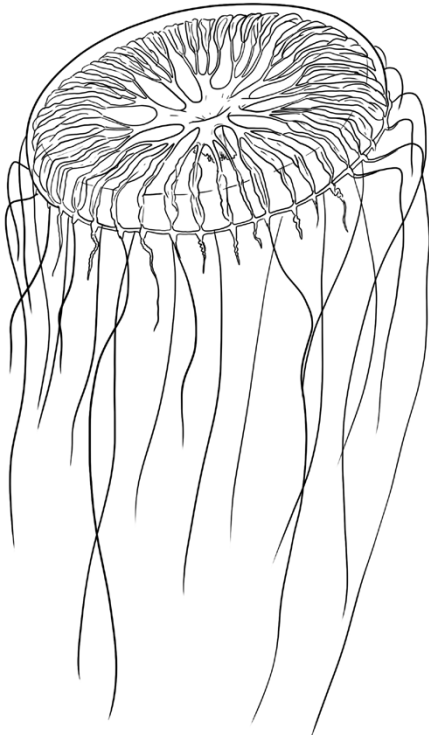
Cepheidae

Mastigiidae

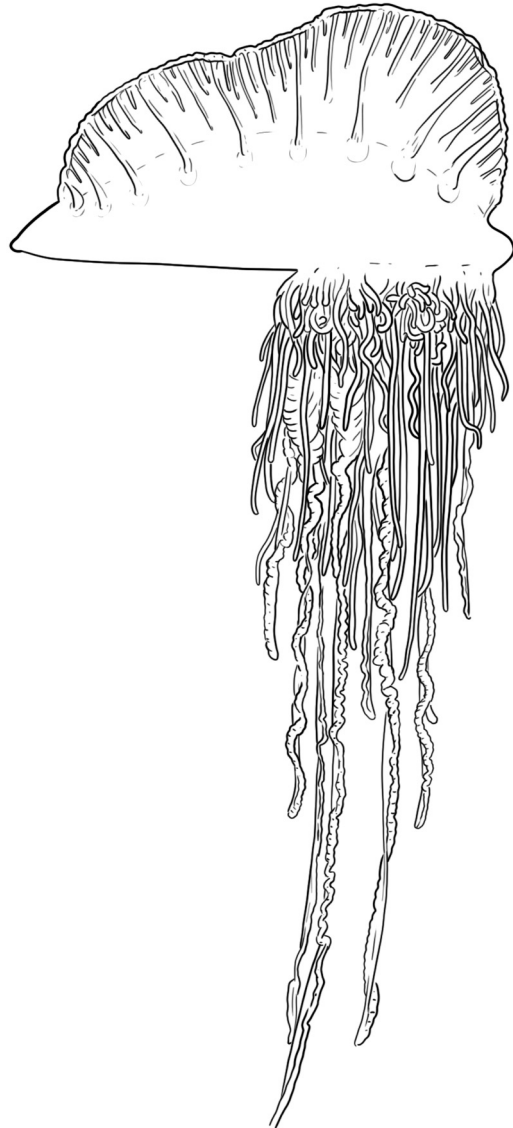


Leptobrachidae

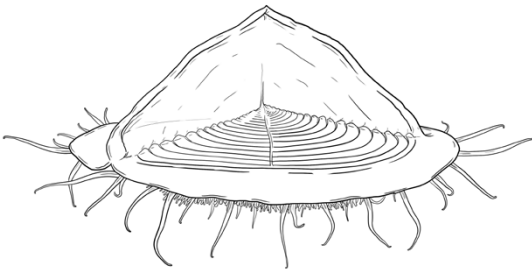
Catostylidae



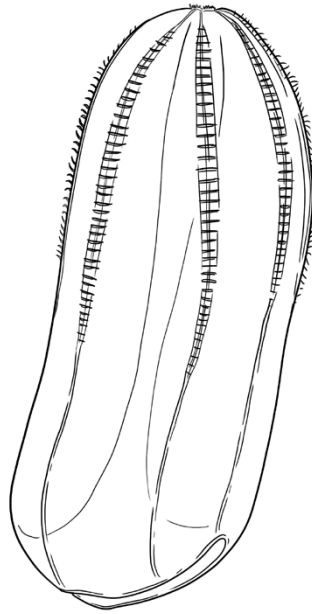
Aequoreidae



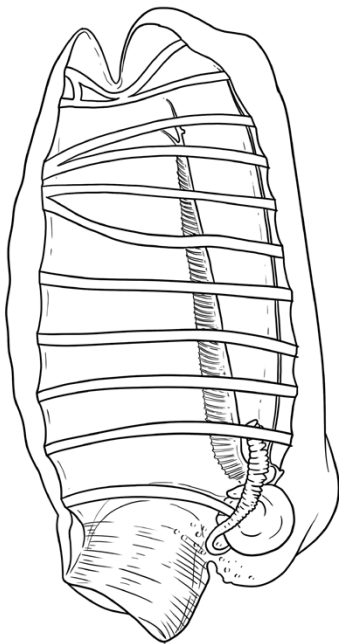
Physaliidae



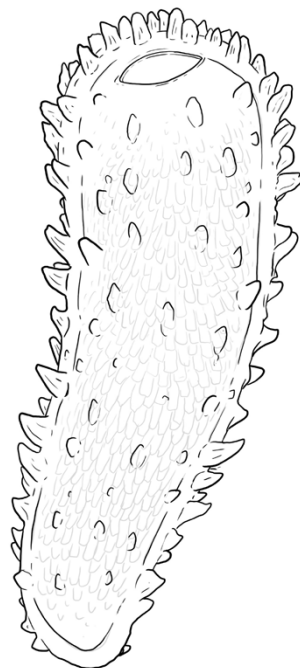
Porpitidae



Beroidae



Salpidae



Pyrosomatidae

PHYLUM CNIDARIA

Members of the phylum Cnidaria are defined by a generally radially symmetrical body plan, two tissue layers (endoderm and ectoderm) separated by a variously filled mesoglea and a diffuse, net-like nervous system lacking any form of centralisation. The mouth, which also functions as the anus, is situated centrally, and food that is digested in the stomach may be further distributed through the body via simple canals prior to final intracellular digestion. But perhaps the most defining characteristic of cnidarians is their possession of cnidocytes, which are specialized cells containing cnidae. Cnidae include the well-known nematocyst, which is an explosive organelle that on stimulation everts a long, often barbed tubule that can penetrate animal tissue and deliver a venom. Cnidae are primarily used in prey capture, but can be used for defensive purposes and represent valuable tools for taxonomists.

The phylum Cnidaria comprises three subphyla, only one of which includes pelagic, free-living members: Medusozoa. As their name suggests, medusozoans typically (and ancestrally) display an alternation of generations (metagenesis) between a (usually) benthic polyp that reproduces asexually and a free-swimming medusa that reproduces sexually (sexes are generally separate). That said, the medusa phase may be lost in some taxa (e.g. *Physalia*), whilst the sessile polyp phase may be lost in others (e.g. *Pelagia*, *Periphylla*). All cnidarians are carnivorous, capturing prey on nematocyst-laden surfaces in a variety of ways, though some shallow water and epipelagic taxa also contain photosynthetic zooxanthellae (e.g. *Cassiopea*, *Mastigias*). Like ctenophores, pelagic cnidarians can be found in all oceans and at all depths, though taxa that have retained a metagenetic life-history are generally more common in shallow water over continental shelves.

The subphylum Medusozoa contains three classes with medusoid members: **Hydrozoa**, **Cubozoa** and **Scyphozoa**. The medusa phase, when present, differs widely in size amongst the different classes, with those of Scyphozoa generally being larger than those of Cubozoa, which in turn are larger than those of Hydrozoa, with some exceptions (e.g. *Aequorea*). Of the three classes, Scyphozoa is certainly the most conspicuous around the west coast of Africa, though Hydrozoa will certainly be more abundant.

The possession of a metagenetic life-cycle confers a distinct advantage to jellyfish that is otherwise denied to species with a holopelagic life style, because polyps allow populations to persist in an area when surface advection may export medusae or when environmental conditions no longer favour the survival of medusae. Polyps and medusae can survive in waters with a low concentration of dissolved oxygen, and when food densities decline to the point of starvation, some medusae (and polyps) may metabolise body tissues and shrink before regrowing again when the ambient food environment improves.

CLASS CUBOZOA

Box jellyfish or Cubozoa are the least diverse group of jellyfish, comprising about 50 species, arranged in two orders, eight families and 19 genera. They are approximately cuboidal in shape, supporting tentacles at the four lower corners, and range in size from less than 1 cm to 50 cm in bell height when mature. They are infamous for their strong venoms, which can cause severe injuries (e.g. Irukandji syndrome) and death, and beaches in Australia and Hawaii are routinely closed down when they are seen in abundance: *Chironex fleckeri* is perhaps one of the most venomous animals on the planet today. Although not all cubozoans are dangerous (some are absolutely harmless), caution needs to be exercised in handling them at all times.

With the exception of *Chironex fleckeri* (Chirodropida), the life cycles of cubozoans have been described only for Carybdeida. Although cubozoans all have metagenetic life cycles, they display some fascinating reproductive strategies. In the family Alatinidae, species may come together in aggregations to spawn, and one (*Alatina alata*) even has a special date night, 8-10 days after a full moon. Other species will actually come together, "dance" and then appear to "copulate", as the male passes a sperm packet across to the female (Tripedaliidae). While other species still just shed their gametes freely into the open water column, blindly assuming that fertilisation will take place (e.g. Carukiidae, Tamoyidae, Chiropsalmidae), females of Alatinidae and Carybdeidae may ingest sperm from the surrounding water and fertilise their eggs inside the gastric cavity, thereby ensuring that fertilisation takes place.

The fertilized eggs develop into planula larvae that settle and metamorphose into tiny polyps. The polyps multiply asexually in most cases by budding secondary polyps. In the family Carukiidae, polyps may strobilate in a monodisk-like fashion, as is seen in some Scyphozoa, but in most cases the polyp metamorphosises into a small bell-shaped medusa. In contrast to Scyphozoa, there is no ephyra stage and this gives the young medusa a head start in life and allows them to be fast swimming hunters of planktonic crustaceans. While scyphozoans tend to simply drift with ocean currents, because the bells of cubozoans are fitted with a velum, which increases the efficiency of the "jet propulsion", some species can actively swim against weak currents. This effectively elevates them from plankton to nekton. Cubomedusae can live for more than one season, and may have a life-span of several years.

For such simple metazoans, cubozoans have evolved some surprisingly "sophisticated" anatomical features that you might not associate with Cnidaria. They have four brain-like structures, the rhopalia, that are connected by a central nerve system. Each rhopalium bears centres for smelling/tasting, a statolith to sense acceleration in the water column and three pairs of eyes. Two pairs of the latter are regarded as pit and slit eyes, which are also found in scyphozoans, but the other pair consists of one incomplete and one complete lens. These lenses allow the individual to dodge obstructions in their often-murky habitat, but they don't allow focusing on individual prey items. Box jellyfish are agile and active hunters that will feed on a variety of crustaceans and fish, and will change their diet in an ontogenetic way. Despite their venom, cubozoans will be eaten by some fish and turtles.

The class Cubozoa is split into two orders: Carybdeida (about 33 species) and Chirodropida (about 16 species). Carybdeida are defined by medusae with simple pedalia with a single tentacle per umbrella corner while the Chirodropida display branched pedalia with four to 17 tentacles per umbrella corner. Carybdeida contain the smallest species *Carybdea sivickisi* with bell height of 0.5 cm and largest species *Keesingia gigas* with bell height of 50 cm – both species found in South East Asia. Most medusae of both orders are colourless and transparent but there are some colourful species like the yellow, rust and mauve-coloured chirodropid species *Chirodropus gorilla* distributed along the western coast of Africa, and the huge *Alatina grandis* (bell height 24 cm) with bright orange-coloured tentacles found also along the coasts of southern and eastern Africa.

CLASS CUBOZOA

Illustrated glossary of technical terms

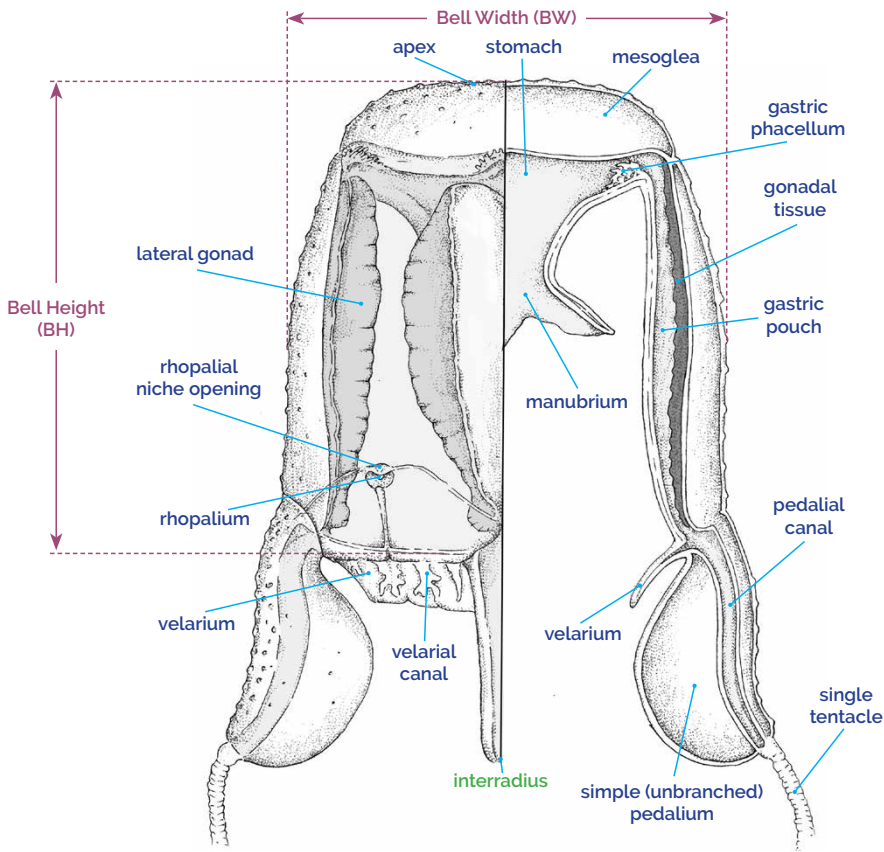


Fig. 1. Carybdeida (interradial view; left side, external view; right side, internal organization)

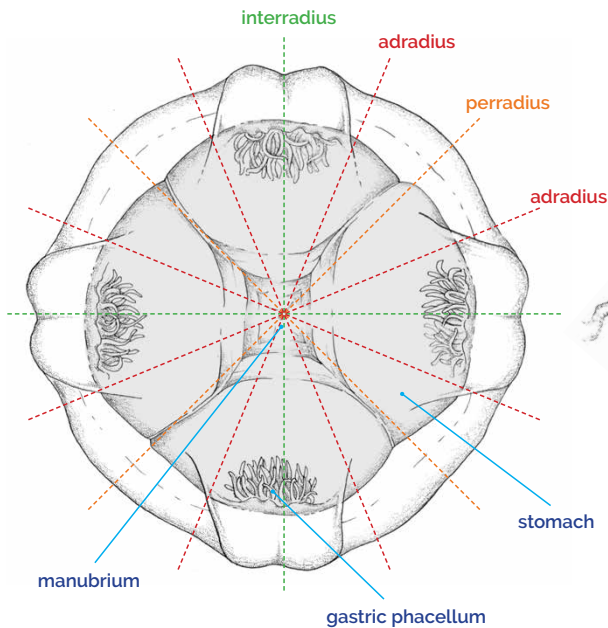


Fig. 2. Carybdeida (aboral view)

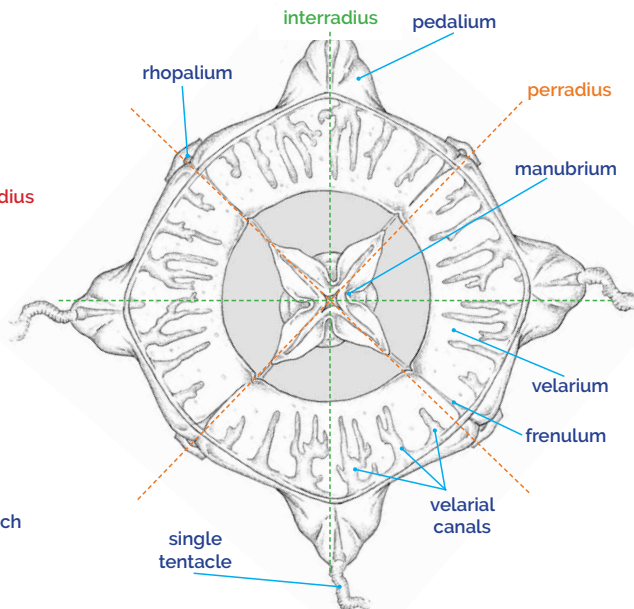


Fig. 3. Carybdeida (oral view)

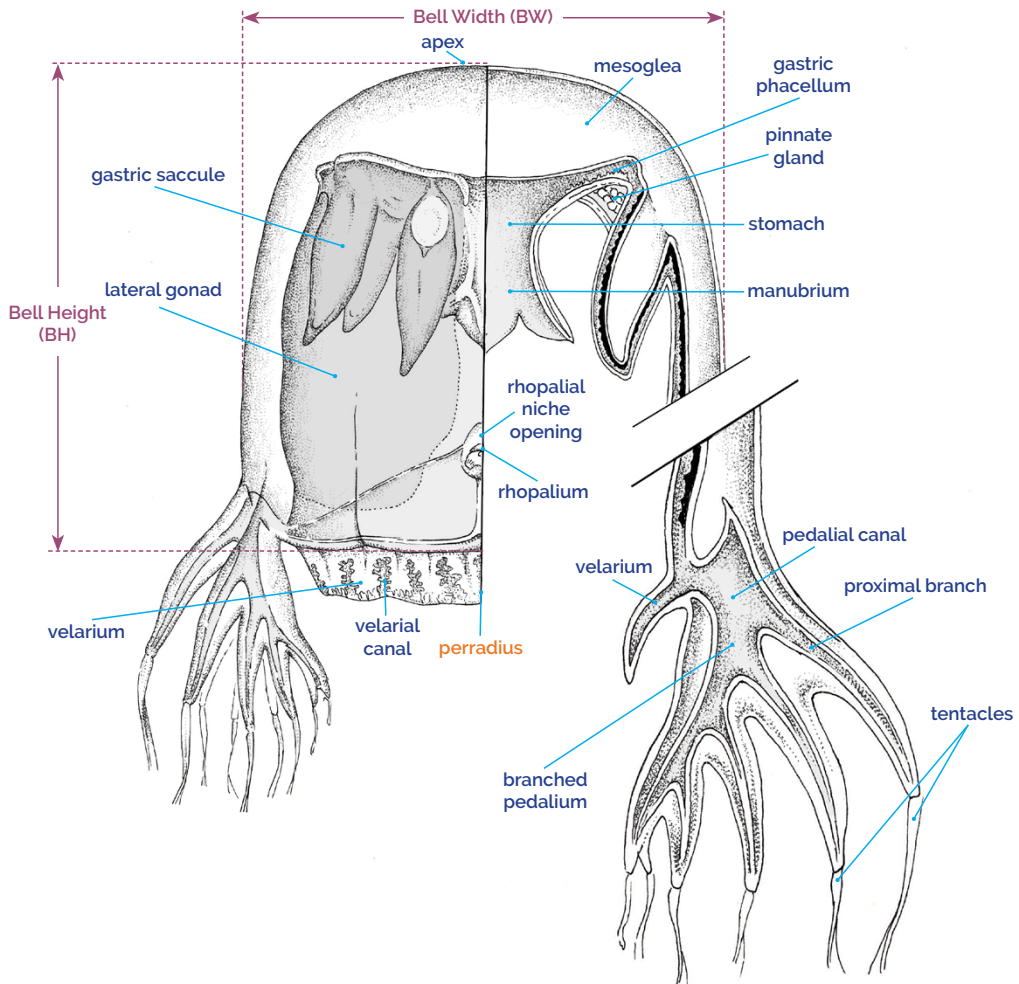


Fig. 4. Chirodropida (perradial view; left side, external view; right side, internal organization; section of pedalum on the right in interradiar view)

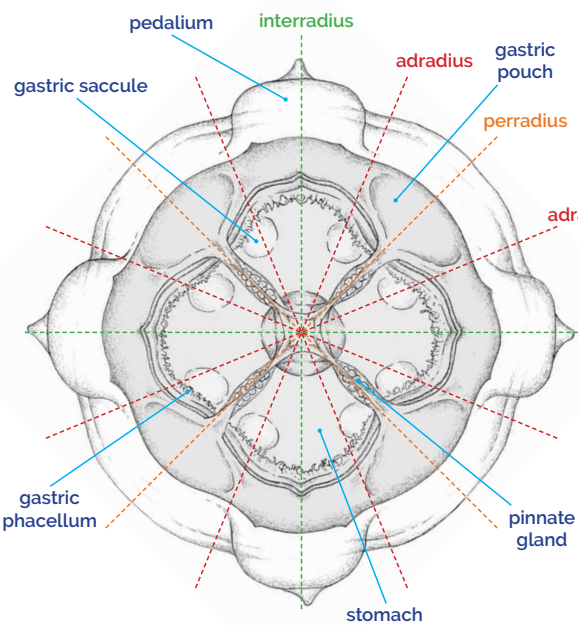


Fig. 5. Chirodropida (aboral view)

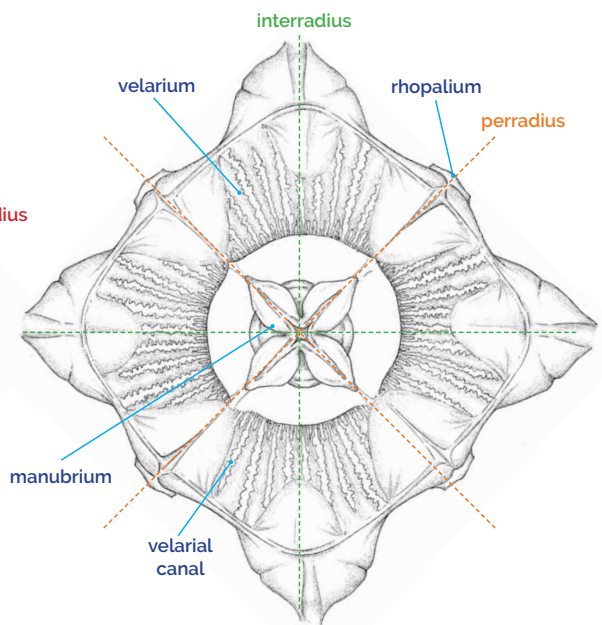


Fig. 6. Chirodropida (oral view)

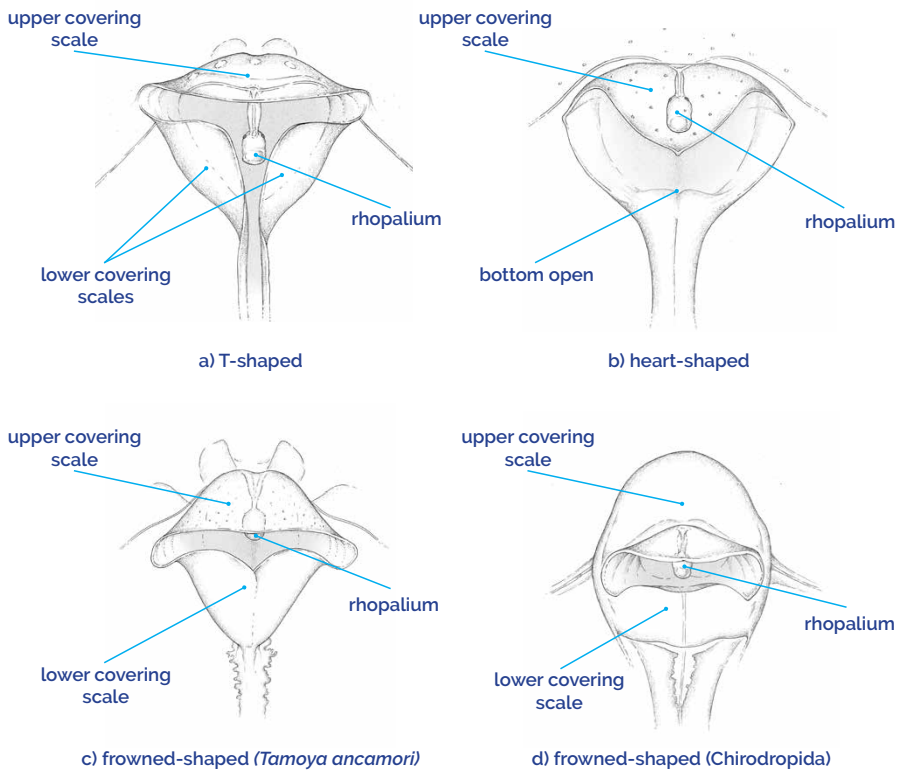


Fig. 7. Types of rhopalial niche openings

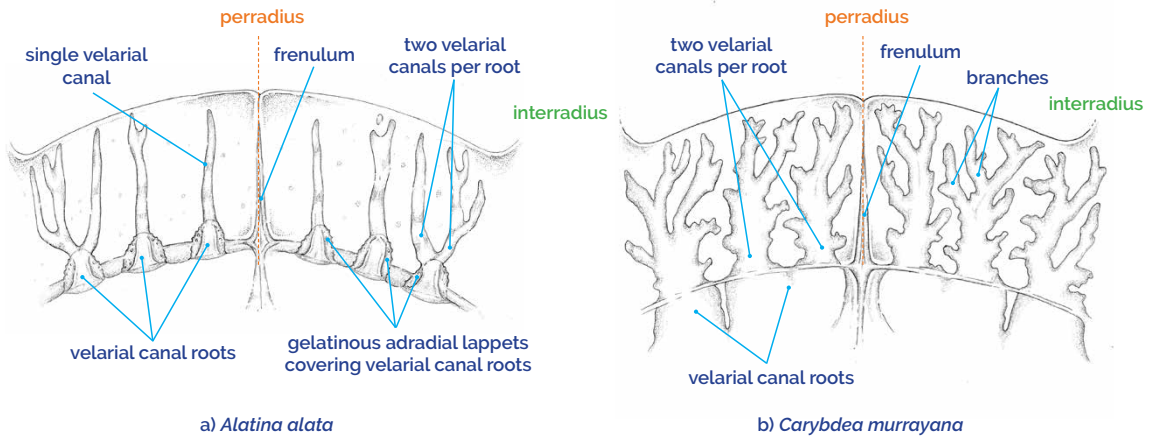


Fig. 8. Portion of velarium

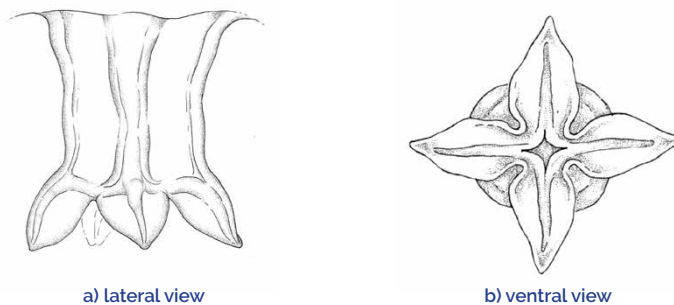
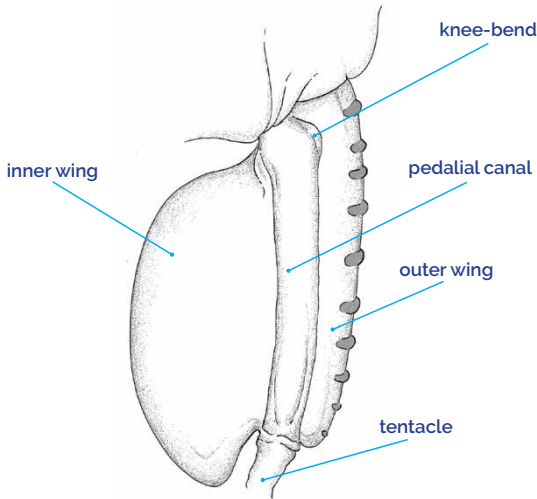
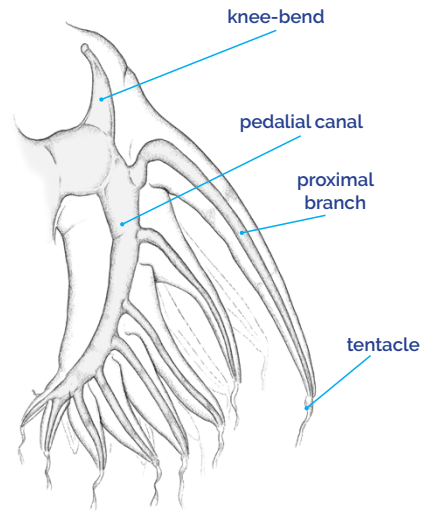


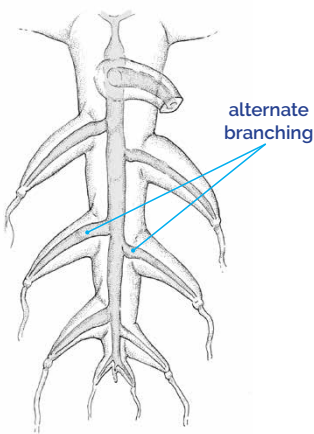
Fig. 9. Manubrium



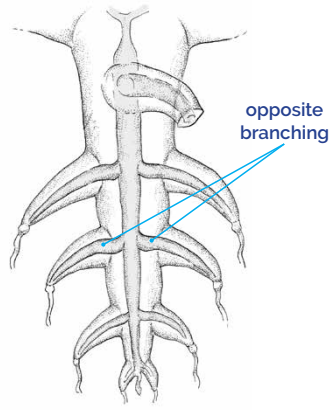
a) Carybdeida (lateral view)



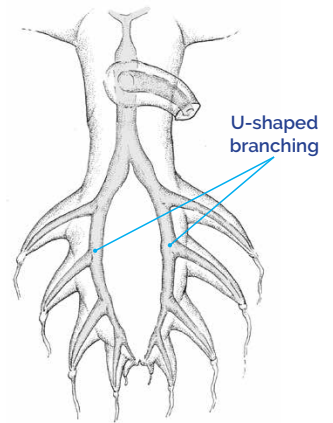
b) Chirodripida (lateral view)



c) *Chirodripus palmatus* (frontal view)

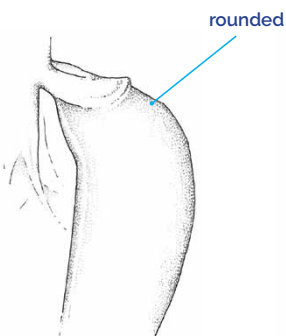


d) *Chirodripus gorilla* (frontal view)

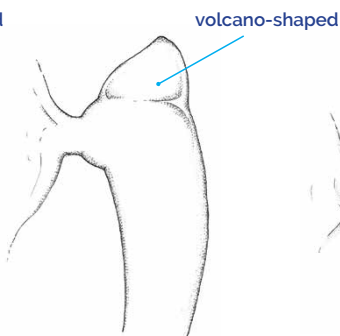


e) *Chironex* spp. (frontal view)

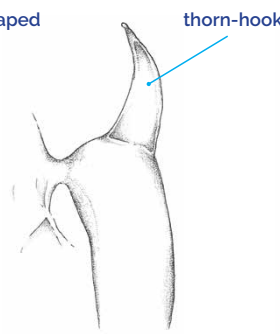
Fig. 10. Types of pedalia



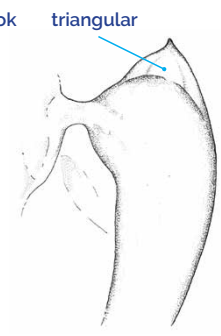
a)



b)



c)



d)

Fig. 11. Types of pedial knee-bends

CLASS CUBOZOA

Key to orders of Cubozoa occurring in the area

- 1a.** Pedalia simple, with a single tentacle (Fig. 1), gastric saccules and pinnate glands absent (Fig. 2); interradial lappets in velarium absent **order Carybdeida** (p. 28)

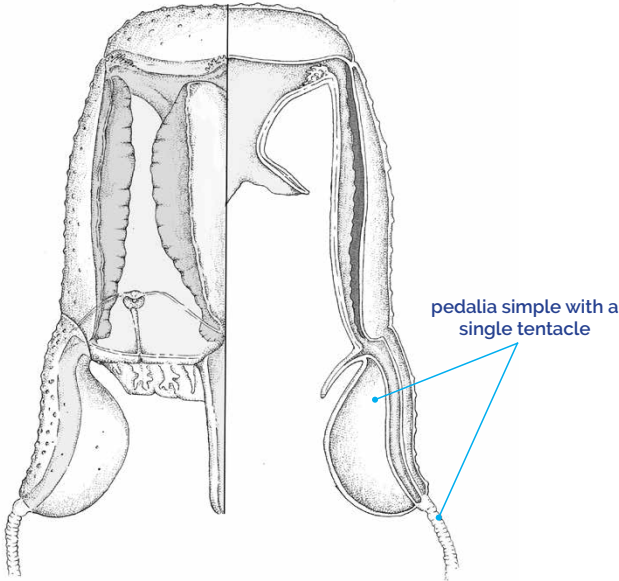


Fig. 1. Carybdeida (lateral view; left side, external view; right side, internal organization)

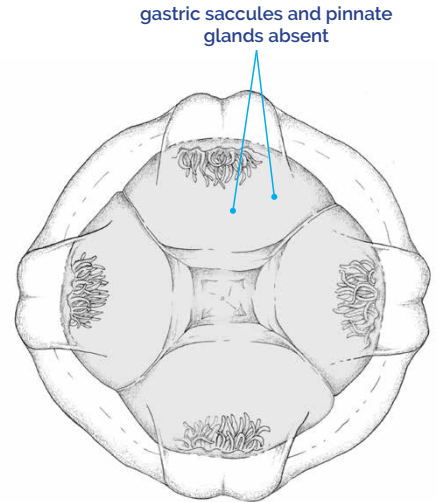


Fig. 2. Carybdeida (aboral view)

- 1b.** Pedalia branched, with numerous tentacles (Fig. 3); perradial gastric saccules and four perradial pinnate glands present (Fig. 4); eight perradial and eight interradial lappets in velarium present **order Chirodropida** (p. 42)

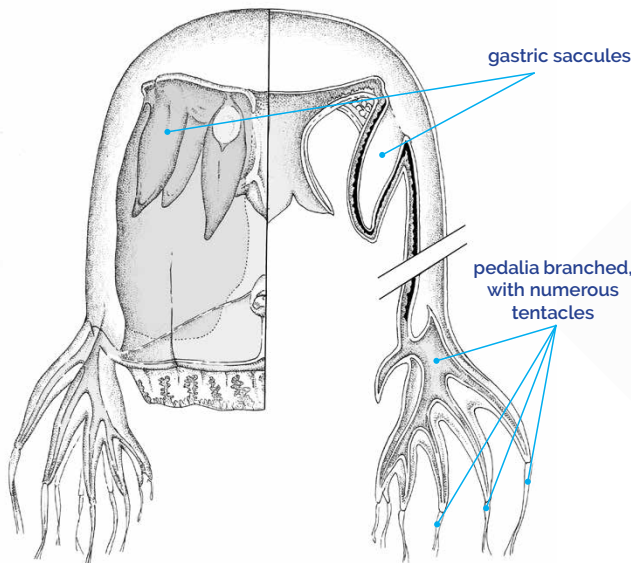


Fig. 3. Chirodropida (lateral view; left side, external view; right side, internal organization)

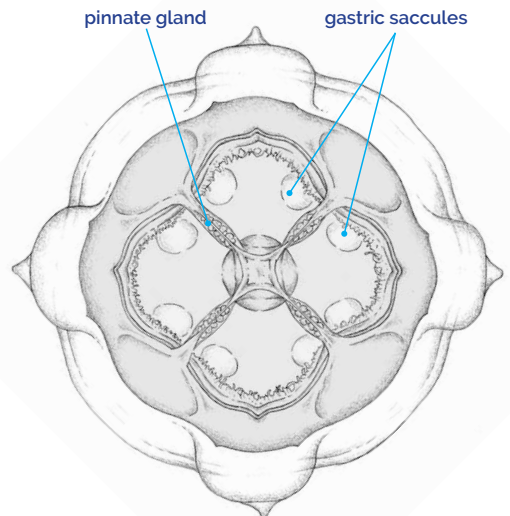


Fig. 4. Chirodropida (aboral view)

ORDER CARYBDEIDA

Key to families of Carybdeida occurring in the area

- 1a.** Gastric phacellum crescentic-shaped (Fig. 1); stomach small, flat; **rhopial niche openings T-shaped, with three covering scales** (one upper and two lower) (Fig. 2); velarium with adradial lappets, with three canal roots per octant, with one simple to complexly branched canal per root (Fig. 3) **family Alatinidae** (one genus in the area: *Alatina*) (p. 29)

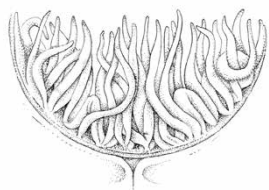


Fig. 1. Gastric phacellum

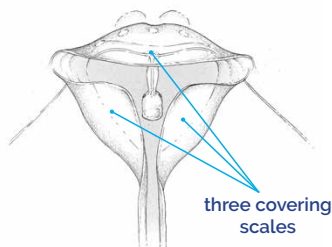


Fig. 2. Rhopial niche opening

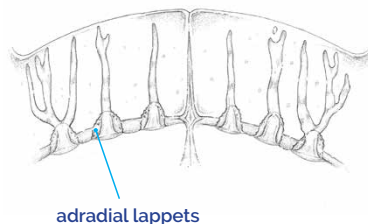


Fig. 3. Portion of velarium

- 1b.** Gastric phacellum epaulette-shaped (Fig. 4); stomach small, flat; **rhopial niche openings heart-shaped with one upper covering scale** (Fig. 5); velarium plain, lacking any lappets, with two or three canal roots per octant with one or up to four single or multiple, simple to branched canals per root (Fig. 6) **family Carybdeidae** (one genus in the area: *Carybdea*) (p. 35)

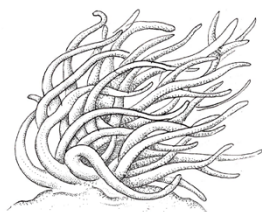


Fig. 4. Gastric phacellum

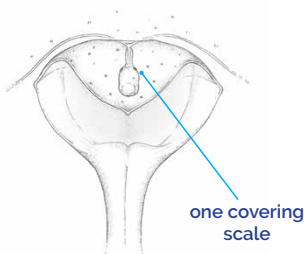


Fig. 5. Rhopial niche opening

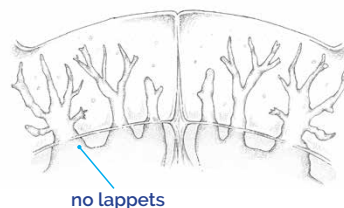


Fig. 6. Portion of velarium

- 1c.** Gastric phacellae arranged in vertical lines (Fig. 7); stomach huge, sack-like (1/3 of BH) (Fig. 8); **rhopial niche openings slit to frown-shaped with two covering scales (one upper, one lower scale) and two back-ground bays of niche cavity** (Fig. 8); velarium lacking any lappets, with three canal roots per octant, with one to three complexly lobed and branched canals per root (Fig. 9). **family Tamoyidae** (one genus *Tamoya*; only one species in the area: *Tamoya ancamori*, p. 40)

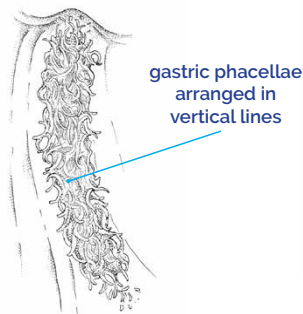


Fig. 7. Gastric phacellum

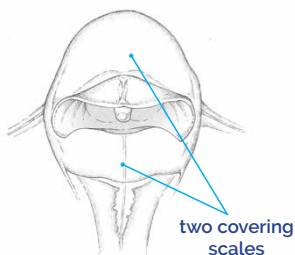


Fig. 8. Rhopial niche opening

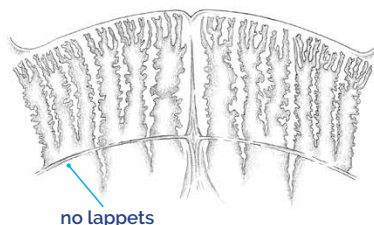
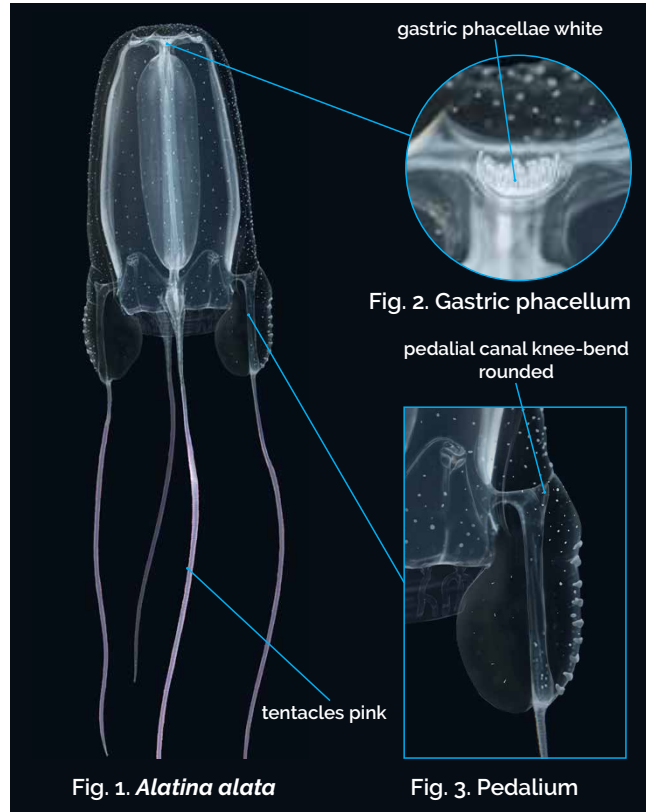


Fig. 9. Portion of velarium

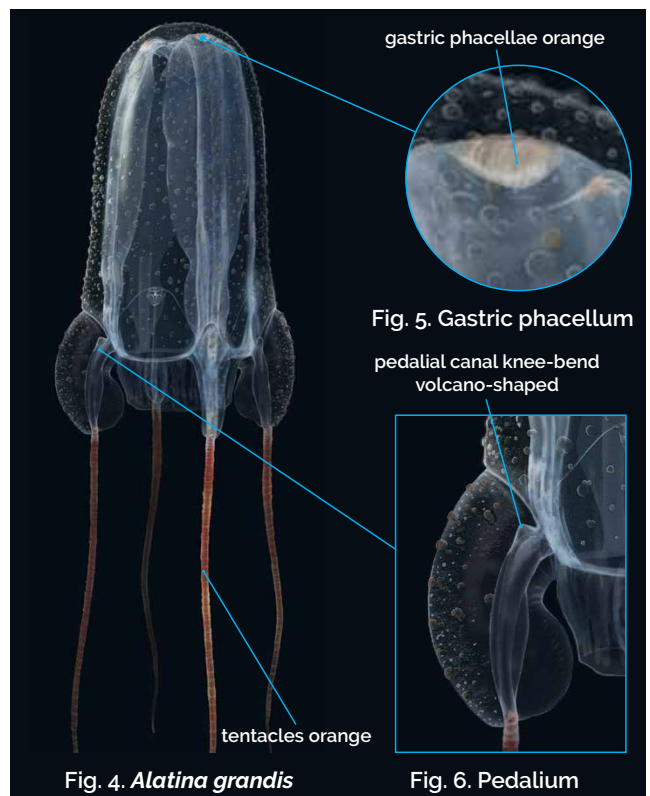
FAMILY ALATINIDAE

Key to species of *Alatina* occurring in the area and neighbouring waters

- 1a. Gastric phacellae white (Fig. 2), tentacles pink; bell pyramidal to rocket-shaped (Fig. 1); mesoglea feeble (body not holding shape when preserved), bell scattered with evenly spaced, very small, reddish nematocyst warts; pedalum broad, scalpel-shaped, pedial canal knee-bend rounded (Fig. 3) *Alatina alata* (p. 30)



- 1b. Gastric phacellae and tentacles orange, bell orange tinged (Figs. 4 & 5); bell rocket-shaped, mesoglea very sturdy, densely scattered with large, gelatinous, orange-tinged nematocyst warts; pedalum broad, double-axe-shaped, outer and inner wing overhanging tentacle insertion, pedial canal knee-bend volcano-shaped, pedial canal characteristically spindle-shaped (narrow-broad-narrow) below knee-bend (Fig. 6) *Alatina grandis* (p. 32)



Alatina alata (Reynaud, 1830)

Diagnostic features

Bell pyramidal to rocket-shaped; **mesoglea feeble** (the body of freshly sampled specimens is quite solid but does not keep its shape when preserved in formol).

Gastric phacellae crescentic-shaped (Fig. 1).

Rhopial niche openings T-shaped with one upper and two lower covering scales (Fig. 2); lower covering scales completely separated.

Pedaliu broad, **scalpel-shaped**, inner wing very broad, might overhang tentacle insertion (in older/larger specimens); **pedalial canal** straight, of constant width from below knee-bend towards tentacle insertion; **knee-bend rounded without, or slightly volcano-shaped with blunt hook appended** (in larger/older specimens).

Velarium with three velarial canal roots per octant, one or two velarial canals per root, forked at tips in older specimens; canals flanking pedaliu biforked; canal roots covered with gelatinous adradial lappets (hard to see without a dissecting microscope) (Fig. 3).

Tentacles simple, filiform.

Colour

In life, bell highly transparent, colourless, with a blue tinge at bell ridges, scattered with tiny white to pinkish nematocyst warts. **Gastric phacellae transparent, colourless to pinkish white**. Ripe gonads cream to pale amber. **Tentacles 'fluorescent' pink**. Colours fade/change when specimens are preserved.

Size

BH about 12.0 cm; BW about 5.0 cm. BH/BW about 2.0.

Ecology

Medusae live more than one year. Normally found in deep waters, but they spawn en masse in shallow waters close to the coast approximately 12 days after full moon. Known to feed on benthic invertebrates.

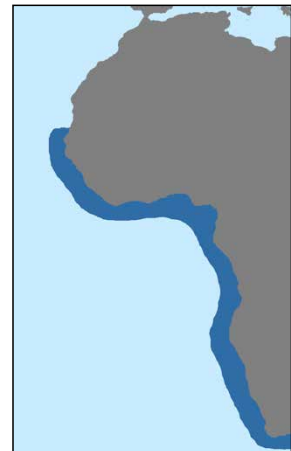
Stinging

Severe. Irukandji syndrome: local pain (abdominal, knee, ankle), nausea, sweating, anaphylaxis, anaphylactoid syndrome, persistent or delayed local cutaneous syndrome, catecholamine excess, elevated blood pressure, diaphoresis, tremor and abdominal cramps. Symptoms settle within 12 hours.

A report from Kwajalein Atoll reef (Marshall Islands) describes a slight sting to the finger causing excruciating pain for some time until application of a bee-sting ointment after which the pain gradually decreased.

Distribution

Circumtropical.



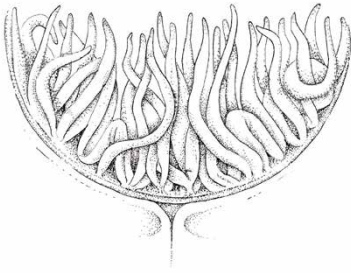


Fig. 1. Gastric phacellum

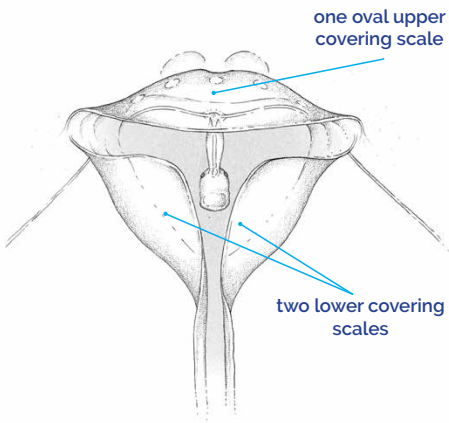


Fig. 2. Rhopalial niche opening

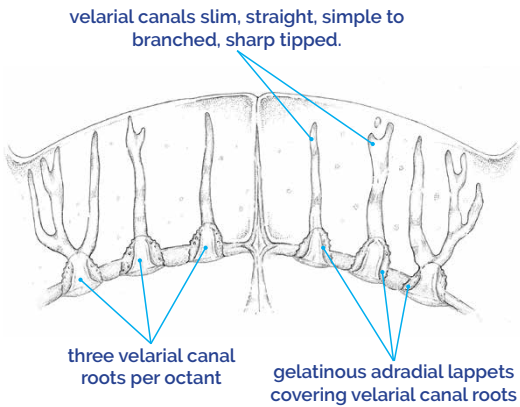
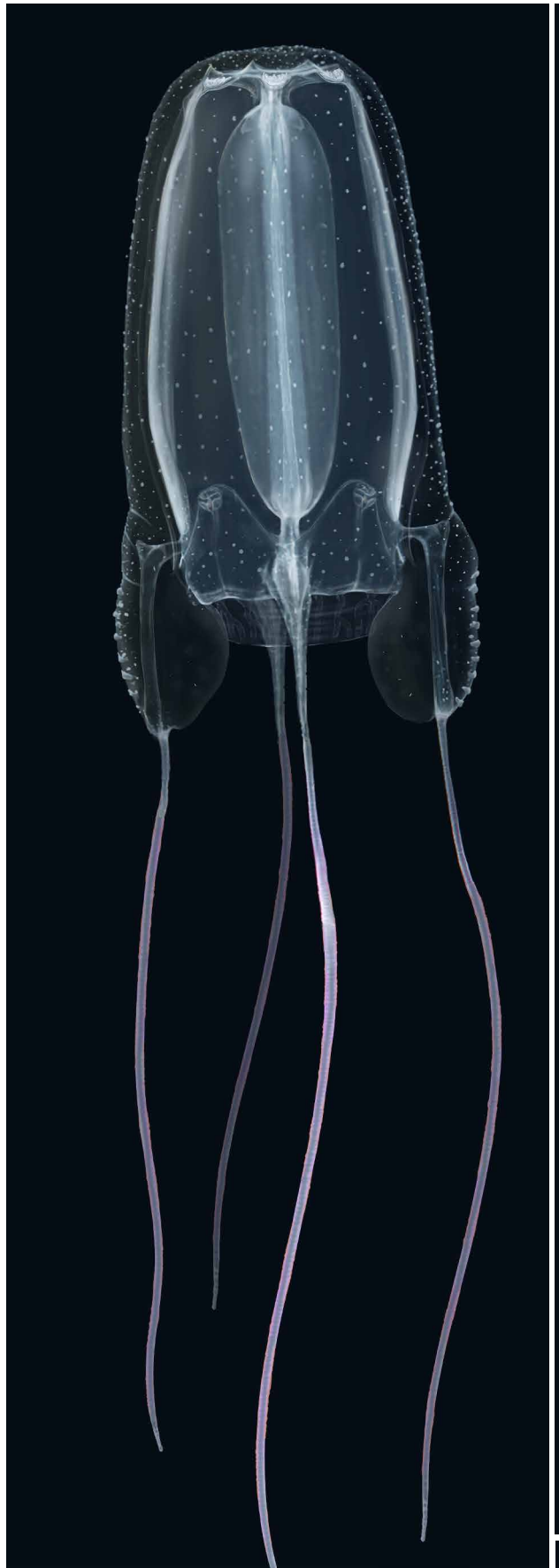


Fig. 3. Portion of velarium



Alatina grandis (Agassiz and Mayer, 1902)

Diagnostic features

Bell truncate, cone- to torpedo-shaped, covered with large, raised, nematocyst warts; **mesoglea thick, very heavy** (bell can break apart when lifted into the air due to weight).

Gastric phacellae crescentic-shaped (Fig. 1).

Rhopalial niche openings T-shaped with one upper and two lower covering scales (Fig. 2); lower covering scales completely separated.

Pedaliium broad axe- to double-axe-shaped; inner and outer wings nearly equal in shape and breadth, both well "over-hanging" tentacle insertion; inner wing rips off easily when handled/sampled; **pedalial canal** characteristic in shape, depressed at base, broad from canal knee-bend downwards, tapering towards distal end after first half of pedaliium; **knee-bend dome- to volcano-shaped with broad, blunt, rounded top** (Fig. 3).

Velarium with three velarial canal roots per octant, one to three velarial canals per root, broad at base, tapering towards distal end, straight, all more or less equally complex: simple to triforked with additional biforked tips; many short, spike-like side canals and lobes with sharp tips give a jagged appearance; canal roots covered with gelatinous adradial lappets (hard to see without a dissecting microscope).

Tentacles simple, filiform.

Colour

In-life, bell highly transparent, colourless with a faint orange tinge, covered with large transparent, gelatinous nematocyst warts, some of which are orange to reddish brown along bell ridges. Gastric phacellae transparent to pinkish to yellowish pink (in larger animals). Pedalial keels marked by large reddish brown nematocyst warts or bands; distal end of pedalia orange to reddish brown. **Tentacles yellowish pink to orange**, may also be striped (white/orange). Colours fade/change when specimens are preserved.

Size

BH \geq 24.0 cm, BW \geq 14.0 cm (according to Williamson *et al.*, 1996: BH \leq 38.0 cm; BW \leq 22.8 cm); BW/BH about 0.6.

Ecology

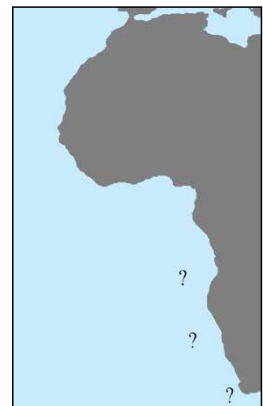
A. grandis seems to be a deep-sea species as it was also collected between 600 and 1 000 m depth with a closing net.

Stinging

Mild to severe (reported from Oman without further details). One report from the Republic of Marshall Islands stated a stinging sensation on fingers and palm of the hand after touching a PVC pipe used to fend one specimen off. This stinging sensation turned to pain that continued to mount to excruciating pain and took a couple of hours to subside. The fingers almost looked burned. No fatal cases reported up to now.

Distribution

Pacific Ocean (French Polynesia), Indian Ocean (from Malaysia to the Arabian and Red Sea and to Southern Africa).



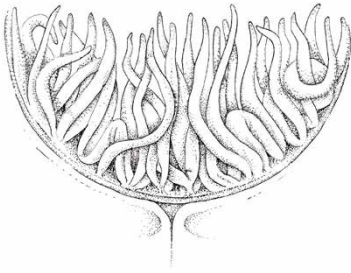


Fig. 1. Gastric phacellum

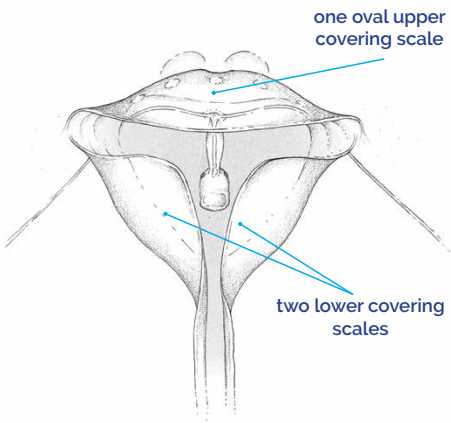


Fig. 2. Rhopalial niche opening

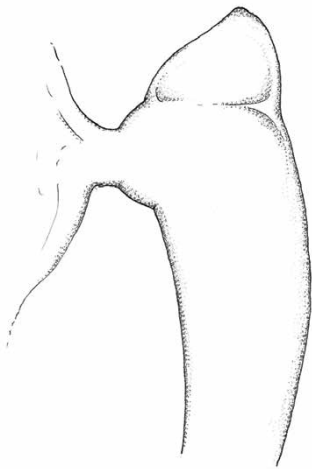
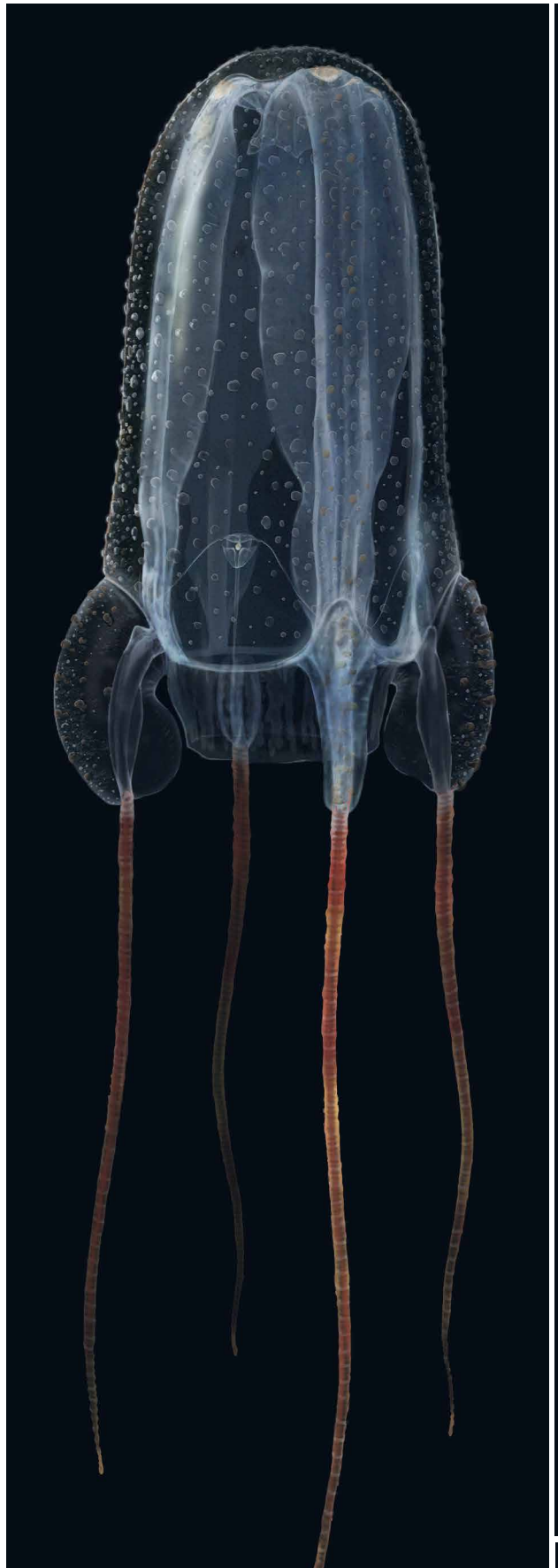


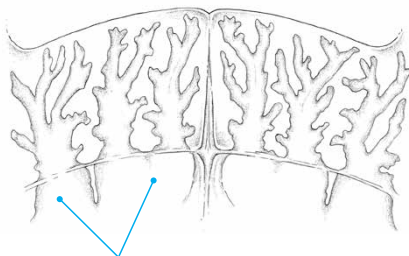
Fig. 3. Detail of pedaliu knee-bend



FAMILY CARYBDEIDAE

Key to species of Carybdeidae occurring in the area and neighbouring waters

- 1a.** Brownish coloured spots located over gastric phacellae, pedalia bases, and tentacle insertion (Fig. 1); tentacles whitish, cubic bell covered with large, white nematocyst warts; pedial canal knee-bend, strongly volcano-shaped (Fig. 2); two velarial canal roots per octant, with two to four complexly branched canals per root (Fig. 3); BH up to 9.0 cm.
 . . . *Carybdea murrayana* (=former *Carybdea branchi*) (p. 36)



two velarial canal roots per octant

Fig. 3. Portion of velarium

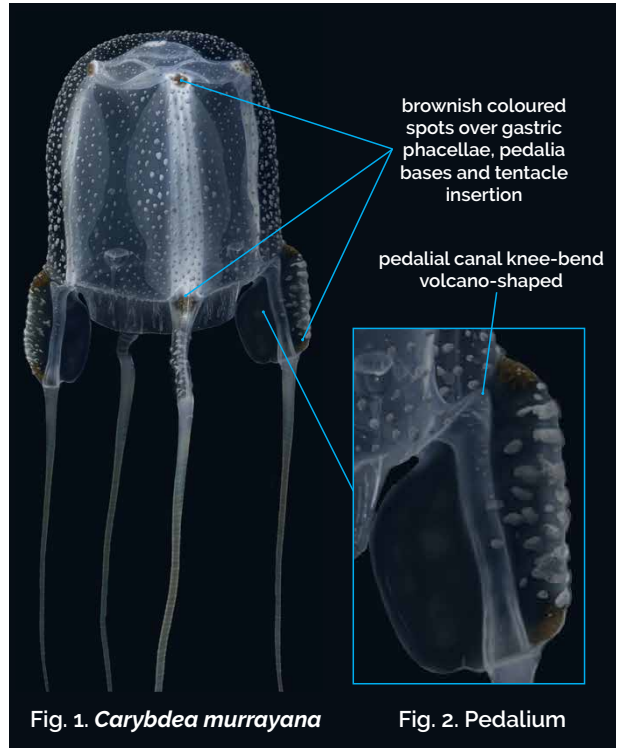
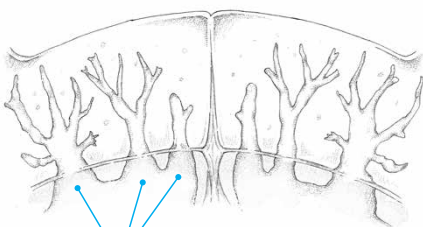


Fig. 1. *Carybdea murrayana*

Fig. 2. Pedalium

- 1b.** Gastric phacellae brownish coloured at "brush base" (only brownish-coloured body part) (Figs. 4 & 5), tentacles white; cubic bell covered with small, white to brownish nematocyst warts; pedial canal knee-bend rounded, without appendage (Fig. 6); three velarial canal roots per octant with one simple to branched canal per root (Fig. 7); BH up to 4.5 cm
 *Carybdea marsupialis* (p. 38)



three velarial canal roots per octant

Fig. 7. Portion of velarium

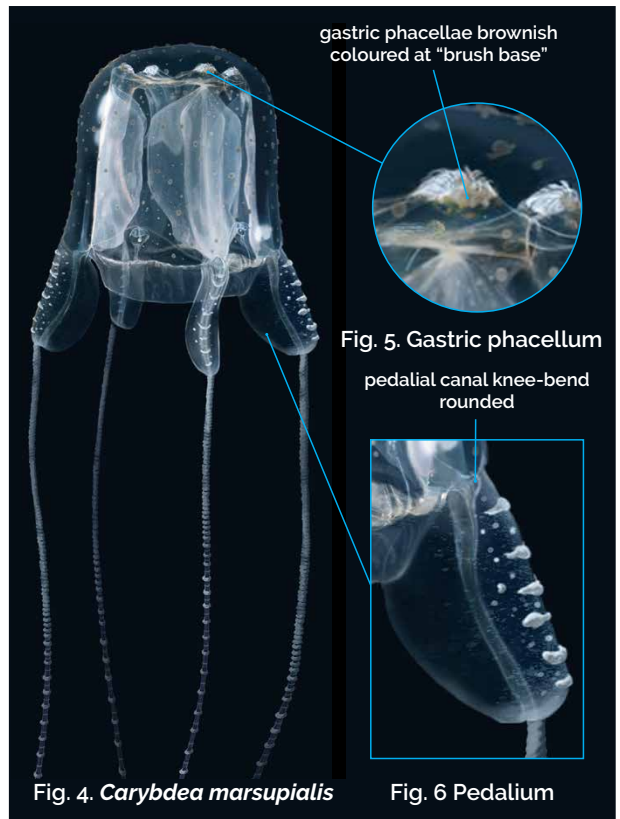


Fig. 4. *Carybdea marsupialis*

Fig. 6 Pedalium

Fig. 5. Gastric phacellum

Diagnostic features

Bell cuboid, wider than high, densely scattered with irregularly shaped nematocyst warts of different sizes from apex (very small warts also on bell sides) to bell margin (large warts on bell ridges and margin); **mesoglea** very thick at domed apex.

Gastric phacellae epaulette-shaped (Fig. 1).

Rhopalial niche openings broad, heart-shaped with one upper covering scale; bottom open (Fig. 2).

Pedaliium scalpel-shaped; inner wing broad, slightly overhanging tentacle insertion, outer wing narrow, with irregular, white nematocyst warts and bands; outer keel lined with irregularly shaped nematocyst bands; **pedalial canal** of even width from knee-bend towards distal end, going straight through pedaliium, flaring at tentacle insertion; **knee-bend volcano shaped without appendage**.

Velarium with two velarial canal roots per octant, two to four velarial canals per root, slim, mostly with rounded tips; canals flanking frenulum of the same complexity and size as canals flanking pedalia, with two or three lobed main branches and several lobed side branches, resembling "gnarled" trees; no adradial lappets (Fig. 3).

Tentacles simple, filiform.

Colour

In life, bell highly transparent, colourless with white nematocyst warts. Gastric phacellae mainly white, **lower parts of gastric filaments yellowish to reddish brown.** Pedalial keels marked by white nematocyst warts or bands, outer wing base-area light brown, outer wing distal end-area dark reddish brown; tentacles pale pink. Gonads transparent to white. Colours fade/change fast when specimens are preserved.

Size

BH \leq 8.2 cm, BW \leq 9.9 cm; BW/BH about \leq 1.26.

Ecology

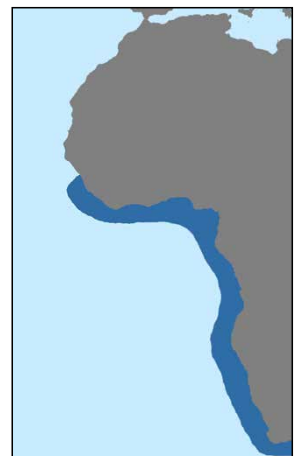
Medusae seem to travel with the Benguela current along the western shores of the African continent. It is a cold-water species found in harbours and kelp forests.

Stinging

Severe. Fire-like pain lasting about 10 minutes; cessation of heart-beat, followed by abnormally rapid heartbeats for a few minutes, repeating the process for several times before the heart stabilizes.

Distribution

From the Indian Ocean (South Africa) to the East Atlantic Ocean (Namibia to Sierra Leone).



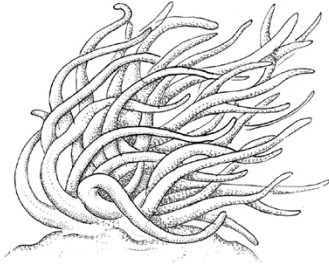


Fig. 1. Gastric phacellum

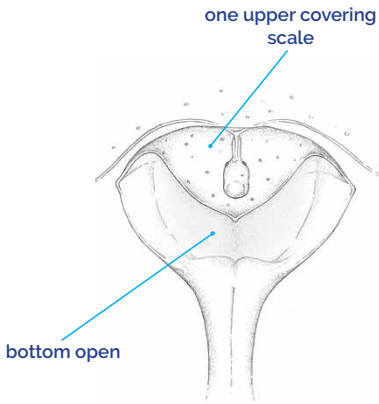


Fig. 2. Rhopalial niche opening

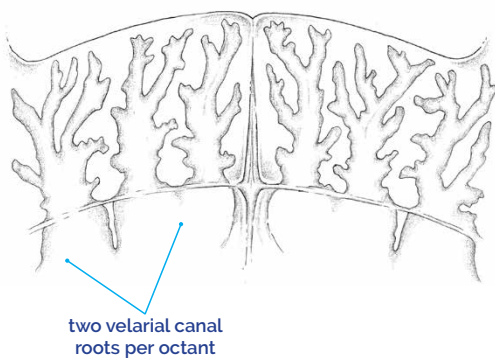


Fig. 3. Portion of velarium



Carybdea marsupialis (Linnaeus, 1758)

Diagnostic features

Bell truncate, cuboid, slightly higher than wide, scattered with nematocyst warts of different sizes from apex (very small warts) to bell margin (large warts on bell sides); **mesoglea** very thick at domed apex.

Gastric phacellae epaulette-shaped (Fig. 1).

Rhopalial niche openings heart-shaped with one upper covering scale; bottom open (Fig. 2).

Pedaliium scalpel-shaped; inner wing broad, outer wing narrow, scattered with tiny nematocyst warts, outer keel lined with irregularly shaped nematocyst bands; **pedalial canal** of even width from knee-bend towards distal end, slightly curved towards inner keel; **knee-bend rectangular to rounded without any appendage**.

Velarium with three velarial canal roots per octant, one velarial canal per root, and slim, sharp pointed tips; canals flanking frenulum simple, mostly non-forked; middle canals mostly with two main branches and single side branches; canals flanking pedalial bases with three or four main branches and several side branches (Fig. 3); no adradial lappets.

Tentacles simple, filiform, pearl chain-like.

Colour

Bell (in-life) highly transparent, colourless with **whitish to brownish, different sized scattered nematocyst warts**. **Gastric phacellae mainly white, lower parts of gastric filaments brownish orange to reddish brown**. Pedalial keels marked by large white to brownish nematocyst warts or bands, tentacles pale pink with white nematocyst batteries. Gonads white. Colours fade/change when specimens are preserved; colour of brownish base of gastric phacellae fades very slowly.

Size

BH \leq 4.05 cm, BW \leq 4.0 cm; BW/BH about \leq 0.99.

Ecology

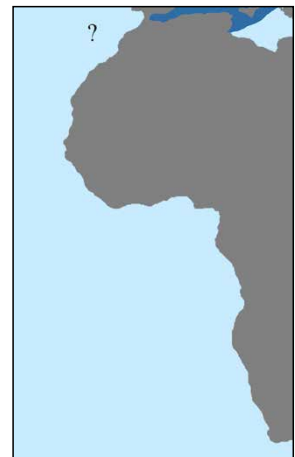
Medusae can be found along sandy beaches with a gentle slope where seagrass meadows (*Posidonia oceanica*) coexist with rocky and sandy bottoms or in deeper waters of the temperate Mediterranean Sea. Medusae are night and day active, hunting for plankton and fish larvae. Fertilization internal, shedding fertilized eggs into the open water.

Stinging

Severe pain, burning sensation, erythematous-vesicular eruption and local oedema.

Distribution

Mediterranean Sea.



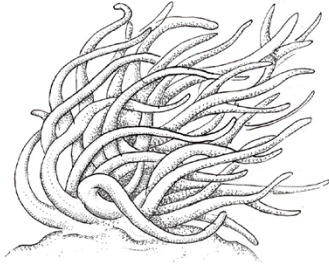


Fig. 1. Gastric phacellum

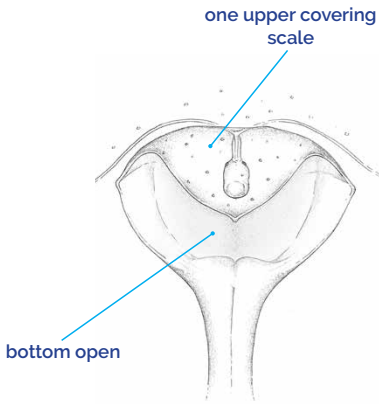


Fig. 2. Rhopalial niche opening

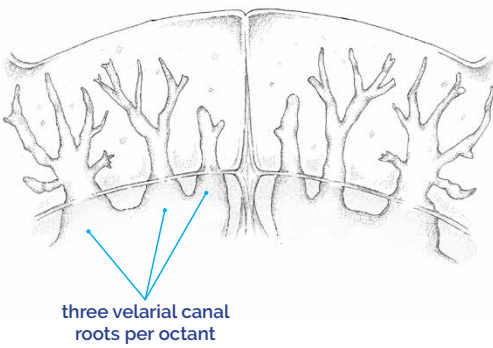
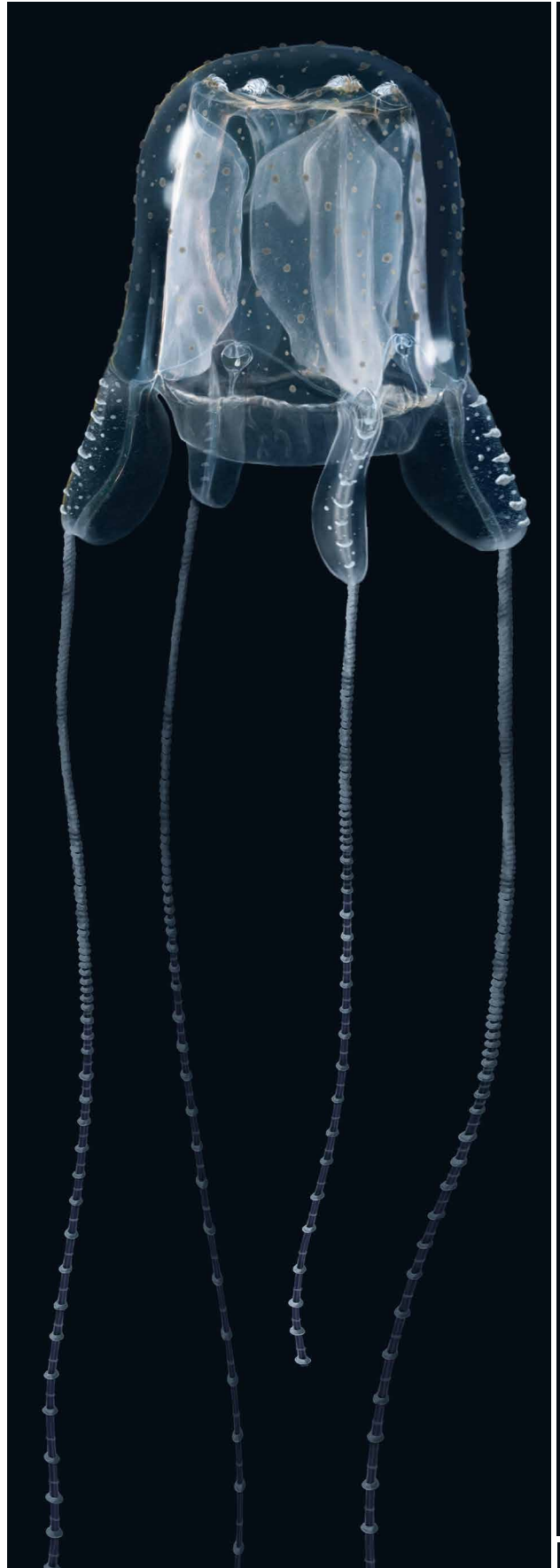


Fig. 3. Portion of velarium



Diagnostic features

Bell pyramidal with rounded edges, higher than wide, densely scattered with large, prominent, colourless nematocyst warts; **mesoglea** thick, thickest at slightly arched apex.

Gastric phacellae arranged in vertical rows lining stomach walls from top to mouth entrance (Fig. 1).

Rhopalial niche openings slit-like to frown-shaped with one rounded, upper covering scale and one rounded, lower covering scale (Fig. 2).

Pedanium narrow, leaf-shaped, inner wing nearly semi-oval, outer wing narrow, semi-oval, without nematocyst warts; **pedalial canal** of even width from below knee-bend to distal end, where it broadly flares, going straight through pedanium; knee-bend sharply edged, triangular with upward turned thorn appended.

Velarium with three velarial canal roots per octant, one to three velarial canals per root, broad in width, running straight in parallel, complexly branched with delicately dendritic ends with rounded "capitate" tips. Number of canals increasing from frenulum to pedalial base: one canal next to frenulum, two or three middle canals, three or four canals flanking pedanium (Fig. 3). Velarial canal patterns from pedalial base to frenulum equally complex; no adradial lappets.

Tentacles filiform in preserved specimens, might be ribbon-like in living specimens.

Colour

In preserved specimens, bell transparent, large gelatinous nematocyst warts colourless, gastric phacellae off white, might be pinkish in living animals; tentacles light pink to flesh coloured, gonads opaque brown-orange to flesh coloured. As the colours of living box jellyfish fade in general fast as soon as they are preserved the colours presented here might not be the colours in life.

Size

Preserved (formol): BH \leq 10.0 cm, BW \leq 8.9 cm; BW/BH about \leq 0.89.

Ecology

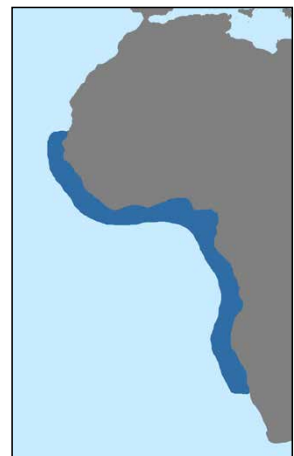
No data. The only preserved animals from the MS *Discovery*" survey were examined in European museums.

Stinging

No data.

Distribution

East Atlantic Ocean (West Africa from the Gambia to Gabon).



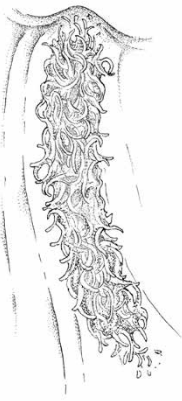


Fig. 1. Gastric phacellum

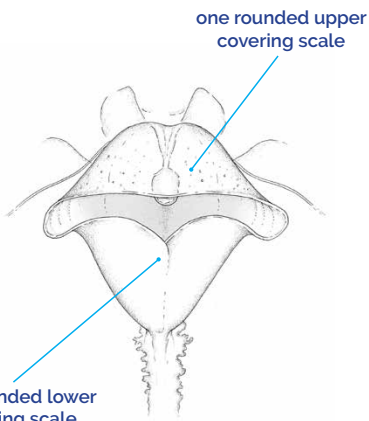


Fig. 2. Rhopalial niche opening

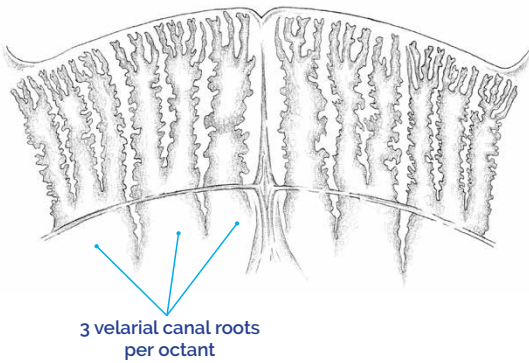


Fig. 3. Portion of velarium



ORDER CHIROPIDIDA - FAMILY CHIROPIDIDAE*

Key to genera of Chirodripidae occurring in the area and neighbouring waters

- 1a. Pedalial canal undivided, oppositely branched (Fig. 1); knee-bend with huge spike-like appendage (Fig. 2) *Chirodripus* (p. 43)

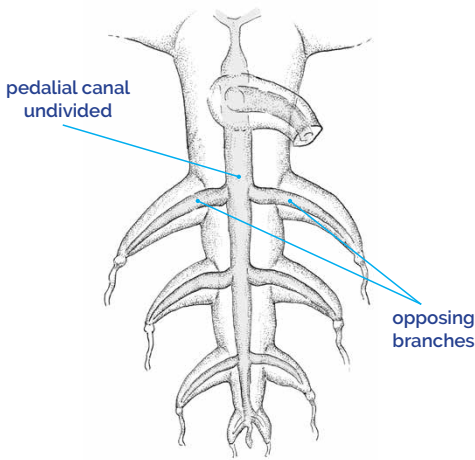


Fig. 1. Pedalium (ventral view)

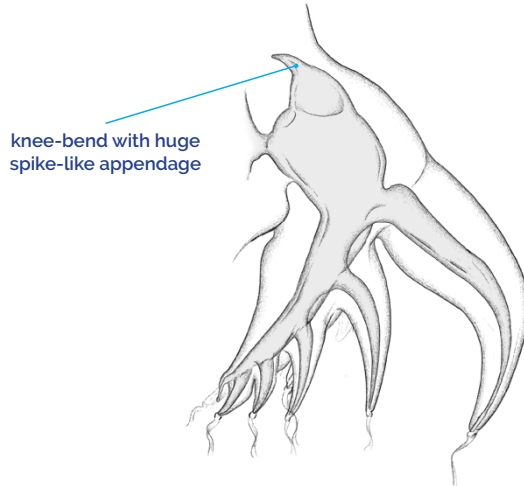


Fig. 2. Pedalium (lateral view)

- 1b. Pedalial canal divided, each fork arm with unilateral branches (Fig. 3); knee-bend with volcano to thorn-shaped appendage (Fig. 4) *Chironex* (two, not yet described species occurring in African waters – be aware that those animals can be deadly dangerous)

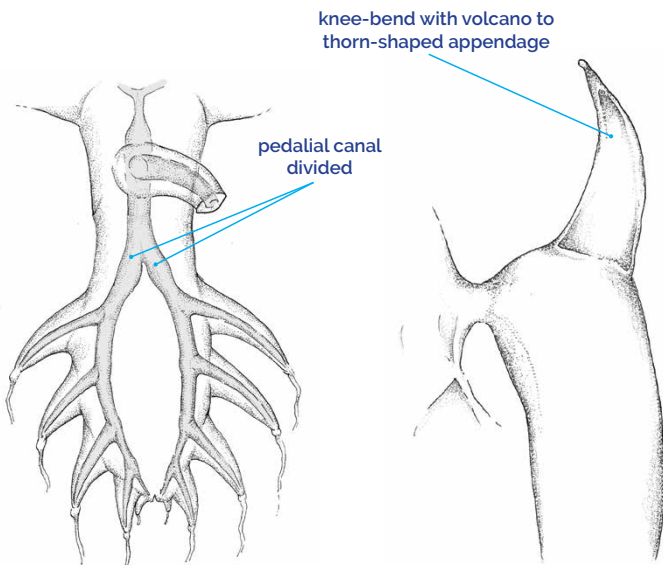


Fig. 3. Pedalium (ventral view)

Fig. 4. Detail of knee-bend (lateral view)



Fig. 5. *Chironex* sp.

*Up to now only one family occurring in the area

Key to species of *Chirodopus* occurring in the area

- 1a.** Gastric saccules cock's-comb-shaped with distinct lobes or numerous (> 20), digitate appendages (Fig. 1), without leaf-like lateral gonads.
 *Chirodopus gorilla* (p. 44)

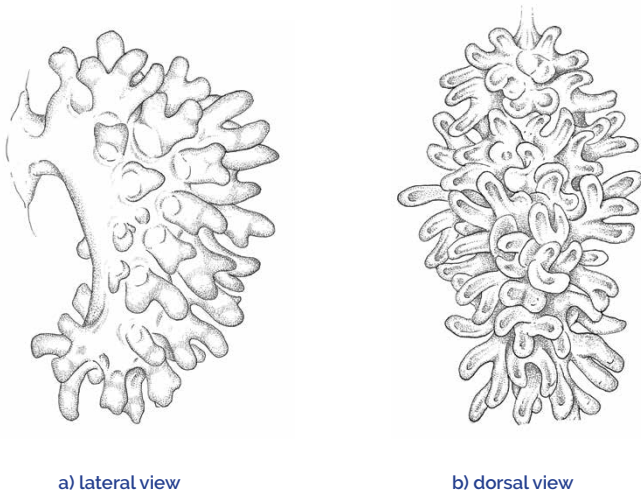


Fig. 1. Gastric saccules



Fig. 2. *Chirodopus gorilla*

- 1b.** Gastric saccules pendant, partly hollow, cone to finger-shaped, smooth (immature specimens) to lobed (mature specimens) with ≤ 10 drop-like to digitate appendages in one row (seldom two rows) along lateral rims (Fig. 3); leaf-like lateral gonads present (Fig. 4) .
 *Chirodopus palmatus* (p. 46)

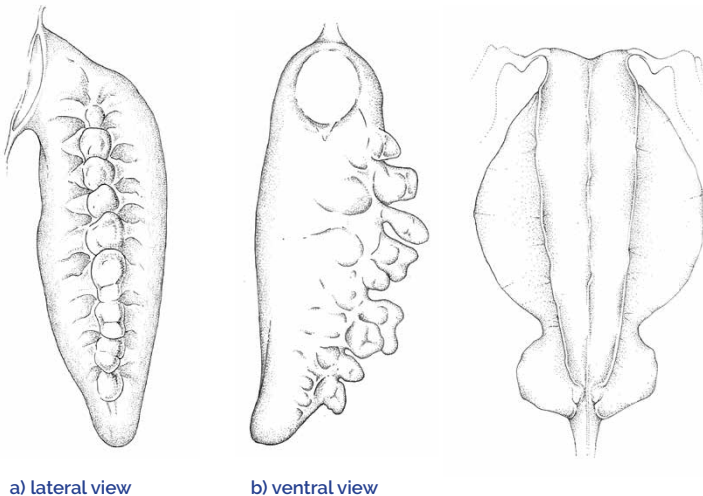


Fig. 3. Gastric saccules

Fig. 4. Lateral gonads



Fig. 5. *Chirodopus palmatus*

Diagnostic features

Bell sturdy, hemispherical, smooth, with eight meridian furrows; **mesoglea** thick. In preserved specimens, structure of bell surface shagreened (with leather-like pattern).

Gastric phacellae vertical, trapezium-shaped (Fig. 1), lining stomach walls from top to mouth entrance.

Rhopalial niche openings slit-like to frown-shaped with one hood-like upper covering scale and one convex lower covering scale (Fig. 2).

Pedaliium branched with 9–11 finger-like branches: one very long, single proximal branch (distinctly longer than pedalial palm) followed by four or five pairs of progressively shorter branches each bearing a single tentacle; **pedalial canal branches emanate from both sides of the undivided main canal, right and left-side branches arranged opposite to each other. Knee-bend volcano-shaped with a massive, upward-pointing thorn-shaped appendage.**

Velarium with one velarial canal root per octant, six velarial canals per root and an uncountable number of side canals.

Tentacles flat in cross section, ribbon-like (Fig. 3).

Four pairs of perradial gastric saccules, cock's comb-shaped, with ≥ 20 grape-like to long digitate appendages in at least two rows along the outer rim, filling nearly the whole subumbrella in mature specimens. No additional lateral gonads.

Colour

In life, bell highly transparent, colourless to brownish with reddish brown stripes lining the meridian bell furrows; pale brown linings marking the pedalia insertions, the midline of the pedalial branches and the sense niche openings; gastric saccules pink to mauve coloured; velarial canals purple; tentacles pale yellow to "rusty" yellowish-brown. Colours fade/change when specimens are preserved.

Size

Preserved (formol): BH \leq 21.0 cm, BW \leq 27.0 cm; BW/BH about \leq 1.29.

Ecology

No data on mating or brooding behaviour. Suggested to be a deeper water species that travels with the currents along the Western African coastline.

Stinging

No deaths nor serious stings are documented, but they have probably occurred. The geographical distribution of *Chirodopus* is along a coastline where records of envenomation may be difficult to access.

Distribution

Eastern Atlantic (from Liberia to Namibia).

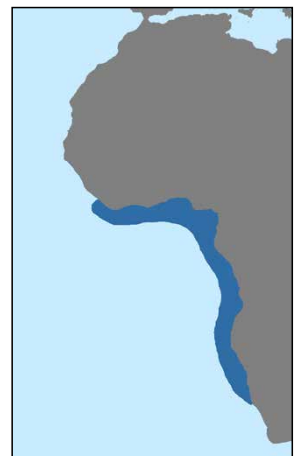
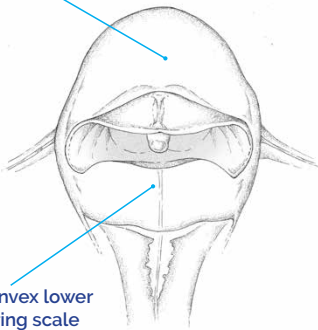




Fig. 1. Gastric phacellum
(vertical, along inner
stomach wall)

one hood-like upper
covering scale



one convex lower
covering scale

Fig. 2. Rhopalial niche opening



flat, ribbon-like

Fig. 3. Tentacle



Chirodromus palmatus Haeckel, 1880

Diagnostic features

Bell sturdy, hemispherical, smooth without eight meridian furrows; **mesoglea** thick, thickest at domed apex. In preserved specimens, structure of bell surface remains smooth.

Gastric phacellae horizontal, U-shaped (Fig. 1), lining stomach rim.

Rhopalial niche openings slit-like to frown-shaped with one hood-like upper covering scale and one convex lower covering scale (Fig. 2).

Pedaliium branched with 12–21 finger-like branches: one long, single proximal branch (equal to or shorter than pedalian palm, never longer) followed by six to ten pairs of progressively shorter branches each bearing a single tentacle; broad bases of branches overlap each other like roof shingles or fish scales; **pedalian canal** branches emanate from both sides of the undivided main canal; right and left side branches arranged alternating to each other; knee-bend volcano-shaped with a massive, upward-pointing spike to thorn-shaped appendage.

Velarium with one velarial canal root per octant, and one velarial canal per root, candelabrum-shaped, and with an uncountable number of side canals.

Tentacles filiform (round in cross section) (Fig. 3).

Four pairs of perradial gastric saccules, cone to finger-shaped with ≤ 10 drop-like to digitate appendages in one row (seldom two rows) along either lateral rims. Additional leaf-like lateral gonads present.

Colour

In life (and preserved), bell highly transparent, colourless with slightly opaque, yellowish to brownish gastric saccules, gastric filaments and lateral gonads; tentacles whitish to pinkish.

Size

BH ≤ 12.2 cm, BW ≤ 15.0 cm; BW/BH about ≤ 1.23 .

Ecology

Medusae are found at rocky coasts, with sandy beaches with rocky outcrops. They feed on small shrimps, fish and crab species.

Stinging

No data. The geographical distribution of *Chirodromus palmatus* is along a coastline where stinging may occur, but where track of these records are not kept.

Distribution

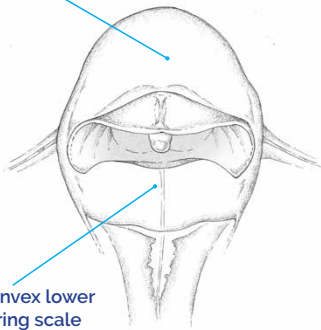
Northeastern to southeastern Atlantic Ocean (from Liberia to Angola).





Fig. 1. Gastric phacellum (horizontal, framing upper stomach rim)

one hood-like upper covering scale



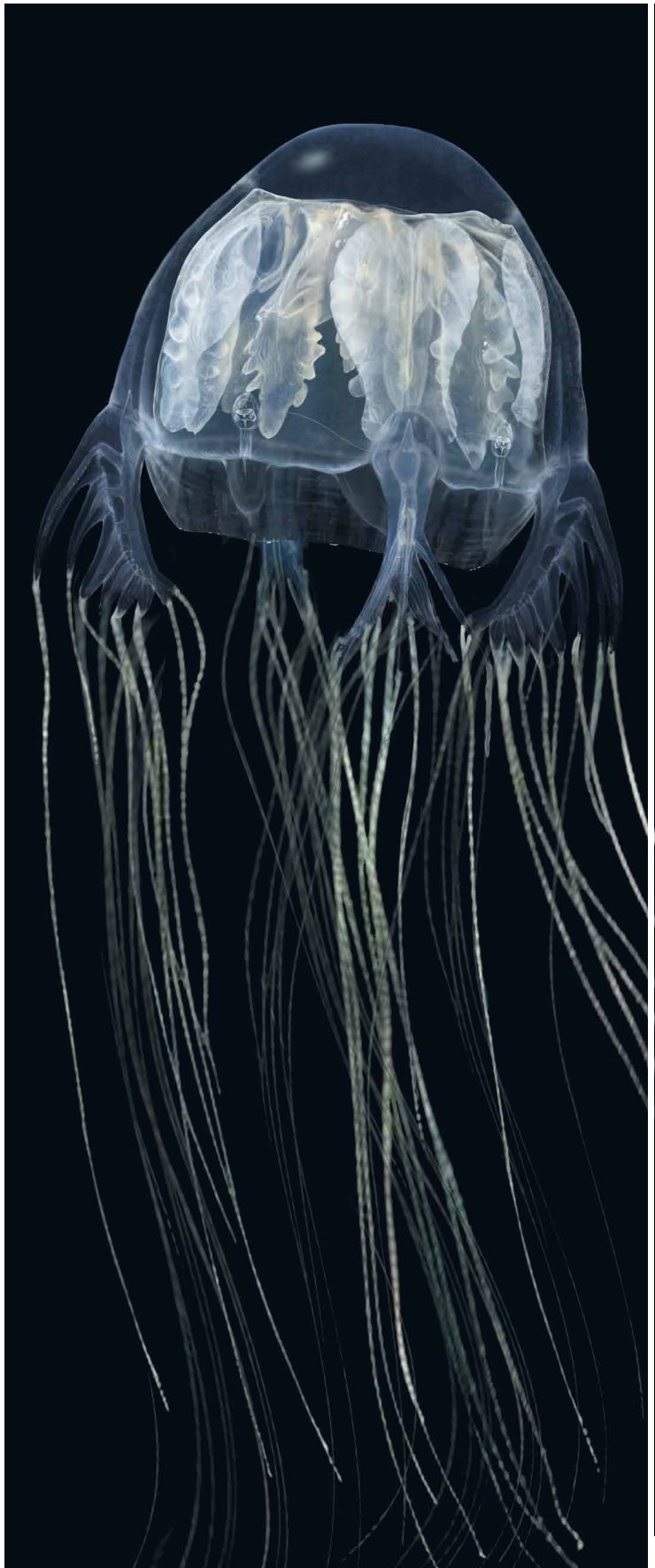
one convex lower covering scale

Fig. 2. Rhopalial niche opening



filiform, round in cross-section

Fig. 3. Tentacle



CLASS SCYPHOZOA

Scyphozoans are what most of us recognize as classical jellyfish. The familiar “blob” of jelly that is stranded on the shore and that is cautiously poked at by curious adults and children alike. Most species are less than 30 cm in diameter, but some may achieve a width of up to 2 metres and a mass of close to 200 kg. The class is difficult to unambiguously define. Technically, species have linear (not circular) mitochondrial DNA, microbasic euryteles (type of cnidocyte) and tetra-radial symmetry. But so too do cubozoans. Scyphozoans also have a lobed (scalloped) margin in the medusa stage and display true strobilation. In other words, one or more ephyra/e is/are released following transverse fission/s of the polyp at its oral end. The polyp persists and the process may be repeated.

The majority of scyphozoans have metagenetic life cycles; they enjoy a coastal distribution and are concentrated in the upper layers of the water column. That said, a few may be holoplanktonic (e.g. *Pelagia*), while others are primarily found in the mesopelagic zone.

Polyps give rise to ephyrae through a process known as strobilation, and may bud off just a single ephyra at a time (monodisk strobilation) or release multiple ephyrae in quick succession (polydisk strobilation). In temperate waters, the cue for strobilation is species-specific but is generally linked to changes in the environment (temperature, salinity, day-length, etc.) that signal the imminent arrival of conditions favourable for ephyra survival. Coastal ephyrae grow quickly on a diet of microzooplankton and protists, eating progressively larger prey as they mature. Sexual reproduction occurs either through the shedding of gametes freely into the water column, or by the fertilization of eggs brooded in the gastric cavity of females. Typically, but not always, sexual reproduction occurs synchronously across the population and adults generally die en masse afterwards. Regardless, the planula that develops eventually makes its way to the benthos, settles on a hard substratum and transforms itself into a polyp and the life cycle is repeated.

Ephyrae are likely to be eaten by many species of fish and jellyfish, like Cyaneidae and Pelagiidae, though field evidence to support this is scant owing to both their small size and the fact that they are likely to be digested very quickly. Adults (alive/dead) fall prey to a surprising variety of predators, including billfish, sharks, sunfish and turtles as well as seabirds and a number of pelagic and benthic invertebrates. While all scyphozoans can sting, the venom of the majority species is fairly mild to most people; the exception being the aptly named mauve stinger *Pelagia noctiluca*.

The class Scyphozoa is split into two orders: **Coronamedusae** (about 60 species) and **Discomedusae** (about 170 species) and advice on how to differentiate field caught specimens of the two orders is provided below.

Coronamedusae are defined by the presence of polyps (if present) that sit within a tubular, chitinous exoskeleton, and medusae (if present) that have a coronal groove and lack “oral arms”. The group displays a bewildering array of life cycles, with a number of species foregoing a classical medusa stage altogether. Although most Coronamedusae are less than 10 cm in diameter, *Periphylla periphylla* may attain a width of 35 cm. They are uncommon in coastal plankton samples, but may dominate samples collected in

deeper water; such individuals generally being dark red/purple in colour.

Discomedusae can be conspicuous in coastal waters and they come in a huge variety of shapes and colours: some may resemble enormous balls, others may be smooth, flattened discs and others still can be fluffy, frilly or conspicuously knobby. Not all species have tentacles at either the umbrella margin or on the subumbrella surface, but all possess oral arms. In the case of the Semaestomeae (about 70 species), the mouth sits centrally between the bases of these arms on the subumbrella surface, and the gastrovascular system radiates out to the periphery of the bell in a relatively simple way (see figs. 1-3, pp. 53 & 54). The arms themselves are generally lanceolate in shape, thin and comparatively long, and they lack any clubs, filaments or other outgrowths. In the Rhizostomeae (about 100 species), the central mouth is sealed off, and instead the oral arms support thousands of minute "mouthlets" that individually feed into a series of internal canals that run up through the arms to then radiate out to the bell periphery through a complex network of channels (see figs. 1 & 2, p 43). The arms are correspondingly stout and thickened, they are often fused (basally) and split and frequently support clubs and filaments (= appendages). Because species of Cepheida and (especially) Rhizostomida have thickened bells and oral arms, and lack any tentacles, they are favoured for human consumption.

CLASS SCYPHOZOA

Illustrated glossary of technical terms

Subclass Coronamedusae

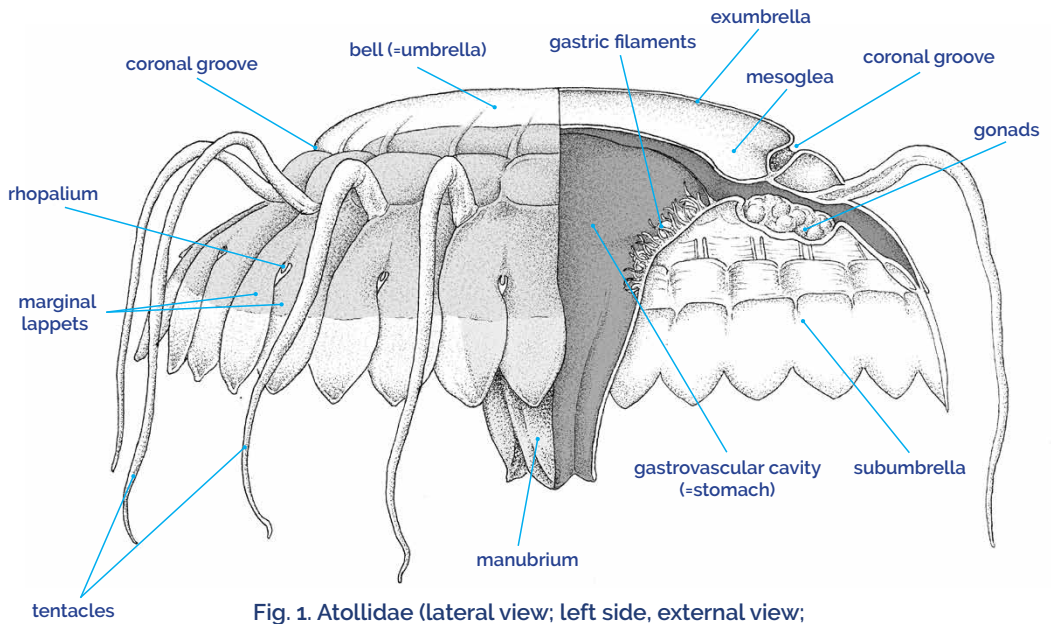


Fig. 1. Atollidae (lateral view; left side, external view; right side, internal organization)

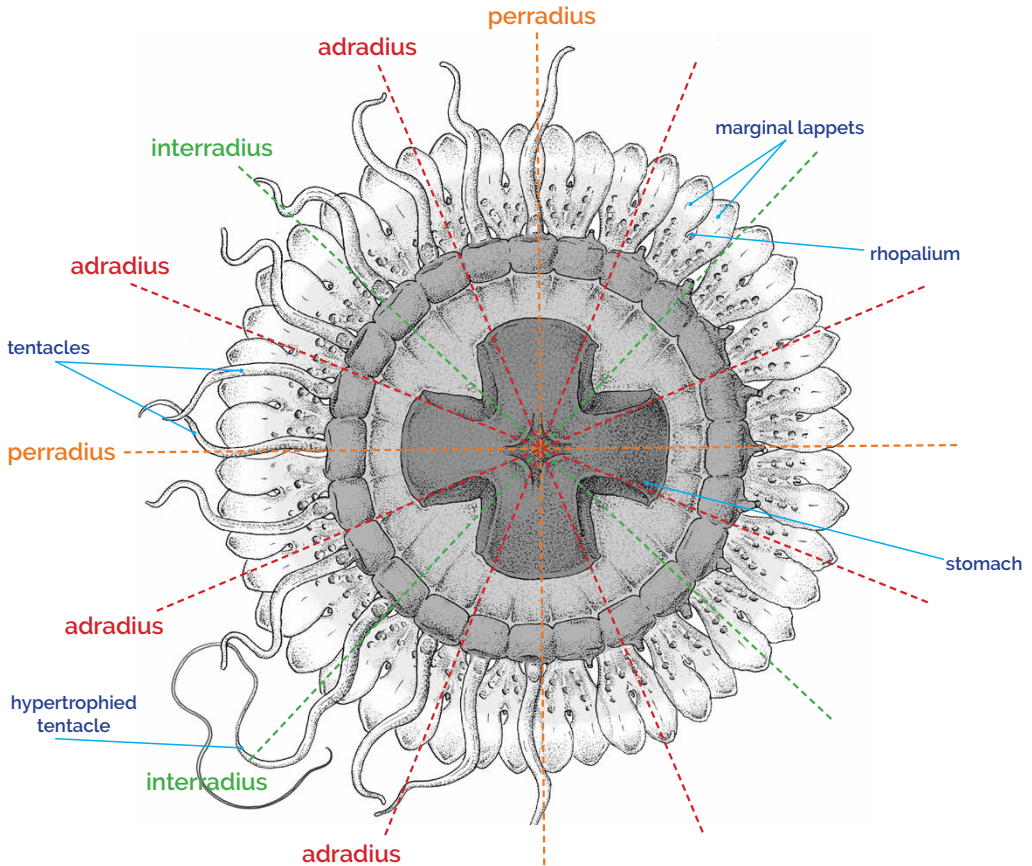


Fig. 2. Atollidae (aboral view)

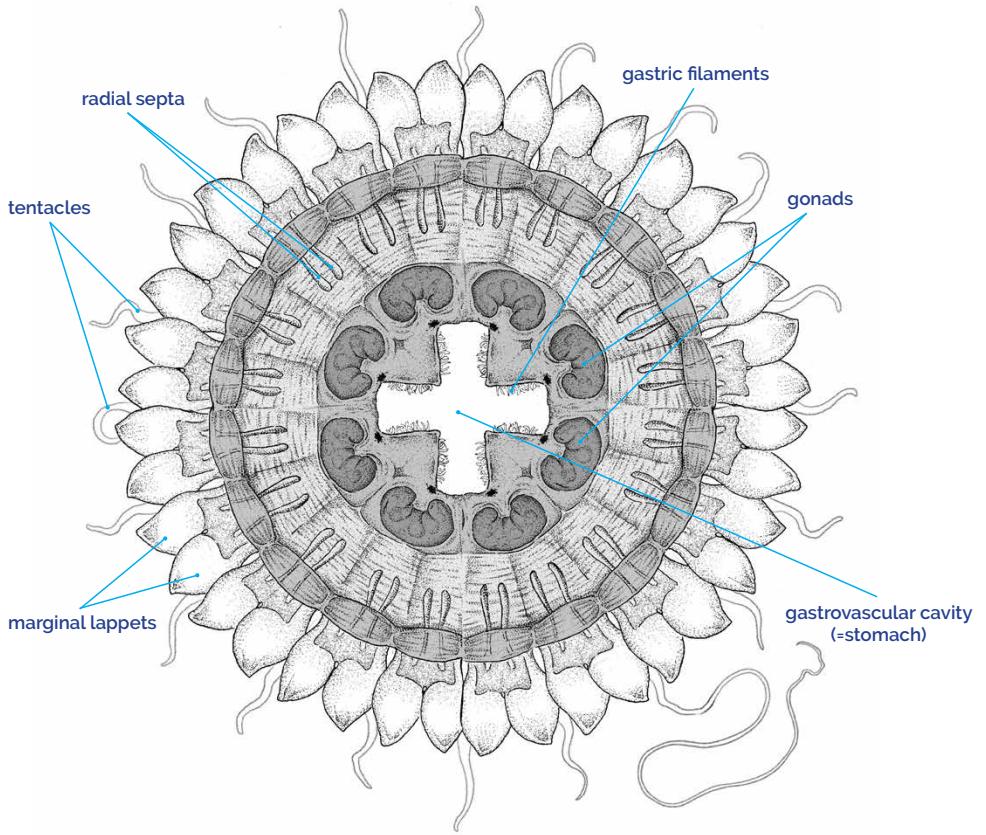


Fig. 3. Atollidae (oral view)

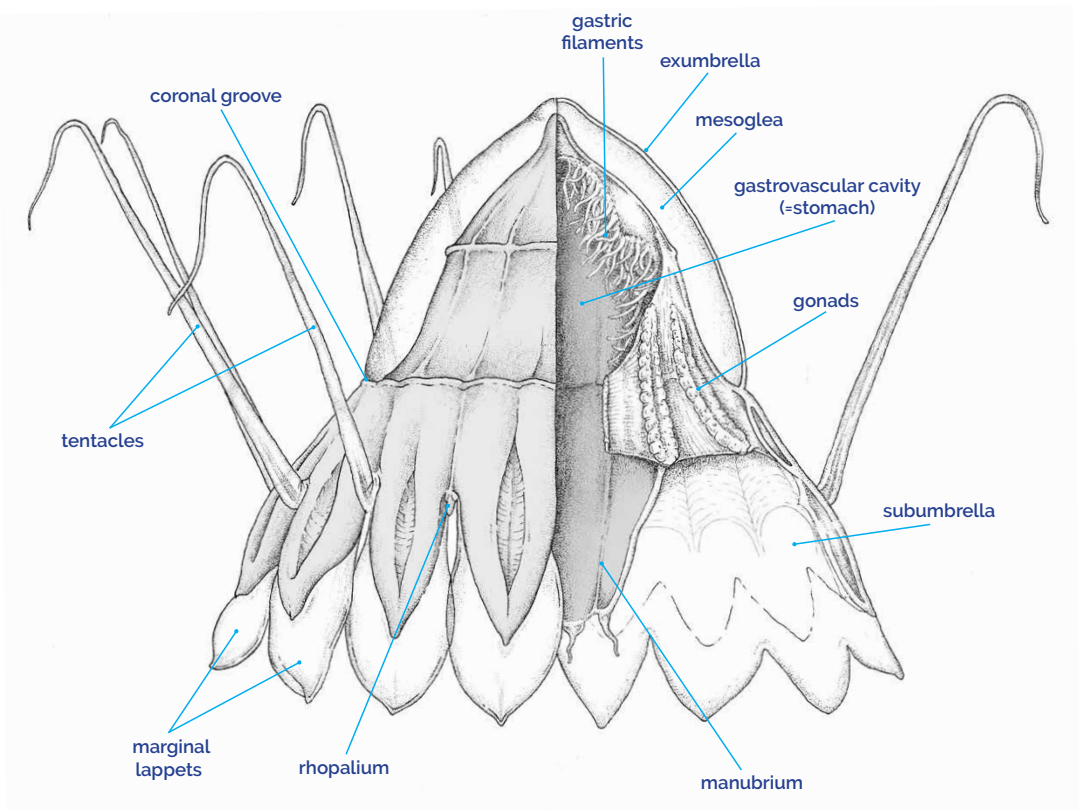


Fig. 4. Periphyllidae (lateral view; left side, external view; right side, internal organization)

Subclass Discomedusae

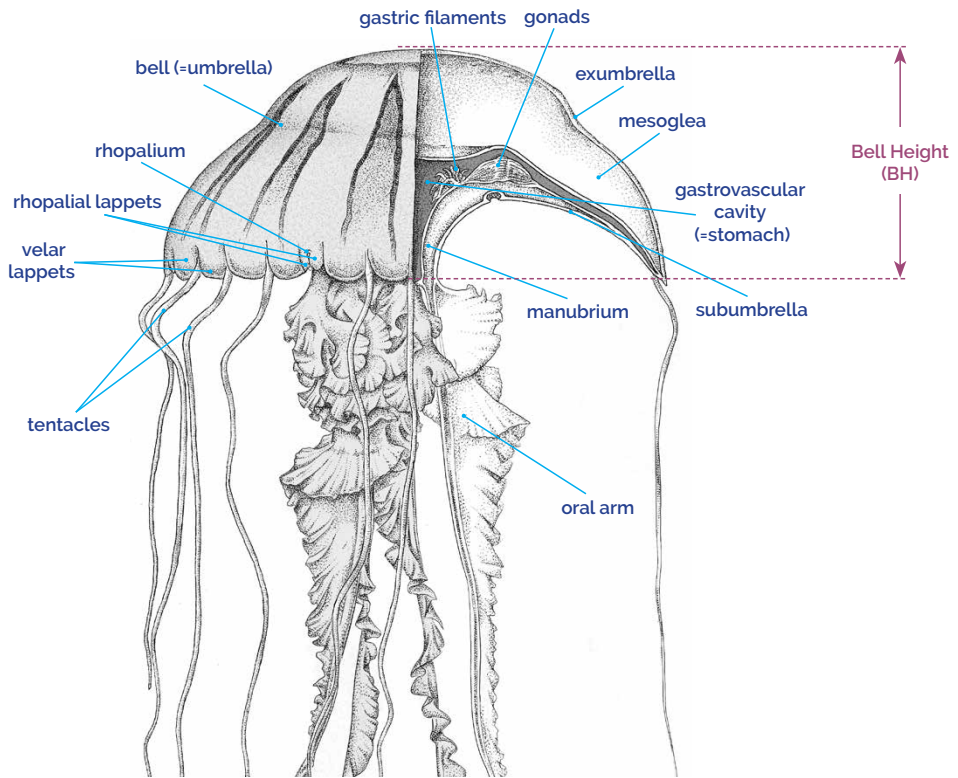


Fig. 1. Pelagiidae (lateral view; left side, external view; right side, internal organization)

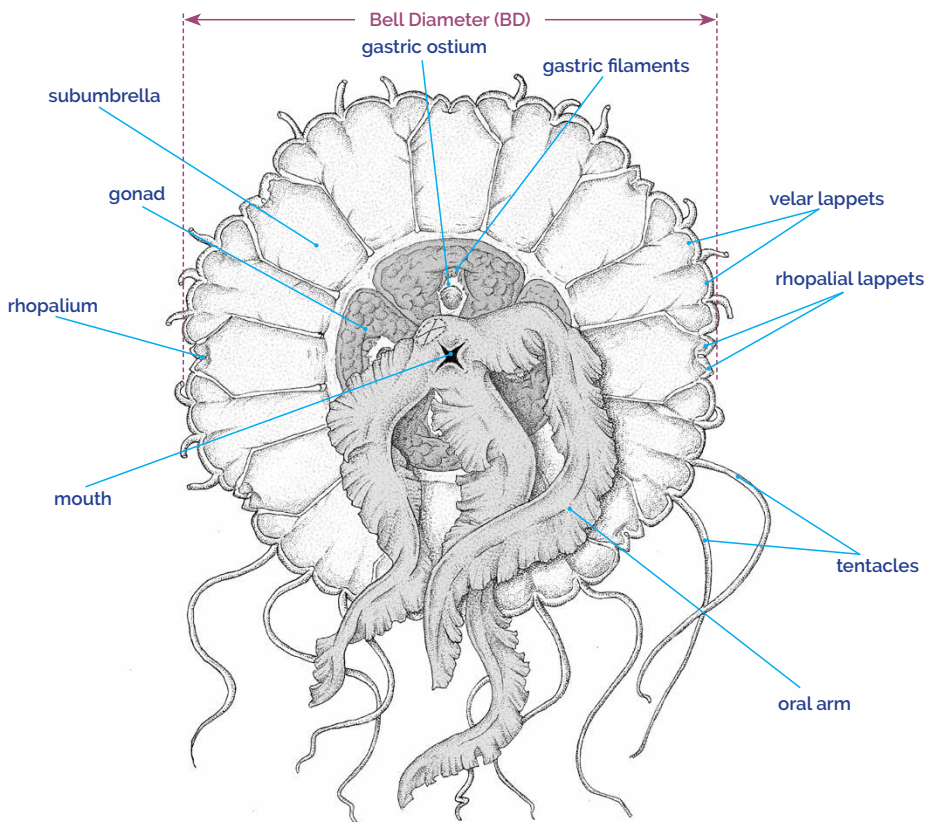


Fig. 2. Pelagiidae (oral view)

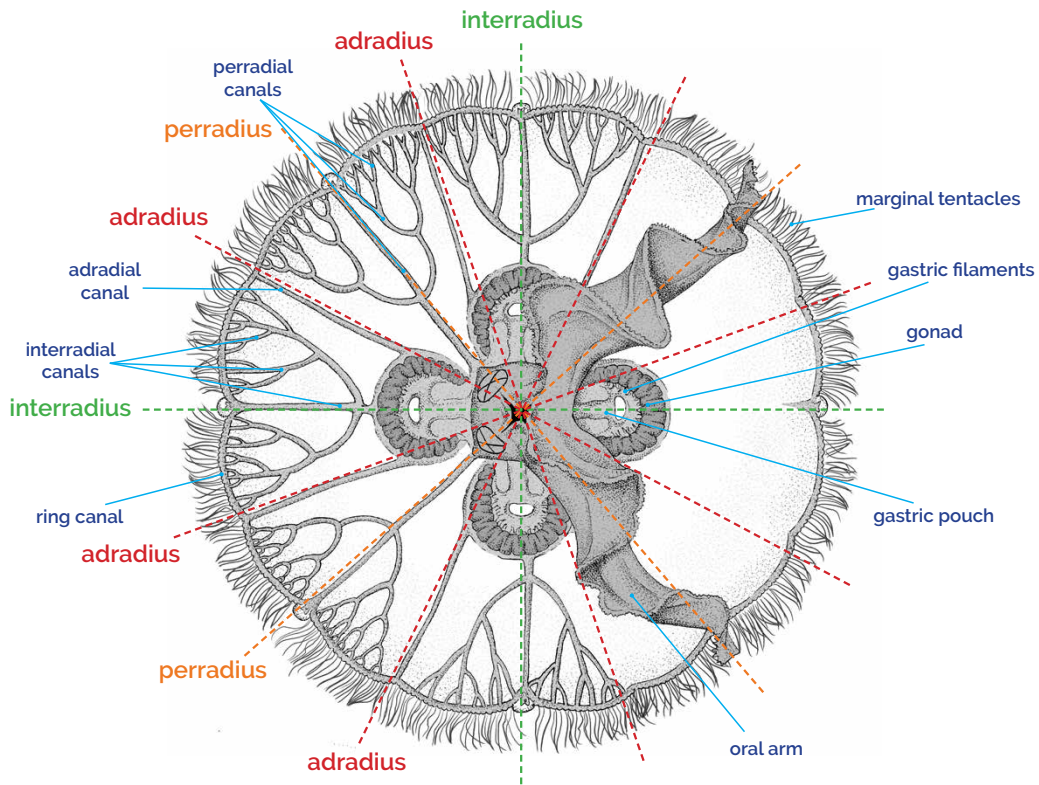


Fig. 3. Ulmaridae (oral view)

Order Rhizostomeae

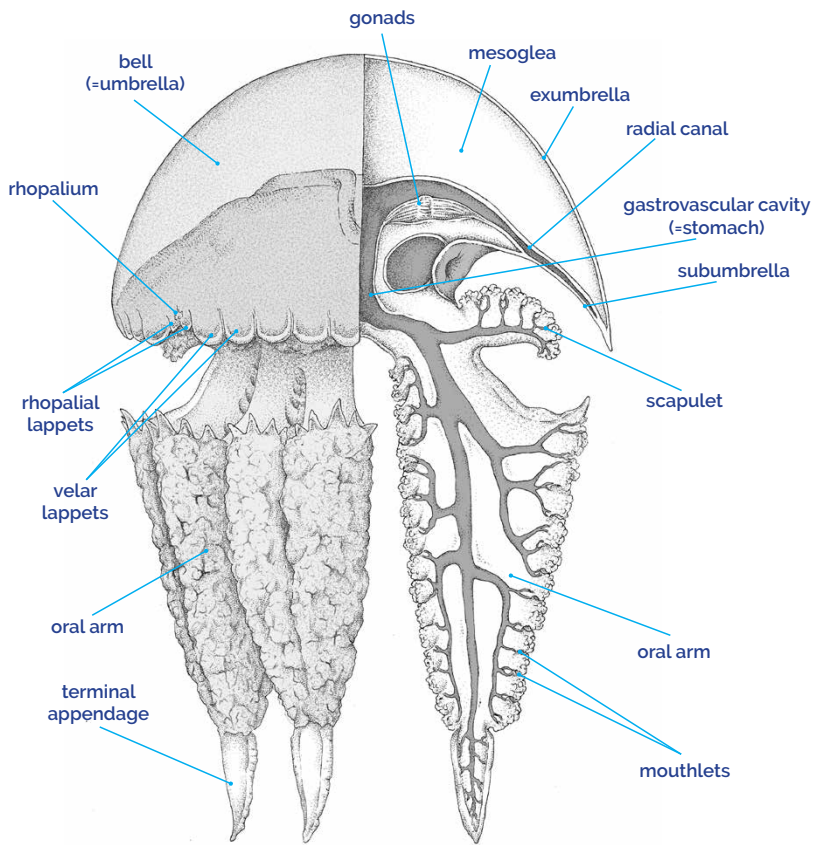


Fig. 1. Rhizostomatidae (lateral view; left side, external view; right side, internal organization)

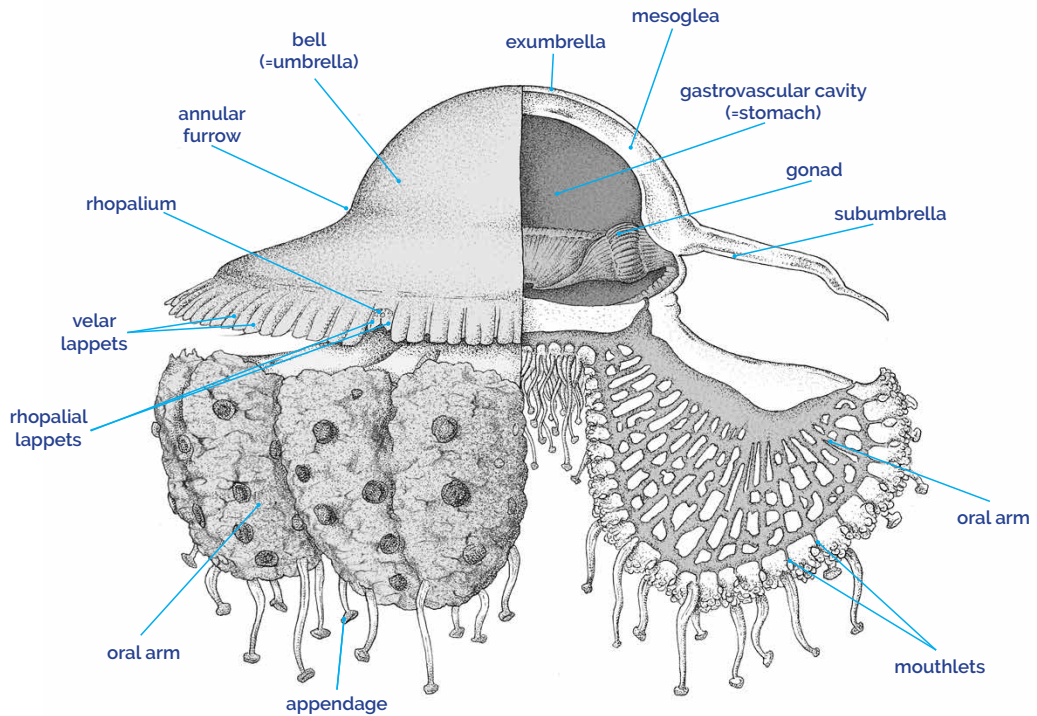


Fig. 2. Cepheidae (lateral view; left side, external view; right side, internal organization)

CLASS SCYPHOZOA

Key to subclasses of Scyphozoa occurring in the area

- 1a. Bell flat (lens-shaped) (Fig. 1) or with an elevated dome (triangular hat) (Fig. 2); with a characteristic coronal groove..... subclass **Coronamedusae** (p. 59)

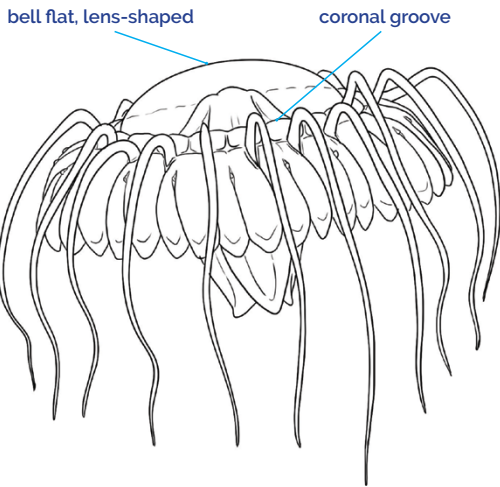


Fig. 1. *Atolla wyvillei*

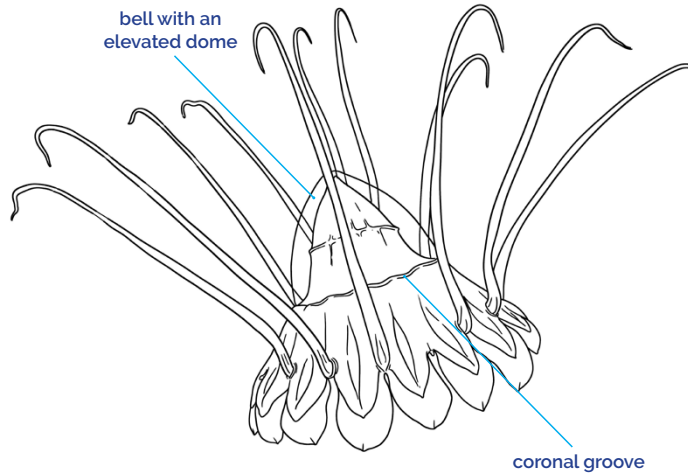


Fig. 2. *Periphylla periphylla*

- 1b. Bell more or less hemispherical, sometimes flat, but **never with a coronal groove** (Figs. 3 & 4)..... subclass **Discomedusae** (p. 78)

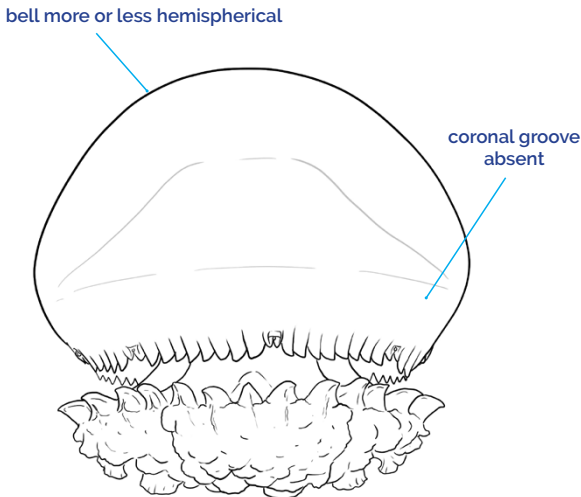


Fig. 3. *Eupilema inexpectata*

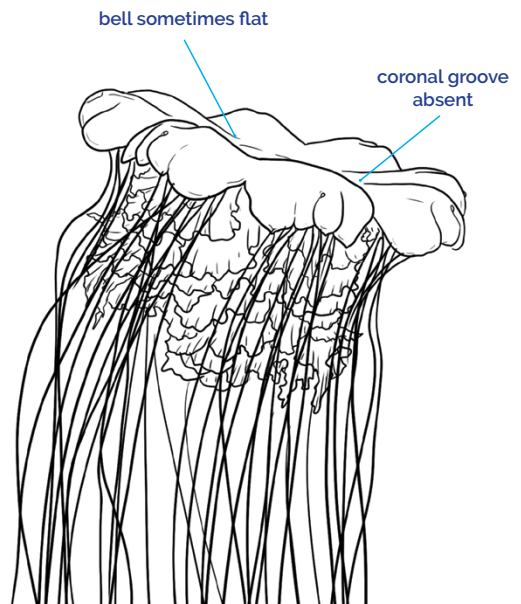


Fig. 4. *Cyanea annasethe*

SUBCLASS CORONAMEDUSAE

Key to the families of Coronamedusae occurring in the area

- 1a.** Bell flat (lens-shaped); jelly firm and thick; more than 16 rhopalia and tentacles (Fig. 1)
..... family *Atollidae* (one genus in the area: *Atolla*) (p. 60)

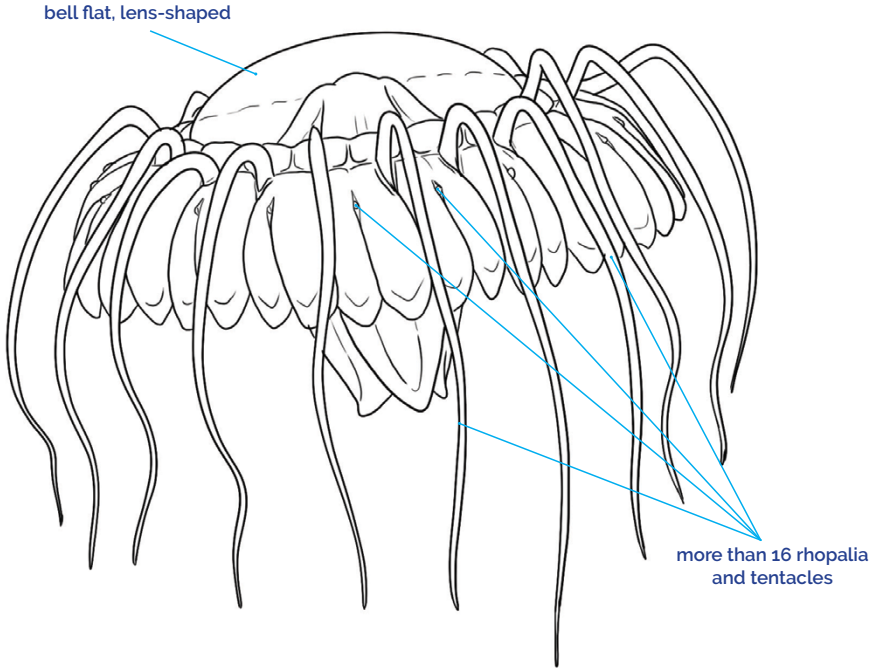


Fig. 1. *Atolla wyvillei*

- 1b.** Bell with an elevated dome (triangular hat); jelly flaccid and thinner; four rhopalia (Fig. 2).
..... family *Periphyllidae* (p. 73)

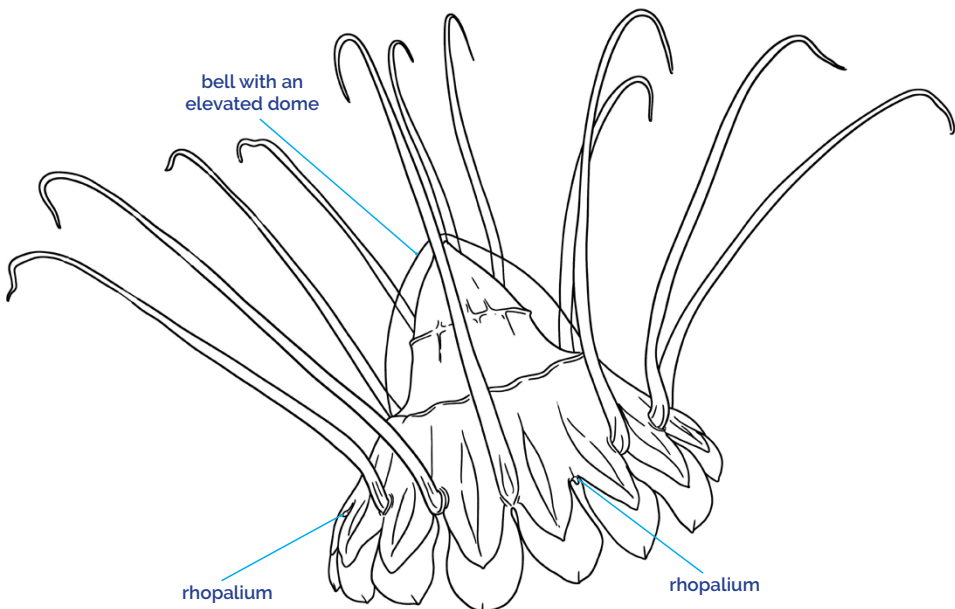


Fig. 2. *Periphylla periphylla*

FAMILY ATOLLIDAE

Key to species of *Atolla* occurring in the area

1a. Tentacles less than 20 (Fig. 1) *Atolla russelli* (p. 66)

1b. Tentacles 20 or more (Figs. 2-5). ► 2

2a. Exumbrella with warts/papillae on lappets (Fig. 2) *Atolla chuni* (p. 62)

2b. Exumbrella without warts/papillae on lappets. ► 3

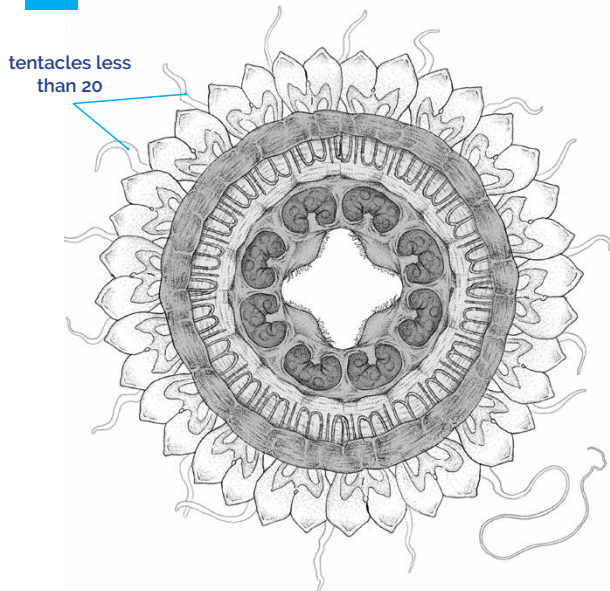


Fig. 1. *Atolla russelli* (oral view)

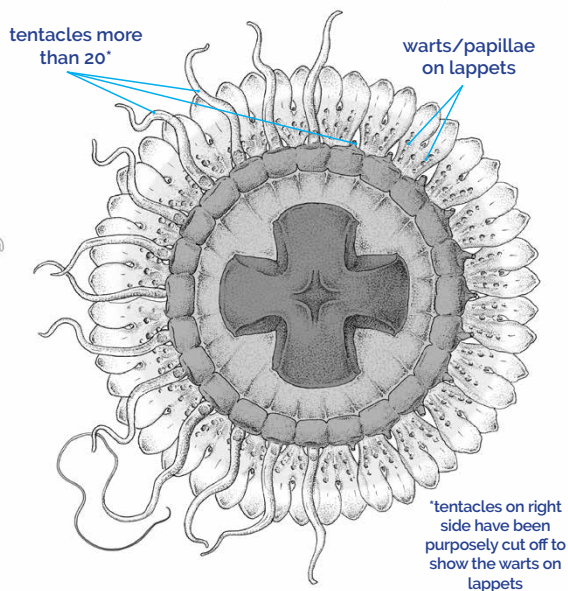


Fig. 2. *Atolla chuni* (aboral view)

3a. Subumbrellar radial septa diverging towards stomach (Fig. 3) *Atolla wyvillei* (p. 70)

3b. Subumbrellar radial septa straight or fairly straight (Figs. 4 & 5) ► 4

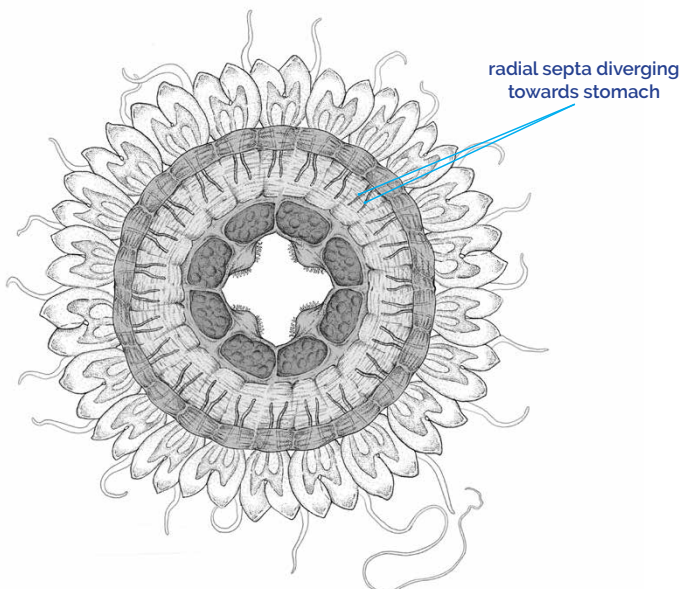


Fig. 3. *Atolla wyvillei* (oral view)

- 4a. Presence of pigment spots on sides of the cruciform stomach (Fig. 4) *Atolla vanhoeffeni* (p. 68)
- 4b. Absence of pigment spots on stomach (Fig. 5) *Atolla parva* (p. 64)

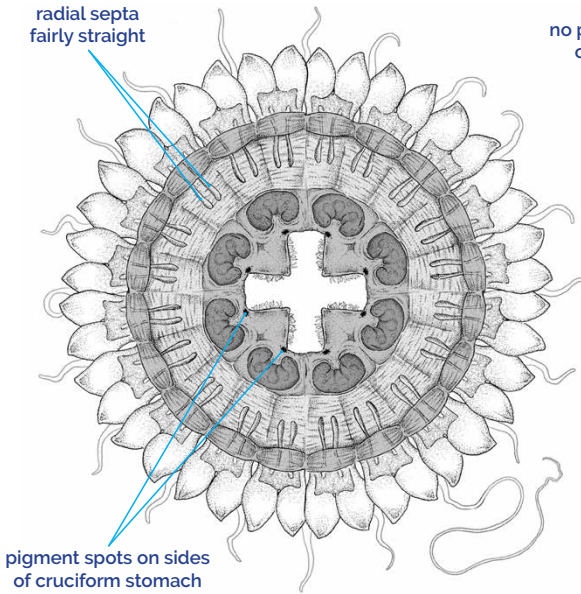


Fig. 4. *Atolla vanhoeffeni* (oral view)

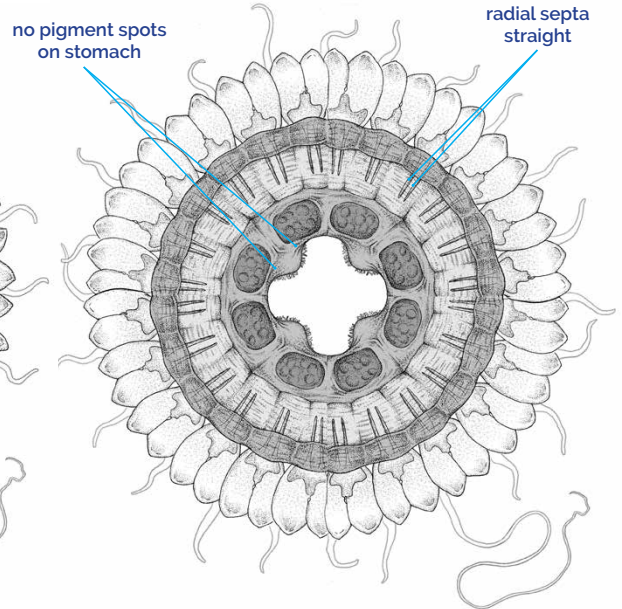


Fig. 5. *Atolla parva* (oral view)

Diagnostic features

Bell flattened, lens-shaped, but with a characteristic deep circular furrow (**coronal groove**) near margin, smooth to the touch. **Mesoglea** thick and firm. Two series of thickenings beyond the coronal groove, the outermost ending in a rhopalium and the innermost in a tentacle.

Usually, 24 rhopalia and solid tentacles. Longer tentacle (hypertrophied) aligned with the interradius. **Marginal lappets** longer than broad, **showing characteristically two rows of papillae on the basal part of each lappet** (three or four on each side, and one in the middle), usually 48 in number.

Central **gastrovascular cavity (=stomach)** base resembling a four-leaved clover, with its central part circumscribed by triangular gastric septa hanging **gastric filaments**, and its marginal region with usually 48 paired **radial septa** which diverge towards the stomach, extending beyond circular musculature ring.

Eight **gonads**, elongate-oval or trapezoid in shape.

Colour

Bell usually reddish-brown and translucent; stomach, gonads and musculature cream-orange. Some damaged specimens completely transparent.

Size

Up to 7 cm BD. BH about 30-50% BD.

Ecology

Life cycle completely unknown; feeding habits and association with other species also unknown.

Stinging

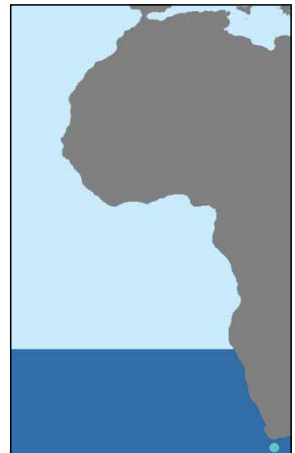
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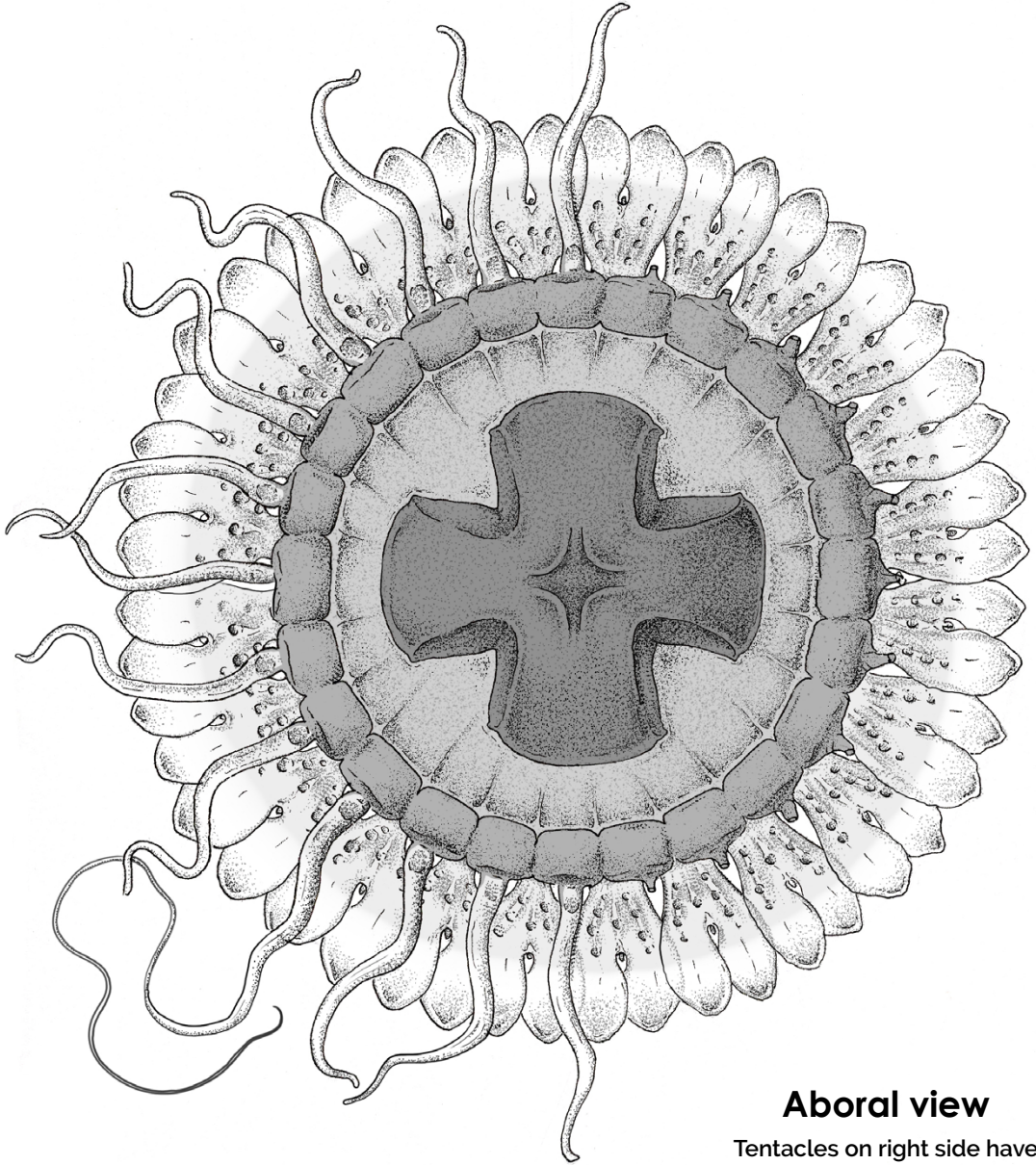
Distribution

Southern Ocean and South Atlantic (south of 30°S).

Remarks

Never found shallower than 800 m depth.





Aboral view

Tentacles on right side have been purposely cut off to show the warts on lappets

Diagnostic features

Bell flattened, lens-shaped, but with a characteristic deep circular furrow (**coronal groove**) near margin, smooth to the touch. **Mesoglea** thick and firm. Two series of thickenings beyond the coronal groove, the outermost ending in a rhopalium and the inner most in a tentacle.

Usually, 20 or 24 rhopalia and solid tentacles, possibly 26. Longer tentacle (hypertrophied) aligned with the interradius. **Marginal lappets** smooth and elongated with a rounded edge, usually 40 or 48, possibly 52 in number.

Central **gastrovascular cavity** (=stomach) base resembling a four-leaved clover, with its central part circumscribed by triangular gastric septa, and **its marginal region with usually 40 paired, straight radial septa**, not extending beyond circular musculature ring.

Eight **gonads**, elongate-oval in shape, sometimes paired.

Colour

Bell deep reddish-brown; stomach usually darker.

Size

Up to 6.3 cm BD, but usually around 3 cm BD. BH about 10% BD.

Ecology

Life cycle completely unknown; feeding habits and association with other species also unknown.

Stinging

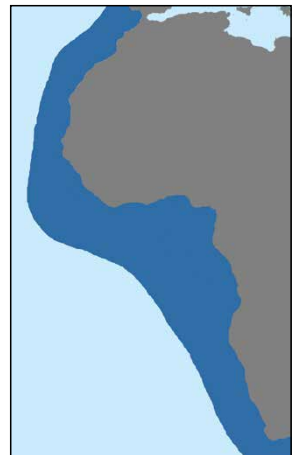
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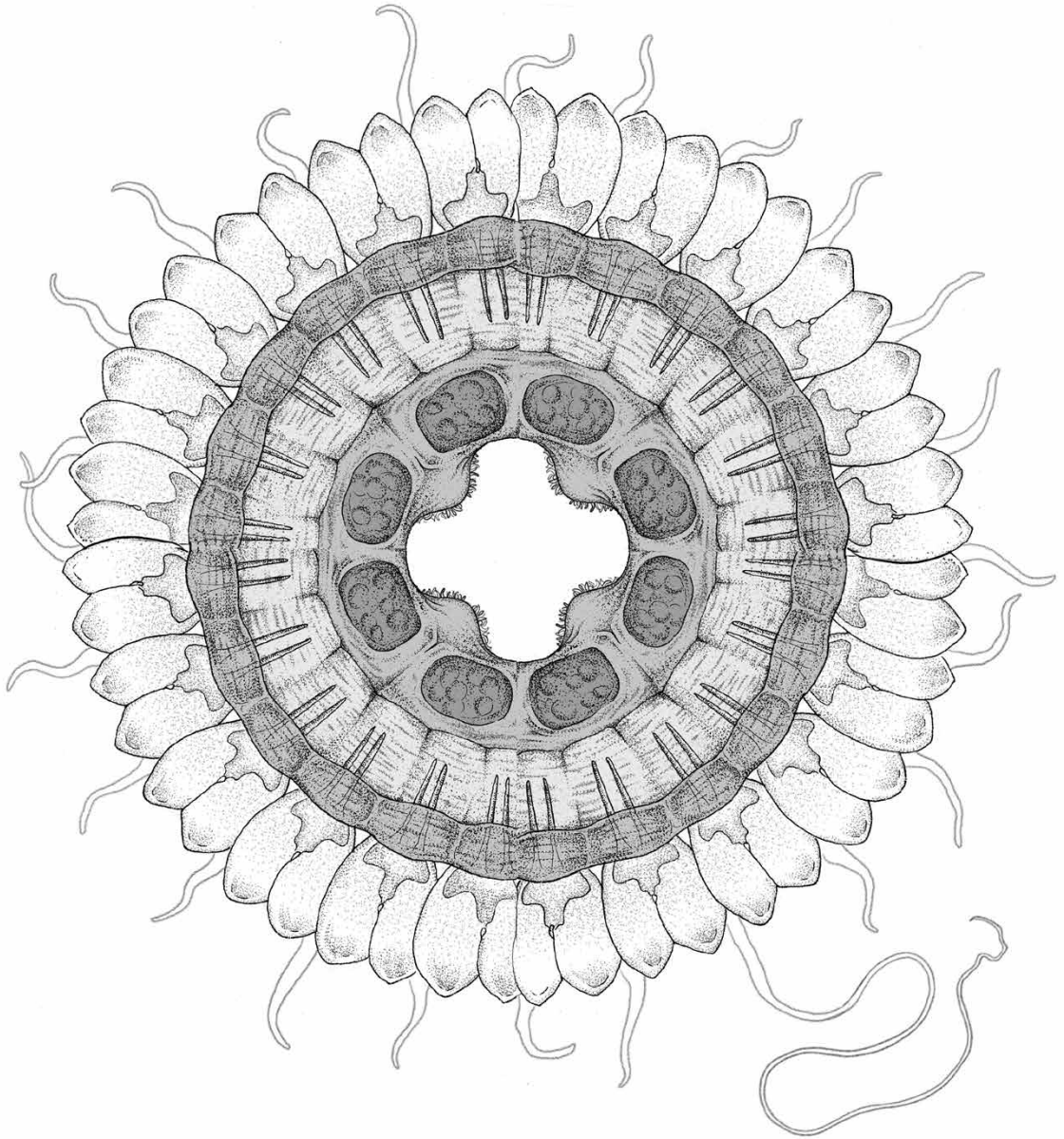
Distribution

Found off the west coast of Africa.

Remarks

This species has some bioluminescence.





Oral view

Diagnostic features

Bell flattened, lens-shaped, but with a characteristic deep circular furrow (**coronal groove**) near margin, smooth to the touch. **Mesoglea** thick and firm. Two series of thickenings beyond the coronal groove, the outermost ending in a rhopalium and the innermost in a tentacle.

Usually, **18 rhopalia and solid tentacles, rarely 16 or 17**. **Marginal lappets** smooth and elongated with a rounded edge, usually 36 in number. Longer tentacle (hypertrophied) aligned with the interradius.

Central **gastrovascular cavity (=stomach)** base resembling a four-leaved clover, with its central part circumscribed by triangular gastric septa and its marginal region with usually 36 paired **radial septa** which diverge towards the stomach, extending beyond circular musculature ring.

Eight **gonads**, auricle-shaped and bilobed (might be paired in some individuals).

Colour

Bell uniformly brownish-red.

Size

Up to 4.5 cm BD. BH about 15% BD.

Ecology

Life cycle completely unknown; feeding habits and association with other species also unknown.

Stinging

Unknown.

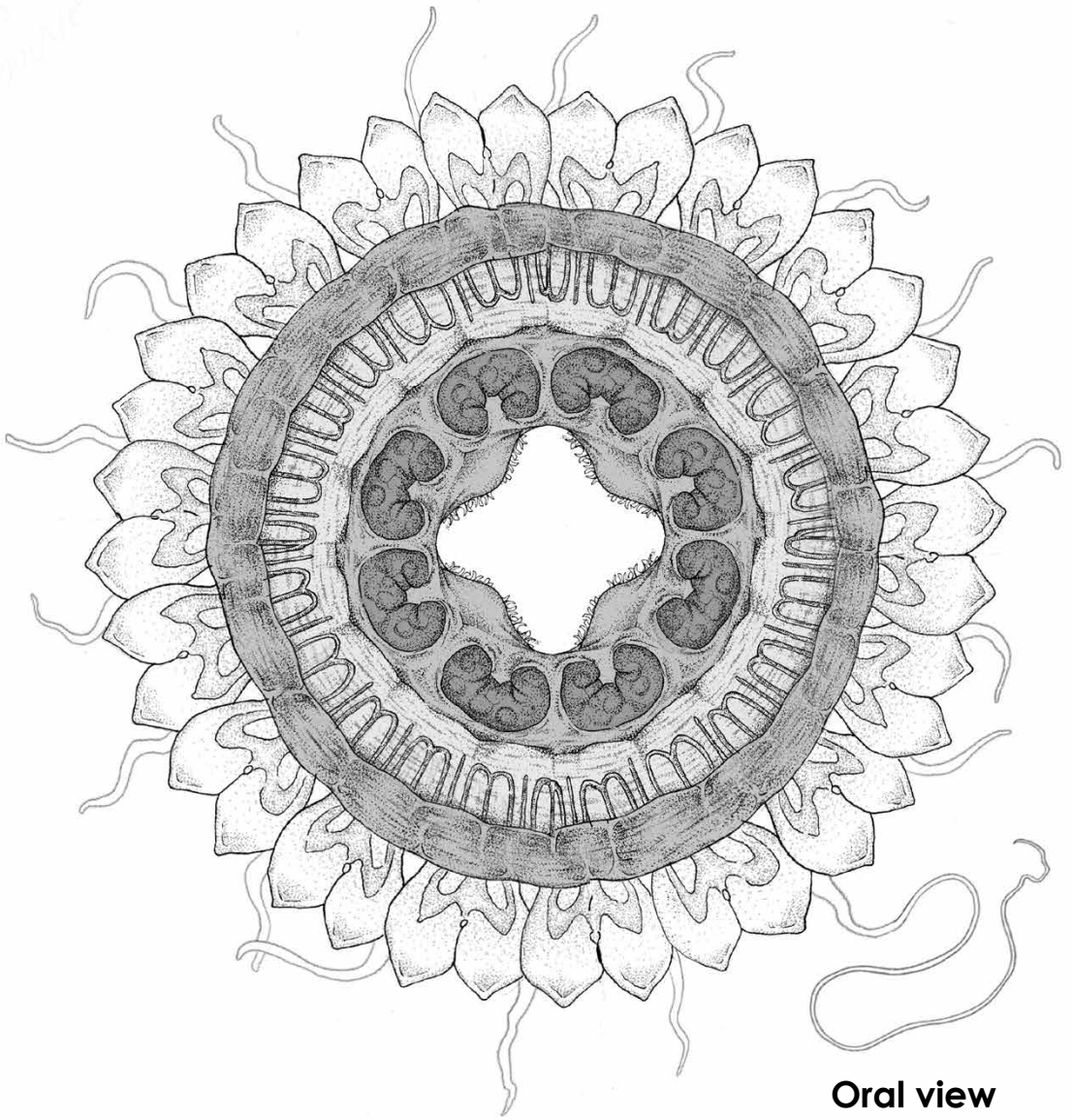
Distribution

Found off the east and west coasts of Africa. Type locality, the Angola Basin.

Remarks

Found from 300 to 500 m depth.





Diagnostic features

Bell flattened, lens-shaped, but with a characteristic deep circular furrow (**coronal groove**) near margin, smooth to the touch. **Mesoglea** thick and firm. Two series of thickenings beyond the coronal groove, the outermost ending in a rhopalium and the innermost in a tentacle.

Usually, **20 rhopalia and solid tentacles, which can rarely vary in number from 18 to 19**. Longer tentacle (hypertrophied) aligned with the interradius. **Marginal lappets** smooth and elongated, with a rounded edge, usually 40 in number.

Central **gastrovascular cavity (=stomach)** base resembling a cross, with **characteristically, a pair of dark pigment spots on each side of the cruciform stomach**, and marginal region with usually **40 paired straight radial septa**, not extending beyond circular musculature ring.

Eight **gonads** bean to round in shape.

Colour

Bell and tentacles usually reddish and translucent; stomach deep red/brown to black; gonads yellowish-brown.

Size

Up to 5 cm BD, but usually larger than 3-4 cm BD. BH about 15% BD.

Ecology

Life cycle completely unknown; feeding habits and association with other species also unknown.

Stinging

Unknown.

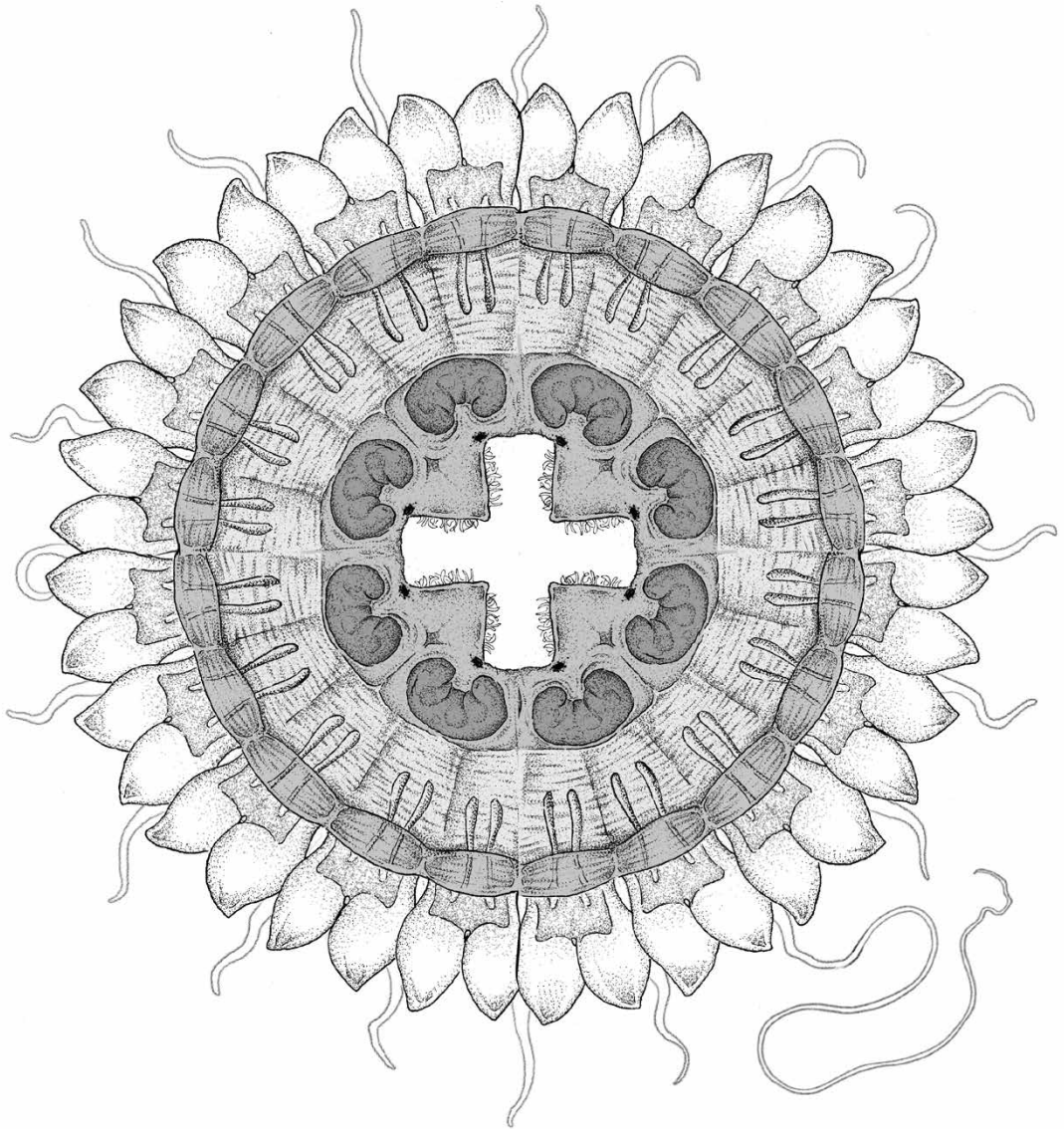
Distribution

Possibly worldwide, certainly from the Bay of Biscay to the Angola Basin, and off the Cape of Good Hope.

Remarks

Found from 500 to 1 000 m depth. Bioluminescence reported for the species.





Oral view

Diagnostic features

Bell flattened, lens-shaped, but with a characteristic deep circular furrow (**coronal groove**) near margin, smooth to the touch. **Mesoglea** thick and firm. Two series of thickenings beyond the coronal groove, the outermost ending in a rhopalium and the innermost in a tentacle.

Usually, 22 rhopalia and solid tentacles, rarely varying in number from 17 to 36. Rhopalia with hood and without ocellus. Longer tentacle (hypertrophied) slightly misaligned with the interradius. **Marginal lappets** smooth, elongated, with a rounded edge, usually 44 in number, but varying and always twice the number of rhopalia and tentacles.

Central **gastrovascular cavity (=stomach)** base resembling a four-leaved clover, with its central part unpigmented, circumscribed by triangular gastric septa hanging **gastric filaments** on each side (being up to or more than 192 filaments), and its marginal region with usually **44 paired radial septa which diverge towards the stomach**, extending beyond circular musculature ring.

Eight **gonads**, bean to auricle-shaped (might be paired in some individuals).

Colour

Bell usually brownish-reddish and translucent; stomach deep red/brown to black; gonads and musculature varying from a cream tone to an orange tinge. Some damaged specimens completely transparent.

Size

Up to 15 cm BD, usually larger than 4 cm BD. BH about 15% BD.

Ecology

Life cycle completely unknown; it is suggested to be holopelagic but there is no evidence. Adult medusae with separate sexes, females produce eggs continuously over a long period of time. Bioluminescent species producing a blue light concentrated around umbrella rim, probably to avoid predation. The longer (hypertrophied) tentacle is used to grab gelatinous and hard-shelled prey (siphonophores, crustaceans). Amphipods and shrimps found to be preying upon the species.

Stinging

Unknown.

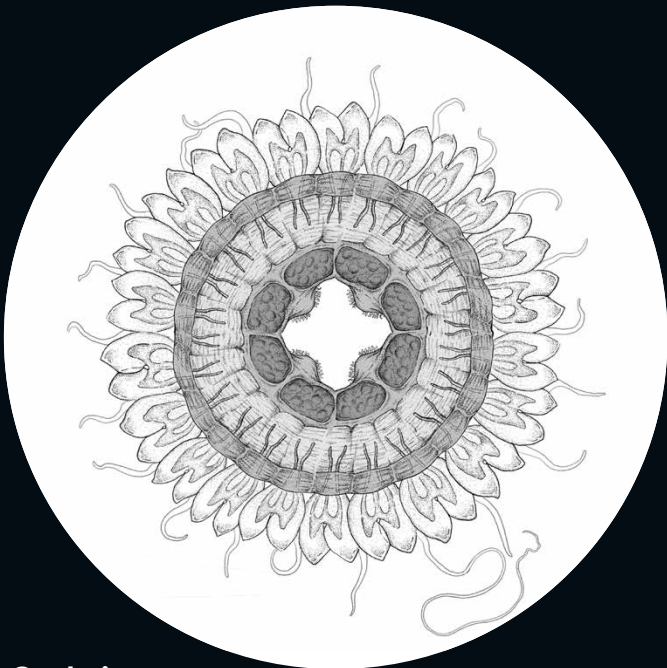
Distribution

Cosmopolitan in deep waters (not found in Japan, the Mediterranean Sea or Arctic Ocean).

Remarks

Common in mesopelagic trawls. The identification of deep-sea species is challenging, mostly due to the poor quality of the dredged/trawled specimens. Scyphomedusae of the genus *Atolla* are not an exception, with many species descriptions based on damaged specimens. Two similar-looking species, *Atolla bairdii* and *Atolla valdiviae*, reported from the area are here considered as junior synonyms of *A. wyvillei* (mostly after Russell, 1970: 39).





Oral view

FAMILY PERIPHYLLIDAE

Key to species of Periphyllidae occurring in the area

- 1a. Three tentacles between successive rhopalia (totaling 12) (Fig. 1) *Periphylla periphylla* (p. 74)

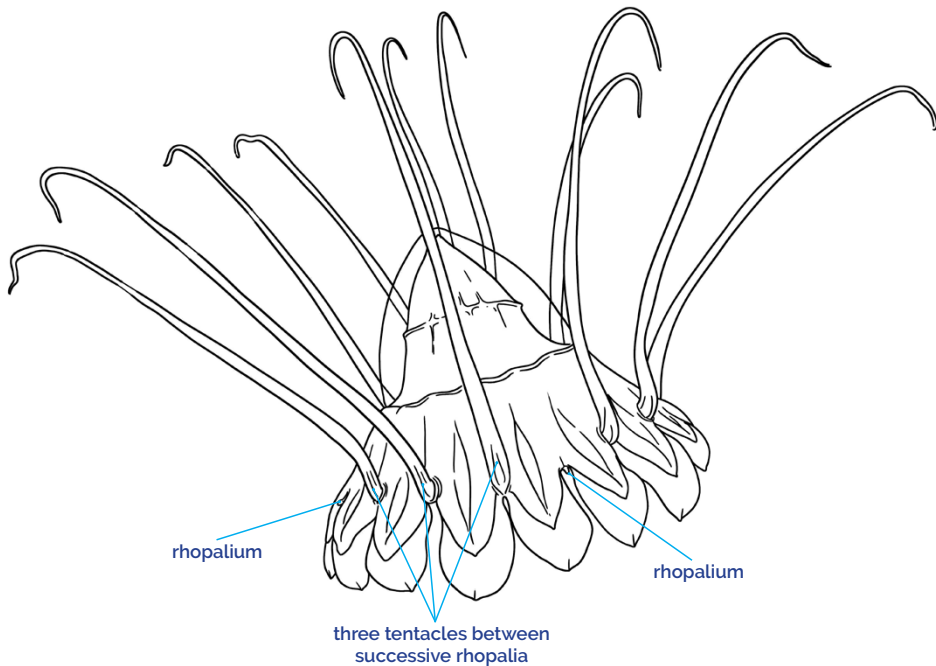


Fig. 1. *Periphylla periphylla*

- 1b. Five tentacles between successive rhopalia (totaling 20) (Fig. 2) *Periphyllopsis braueri* (p. 76)

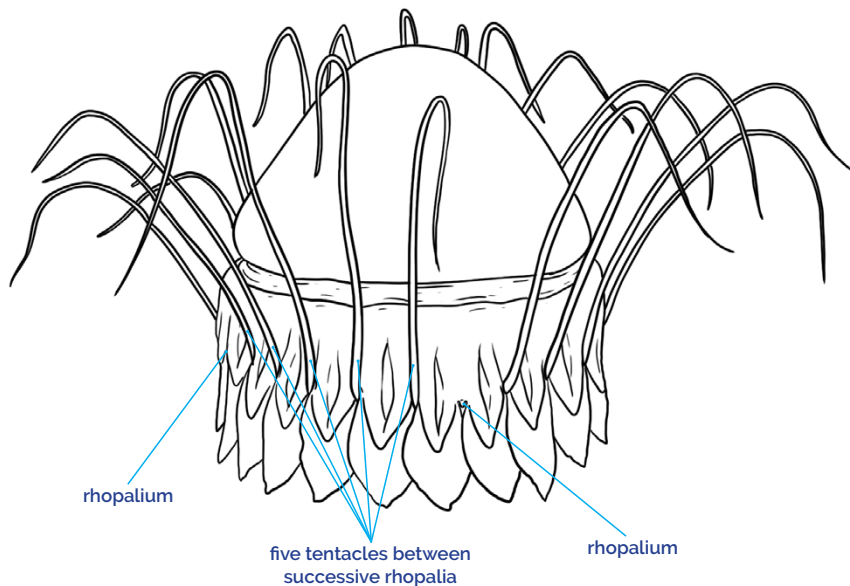


Fig. 2. *Periphyllopsis braueri*

Periphylla periphylla (Péron and Lesueur, 1810)

Diagnostic features

Bell triangular, with an elevated dome, smooth to the touch, with a characteristic circular furrow (**coronal groove**) at middle part. **Mesoglea** flaccid and thin.

Usually, four **rhopalia** (interradial in position) and **12 solid tentacles, three between each rhopalium**. Rhopalia with hood and without ocellus. Marginal lappets smooth and elongated with a rounded edge, 16 in number.

Central **gastrovascular cavity** (=stomach) triangular in side view (in some specimens more rounded) but with apex often elongated resembling a thin canal. Subumbrellar musculature well developed.

Eight **gonads** U or J-shaped (might be paired in some individuals).

Colour

Usually whole animal is coloured deep red-brown. Some individuals with bell translucent, stomach and manubrium deep brown-reddish; gonads with yellowish eggs.

Size

Up to 35 cm BD, and up to 25 cm BH.

Ecology

Life cycle holopelagic, with no polyp, ephyra or planula stage. Eggs develop directly into a small medusa. Adult medusae with separate sexes entangle tentacles in a mating behaviour. Bioluminescence as a blue diffuse glow. In general specimens are found swimming with tentacles directed to the dome. Preys are copepods, euphausiids, and small fishes. Predated by the siphonophore *Apolemia*, pycnogonids, and amphipods; when close to the bottom it can be captured by sea anemones and nemerteans.

Stinging

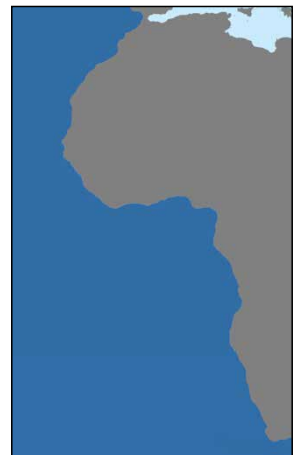
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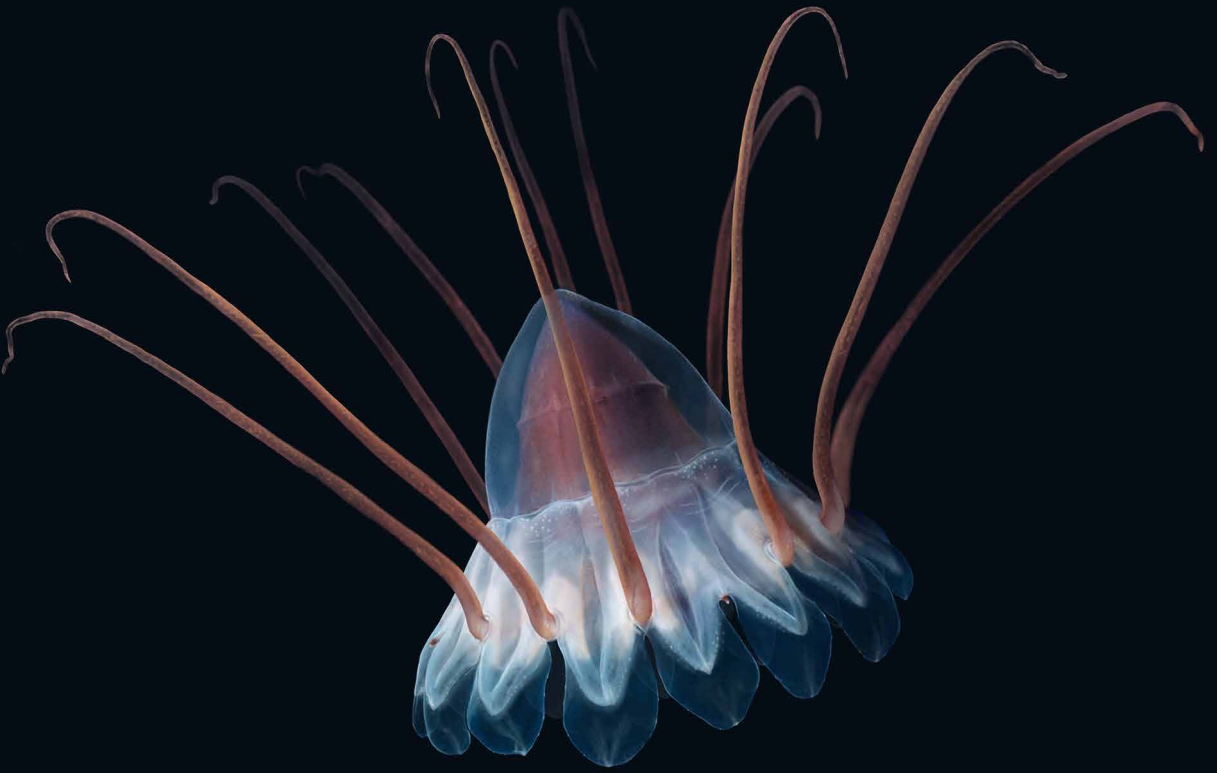
Distribution

Cosmopolitan in deep waters below 300 m (not found in Japan, and the Arctic Ocean).

Remarks

Depending on the region, the size and colour can vary. Thus, in the past, several different names were applied to the species.





Diagnostic features

Bell triangular, with an elevated dome, finely granulated to the touch, with a characteristic thick circular furrow (**coronal groove**) midway between apex and margin.

Usually, four **rhopalia** (interradial in position) and **20 solid tentacles, five between each rhopalium**. Rhopalia with hood and without ocellus. Marginal lappets smooth and elongated with a rounded edge, 24 in number, slightly overlapping each other.

Eight **gonads** oval or C-shaped (paired in some individuals).

Colour

Uniformly dark red, rhopalia white.

Size

Up to 25 cm BD. BH about 90% BD.

Ecology

Life cycle completely unknown. Bioluminescent species.

Stinging

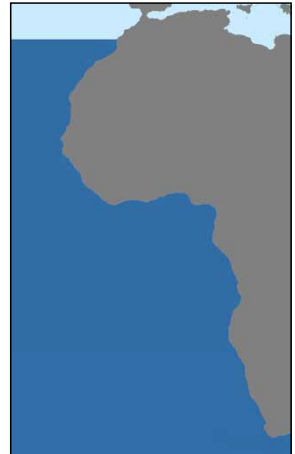
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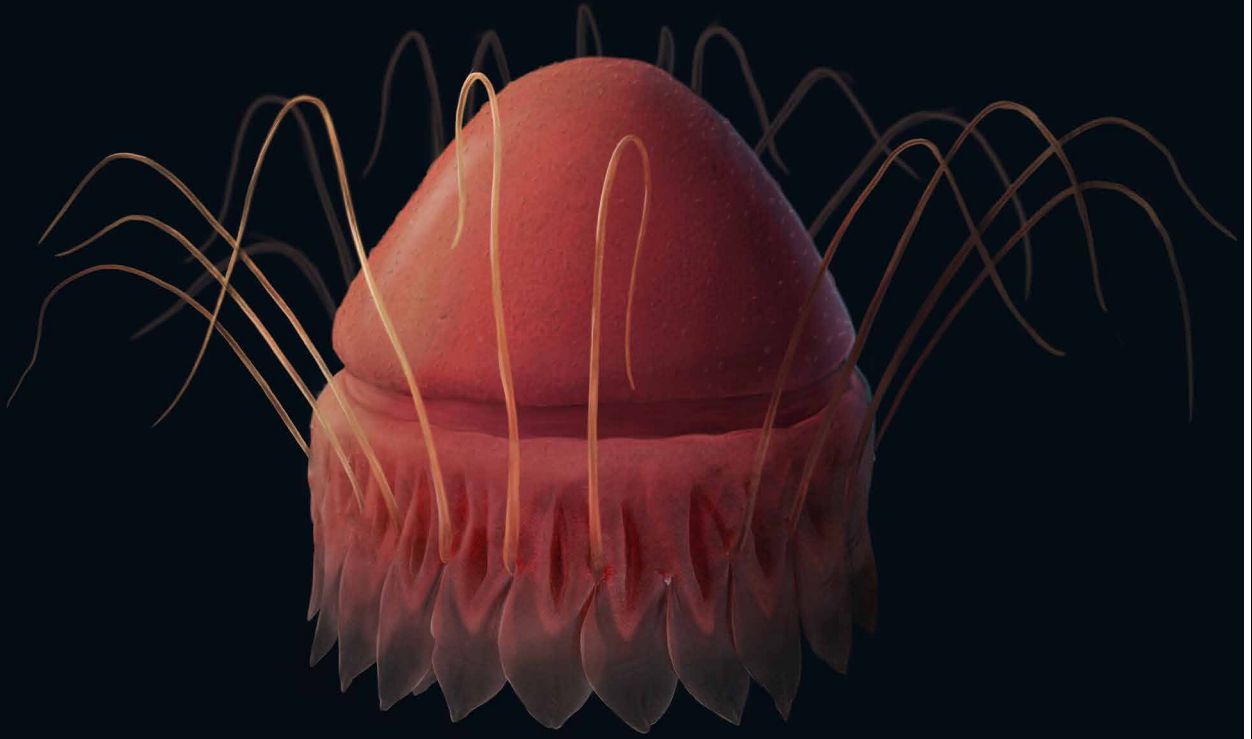
Distribution

Possibly cosmopolitan in deep waters between the tropics.

Remarks

Preyed by the octopus *Haliphron atlanticus*.





Periphyllopsis braueri

SUBCLASS DISCOMEDUSAE

Key to orders and families of Discomedusae occurring in the area and neighbouring waters

1a. Medusae with tentacles inserted on subumbrella (Figs. 1-5) ► **2**

1b. Medusae without tentacles or with tentacles inserted on bell margin (Figs. 6-9) ► **4**

2a. Subumbrellar tentacles arranged in a U-shaped pattern (Fig. 2) **family Cyaneidae**
(one species in the area:
Cyanea annasethe)(p. 80)

2b. Subumbrellar tentacles arranged in a different manner (aligned or scattered) (Figs. 4 & 5) ► **3**

tentacles inserted on subumbrella



Fig. 1. *Cyanea annasethe*

tentacles inserted on subumbrella

tentacles arranged in a U-shaped pattern

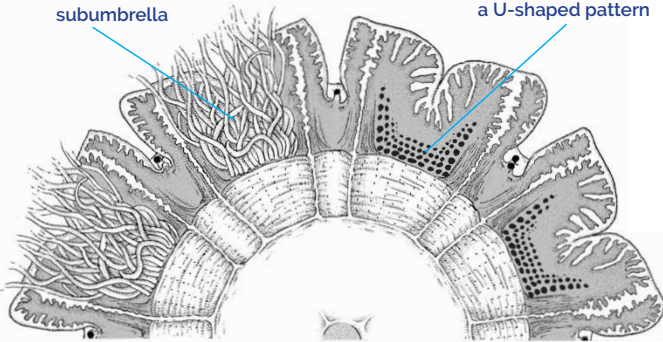


Fig. 2. *Cyanea annasethe* (oral view)

3a. Rhopalia eight, on subumbrella (Fig. 4)
..... **family Drymonematidae**
(one species in the area:
Drymonema dalmatinum)(p. 82)

tentacles inserted on subumbrella

eight rhopalia on subumbrella



Fig. 3. *Drymonema dalmatinum*

tentacles inserted on subumbrella and scattered

rhopalia on subumbrella

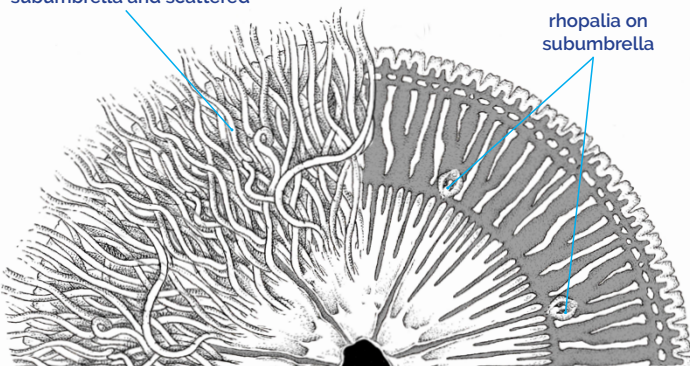


Fig. 4. *Drymonema dalmatinum* (oral view)

- 3b. Rhopalia 16, on bell margin (Fig. 5) . . .
family Phacellophoridae
 (one species in the area:
Phacellophora camtschatica) (p. 84)

- 4a. Oral arms with no obvious mouth; no
 tentacles at margin (Fig. 6).
 **order Rhizostomeae** (p. 118)

- 4b. Oral arms with central mouth opening to
 gastric cavity; with or without tentacles
 (Fig. 7). ▶ 5

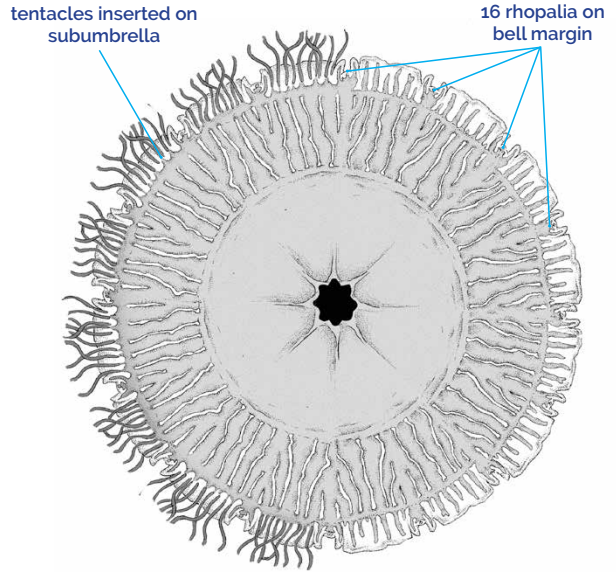


Fig. 5. *Phacellophora camtschatica* (oral view)

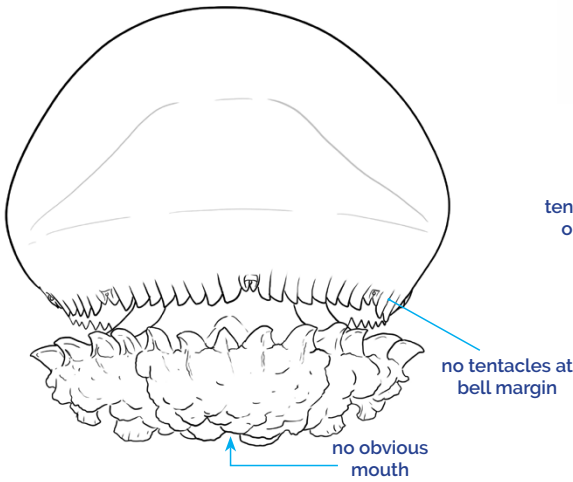


Fig. 6. *Eupilema inexpectata*

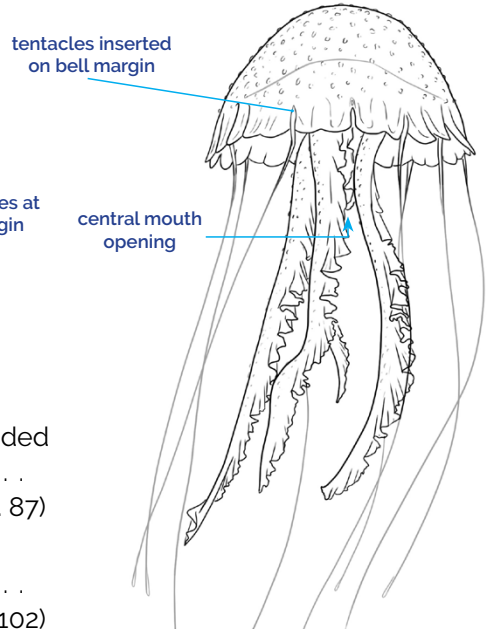


Fig. 7. *Pelagia noctiluca*

- 5a. Gastric cavity with large spaces, only divided
 by radial septa (Fig. 8).
 **family Pelagiidae** (p. 87)

- 5b. Gastric cavity divided by canals (Fig. 9).
 **family Ulmaridae** (p. 102)

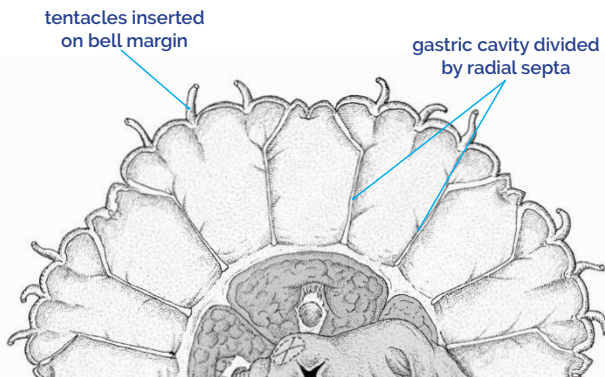


Fig. 8. Pelagiidae (oral view)

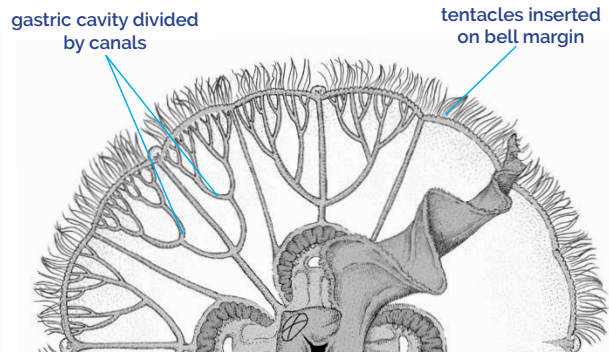


Fig. 9. Ulmaridae (oral view)

Cyanea annasethe (Haeckel, 1880)

Diagnostic features

Bell with 16 radial grooves, with a central depression with some furrows. **Mesoglea** thicker in the central part. Eight **rhopalia** sided by 16 asymmetrical broader **lappets** (pentagonal in contour), pointed near rhopalia. Rhopalial clefts not so deep as the other ones.

Tentacles on subumbrella arranged in eight crescent-shaped (U-shaped) groups, each group with five larger tentacles centrally, sided by four to six smaller ones, being 13–17 tentacles per octant, and 100–140 in total, longer than BD.

Four curtain-shaped **oral arms** longer than BD, surrounding a central mouth. Central part of **gastrovascular cavity (=stomach)** wide, with 16 marginal pouches, each pouch with two main canals that enter the lappets forming a dendritic pattern, less branched near rhopalia. Four protruding **gonads**, hanging from subumbrella.

Colour

Although there is a coloured drawing of the species, the description was based on a preserved specimen with no details of the coloration pattern.

Size

The only recorded specimen with 10 cm BD. BH about 30% BD.

Ecology

There is no data on feeding habits, associations or life cycle, although several other species of the genus exhibit a metagenetic life cycle. Other *Cyanea* feed on gelatinous prey and have several fishes and crustaceans as associated fauna.

Stinging

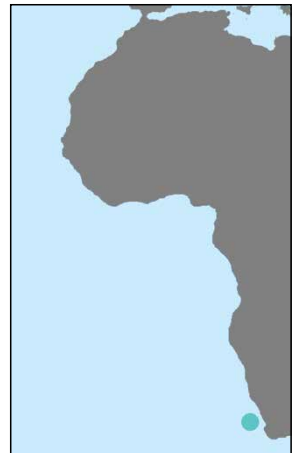
Unknown, but other species of the genus can cause mild to severe stings.

Distribution

The species is only known from the type locality "west coast of South Africa". This is the only *Cyanea* found off the African coast.

Remarks

This species is known only from the single preserved specimen that Ernst Haeckel inspected. Although some authors considered the species as a synonym of *Cyanea annaskala* von Lendenfeld, 1882, there are some controversies. Further validation depends on the finding of more specimens and comparison with congeners.





Cyanea annasethe

Drymonema dalmatinum Haeckel, 1880

Diagnostic features

Bell relatively flat, disc shaped, noticeably thickening towards centre, pitted and with numerous papillae, often with bifurcating exumbrellar crenulations. Bell margin with up to 24 **lappets** of uniform shape and size, squarish.

Four interradial and four perradial rhopalia situated in subumbrella pits located about 30% of radius length from bell margin.

Numerous, irregularly spaced tentacles arise from subumbrellar furrows in triangular adradial clusters between the mouth and the proximal edge of the rhopalia. Tentacles straight, hollow, decreasing in length towards rhopalia, may be as long as BD but frequently lost and damaged on capture.

Mouth central, with four thin, highly folded and veil-like **oral arms** up to 50% BD in length.

Gastrovascular system (=stomach) organized into eight alternating **rhopalial and velar pouches**, separated by straight mesenteries that terminate in lappets at bell margin. Velar mesenteries bifurcate once, velar mesenteries bifurcate up to four times.

Gonads prominent and pendulous, hang from subumbrella like a curtain amongst oral arms.

Colour

Bell generally lacking strong pigmentation, translucent; oral arms and gonads may be pink or light brown.

Size

Individuals can reach up to 100 cm in BD.

Ecology

Medusivorous. Erratic in appearance in coastal waters and often not recorded for prolonged periods of time. Individuals are generally found close to the surface in coastal waters, though may be found deeper.

Stinging

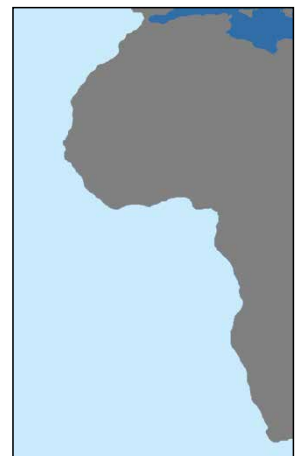
Relatively painful.

Distribution

Widely, if uncommonly, distributed in the Mediterranean Sea from Turkey in the east to the Strait of Gibraltar in the west. The record off the coast of Angola is regarded as the following species (Kramp, 1959).

Remarks

Two other species of *Drymonema* have been formally described, whilst another is in the process of description from South Africa. All species appear to be geographically separated: *Drymonema larsoni* Bayha and Dawson, 2010 is found in the western subtropical north Atlantic, whilst *Drymonema gorgo* Müller, 1883 is found along the coast of Brazil.





Drymonema dalmatinum

Phacellophora camtschatica (Brandt, 1835)

Diagnostic features

Bell flattened, but with central part slightly elevated, with minute warts (opaque glass appearance). **Mesoglea** thick centrally, but more flaccid near margin.

Sixteen rhopalia in deep clefts, sided by 32 small, pointed rhopial lappets; other marginal lappets more or less rectangular. **Tentacles forming a row on subumbrella arranged in 16 groups, each group with 5–24 tentacles, longer than BD**, characteristically with two series of nematocyst papillae on the abaxial side.

Central part of **gastrovascular cavity (=stomach)** wide, occupying 50% of BD; marginal area with radial canals, the tentacular ones not branched, the rhopial ones branched; canals entering the lappets. Four curtain-shaped **oral arms** surrounding a central mouth, longer than BD.

Four protruding **gonads**, hanging from subumbrella.

Colour

Bell whitish and pale yellow translucent, some individuals darker. Gonads vivid yellow. Oral arms orange in some individuals. Tentacles whitish to transparent.

Size

Up to 60 cm BD, but usually between 25 and 35 cm BD. BH about 20% BD.

Ecology

Metagenetic life cycle known from laboratory observations; polyp with long stalk; ephyrae with a pale orange tint. Separate sexes, but no sexual dimorphism. Feeds on gelatinous prey; found in association with crabs and amphipods, and also goose barnacles attached to the exumbrella.

Stinging

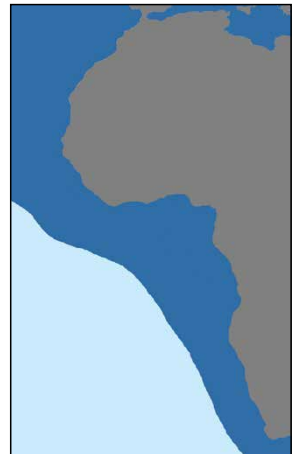
Mild.

Distribution

Worldwide distributed species, not reported from polar regions.

Remarks

Found in surface waters.





Phacellophora camtschatica

FAMILY PELAGIIDAE

Key to genera and species of Pelagiidae occurring in the area

1a. Tentacles usually more than eight; lappets 32 or more (Fig. 1)
 genus *Chrysaora* (p. 92)

1b. Tentacles eight; lappets 16 (Fig. 2) **▶ 2**

2a. Projections of gastric pouches into lappets wide (somewhat triangular), more than ½ lappet width (Fig. 3)
 *Mawia benovici* (p. 88)

2b. Projections of gastric pouches into lappets narrow (finger-like), less than ½ lappet width (Fig. 4)
 *Pelagia noctiluca* (p. 90)

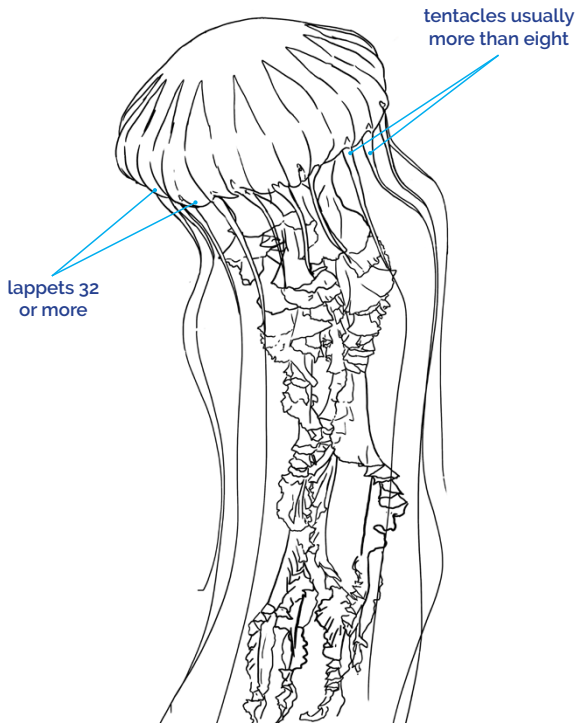


Fig. 1. *Chrysaora agulhensis*

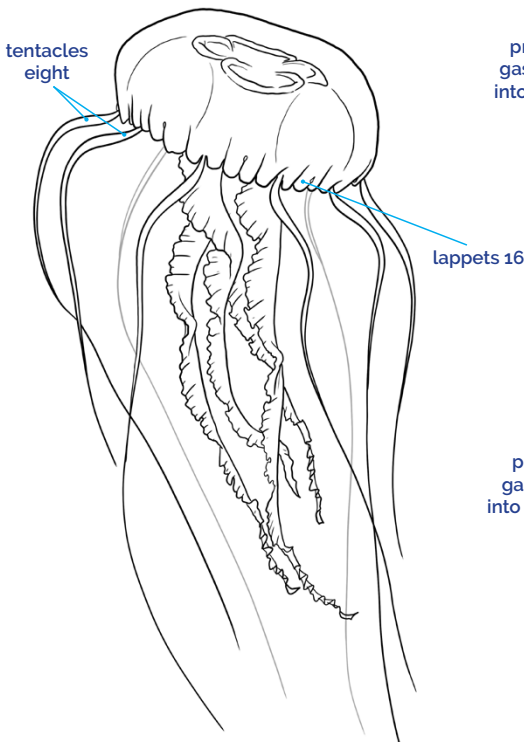


Fig. 2. *Mawia benovici*

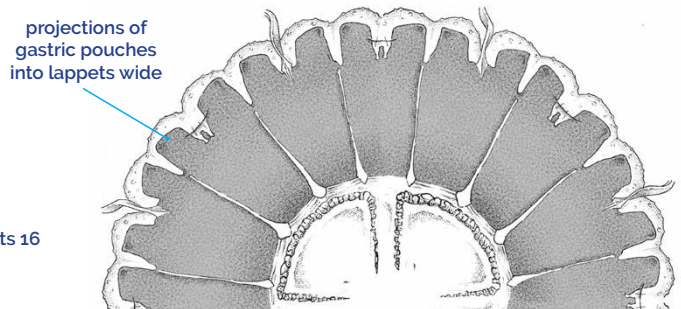


Fig. 3. *Mawia benovici* (oral view)

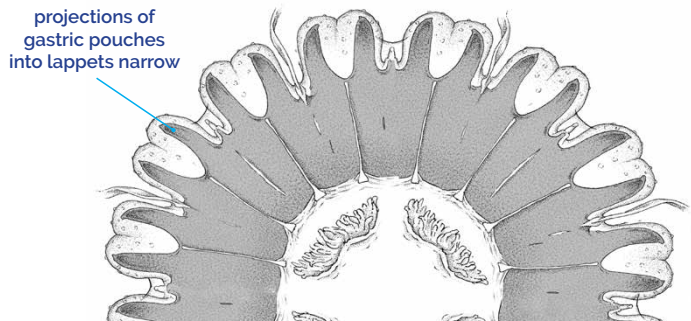


Fig. 4. *Pelagia noctiluca* (oral view)

Mawia benovici (Piraino, Aglieri, Scorrano and Boero, 2014)

Diagnostic features

Bell thin, slightly thickened centrally, with numerous, evenly spaced, highly pigmented, nematocyst warts of various shapes and sizes, scattered across bell and extending onto lappets.

Eight marginal rhopalia divide bell into octants, each with two broad, rectangular, velar lappets, sometimes with a median notch and rounded at the edges. **Rhopalial lappets** absent.

Each octant with one hollow tentacle, up to two times BD in length. Tentacle bases typically large and flattened into ovoid shape, lacking any muscle, folding and tapering distally.

Sixteen, evenly spaced, **radial septa** divide subumbrella into eight tentacular and eight rhopalial pouches. Septa straight, terminating in the centre of lappets. **Manubrium** arises from centre of subumbrella from four thickened oral pillars, giving rise to a relatively short oral tube and four **oral arms** with frilled edges. Manubrium (including oral arms) typically less than 1.3 times BD. Nematocyst warts scattered across subumbrella, including manubrium and oral arms, but warts situated between adjacent gonads larger and more pigmented than those covering the rest of the subumbrella and manubrium. Four highly folded, ribbon-like, horse-shoe shaped **gonads**, develop directly on subumbrella and typically span three or four gastrovascular pouches.

Colour

Yellowish-brown with numerous, usually brown nematocyst warts scattered across surface. Nematocyst warts can make the bell appear to be dark brown. Gonads usually milky-white and sometimes with a slight pink hue.

Size

Up to 8 cm BD.

Ecology

Species with separate sexes that are indistinguishable. Known to bloom within the Mediterranean and Adriatic seas. Considered to be invasive but native region unknown.

Stinging

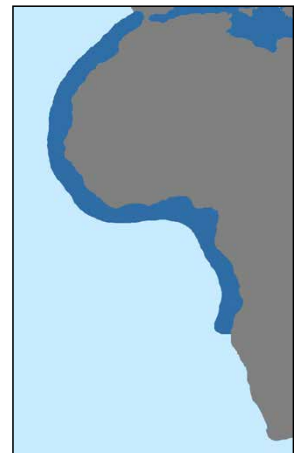
Not recorded, likely painful but not fatal.

Distribution

West Coast of Africa from Morocco to Angola, and the Mediterranean Sea.

Remarks

Mawia benovici was originally described as *Pelagia benovici* as a result of its morphological similarity to *Pelagia noctiluca*. It was later moved to a newly erected genus *Mawia* and contains only one valid species, *Mawia benovici*.





Mawia benovici

Pelagia noctiluca (Forsskål, 1775)

Diagnostic features

Bell thin, with numerous raised warts, rough to the touch. **Mesoglea** thickening centrally. **Eight marginal rhopalia divide bell into octants, each with two relatively broad, rounded/rectangular velar lappets**, occasionally with a median notch, and generally with two pronounced extensions of gastrovascular pouch basally. **Rhopalial lappets** absent.

Each octant with one, hollow, generally strongly pigmented tentacle arising between adjacent velar lappets, two to three times BD in length. A broad band of coronal muscle on subumbrella, and a thin circle of nematocyst warts proximally.

Sixteen, straight **radial septa** span coronal muscle, terminating at base of lappet in midline between pouch extensions into lappet. **Manubrium** arising centrally from four thickened pillars, and giving rise to four **oral arms**, up to three times BD in length. Oral tube may represent up to 25% of oral arm length. Manubrium and oral arms with numerous nematocyst warts.

Four ribbon-like **gonads**, richly folded and in mature specimens bulging towards manubrium.

Colour

Variable but usually with a faint pink/brown tinge, translucent, without distinct pattern on bell surface. Nematocyst warts and tentacles may be strongly pigmented (pink/purple). Gonads generally pink/purple in colour and clearly visible through bell.

Size

Up to 10 cm BD.

Ecology

A holopelagic species that may inundate coastal waters seasonally, known to bloom. In the Mediterranean Sea, populations may overwinter at depth. Sexes separate, morphologically indistinguishable. Diet includes a wide variety of relatively small zooplankton taxa, including fish larvae. Will give off light when disturbed, hence *noctiluca*.

Stinging

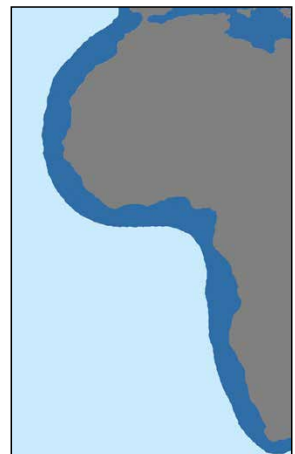
Painful but not fatal.

Distribution

Found in temperate and tropical waters around the world. It is primarily an oceanic species that appears associated with the shelf edge and may move into shallow water following sustained onshore winds.

Remarks

Although a number of different species of *Pelagia* have been described over the years, most are considered of dubious validity owing to a very conserved morphology. That said, there are clear genetic differences between specimens found around southern Africa, the Indian Ocean, the northwest Pacific, and those in the Mediterranean and North Atlantic, which has led some authors to consider the former a separate species.





Pelagia noctiluca

GENUS *CHRYSAORA*

Key to species of *Chrysaora* occurring in the area and neighbouring waters

1a. Tentacles more than 24 (up to 48) (Fig. 1)
 *Chrysaora africana* (p. 94)

1b. Tentacles up to 24 (in some specimens, tentacles very easily break off at the base) (Fig. 2) ▶ **2**

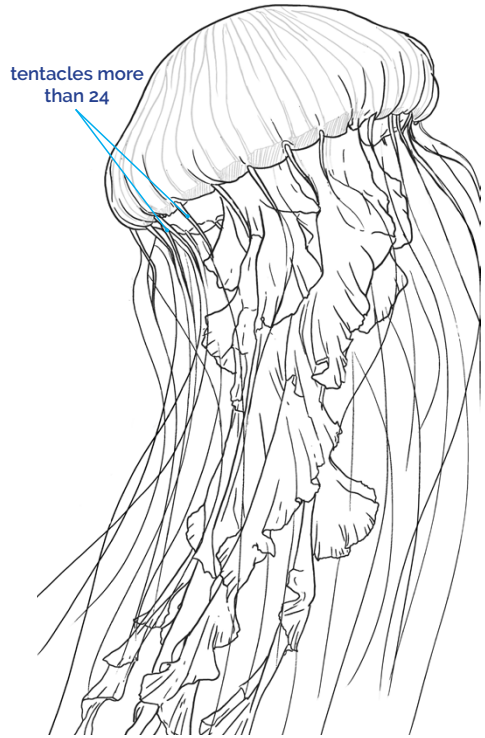


Fig. 1. *Chrysaora africana*

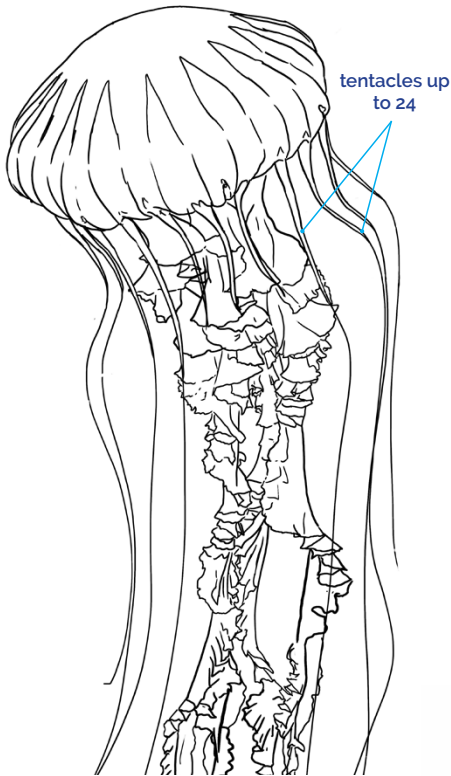


Fig. 2. *Chrysaora agulhensis*

2a. Tentacles laterally flattened (Fig. 3)
 *Chrysaora agulhensis* (p. 96)

2b. Tentacles cylindrical (Fig. 4) ▶ **3**

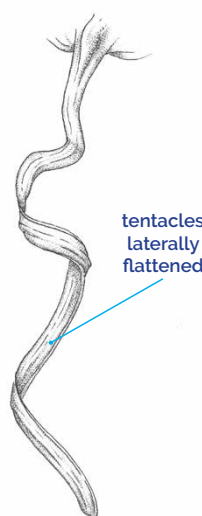


Fig. 3. Tentacle of *C. agulhensis*

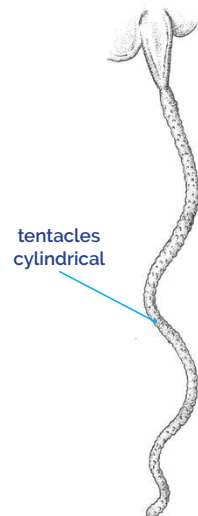


Fig. 4. Tentacle of *C. fulgida*

3a. Marginal lappets with small canals (Fig. 5) *Chrysaora fulgida* (p. 98)

3b. Marginal lappets without canals (Fig. 6) *Chrysaora hysocella* (p. 100)

marginal lappets with
small canals

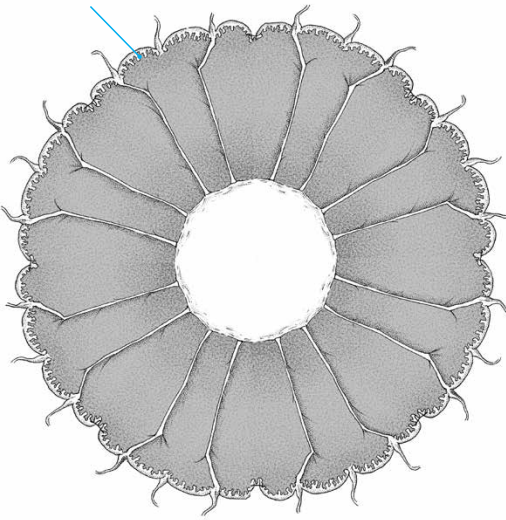


Fig. 5. *Chrysaora fulgida* (oral view)

marginal lappets
without canals

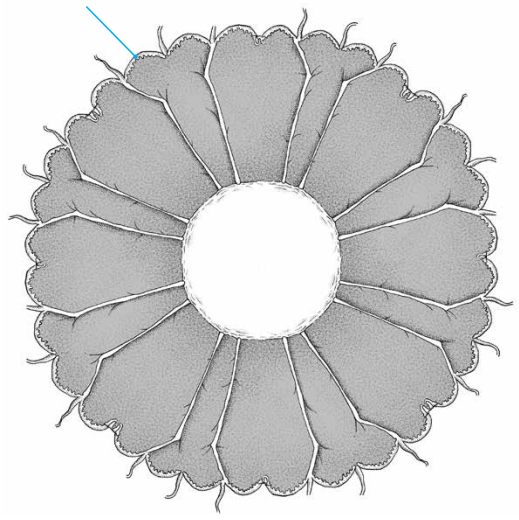


Fig. 6. *Chrysaora hysocella* (oral view)

Chrysaora africana (Vanhöffen, 1902)

Diagnostic features

Bell with small, raised nematocyst warts, granular to the touch, gracile. **Mesoglea** slightly thickened centrally. Eight marginal **rhopalia** divide the bell into octants, each comprising two rhopalial and four roughly triangular, relatively narrow **velar lappets**. **Rhopalial lappets** indented at termination of septum, do not overlap the rhopalium, strongly pigmented and free of gastrovascular canals.

One **primary**, two **secondary** and two **tertiary tentacles** per octant (for **a total of 40 tentacles**), located at umbrella margin in clefts between lappets. Tentacles approximately equal in length, more than two times BD in length, persistent, hollow, **flattened** (not circular) in cross-section, proximally.

Stomach circular, marginally limited by 16 radial septa spanning the entire width of the circular muscle, narrow, becoming gradually wider and strongly truncated centripetally. **Manubrium** unpigmented, surrounding a relatively broad mouth (about 28% BD in width), arising as a short tube from four fairly stout pillars proximally, distally divided into four **oral arms**, about three times BD in length. Oral arms lancet-shaped, generally lacking pigment, width about 50% BD at widest point, V-shaped in cross section, highly crenulate, with delicate frills on edges, not spirally folded proximally. **Quadralinga** absent.

Colour

Bell's base-colour white, translucent with a strongly pigmented (dark purple) pattern of (typically 16) alternating lines and radially distributed triangles expanding to margin. The pattern on the bell is highly variable as too is the exact mix of the colours on tentacles and oral arms. Marginal tentacles usually purple, but sometimes white; oral arms usually white throughout, occasionally with a purple trim at base of "V". Unlike *Chrysaora fulgida*, juveniles always showing adult pigmentation.

Size

Up to 35 cm BD.

Ecology

Poorly known. Although frequently caught, rarely abundant except in coastal harbours. Metagenetic, sexes separate but externally indistinguishable. A shallow water species displaying (off Namibia) seasonal strobilation. Diet as *Chrysaora fulgida*, but including other jellyfish.

Stinging

Undocumented. Likely mild.

Distribution

Found in nearshore waters along the west coast of Africa from Walvis Bay to the Gulf of Guinea. Endemic to the region.





Chrysaora africana

Diagnostic features

Bell with small raised nematocyst warts, slightly granular to the touch. **Mesoglea** thickened centrally, especially in larger specimens. Eight marginal **rhopalia** situated in deep clefts divide bell into octants, each with two elongated **rhopalial lappets** and two triangular-shaped **velar lappets**, pigmented on upper and lower surfaces and with ill-defined gastrovascular canals basally.

One **primary tentacle** found in each octant, located in a cleft between adjacent velar lappets, with two well-developed **secondary tentacles** situated in clefts between adjacent velar and rhopalial lappets for a total of **24 tentacles**. Tentacles persistent, **laterally flattened** (not circular), solid in cross-section and "ribbon-like".

Stomach circular, marginally limited by 16 radial septa spanning the entire length of circular muscle and fused at periphery of rhopalial lappets. Tentacular pouches dilate and contract distally; rhopalial pouches contract and dilate distally. **Manubrium** arising from central **stomach** forms thin, tubular, slightly elongated structure with thickened mesoglea. Oral opening (mouth) cruciform and situated in the centre of manubrium whose wall is divided into four oral arms distally. **Oral arms** lancelet-shaped, V-shaped in cross section, spiralled proximally, becoming linear distally, between 15 and 25% longer than bell diameter.

Quadralinga absent.

Colour

Base colour white, with 16 maroon/purple variously pigmented and radially distributed triangles expanding to margin. Central apex an unpigmented, translucent circle. White spots scattered throughout bell. Tentacles cream and unpigmented at base, becoming more pigmented distally and light brown towards tentacle tip. Oral arms generally pale in colour, though edges and frills are maroon/purple, with some specimens displaying some maroon/purple coloration in the central portions as well. With an increase in size, the oral arms become darker proximally and lose colour distally, and subumbrella becomes slightly maroon/purple. Unlike *Chrysaora fulgida*, juveniles always showing adult pigmentation.

Size

Up to 35 cm BD.

Ecology

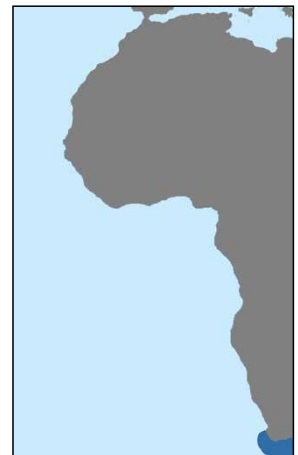
Poorly known. Metagenetic, sexes separate but morphologically indistinguishable. The commonest large pelagiid encountered along the south coast of South Africa and may strand *en masse*.

Stinging

Undocumented. Likely, mild.

Distribution

Found across the shelf on the south coast of South Africa from north of Cape Town to east of Port Elizabeth. Endemic to the region.





Dorsal view of bell in juveniles

Chrysaora fulgida (Reynaud, 1830)

Diagnostic features

Bell smooth to the touch, robust, with thickened **mesoglea** centrally. Eight **rhopalia** at bell margin divide the bell into octants, each comprising two rhopalial and no more than two broad, flat, semi-circular **velar lappets**. **Rhopalial lappets** slightly more rounded than velar lappets, do not overlap the rhopalium, pigmented, with a **filamentous network of gastrovascular canals basally**.

Eight persistent and prominent **primary tentacles, circular in cross-section**, one per octant, located in deepish clefts between velar lappets, less than two times BD in length. Up to two deciduous, circular, hollow, **secondary tentacles** per octant, half the width of primary tentacles at base, located in shallow clefts between rhopalial and velar lappets.

Stomach circular, marginally limited by 16 radial septa spanning the entire width of the circular muscle, narrow, rounded centripetally, straight but describe a pronounced curve before fusing to the edge of rhopalial lappets near mid-line. **Manubrium** surrounding a relatively small mouth (about 18% BD in width), arising as a short, thin tube from four relatively thin pillars proximally, distally divided into four **oral arms**, \geq two times BD in length. Oral arms lancet-shaped, width about 40% BD at widest point, V-shaped in cross section, highly crenulate, with delicate frills on edges, lavishly spiralled basally. **Quadralinga** present in specimens larger than 40 cm BD.

Colour

Bell translucent rose/orange in colour with characteristic star-shaped pattern formed from (typically) 16, darker-than-base pigmented, radially distributed triangles expanding to margin. Tentacles maroon in colour. Oral arms with orange/brown frills, opaque and colourless in their inner portion. Juveniles with uniformly pink umbrella lacking compass marks and possessing conspicuous maroon tentacles and pale oral arms.

Size

Up to 80 cm BD. Twenty kg in weight.

Ecology

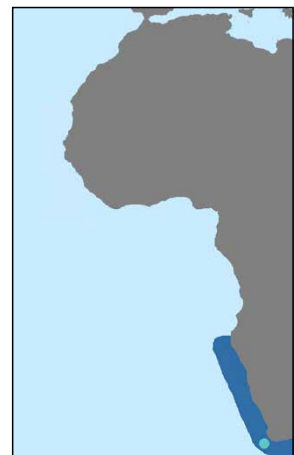
Present across the Namibian shelf throughout the year; commonest at depths less than 200 m; more seasonal (autumn peak) off South Africa. Can dominate pelagic catches, frequently necessitating extensive repairs to nets. Strands en masse. Metagenetic, sexes separate, externally indistinguishable. Adults may reproduce throughout the year; strobilation by polyps seasonal. Often caught with bearded gobies, *Sufflogobius bibarbatu*. Diet includes dinoflagellates, diverse zooplankton and occasionally zoobenthos.

Stinging

Ephyrae known to illicit pronounced sting; adult specimens produce a mild sting in some individuals.

Distribution

Endemic to the Benguela upwelling ecosystem (south of Angola to Cape Agulhas); particularly abundant off central Namibia.





Dorsal view of bell in juveniles

Chrysaora hysoscella (Linnaeus, 1767)

Diagnostic features

Bell smooth to the touch. **Mesoglea** thickened centrally and relatively stiff at bell margin. Eight marginal **rhopalia** situated in relatively deep clefts divide bell into octants, each with two semi-circular **velar lappets** and two shorter and broader **rhopalial lappets**, generally pigmented on both upper and lower surfaces and without extensions of the gastrovascular cavity.

One **primary tentacle** found in each octant, located in a cleft between adjacent velar lappets, with two well-developed **secondary tentacles** situated in clefts between adjacent velar and rhopalial lappets for **a total of 24 tentacles**, persistent, **circular in cross section**, hollow, up to three times BD in length. **Stomach** marginally limited by 16 radial septa spanning entire width of circular muscle and then diverge to fuse with edge of rhopalial lappets close to base of marginal tentacle. **Manubrium** arising from thickened pillars around central **stomach**, a short oral tube divided into four oral arms distally. **Oral arms** lancelet-shaped, V-shaped in cross section, loosely spiralled proximally, may be tightly coiled distally. **Quadralinga** absent.

Colour

Highly variable. Base colour cream or pale brown/yellow. Northern populations with (a median of) 16 variously (brown) pigmented, radially distributed triangles expanding to base of lappets. Central apex with a pigmented spot. Mediterranean populations more uniformly coloured, occasionally without pigmented bell. Always with pigmented lappets. Tentacles uniformly pale, oral arms pale at margin, maybe pigmented basally.

Size

To a maximum of 30 cm BD.

Ecology

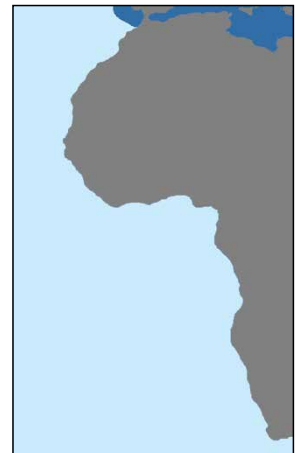
Seasonally (late summer and autumn) common in the north, generally uncommon otherwise and rarely "blooms". Metagenetic, a protandric hermaphrodite. Diet includes a variety of zooplankton but favours other gelatinous species.

Stinging

Mild, if at all.

Distribution

Shelf waters of western Europe and the Mediterranean Sea. Not recorded from the Canary Islands, Azores and Madeira.



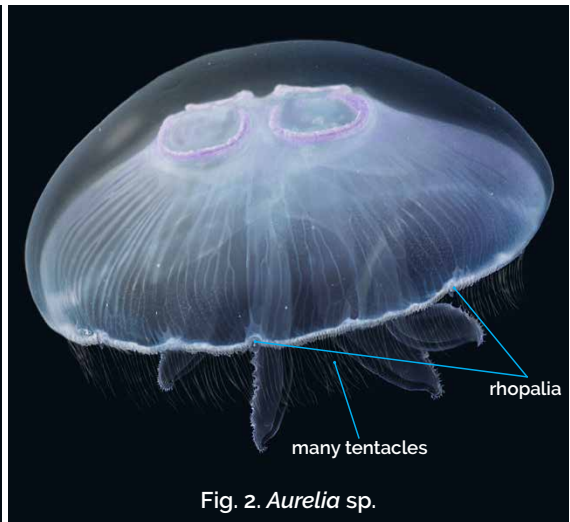
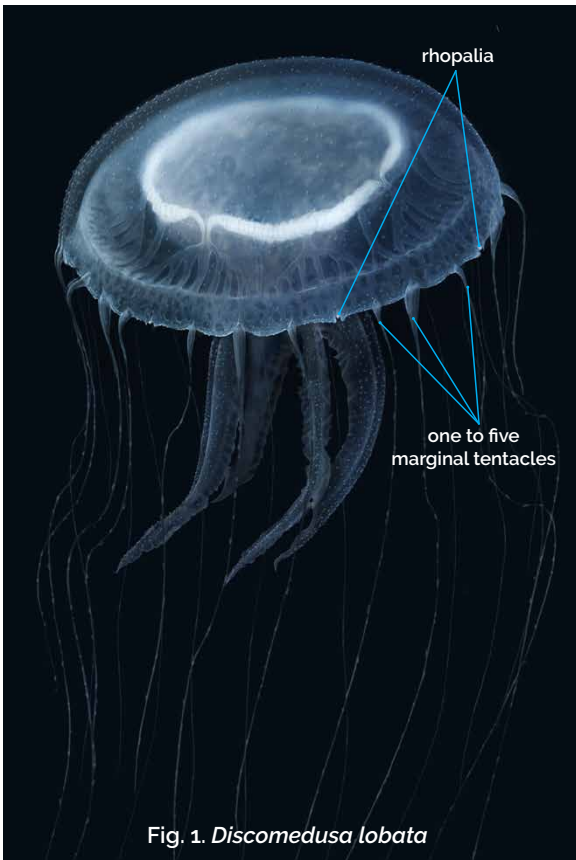


Chrysaora hysoscella

FAMILY ULMARIDAE

Key to genera and species of Ulmaridae occurring in the area

- 1a. Specimens transparent or translucent (Figs. 1 & 2) ► 2
- 1b. Specimens coloured (dark red, brown, or creamy white) (Figs. 3-5). ► 3
- 2a. From one to five marginal tentacles between successive rhopalia (Fig. 1)
. *Discomedusa lobata* (p. 106)
- 2b. Many tentacles between successive rhopalia (arising slightly above margin) (Fig. 2)
. *genus Aurelia* (p. 104)

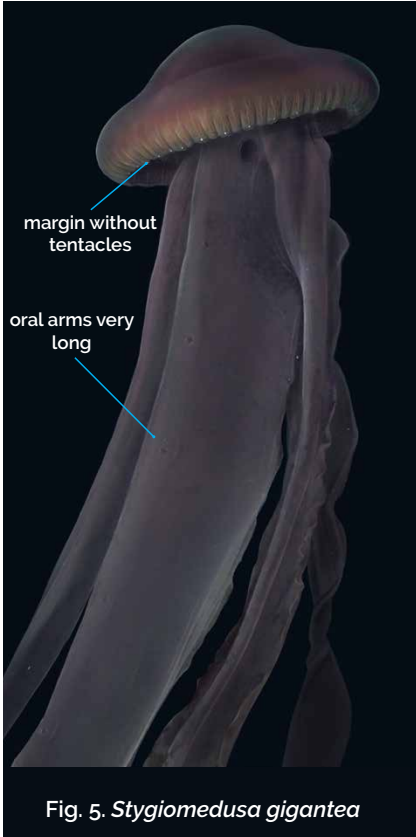
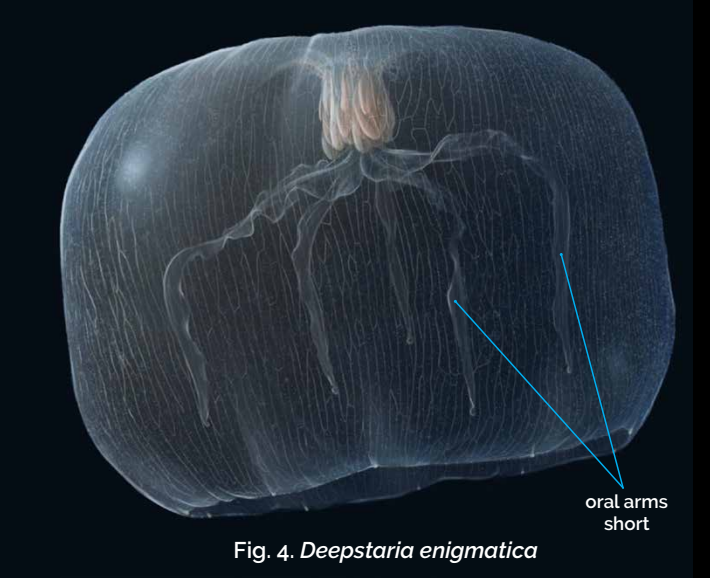


- 3a. Margin with tentacles (Fig. 3).
. *Poralia rufescens* (p. 108)
- 3b. Margin without tentacles (Figs. 4 & 5, p. 103). ► 4



4a. Oral arms short, shorter or nearly as long as BD (Fig. 4) *genus Deepstaria* (p. 113)

4b. Oral arms very long, three to four times BD (Fig. 5) *Stygiomedusa gigantea* (p. 110)



Aurelia spp.

Diagnostic features

Bell flattened, smooth to the touch, thickening towards centre. Eight marginal **rhopalia**, equally spaced, divide bell into octants, each rhopalium with two ocelli may be flanked by short, minute, narrow and pointed **rhopalial lappets**. One (with or without a median notch) or two broad rounded and relatively narrow **velar lappets** in each octant. **Numerous short, fine tentacles slightly above bell margin**, create impression of velarium. Tentacles hollow, broader at base and may narrow to a filament distally.

Manubrium may be relatively broad and deep, thickened, giving rise to four undivided **oral arms** of variable length (generally less than BD), V-shaped in cross-section, thickened on inner axis and crenelated on outer edges. Oral arms may support numerous small tentacle-like structures (= digitata), generally lancet-like but can display complex folding proximally. Each of the four **gastric pouches** leads into two unbranched adradial canals; perradial and interradian canals may branch (anastomose) to ring canal in various ways.

Gonads pigmented, horse-shoe shaped, visible through bell.

Colour

Species within the genus generally translucent or transparent, with pigment (blue/purple/pink/white) confined to the gonads and sometimes the marginal tentacles. Radial canal network opaque.

Size

Usually less than 40 cm BD, occasionally to 110 cm BD.

Ecology

In temperate latitudes, species strongly seasonal with some individuals overwintering; locally unknown. Metagenetic, sexes are separate but morphologically indistinguishable. Diet includes a very wide range of small zooplankton, including the eggs and larvae of fishes. Known to form large blooms elsewhere.

Stinging

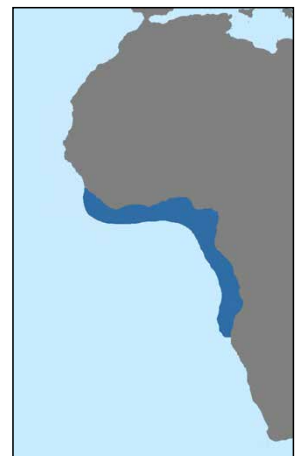
Mild, if at all.

Distribution

A strictly coastal genus, that may occur abundantly in sheltered localities. Absent from the cool Benguela upwelling ecosystem. A species genetically distinct from all presently known species is common in the Gulf of Guinea and is in the process of being described.

Remarks

The genus exhibits a highly conserved morphology and crypsis is widespread, to the extent that a number of genetically distinct entities (species) are simply referred to by number and await definitive description. Three species have been recorded in the region, including *Aurelia aurita* (Linnaeus, 1758), *Aurelia colpota* Brandt, 1835 and *Aurelia solida* Browne, 1905. A newly discovered species *Aurelia mozambica* Brown and Gibbons, 2021, is found off the mouth of the Zambezi River, in southern Mozambique.





Aurelia spp.

Discomedusa lobata Claus, 1877

Diagnostic features

Bell flatter than a hemisphere, finely granulated to the touch. **Mesoglea** thick and firm. Eight **rhopalia** sided by small rounded rhopalial lappets. **Tentacles varying in number from one to five per octant (depending on size), totalling 8-40**, the primary eight tentacles slightly thicker at base. Marginal lappets also varying in number depending on size and tentacles' number, from two to six per octant (totalling 16-48 + rhopalial ones). Lappets siding primary tentacles larger and wider than the others, all with a rounded edge. Central **gastrovascular cavity (=stomach)** round, 50% BD in width. **Gastric filaments** and four **gonads** forming an almost continuous ring at the edge. **Manubrium** tube-like (20% BD in length) and four V-shaped **oral arms** (20% BD in length) extending beyond bell margin; free edges of arms somewhat frilled and having small digitata. Eight unbranched adradial and eight branched perradial and interradial canals located marginally to central **stomach**, all connected by a marginal ring canal.

Colour

Bell translucent; only rhopalia and gonads white.

Size

Up to 15 cm BD. BH about 40% BD.

Ecology

Life cycle and feeding habits unknown.

Stinging

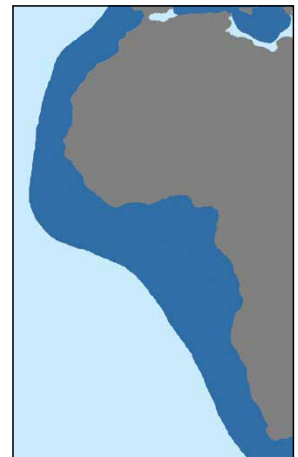
Unknown.

Distribution

Found in the Mediterranean Sea, English Channel, and west coast of Africa.

Remarks

The species *Undosa undulata* and *Ulmaris prototypus* both described by Haeckel in 1880 are considered synonyms. Oogenesis was studied in specimens from the Adriatic Sea.





Discomedusa lobata

Poralia rufescens Vanhöffen, 1902

Diagnostic features

Bell somewhat a flat hemisphere, depending on the contraction state, covered by small nematocyst warts. **Mesoglea** thin and delicate, with reddish-brown granules.

Twelve to 30 whitish **rhopalia**, sided by **rhopalial lappets** slightly longer than interrhopalial ones. **One to four tentacles between each rhopalium, very thin and delicate, inserted on the subumbrella, near margin.** Marginal lappets sometimes connected by a thin membrane, almost indistinct.

Central **gastrovascular cavity (=stomach)** circular, 20% BD; marginal region with rarely branched radial canals connected marginally by a thin ring canal. Short tube-like **manubrium** bearing four to eight short **oral arms**, 10% BD in length; edge of arms with small papillae. **Gonads** forming an almost continuous ring around central **stomach**, with several folds.

Colour

Mostly red to reddish-brown, tentacles red to orange, oral surface of arms whitish.

Size

Up to 25 cm BD. BH about 40% BD.

Ecology

Life cycle and reproduction completely unknown. Recorded capturing arrow worms (chaetognats) and hydromedusae. Hyperiid and gammarid amphipods observed in association with the oral arms and subumbrella.

Stinging

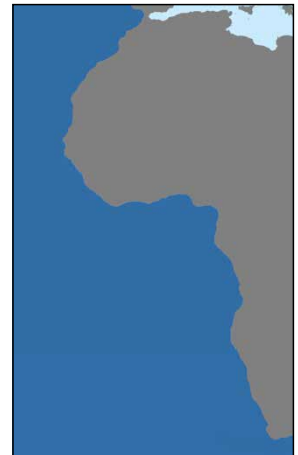
Unknown.

Distribution

Cosmopolitan in deep waters (not found in the Mediterranean Sea and polar regions).

Remarks

As many other deep-sea species, *Poralia rufescens* is known mostly from video footages with a few specimens collected. No mention about bioluminescence.





Poralia rufescens

Stygiomedusa gigantea (Browne, 1910)

Diagnostic features

Bell with a high central dome and a flatter margin, resembling a wide-brimmed hat. **Mesoglea** thick centrally, becoming thinner near the margin.

Twenty **rhopalia** and no marginal **tentacles**. Marginal **lappets** broad and poorly defined, 20 in number.

Central **gastrovascular cavity** (=stomach) round (40% BD in width), divided internally to form four wide chambers. Twenty rhopalial radial canals, lace-like, branching towards margin; 20 interrhopalial canals, unbranched and only anastomosing halfway towards margin, all connected by a peripheral ring canal. **Four extremely long V-shaped, ribbon-like oral arms, 10 times BD in length**. Small, oval to round subgenital ostia between bases of oral arms.

Four **gonads** (=germinal line by Russell and Rees, 1960) lining the sides of the brood chambers.

Colour

Bell and oral arms dark red-brown; gastrovascular canals whitish.

Size

Up to 150 cm BD. BH about 50% BD.

Ecology

There is no polyp stage, young are viviparously brooded by mature individuals. Commonly found in association with the mesopelagic fish *Thalassobathia*. A decapod crustacean of the genus *Eryoneicus* was found in the stomach of the species.

Stinging

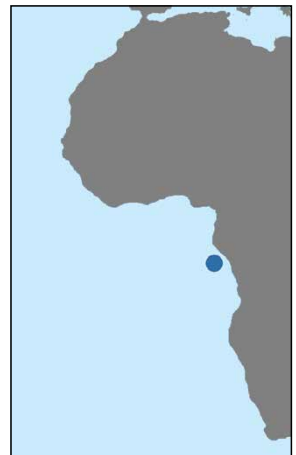
Unknown.

Distribution

Found in most of the major ocean basins (North Atlantic, Northeast Pacific, off Congo, off east Japan, around the Antarctic Peninsula, Bay of Bengal), except for the Mediterranean Sea, Japan and Arctic Ocean.

Remarks

Occurring in mesopelagic trawls. *Stygiomedusa fabulosa* Russell, 1959 and *S. stauchi* Repelin, 1967 are both considered synonyms.





Stygiomedusa gigantea

GENUS *DEEPSTARIA*

Key to species of *Deepstaria* occurring in the area

- 1a. Gastric filaments spread over base of stomach and the interradiial walls of the manubrium (Fig. 1), bell creamy-white in freshly caught specimens. *Deepstaria enigmatica* (p. 114)

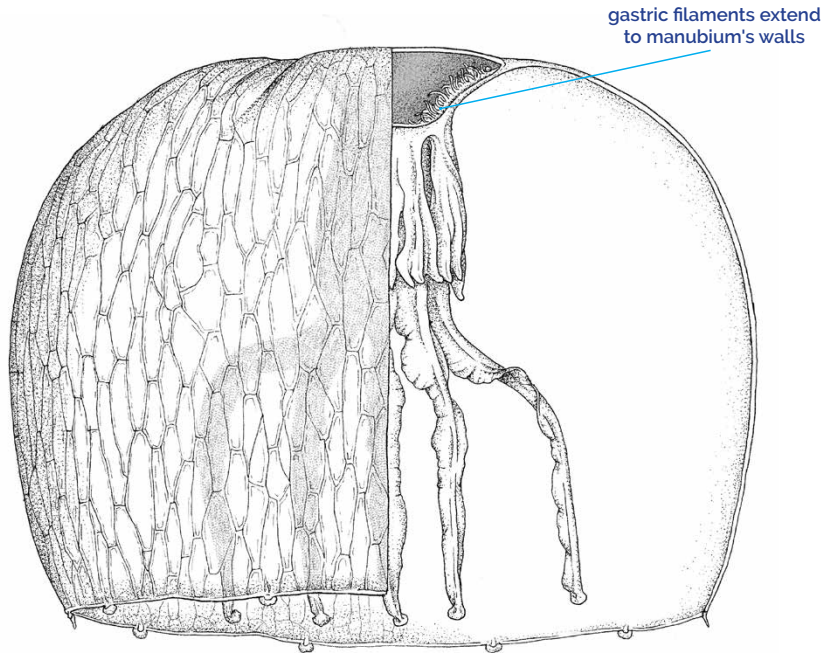


Fig. 1. *Deepstaria enigmatica*

- 1b. Gastric filaments spread over base of stomach only (Fig. 2); bell deep reddish-brown in freshly caught specimens. *Deepstaria reticulum* (p. 116)

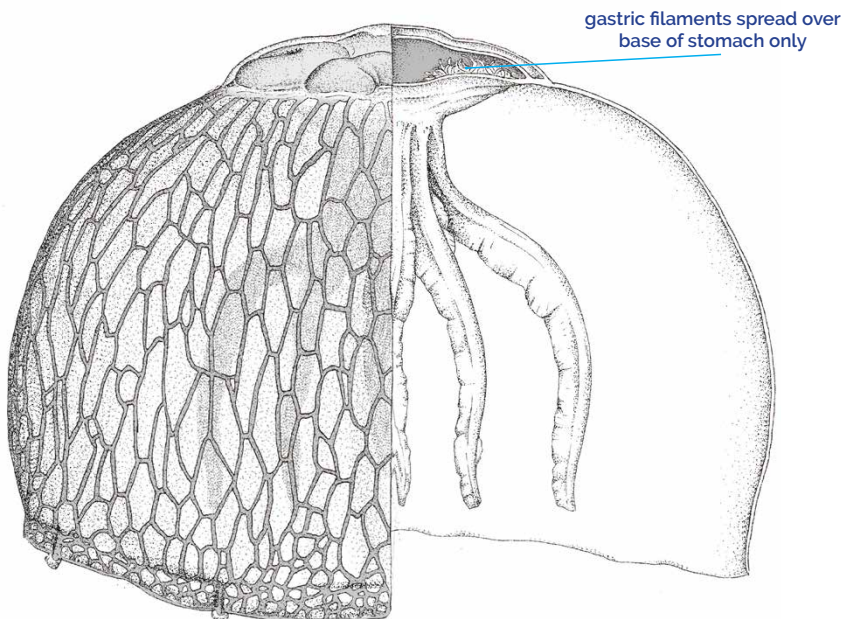


Fig. 2. *Deepstaria reticulum*

Diagnostic features

Bell bag-like, broad, resembling a flat inverted bowl when relaxed, smooth to the touch.

Mesoglea 10 to 20 mm thick, but delicate and appearing flaccid.

Exact number of **rhopalia** unknown, possibly 20. **Tentacles** absent. Marginal lappets not evident, either lacking or very shallow. Subumbrellar musculature mostly restricted to bell margin.

Central **gastrovascular cavity** (=stomach) small, about 15-20% BD, forming, in the periphery, a delicate net of fine canals; **manubrium** fused, 10% BD in length. Five V-shaped **oral arms**, 10% BD in length, with spatulate tips; **gastric filaments spread over base of stomach and extend to the interradial walls of the manubrium.**

Gonads folded along interradial walls of manubrium.

Colour

Bell transparent; canals opaque white; some specimens slightly brownish near stomach and bell margin.

Size

Up to 60 cm BD, variable form.

Ecology

Life cycle and reproduction mode completely unknown. Species seems to feed by embracing the prey with the umbrella and closing the margin. Possibly not swimming but moving by peristaltic contractions of bell. Isopods found on the subumbrella and oral arms.

Stinging

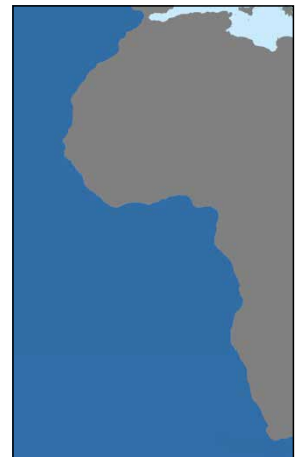
Unknown.

Distribution

Possibly cosmopolitan in deep waters (600–1750 m depth), not found in Japan, the Mediterranean Sea, or the Arctic Ocean.

Remarks

Due to the delicate bell, usually found in pieces. Much of what is known of the species is due to underwater video footage from Remotely Operated Vehicles (ROVs).





Deepstaria enigmatica

Diagnostic features

Bell bag-like, broad, smooth to the touch. **Mesoglea** three to five mm thick, but delicate and appearing relatively firm. Eight **rhopalia**, possibly more, each one sided by a pair of large rounded **rhopalial lappets**. **Tentacles** absent. Marginal lappets not evident, either lacking or very shallow. Bell margin folded (few mm) towards subumbrellar side. Ring musculature mostly restricted to subumbrellar bell margin.

Central **gastrovascular cavity** (=stomach) small, about 10-15% BD, forming, in the periphery, a delicate net of fine canals; about 20 thicker straight canals (some rhopalial, other not), and all connecting in marginal ring canal. **Manubrium** fused, 10% BD in length. Four V-shaped **oral arms**, 10% BD in length; **gastric filaments spread over manubrium's V-shaped basal part only**. Developed **gonads** not recorded.

Colour

Bell deep reddish-brown; stomach and part of oral arms light brown; gastric cirri cream-whitish.

Size

Up to 75 cm BD, variable form.

Ecology

Life cycle and reproduction mode completely unknown. *Deepstaria* species are known to capture prey embracing them with the umbrella and closing the margin. Possibly not swimming but moving by peristaltic contractions of bell. Isopods found on the subumbrella.

Stinging

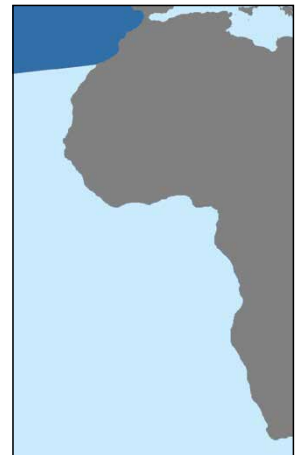
Unknown.

Distribution

Found only in deep waters (745–1498 m depth) of the North Atlantic, but possibly distributed worldwide.

Remarks

Similar to *D. enigmatica*, what is known of the species is due to underwater video footage from Remotely Operated Vehicles (ROVs).





Deepstaria reticulum

ORDER RHIZOSTOMEAE

Key to families of Rhizostomeae occurring in the area

- 1a. Oral arms with scapulets (Fig. 1) family Rhizostomatidae (p. 119)

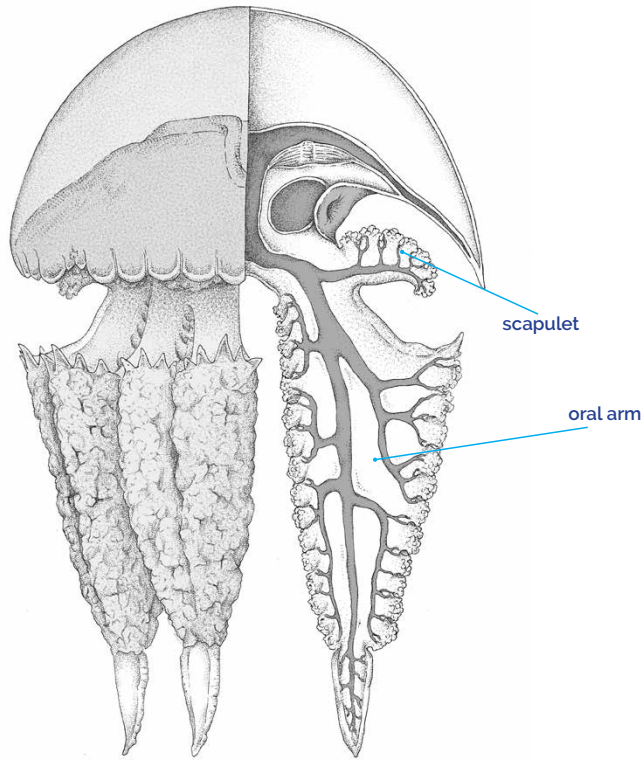


Fig. 1. Family Rhizostomatidae

- 1b. Oral arms without scapulets (Fig. 2) other families of Rhizostomeae (p. 128)

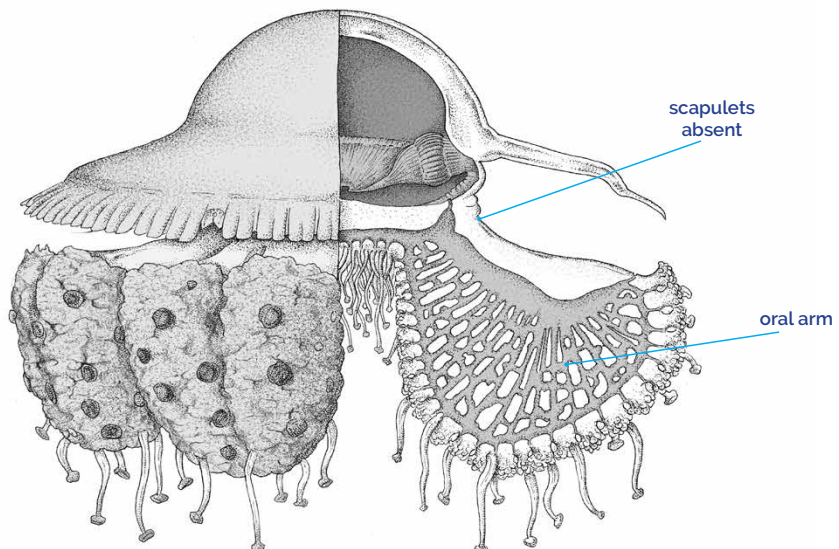


Fig. 2. Other Rhizostomeae (*Cotylorhiza tuberculata*)

FAMILY RHIZOSTOMATIDAE

Key to genera of Rhizostomatidae occurring in the area

- 1a. Oral arms without appendages (Fig. 1) **genus *Eupilema*** (one species in the area: *Eupilema inexpectata*) (p. 120)
- 1b. Oral arms with appendages (Figs. 2 & 3) ► 2

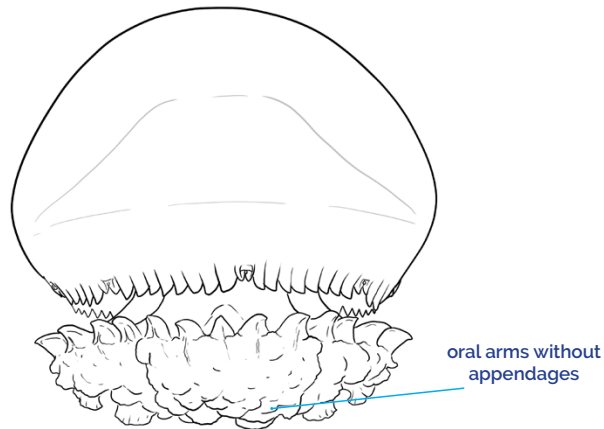


Fig. 1. *Eupilema inexpectata*

- 2a. Oral arms with terminal and other appendages (Fig. 2) **genus *Rhopilema****
- 2b. Oral arms only with terminal appendages (Fig. 3) **genus *Rhizostoma*** (p. 123)

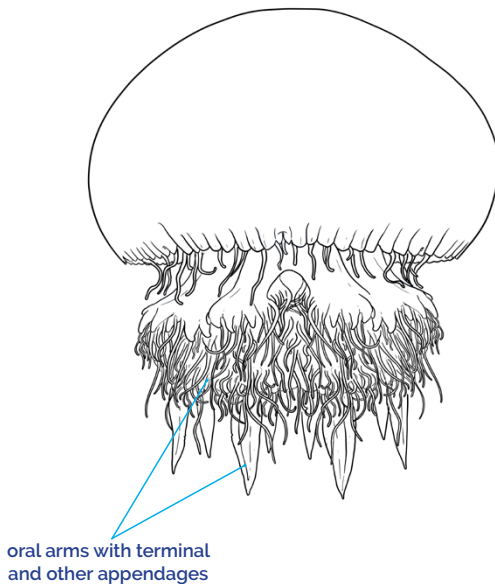


Fig. 2. *Rhopilema* sp.

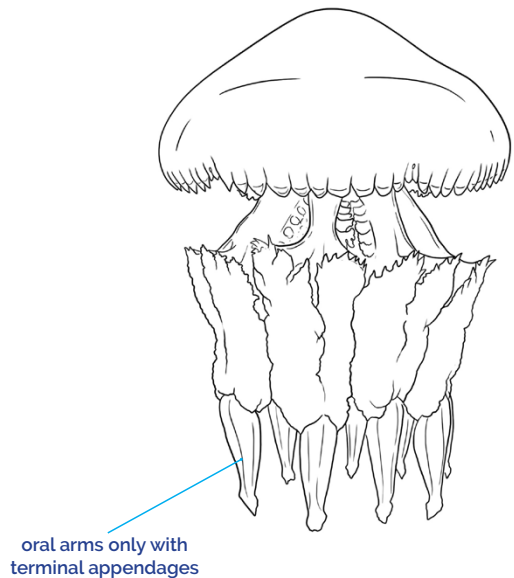


Fig. 3. *Rhizostoma pulmo*

*A specimen of *Rhopilema* was recently photographed in False Bay, Cape Town, South Africa. As its external characters differed from all the *Rhopilema* species known to occur in neighbouring waters, it is treated here only at the genus level.

Diagnostic features

Bell a high hemisphere, thick and rigid centrally, thinning to margin, granular to the touch, translucent. Eight **rhopalia** at bell margin divide bell into octants. Each rhopalium flanked by two short, triangular, **rhopalial lappets**. Usually eight **velar lappets** per octant, triangular, pointed, broad at base, longer than rhopalial lappets.

No central primary mouth opening. **Eight stiff oral arms without appendages**, each bearing a pair of short, arched, and bifurcated mouthlet-bearing scapulets basally. Oral arms fused proximally, to about 50% total length, distally divided into two aboral and one adoral wings. Wings with stiff hooks, mouthlets confined to ends of oral arms and along adoral wing, and no filaments or clubs.

Four perradial, four interrarial and eight adradial **canals**. Interradial canals terminating at rhopalia, others at wide, diffuse, ring canal. A network of anastomoses connects all canals. Four oval interrarial openings to subgenital cavity.

Four interrarial folded **gonads**.

Colour

Translucent, pale blue or white. Mouthlets opaque.

Size

Up to 40 cm BD.

Ecology

Poorly known.

Stinging

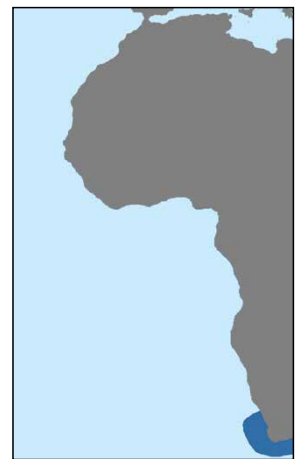
Unknown.

Distribution

Known only from the southwestern Cape off South Africa. Usually coastal but may occasionally be caught in offshore waters. Seasonally uncommon.

Remarks

Could be confused with species of *Rhizostoma*, from which it can be differentiated by its short, stiff oral arms that terminate in rigid hooks and which lack foliaceous mouthlets.





Eupilema inexpectata

GENUS *RHIZOSTOMA*

Key to species of *Rhizostoma* occurring in the area

- 1a. Eight whitish velar lappets per octant; sometimes very long terminal appendages, three to four times bell diameter (Fig. 1)
..... *Rhizostoma luteum* (p. 124)

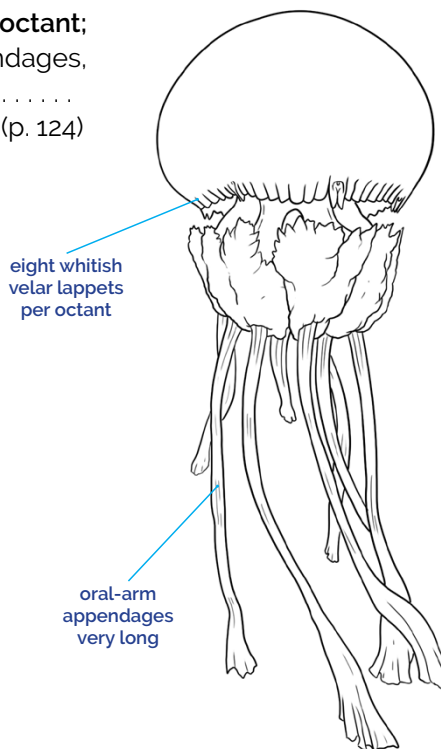


Fig. 1. *Rhizostoma luteum*

- 1b. Ten dark blue/violet velar lappets per octant; short terminal appendages, not longer than bell diameter (Fig. 2) . . . *Rhizostoma pulmo* (p. 126)

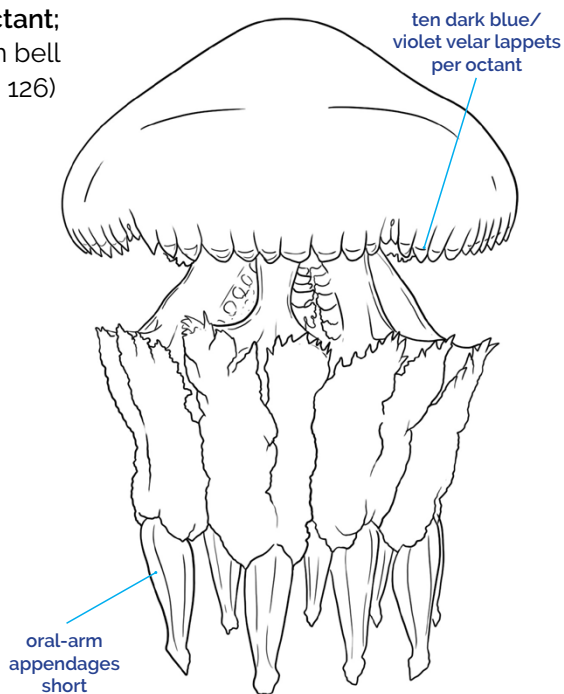


Fig. 2. *Rhizostoma pulmo*

Rhizostoma luteum (Quoy and Gaimard, 1827)

Diagnostic features

Bell dome shaped, finely granular to the touch, thickened centrally, becoming thinner towards margin, translucent. **Mesoglea** thick and solid throughout.

Eight marginal **rhopalia**, each flanked by a pair of triangular and sharply pointed **rhopalial lappets**. Eight **velar lappets** per octant, triangular, broad-based, shorter than rhopalial lappets, pigmented on upper and lower surface. Well-developed coronal muscle band extends to base of lappets.

No central primary mouth opening. **Manubrium** a short, rigid oral tube, with four pairs of **oral arms** distally, each with one adoral and two aboral wings, with soft folded mouthlets occurring along wing edges. **Oral arms with a naked terminal appendage, frequently damaged or lost, characteristically club-shaped, and three to four times BD in length.** Oral arm (excluding terminal appendage) approximately equal to BD in length.

Sixteen broad, relative short, straight **radial canals** (eight adradial, four perradial and four interradial) extending from gastric cavity to ring canal situated one third of radius inward from margin; perradial and interradial canals extend to rhopalia. Fine network of anastomosing canals between the ring canal and into lappets at umbrella margin; intracircular network discrete and not communicating with radial canals.

Four oval, interradial openings to subgenital cavity, each with a pronounced, raised, approximately circular bump. Four highly folded **gonads** interradially, visible through exumbrella.

Colour

Translucent white or pale blue, **lappets whitish**, mouthlets cream or pale brown, terminal club often pigmented, purple/brown. Gonads cream or pale pink in colour.

Size

Up to 60 cm BD.

Ecology

Surprisingly, poorly known, in the region or elsewhere. A coastal and shelf species that may be seasonally abundant. Diet not documented.

Stinging

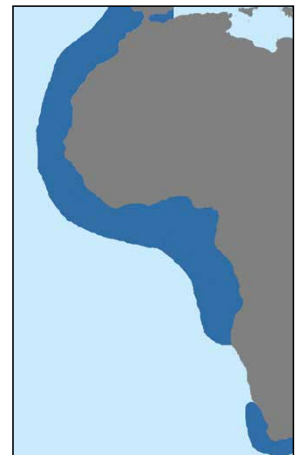
Mild, if at all.

Distribution

Recorded from the western Mediterranean Sea and along the west coast of Africa to Angola. Abundant in the Canary Current system and around Macaronesia. Absent from Namibia but common once again in the southwest Cape off South Africa and over the Agulhas Bank.

Remarks

Off South Africa, could be confused with *Eupilema inexpectata* from which it can be readily distinguished by the "soft" nature of the oral arms.





Rhizostoma luteum

Rhizostoma pulmo (Macri, 1778)

Diagnostic features

Bell dome shaped, thickened centrally becoming thinner to margin, finely granular, translucent.

Mesoglea thick and solid throughout.

Eight marginal **rhopalia** divide bell into octants, each flanked by a pair of approximately triangular **rhopalial lappets**. **Ten velar lappets per octant**, semi-circular, broadly based, slightly longer than rhopalial lappets, pigmented on upper and lower surface at edge. Well-developed coronal muscle band extends to base of lappets.

Manubrium a short but "massive", rigid oral tube, with four pairs of **oral arms** distally, each with two scapulets proximally for a total of 16. Scapulets three winged, folded aborally and supporting numerous soft mouthlets. Oral arms with one adoral and two aboral wings, with soft folded mouthlets occurring along wing edges, and with a naked **terminal appendage** (frequently damaged or lost), characteristically triangular in cross section and club-shaped, narrowest at mid-length. **Oral arm (including club) approximately equal to BD in length**. Four slit-like interradial openings to subgenital cavity, obstructed medially by a pronounced semi-circular knob protruding from the subumbrella.

Sixteen broad, relatively short, straight **radial canals** (eight adradial, four perradial and four interradial) extend from gastric cavity to ill-defined ring canal situated about 40% of radius inward from margin; perradial and interradial canals extend to rhopalial. Fine network of anastomosing canals occurs between the ring canal and into lappets at umbrella margin; intracircular network discrete and not communicating with radial canals.

Four highly folded **gonads** interradially, visible through exumbrella.

Colour

Bell with a slight yellow/cream tinge, translucent; **lappets with dark blue/purple pigment**; clubs may be dull brown/orange; mouthlets yellow/brown.

Size

Up to 60 cm BD.

Ecology

Metagenetic. Diet ranges from protists to fish eggs, with copepods and their nauplii numerically dominant.

Stinging

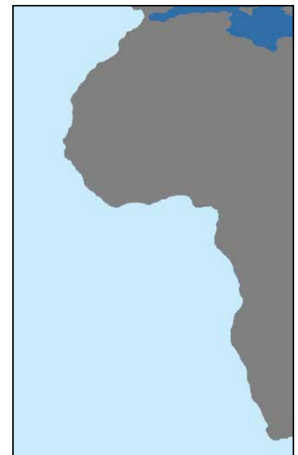
Mild.

Distribution

Mediterranean Sea, from Israel in the east to the Straits of Gibraltar to the west. Strongly seasonal in the northwestern Mediterranean Sea, peaking in abundance during summer and early autumn. Coastal and shallow water.

Remarks

Could be confused with *Rhizostoma octopus*, which is found in the northeast Atlantic, but which is characterized by a greater size, the presence of 8-12 more "pointed" velar lappets per octant (size dependant) and by the slightly greater length of the distal than proximal portion of the oral arms: the terminal clubs are widest terminally, stout and relatively short.





OTHER RHIZOSTOMEAE

Key to families of other Rhizostomeae occurring in the area

- 1a. Oral arms without appendages (Fig. 1)
 family *Catostylidae*
 genus Catostylus (p. 133)
- 1b. Oral arms with appendages (Figs. 2 & 3)
 ▶ 2
- 2a. Oral arms with a thick appendage at tip of
 arms (terminal club) (Figs. 2 & 3) ▶ 3
- 2b. Oral arms with other types of appendages
 (Fig. 4) ▶ 4
- 3a. Oral arms three to four times longer than bell
 diameter (Fig. 2) family *Leptobrachidae*
 Thysanostoma flagellatum (p. 144)
- 3b. Oral arms shorter than bell diameter (Fig. 3) . . .
 family *Catostylidae*
 Crambionella stuhlmanni (p. 130)

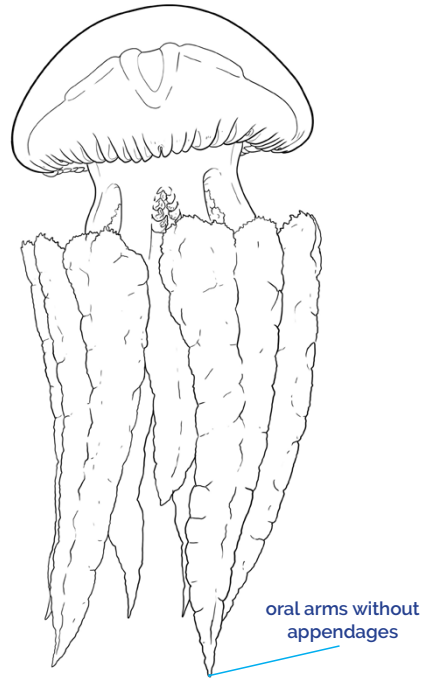


Fig. 1. *Catostylus tagi*

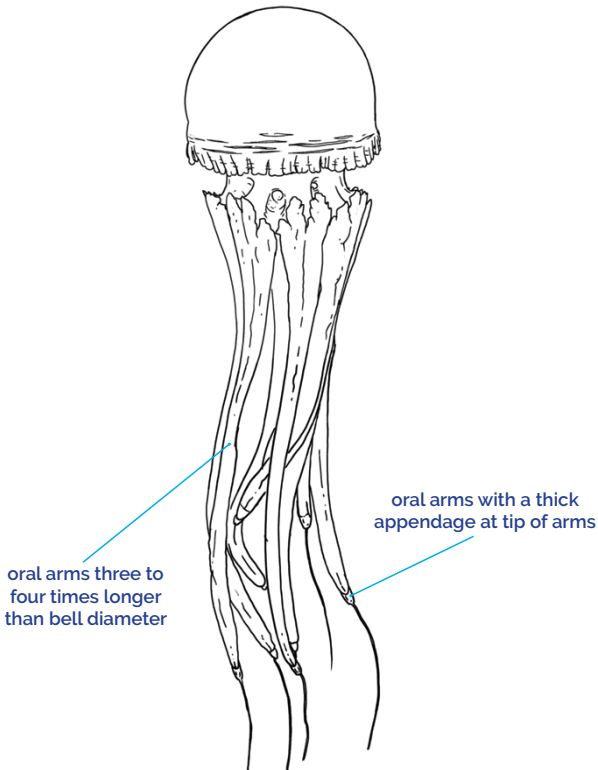


Fig. 2. *Thysanostoma flagellatum*

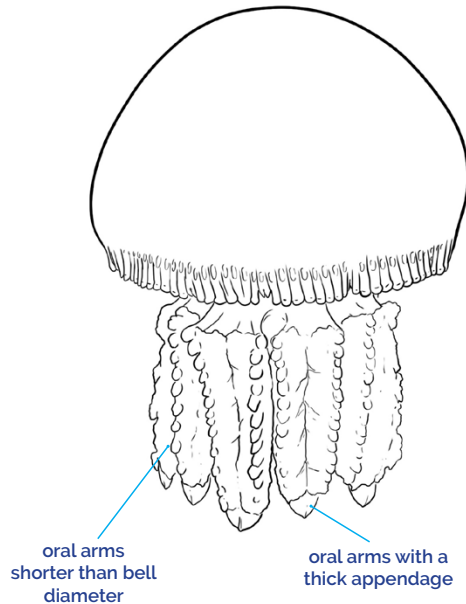


Fig. 3. *Crambionella stuhlmanni*

- 4a. Central part of bell with protuberances, resembling a crown (Fig. 4). **family Cepheidae**
Cephea coerulea (p. 136)

central part of bell with protuberances

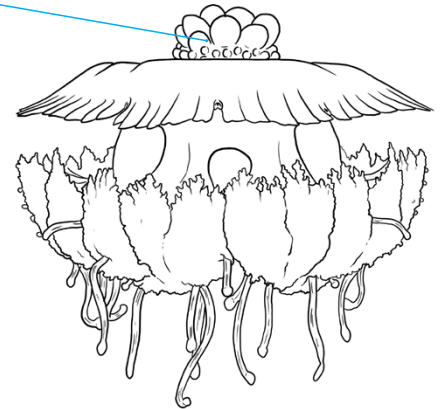


Fig. 4. *Cephea coerulea*

- 4b. Bell without protuberances (Figs. 5–7) ► 5

- 5a. Bell with a central dome (Fig. 5) **family Cepheidae**
genus *Cotylorhiza* (p. 139)

bell with a central dome, without protuberances

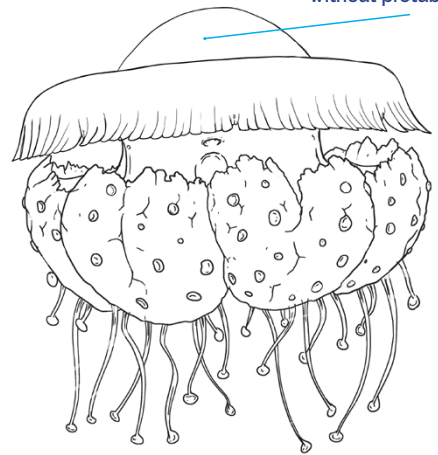


Fig. 5. *Cotylorhiza tuberculata*

- 5b. Bell without a central dome (Figs. 6 & 7). ► 6

- 6a. General bell colour light pinkish (Fig. 6). . . **family Mastigiidae, *Mastigias roseus*** (p. 146)

- 6b. General bell colour yellowish/brownish with white dots (Fig. 7) **family Mastigiidae, *Phyllorhiza punctata*** (p. 148)

bell light pinkish



Fig. 6. *Mastigias roseus*

bell yellowish/brownish with white dots



Fig. 7. *Phyllorhiza punctata*

Diagnostic features

Bell hemispherical, dome-shaped, finely granular to the touch. **Mesoglea** thick. Eight **rhopalia**, situated in pits with radiating furrows, flanked laterally by **rhopalial lappets** that are smaller than, and slightly dorsal to, **velar lappets**. Twelve narrow velar lappets per octant, separated by deep furrows, each with a row of small conical projections mid-dorsally.

No central primary mouth opening. **Eight oral arms, shorter than BD in length**, each divided into a short naked proximal and a three-winged distal portion, the latter almost three times longer than the former. Distal portion with one adoral and two aboral rows of mouthlets and club-shaped appendages, adoral row originating proximal to and terminating distal of the two aboral rows, terminating in a naked pyramidal club, about 20% of oral arm length.

Canal system with a continuous ring canal, four perradial and four interradianal canals, extending to bell margin, and eight adradial canals terminating at the ring canal. Intracircular network of anastomosing canals originating from ring canal. No communication with the **gastric cavity** except occasionally through the perradial and interradianal canals, anastomoses within intracircular network less than in extracircular network; latter not extending into lappets.

Approximately 85 annular muscles on subumbrellar surface, above and uninterrupted by radial canals. Four crescent shaped ostia lead from the gonadal and gastrovascular cavity; ostial and interostial widths approximately equal.

Colour

Bell and base of oral arms translucent, white/pale blue. Mouthlets and appendages on oral arms light-brown or cream, opaque. Lappets with a purple/brown band. Terminal clubs without pigment, gonads cream.

Size

Up to 20 cm BD.

Ecology

Poorly known. In the region, known only from estuarine environments. Seasonally common.

Stinging

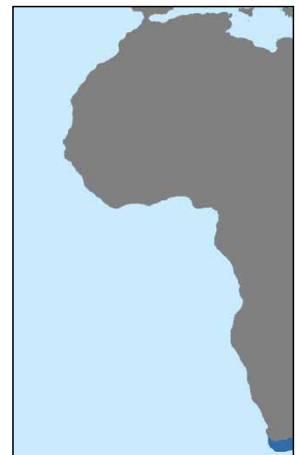
Unknown.

Distribution

Recorded from Lake St. Lucia in the ISimangaliso Wetland Park along the east coast of South Africa and from the Breede River mouth in the southwestern Cape. Otherwise, Madagascar and the east African coast.

Remarks

One of four species in the genus, all restricted to the Indian Ocean. Could be confused in the region by an undescribed species from which it can be differentiated by the presence of a terminal club on the oral arms, by the nature of the velar lappets that support conical projections, and by the anastomosing nature of the intracircular canals.





FAMILY CATOSTYLIDAE - GENUS *CATOSTYLUS*

Key to species *Catostylus* occurring in the area

- 1a. Oral arms gradually ending in a whip-like portion (Fig. 1) *Catostylus tagi* (p. 134)
- 1b. Oral arms without a terminal whip-like portion (Fig. 2). *Catostylus tripterus**

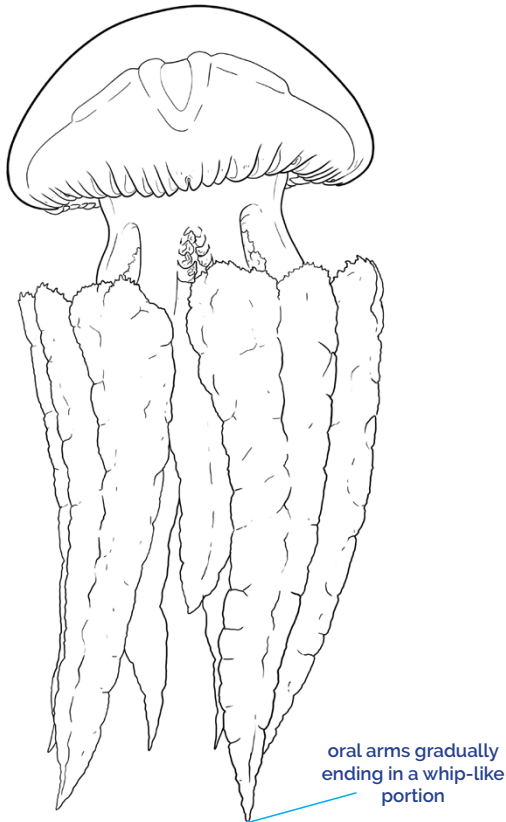


Fig. 1. *Catostylus tagi*

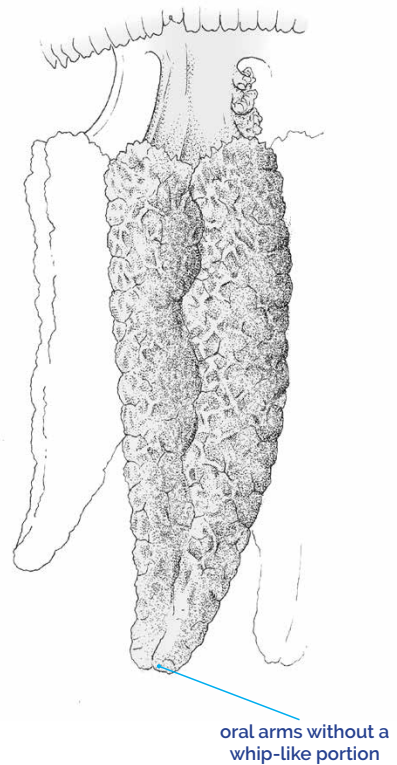


Fig. 2. *Catostylus tripterus* (detail of oral arm)

*The species *Catostylus tripterus* is not dealt with in detail as the only known specimen was described by Haeckel (1880: 586, as *Toxoclytus tripterus*) based on a single small (5 cm BD) preserved individual, with poor details, and no illustration. The animal was collected in Bioko Island (former Fernando Po), Equatorial Guinea. Because there are no details of the gastrovascular system, it is hard to assign this species to the correct genus. Therefore, we keep the identification of Mayer (1910: 671) under the genus *Catostylus* due to the absence of appendages in the oral arms. But it might be a young specimen of a different rhizostome species. Even Haeckel in his description suggests it resembles a young *Rhizostoma*.

Catostylus tagi (Haeckel, 1869)

Diagnostic features

Bell almost hemispherical, finely granulated to the touch, in some specimens with delicate, radial, branching furrows. **Mesoglea** thick and firm. Eight **rhopalia** sided by small, pointed **rhopalial lappets**. **Velar lappets** pointed, with some furrows, 64 in number (eight per octant). Marginal **tentacles** absent.

Central **gastrovascular cavity** (=stomach) cross-shaped, 50% BD in width; **subgenital ostia** wide (10% BD in width). **Eight three-winged elongate (longer than BD) oral arms, without appendages throughout their length; each arm tapering towards the tip and ending in a somewhat terminal whip-like portion devoid of mouths.** Eight radial rhopalial canals and eight interrhopalial canals emerging from the central **stomach**, and all connecting to a ring canal 1/3 away from the margin; all radial canals connected by an anastomosing network of small canals (internal and external to the ring canal).

Four **gonads** forming a round Maltese cross.

Colour

Whole body usually whitish to cream, with some irregular brownish markings on bell and marginal lappets; gonads white or greenish depending on maturation.

Size

Up to 65 cm BD. BH about 40% BD.

Ecology

Life cycle with complete metagenesis, oligodisc strobilation, but not yet fully described. Adult medusae with separate sexes, and gametes released in the water column. Some fishes and crabs found in association with the species.

Stinging

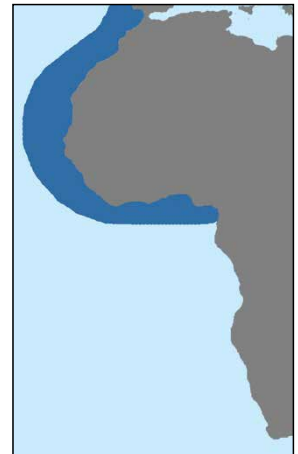
Mild, almost imperceptible.

Distribution

Iberian Peninsula and west African coast (up to the Congo river); a doubtful record in Panama.

Remarks

Several studies about collagen, toxins, anti-oxidant properties, and use as food were conducted in Portugal (where the species is more abundant).





Catostylus tagi

Diagnostic features

Bell somewhat hemispherical, but with a central dome covered by protuberances or warts circled by an annular furrow (forming like a crown). Bell, besides central dome and some marginal furrows, smooth to the touch. **Mesoglea** thick and firm. Eight **rhopalia** sided by small **rhopalial lappets**, and no marginal **tentacles**. Bell margin with almost indistinct lappets, mostly discernible due to marginal furrows; seven or eight **velar lappets** per octant (totalling 56–64).

Central **gastrovascular cavity** (=stomach) round (20% BD in width). Eight radial rhopalial canals extending from the central part to bell margin, and five or six interrhopalial canals per octant between them; the rhopalial canals are thicker and have less anastomoses than the interrhopalial ones; half-way to the margin, the interrhopalial canals anastomose forming a mesh-like net that enters the marginal lappets. **Oral arms** 80% BD in length, eight in number and possessing four large appendages (tentacle-like) per arm; some smaller spatula-like appendages all over mouthlets' surface (frilly area).

No details about **gonads** but should be four in number and similar in shape to other rhizostomes.

Colour

Bell usually bluish or purplish; frilly portion of oral arms pale red or chocolate-brown; oral-arms appendages transparent to whitish.

Size

Up to 30 cm BD. BH about 30% BD.

Ecology

Life cycle and feeding habits unknown; but one species of the genus (*Cephea cephea*) has a metagenetic life cycle.

Stinging

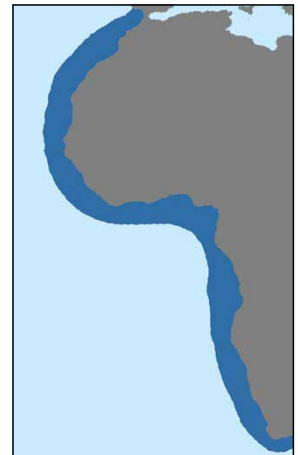
Unknown. But other species produce a mild sting.

Distribution

Found in coastal waters around Africa.

Remarks

There are controversies regarding the number of valid species in the genus *Cephea*; four valid species according to Jarms and Morandini (2019) and two species according to Gul *et al.* (2015). Distinction of species is mostly based on the number of lappets per octant, number of filamentous appendages on oral arms, and number and size of exumbrellar protuberances.





FAMILY CEPHEIDAE - GENUS *COTYLORHIZA*

Key to species *Cotylorhiza* occurring in the area

- 1a. Gastrovascular system with 11-13 interrhopial canals per octant (Fig. 1)
..... *Cotylorhiza ambulacrata* (p. 140)

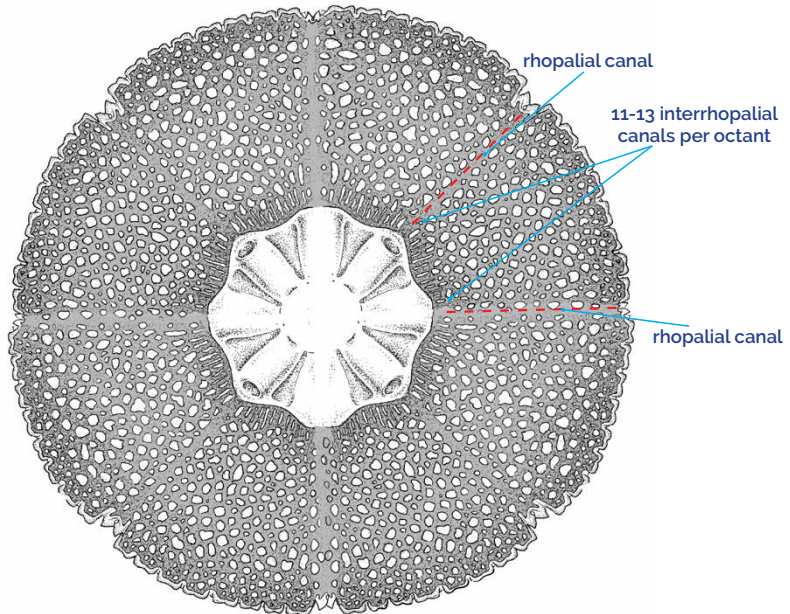


Fig. 1. *Cotylorhiza ambulacrata* (oral view, detail of the gastrovascular system)

- 1b. Gastrovascular system with 7-9 interrhopial canals per octant (Fig. 2)
..... *Cotylorhiza tuberculata* (p. 142)

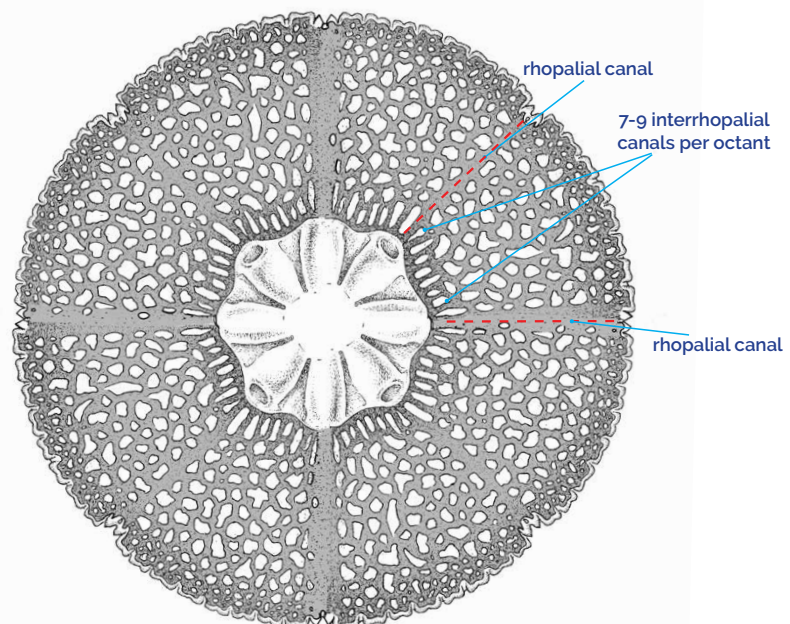


Fig. 2. *Cotylorhiza tuberculata* (oral view, detail of the gastrovascular system)

Diagnostic features

Bell somewhat hemispherical, but with a central part flattened and circled by an annular furrow due to umbrella shape (forming like a crown), smooth to the touch. **Mesoglea** thick and firm. Eight **rhopalia** sided by two small **rhopalial lappets**. Marginal **tentacles** absent. Marginal **velar lappets** hard to discern, with slight indentations, stated as 128 in total (16 per octant).

Central **gastrovascular cavity** (=stomach) round (30% BD in width). Eight radial rhopalial canals (with only a few anastomoses) and **11-13 interrhopalial radial canals** (which anastomose profusely near the margin). Eight **oral arms** (60% BD in length) with many branches, each arm with many bulbous appendages, some club-shaped appendages with sucker tip. Small bean-shaped subgenital ostia. Four **gonads**.

Colour

Nothing is known because the description was based on a preserved specimen.

Size

Up to 9 cm BD. BH about 35% BD.

Ecology

Unknown.

Stinging

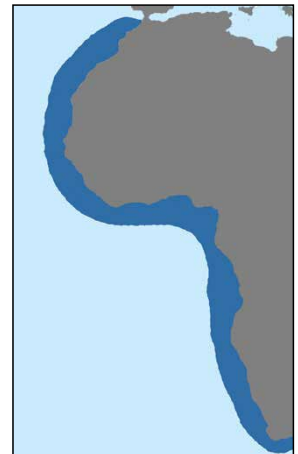
Unknown.

Distribution

Atlantic Ocean, but because the other two species of the genus occur in the Mediterranean Sea, we suppose its distribution is only along the west coast of Africa.

Remarks

The illustration presented is based on the original description by Haeckel (1880), which in fact is poor in details. The type locality is "Atlantic Ocean", and only Haeckel and Stiasny observed this single preserved specimen. This might be considered doubtful because only one individual was seen and described. It might represent a variation of the most common species *Cotylorhiza tuberculata*, but only a thorough analysis of the specific characters can solve this matter.





Cotylorhiza ambulacrata

Cotylorhiza tuberculata (Macri, 1778)

Diagnostic features

Bell somewhat hemispherical, but with a central elevated dome circled by an annular furrow due to umbrella shape (forming like a crown), smooth to the touch. **Mesoglea** thick and firm. Eight **rhopalia** sided by two small round **rhopalial lappets**. Marginal **tentacles** absent. Marginal **velar lappets** almost indistinct, but some counts stating 128 in total (16 per octant), rectangular in shape.

Central **gastrovascular cavity** (=stomach) round (30% BD in width); eight radial rhopalial canals (with only a few anastomoses) and **seven to nine interrhopalial radial canals** (which anastomose profusely near the margin). Eight **oral arms** (50% BD in length) with many branches, each arm with many bulbous appendages, some club-shaped appendages with sucker tip (either purple or transparent). Small round subgenital ostia. Four **gonads**.

Colour

Very characteristic, bell and oral arms yellowish, central dome orange-red, oral-arms appendages white and purple.

Size

Up to 40 cm BD, but usually from 10 to 20 cm BD, BH about 25% BD.

Ecology

Sexes separate, females have brooding appendages (tentacle-like) in the centre of the oral arms. Life cycle metagenetic; whitish polyp with intense budding by planuloid formation; monodisc strobilation producing a zooxanthellate ephyra. Feeds on zooplankton, mysids and shrimps. Tissues bear symbionts (zooxanthellae).

Stinging

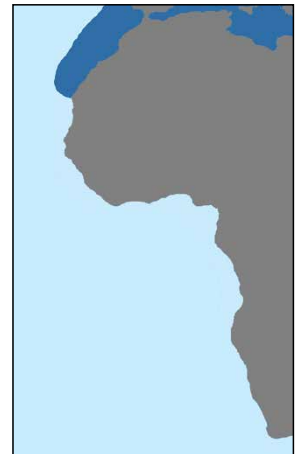
Mild, just a light unpleasant sensation.

Distribution

Mediterranean Sea, coast of the Iberian Peninsula, and Morocco.

Remarks

Coastal species with strong seasonality, blooming every summer in enclosed areas of the Mediterranean Sea.





Cotylorhiza tuberculata

Thysanostoma flagellatum (Haeckel, 1880)

Diagnostic features

Bell almost hemispherical, finely granulated to the touch, and with, in some specimens, coloured radial furrows. **Mesoglea** thick and firm. Eight **rhopalia** sided by small pointed **rhopalial lappets**. Marginal **tentacles** absent. Rhopalia with small hood and ocellus. Exumbrellar sensory pit furrowed. Marginal **velar lappets** round, eight per octant in number. Central **gastrovascular cavity** (=stomach) round. **Eight long and slender three-winged oral arms**, thicker at base and tapering towards the tip; mouthlets present only at the angles of the arms; some very short and thin filamentous appendages between the mouthlets; **arms terminate in a naked appendage thick at base and with a long filament at the tip, whip-like (80% BD in length)**. Four wide **subgenital ostia** (30% BD in width) at the base of the oral arms, with a covering membranous scale. Eight radial rhopalial canals and about 20 interrhopalial canal roots per octant extending from central stomach to bell margin, all anastomosing profusely towards the margin. Strong muscular ring (20% BD in thickness) at the margin. Four horseshoe-shaped **gonads**.

Colour

Somewhat variable, but many specimens with bell background translucent whitish; bell with radiating deep purple or lilac furrows; muscle ring translucent but with a dark brown tinge; marginal lappets deep purple; oral arms light brown or purple, terminal whip-like appendages transparent, but sometimes brownish.

Size

Up to 22 cm BD. BH about 80% BD.

Ecology

Life cycle completely unknown. In many places, specimens of the genus are found in association with fishes, either among the oral arms or possibly inside the wide subgenital ostia.

Stinging

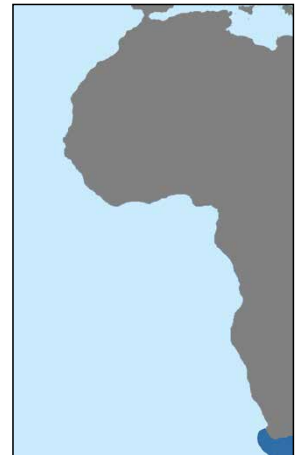
Unknown.

Distribution

Scattered in the Pacific (Hawaii, Malayan Archipelago) and Indian (east coast of Africa) oceans.

Remarks

There are three species in the genus: *T. flagellatum*, *T. loriferum*, and *T. thysanura*, which can be separated based on the size of the naked terminal part of the oral arms and number of interrhopalial canals. Because the distributional range of these three species often overlaps, Jarms and Morandini (2019) suggested they might represent a single species with a wide variation in morphological features. Only future studies, based on several specimens from different areas will unravel this matter.





Thysanostoma flagellatum

Mastigias roseus (Reynaud, 1830)

Diagnostic features

Bell hemispherical, hat-shaped, with radial furrows near the margin. Number of **rhopalia** not specified, but possibly eight. Marginal **tentacles** absent. Marginal **velar lappets** pointed, seven or eight per octant.

Central **gastrovascular cavity** (=stomach) round, 50% BD in width. **Gastric filaments** and **gonads** forming a cross-shaped outline inside the central part. Eight radial rhopalial canals extending from the central stomach to bell margin. Eight short **oral arms** with a short terminal appendage on each arm, and many foliaceous to spatula-shaped appendages all over mouthlets' surface.

Colour

Bell in general light rose, somewhat transparent; gonads and oral arms' frilly part deep rose.

Size

No size is mentioned in the description.

Ecology

Unknown.

Stinging

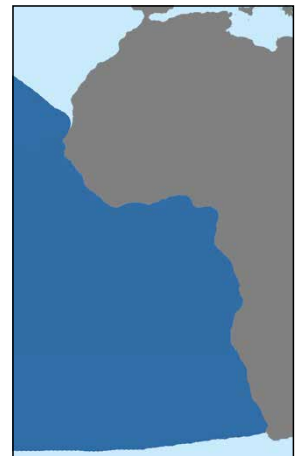
Unknown.

Distribution

There is no specific location; the species was reported from the tropical Atlantic.

Remarks

Although the species was listed for the Atlantic, it was found only once, back in 1830. All other mentions were based on this original description and the figure accompanying it. Because there is no voucher specimen, it is hard to take a taxonomic and nomenclatural approach. It is considered doubtful. Here the species is presented to validate any observation of similar specimens. The illustration presented is based on the original drawing and description by Reynaud (1830). The classification in the genus *Mastigias* is mostly based on the general shape of bell and arrangement and type of appendages on oral arms – but a precise identification would require checking the gastrovascular canal system.





Mastigias roseus

Diagnostic features

Bell slightly hemispherical, finely granulated to the touch, and with irregularly spaced white elevated round warts. **Mesoglea** stiffness can vary, being thicker in the central part of the bell. Eight **rhopalia** sided by small pointed **rhopalial lappets**. Up to 14 **velar lappets** between consecutive rhopalia, broad, semi-circular, and connected by a thin membrane.

No central **mouth opening**, arm disc octagonal in shape, with whip-like filamentous appendages in the central part (longer and more numerous in females). Eight **oral arms**, three-winged and J-shaped, with window-like openings on lateral sides, up to 50% BD in length; a single elongate **terminal appendage** with a bulbous tip on each arm (terminal club, up to 40% BD in length) and several small appendages covering the lower 1/3 of arms surface.

Subgenital cavity wide with large oval subgenital ostia, without any kind of papillae.

Central **gastrovascular cavity (=stomach)** system divided into eight radial **rhopalial canals** with 10 to 12 secondary canals (interrhopalial) between the main ones; all these canals connected near the margin by a ring canal; and between the ring canal and the stomach there is a network connecting all canals but rarely connecting with the rhopalial canals.

Colour

Bell usually brownish-yellowish with distinctive white spots. Some specimens might be colourless or bluish. Oral arms' terminal appendages can be transparent, whitish, or bluish.

Size

Up to 50 cm BD. BH about 50% BD.

Ecology

Non-indigenous species in several tropical places around the globe, usually forming blooms. Some specimens are surrounded by schools of carangid fishes; also found in association with copepods and shrimps. Metagenetic life cycle with seasonal strobilation; adult medusae with separate sexes, females bear larvae on delicate appendages on the centre of mouth disc.

Stinging

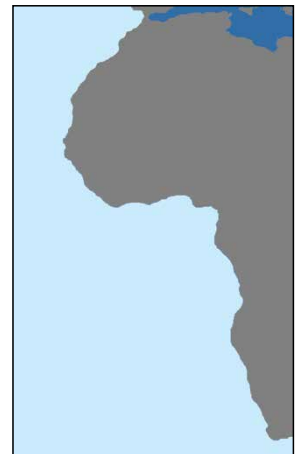
Can inflict a mild sting.

Distribution

First described from southeast Australia, but possibly distributed all over Indo-Pacific waters. Considered invasive in many parts of the world (Gulf of Mexico, Caribbean Sea, Brazilian coast, Mediterranean and Red Sea, east and west coasts of the United States of America).

Remarks

There are three valid species of the genus *Phyllorhiza*, and the boundaries between them needs further investigation.





Phyllorhiza punctata

CLASS HYDROZOA

The class Hydrozoa is the most diverse within the Medusozoa, and includes almost 4 000 species. The systematics of the class is complex, and in a constant state of flux, but at present two sub-classes are recognized: **Hydroidolina** and **Trachylina**. The vast majority of marine species belong to the former, which incorporates the orders **Anthoathecata**, **Leptothecata** and **Siphonophora** (Bouillon *et al.*, 2006). Most of the species within these orders are characterized by the presence of polymorphic colonies at some phase in their life cycle, and life cycles in the class are bewildering in their diversity. Some taxa display classical metagenesis, alternating between a sessile (usually benthic) polyp and a free-living medusa, whilst others have effectively foregone either the polyp or the medusa phase, whilst in the case of siphonophores both tend to co-occur on an individual colony. The medusa phase, if present, may be anything between a fully planktotrophic individual that can persist in the pelagos for several months, to non-feeding cryptomedusoids or swimming gonophores with a fleeting planktonic existence.

Hydrozoan medusae are characterized by the presence of a velum: a thin membrane of tissue that projects inwards from the bell margin like a shelf and which allows the bell, on contraction, to generate greater thrust. It is invariably damaged on capture.

Anthoathecate medusae are released by polyps that lack a firm perisarc around the polyp body: the gastrozooids and gonozooids are unprotected. The medusae are generally bell shaped (deeper than wide) and the gonads are distributed around the manubrium. Almost all anthoathecate medusae are small.

Leptothecate medusae are produced by polyps that are protected by a perisarc, and the gastrozooids sit within cup-like thecae. The medusae are rarely bell-shaped but resemble an inverted saucer or bowl (wider than deep), and the gonads are variously distributed along the radial canals. A full description of hydrozoan anatomy, life cycles and taxonomy can be found in the encyclopaedic work of Bouillon *et al.* (2006), which can be downloaded free from [ResearchGate](#).

Although some siphonophores can lay claim to being amongst the longest marine organisms in the world (46 m, *Apolemia* spp.), most hydromedusae are less than 5 cm in diameter. As a consequence, they will not be collected by trawl or seine nets, though they can be abundant in zooplankton samples. With the exception of the pneumatophores or the nectophores of some siphonophores, the bodies of most hydromedusae will also be readily destroyed following robust collection, as they tend to be thin and delicate, which makes identification extremely difficult. Indeed, the majority of the key features used for species diagnosis are located at the bell margin (ocelli, statocysts, tentacular bulbs), and this part of the bell is particularly vulnerable to damage. Here we focus only on the largest and most robust species of Hydroidolina, though keys to all genera can be found in Bouillon *et al.* (2006).

Aequorea spp.

Diagnostic features

Bell saucer-shaped, with both exumbrella and subumbrella surface smooth and without nematocyst warts. **Mesoglea** fairly rigid, thinning to margin, central disc taking form of a thick biconvex lens.

Tentacles numerous, long and delicate arise at umbrella margin, each from a basal bulb.

Statocysts closed, numerous, situated between tentacle bulbs.

Stomach between 33-50% BD in width. Mouth wide, framed by thin, delicate curtain-like lips without a **gastric peduncle**. **Radial canals** variable in number (16 to more than 200), simple, straight, originating at margin of stomach and extending to ring canal at bell margin. Radial canals flanked by generally linear gonads, that neither extend to stomach nor ring canal.

Colour

Transparent; radial canals opaque, white; gonads may be purple, blue or white in colour.

Size

Up to 30 cm BD; biconvex-lens to an observed maximum diameter of about 13 cm.

Ecology

Despite their widespread distribution, the biology and ecology of species of *Aequorea* are poorly understood. They can be seasonally abundant predators that specialize in eating soft-bodied zooplankton (including other jellyfish) but are routinely present in offshore waters of the northern Benguela ecosystem. These animals are the original source of the green fluorescent protein (GFP) that is widely used in biomedical research.

Stinging

Not known to be painful.

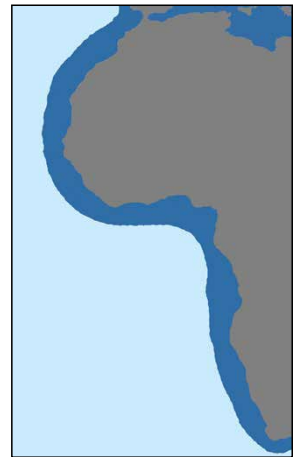
Distribution

Specimens of *Aequorea* can be found across the width of the continental shelf and the genus occurs along the length of the western African coastline from Morocco to South Africa.

Remarks

Also known as crystal jellies, 24 valid species of *Aequorea* (Schuchert, 2021) are recognized, many of which have very wide global distributions. The largest species, *A. forskalea* Péron & Lesueur, 1810 and *A. coerulescens* (Brandt, 1838), are recorded in the region. Differentiating between species demands that specimens are in good condition, as features at the bell margin are critical. The morphology of the delicate lips is also an important character, but it should be noted that only the biconvex lens-like central disc of species of *Aequorea* is usually recovered from fishing nets, as the balance of the animal is very delicate and gets damaged in entirety during capture. This makes identification impossible without samples for DNA analysis.

Rhacostoma atlanticum L. Agassiz, 1850, the only recognized species in the genus *Rhacostoma*, has been recorded off the coast of Senegal, where it may attain a diameter of up to 40 cm. It differs from species of *Aequorea* only by the presence of radial rows of small, gelatinous papillae on the subumbrella surface.





Aequorea spp.

Zygocanna spp.

Diagnostic features

Bell a flattened saucer. Exumbrella surface smooth, may have a number of radial ridges. Subumbrella smooth or supporting radially arranged rows of small gelatinous papillae.

Mesoglea fairly rigid, thinning to margin, central disc taking form of a thin biconvex lens. Marginal **tentacles** of variable length on bulbs of correspondingly variable size.

Statocysts closed, numerous, situated between tentacle bulbs.

Stomach up to 33% BD in width, rarely circular in shape but becoming constricted at periphery and bifurcating/branching a variable number of times before terminating in a variable number of simple, straight, **radial canals** that extend to ring canal at bell margin. Mouth relatively wide and framed by thin, delicate curtain-like lips with or without a gastric peduncle. Radial canals flanked by generally linearly arranged gonads, that neither extend to stomach nor ring canal.

Colour

Transparent; radial canals opaque, white; gonads may be purple.

Size

Up to 10 cm BD.

Ecology

Unknown, but likely similar to species of *Aequorea*.

Stinging

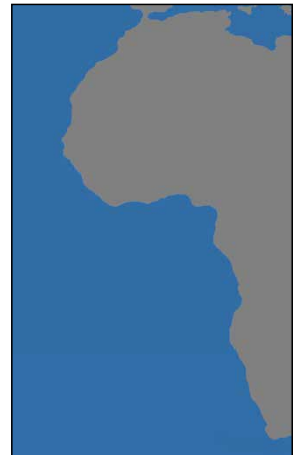
Unknown, but likely similar to species of *Aequorea*.

Distribution

Most species of *Zygocanna* are restricted to the Indo-Pacific, with one, *Z. vagans* Bigelow, 1912, known from the central and south Atlantic where it can be common in shelf waters.

Remarks

Species of *Zygocanna* are delicate, like those of *Aequorea*, and only the biconvex lens-like central disc is usually recovered from fishing nets. While it is difficult to separate the genera on the basis of the central biconvex lens alone, those of *Zygocanna* are thinner (and frequently crack/break) and may support ridges or papillae on the exumbrella and subumbrella surfaces, respectively. If remains of the stomach are visible, this is always branched/bifurcated. Species identification without samples for DNA is usually impossible.





Zygocanna spp.

Physalia physalis (Linnaeus, 1758)

Diagnostic features

Siphonophore with large, horizontally arranged gas-filled **pneumatophore** that forms an erectile sail, which allows the animal to float at the air-sea interface. Below the water surface, **cormidia** with **gastrozoid**, **tentacle** and **gonodendron** attached to one side of the float.

Colour

Various shades of green, blue and purple. Tentacles invariably deep blue.

Size

Pneumatophore to 30 cm in length; contractile tentacles can extend to lengths in excess of 10 m.

Ecology

This holoplanktonic species is monotypic. It feeds on zooplankton, including fish larvae, and is in turn fed upon by a number of other sea surface inhabitants such as species of *Glaucus*, (also known as sea swallows, which are pelagic nudibranchs) and *Janthina* (violet sea snails, which build a raft of bubbles to keep them in the neuston). Other predators include loggerhead turtles and sunfish. Juveniles of some fishes (e.g. *Nomeus gronovii*) may shelter amongst tentacles. Individuals may be left- or right-handed, meaning that their pneumatophores may be orientated to either the left or the right, depending on which side the cormidia are arranged. This handedness influences their susceptibility to winds prevailing from different directions.

Stinging

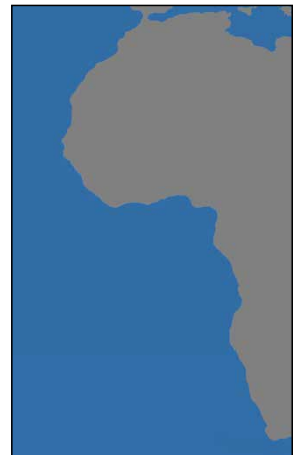
Highly venomous; human fatalities recorded. Beaches may be closed for recreational purposes if large numbers of bluebottles are encountered. An active monitoring programme for this species is undertaken in parts of Morocco and the Canary Islands.

Distribution

Primarily an oceanic species that is recorded along the length of the western African coastline from Morocco to South Africa. Likely to be persistent in offshore waters but becomes seasonally present in coastal areas following local changes in onshore wind patterns.

Remarks

Also known as Portuguese Man-of-War, or bluebottle.





Physalia physalis

Diagnostic features

Colony circular, disc-like, with an internal chitinous **float** comprising a series of concentric chambers, slightly convex dorsally, stiff. Float encased by a mantle of living tissue that contains **radiating canals**, soft at margin of float.

Arrangement of **polyps** on the ventral surface of the float similar to that of *Verella verella*, with a single **gastrozoid** in the centre, surrounded by a median circle of **gastro-gonozooids** and then **dactylozooids**, at the periphery. Central gastrozoid short and broad, lacking tentacles or **cnidocyst** clusters. Gastro-gonozooids club-shaped, being thicker distally than proximally, covered with clusters of cnidocysts, although lacking **tentacles**.

Medusae develop from buds at the base. Dactylozooids of variable length, lacking a mouth and supporting both a distal whorl of capitate tentacles as well as three rows of capitate tentacles along their length. Mass of tissue between the polyps and the underside of the float, containing cnidocysts, various canals and zooxanthellae.

Colour

Colony dark blue, with dark blue tentacles. Internal float generally colorless but may be olive at centre. Gas within float may make it appear silvery.

Size

Colony can reach up to 5 cm in diameter.

Ecology

Largely unknown. The animal caught in fishing nets and as described above represents the polyp stage and not the medusa, which is minute, transparent and has two capitate tentacles. Like *Verella verella* and *Physalia physalis*, it is epineustonic and it is likely to feed on a variety of neustonic zooplankton. It too is preyed upon by species of *Glaucus* and *Janthina*, and it acts as a refuge for some juvenile fishes such as *Caranx malabaricus*.

Stinging

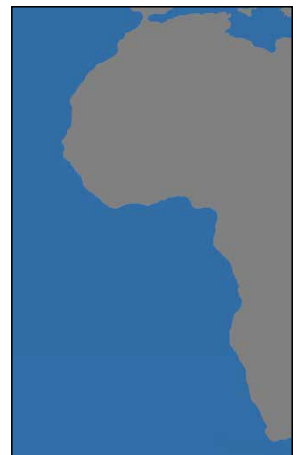
Mild.

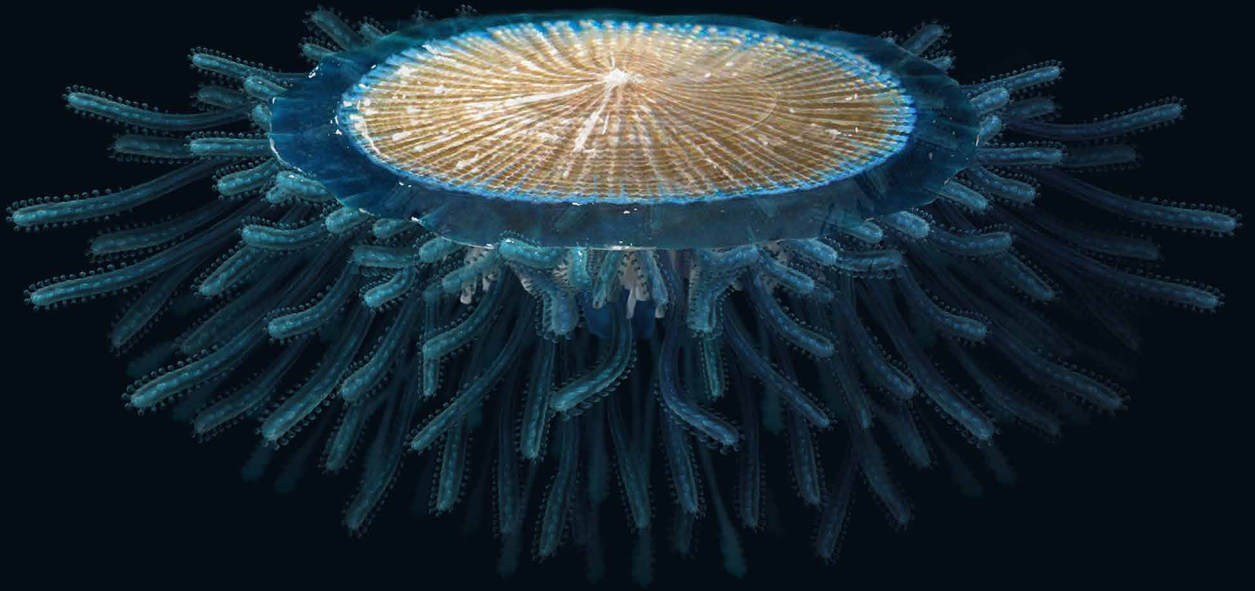
Distribution

Primarily an oceanic species of tropical and subtropical waters that is recorded along the length of the western African coastline from Morocco to the Agulhas Bank, South Africa. Likely to be persistent in offshore waters but becomes seasonally present in coastal areas following local changes in onshore wind patterns

Remarks

Two valid species are recognized (Schuchert, 2021), only one of which is known from the Atlantic Ocean. Also known as a blue button.





Veleva veleva (Linnaeus, 1758)

Diagnostic features

Float flattened, elliptical, with a triangular sail on the dorsal surface, and with concentric air chambers and, like the sail, stiffened by chitin. Soft tissues confined to ventral surface of float, in the centre of which is a large **gastrozoid**, surrounded by a ring of **gastro-gonozoids** and a peripheral band of **dactylozoids**. Gastrozoid is responsible for feeding, approximately oval in shape, and lacking tentacles. Gastro-gonozoids considered to be spindle-shaped, also lacking tentacles around the expanded mouth distally, and supporting medusa buds basally. Dactylozoids bearing tentacles employed for defense, and lacking any mouth.

Colour

Float dark blue when alive, but the medusa buds may appear olive in colour as a result of symbiotic zooxanthellae. The concentric rings of air-chambers in the float can give the animal a silvery appearance.

Size

Float up to 5 cm long and 2 cm wide. Tentacles short.

Ecology

The specimens of *Veleva veleva* that are caught in fishing nets and that get washed up on beaches represent the polyp stage of the animal and not the medusa, which is minute, transparent and has four capitate tentacles. Like most other species of metagenetic Hydrozoa, the polyp represents a colony of polymorphic individuals, some specialized for feeding (gastrozoids), others for defence (dactylozoids) and others still for reproduction (gonozoids). But unlike most other Hydrozoa, in this case the polyp is pelagic not benthic. Like *Physalia physalis* and *Porpita porpita*, *V. veleva* is an epineustonic species that preys on zooplankton, including fish eggs and larvae and is subject to the same predators. Like *P. physalis*, animals may be either left- or right-handed depending on the orientation of the sail, and this influences their distribution in response to prevailing winds.

Stinging

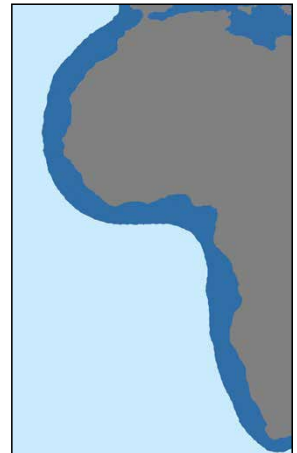
Mild.

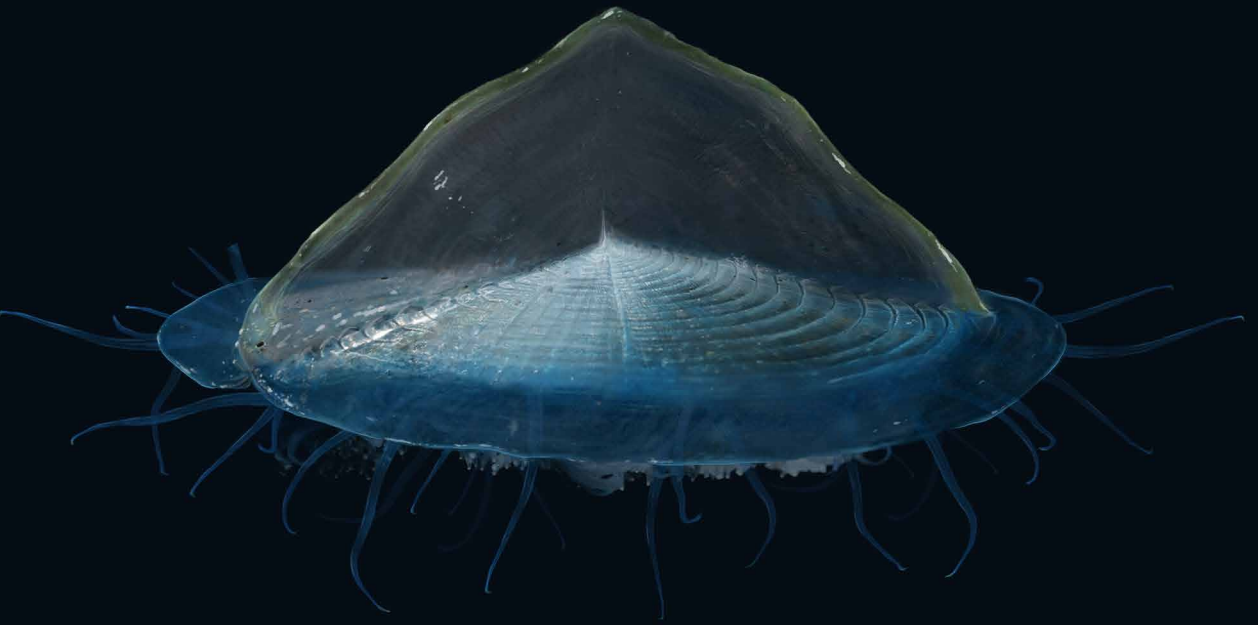
Distribution

Primarily an oceanic species that is recorded along the length of the western African coastline from Morocco to the Agulhas Bank, South Africa. Likely to be persistent in offshore waters but becomes seasonally present in coastal areas following local changes in onshore wind patterns. May accumulate in rafts with sargassum and other floating material.

Remarks

Monotypic: also known as by-the-wind sailor or purple sail.





Verella verella

PHYLUM CTENOPHORA

Ctenophores are an ancient group that have been considered by some to form a sister taxon to all other metazoans. They are exclusively marine and occur from the epipelagic to the hadal zone in all oceans and seas across the globe. The majority of species are planktonic (though some are benthic) and they can be recognized by eight clearly visible bands of cilia plates. These cilia plates are also known as ctene rows. Their body tissues are not thickened, as they are in many Cnidaria, and they generally lack pigmentation, which renders them transparent or translucent. That said, most deep-water species are variously red in colour, a trait shared with many bathypelagic animals, and even epipelagic taxa may exhibit bioluminescence. All ctenophores are predators of zooplankton, and most species use colloblasts to capture planktonic prey using a glue-like substance. Colloblasts are analogous to the cnidocytes of cnidarians and, like the cnidocytes of cnidarians, they tend to be concentrated on the tentacles. The tentacles of some species may bear side-branches or tentillae. Almost all species are hermaphroditic and they do not display metagenesis.

Under the right environmental conditions, some ctenophores may reproduce at a very young age (literally days after being “born”) and at a small size. This means that populations can “explode” very quickly, and if these explosion events are accompanied by physical processes that serve to concentrate populations, blooms may develop. The growth rates of pelagic ctenophores are high, which means that ctenophores can (if conditions are conducive) play a significant role in ecosystem functioning. However, as members of the holoplankton they are strongly influenced by prevailing circulation and local coastal populations may be readily disbursed if outside embayments. This in turn means that populations that are seen in one year, may not be witnessed in subsequent ones. Unfortunately, ctenophores have a bad rap, primarily because of their ability to survive long periods of time inside the ballast tanks of intercontinental freighters, and alien species have been introduced across the Northern Hemisphere with devastating impact. The invasion of the Black Sea by the lobate *Mnemiopsis leidyi*, which is naturally found along the east coast of the continental United States of America, served to temporarily restructure the way energy and materials flowed through the ecosystem to the detriment of fishery resources.

The higher systematics of Ctenophora is controversial, though nine orders, 27 families, and between 150 and 250 species are recognized at present. Most ctenophores have tentacles at some stage in their life and they belong to the class Tentaculata, while those that lack them altogether belong to the class Nuda. The latter class contains just two genera, *Neis* and *Beroe*, which resemble cylinders with one closed end (aboral) and one open end (oral), and they engulf gelatinous zooplankton prey. Pelagic species of Tentaculata may be flattened and resemble belts or girdles with their tentacles aligned across their planar surfaces (order Cestida), be approximately spherical with long, free flowing tentacles (Cydippida) or have large elastic lobes that are used to entrap prey and which possess relatively short tentacles (Lobata). There are other orders (Cambojjida, Ganeshida, Cryptolobiferida), but these are uncommon denizens of the deep sea and are unlikely to be encountered.

Ctenophores are very delicate animals that “disintegrate before your eyes” in most fixatives, and only the most robust of species (*Beroe* spp.) will survive a fishing trawl with enough substance intact (not even structure) to allow identification. Here we provide only a description of *Beroe*, and resources are provided elsewhere that should allow identification of other material.

Diagnostic features

Body cylindrical and cigar- or vase-shaped; variously flattened, generally widest at oral end. Tentacles absent. Eight ctene rows of variable length.

Colour

Generally colorless and opaque, though some species may bear scattered pigment spots or pigment may be arranged beneath the ctene rows. Others may have an overall pinkish hue. Ctene rows of living specimens will refract light and give impression of emitting a rainbow. Some species are known to bioluminesce.

Size

Up to a maximum length of about 20 cm, usually less.

Ecology

Feeds on other ctenophores and gelatinous zooplankton, which are ingested whole.

Stinging

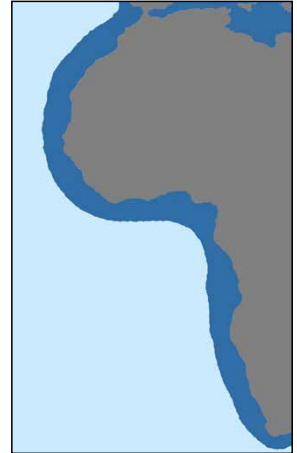
Ctenophores do not sting.

Distribution

The genus is globally distributed and is common in shallow coastal and epipelagic waters.

Remarks

Twenty-six species are recognized globally, which can be differentiated (with difficulty) by their shape, the relative lengths of the ctene rows and the arrangement and level of anastomoses of the different canals. In some species, side branches arising from the canals connect into a fully connected mesh, whilst in other species, the side branches may divide multiple times, but they terminate blindly. It is almost impossible to describe the morphology of ctenophores from preserved specimens owing to the fact that they disintegrate in most fixatives and all observations should be conducted on living material. There is likely to be considerable cryptic speciation within the genus, and material for genetic analysis should be retained.





Beroe spp.

PHYLUM CHORDATA

CLASS THALIACEA

Thaliaceans are chordates, belonging to the subphylum Tunicata. However, unlike members of the class Ascidiacea, which are primarily benthic and sessile, species of Thaliacea are free-swimming and holoplanktonic and are often considered as jellyfish (Lucas and Dawson 2014). The class Thaliacea includes three orders (**Doliolida**, **Salpida** and **Pyrosomatida**), and all are characterized by their approximately barrel-like body form, filter-feeding mode of nutrition and (seemingly unnecessarily) complicated life history.

Like ascidians, thaliaceans draw in water through an inhalant opening or siphon, pass it across a series of ciliated pharyngeal gill slits and expel it through an exhalent or atrial opening. Mucous lines the pharynx, which is produced by cells in a groove at its base and this is used to trap suspended food particles in the water currents. Thaliaceans have very effective mucous filters and can remove particles as small as bacteria and microplankton. In the case of doliolids and pyrosomes, the water current is generated by the actions of the cilia, which also serve to continuously move the mucous sheet across the pharyngeal surfaces before it is rolled up and passed to the oesophagus. In the case of salps, the water current is generated by contractions of the muscle bands in the body wall.

Although doliolids lack any form of outer covering, the body wall of salps and (especially) pyrosomes is protected by a transparent test or tunic of variable thickness. The rugosity and texture of this test, as well as the arrangement and distribution of any tubercles, can aid in identification. But the most important feature used in the identification of salps and doliolids is the number and arrangement of the muscle bands in the body wall. Those of doliolids are generally narrow (nurse stage excepted), separate and entire, and resemble the rings of wine casks; those of salps maybe broad, incomplete and frequently fuse dorsally. The muscles of the body wall are usually well separated from each other and this makes them useful characters for identification, as opposed to those around the mouth and atrial openings, which are very close to each other. It is conventional to number the muscle bands of the body wall (**M**) using Roman numerals, starting at the oral end. Thus **MI** refers to the first muscle band of the body wall, closest to the oral siphon.

The life cycle of thaliacens involves an alteration between an **asexual stage or oozoid** and a **sexual stage or blastozoid**. Whilst the two stages occur together in the test/tunic of pyrosome colonies, they are separate in the other two orders. In order to correctly identify a salp or doliolid, it is first necessary to recognize if one is dealing with an oozoid or blastozoid, because they can look quite different. We do not cover doliolids in this guide because they are generally much smaller than 5 cm in length: they are also very delicate, lacking an external tunic; they get easily squashed and need to be in an excellent condition before key features can be examined under a good microscope.

ORDER SALPIDA

In salps, the solitary oozoid asexually buds off a chain of blastozooids from the stolon, which then breaks off to form a loose colony. A single oozoid may give rise to many such colonies of blastozooids. Blastozooids are protogynous hermaphrodites, and the sperm from older blastozooids fertilizes the eggs of younger individuals: in general, only a few embryonic oozoids develop within a single blastozooid. Whilst oozoids are solitary, blastozooids are colonial and this can be seen most clearly by divers underwater where the specimens are undisturbed. During sampling, however, the relatively fragile links between colony members get broken and it is not unusual to see solitary blastozooids in samples.

Salps feed by passing water across their gills, and trap particles ranging in size between bacteria and ciliates on a mucous sheet that is produced by the endostyle: they are efficient suspension feeders. Every time the body muscles contract and the animal moves, water is passed across the gill bar, which means that in biologically productive areas, their gills may get clogged and individuals may die. Hence, salps are classically found in highest abundances at the edge of the shelf and, with the exception of species of *Thalia*, few are encountered in neritic waters. Salps effectively consolidate surface production and, given their ability to reproduce asexually, populations may quickly bloom, patchily, under the right circumstances. They are not trophic dead-ends and feature in the diet of a wide range of pelagic and demersal fishes, as well as turtles, and their faecal pellets and bodies make a substantial contribution to downward carbon-flux: they play an important role in marine biogeochemical cycles.

Most salp species are epipelagic, though some display diel vertical migrations, and some are bioluminescent. There is evidence to suggest that some species may migrate to the surface for reproductive purposes. Salps may occur in vast numbers and can then clog plankton nets.

Salps are the most diverse group of thaliaceans, both in size and morphology, and are found in all oceans of the world. That said, the majority of species are associated with tropical and warm waters and most are fairly wide-ranging in their distribution. All of the 13 genera can be found off the west coast of Africa, and of the approximately 50 species presently described, 30 are known to occur in the region.

Although many of the other key features that are used to separate species can only really be examined on undamaged specimens in the laboratory, the position and shape of the gut can be assessed quite easily at sea. The gut is frequently pigmented and can be linear, coiled loosely or compacted as a nucleus posteriorly.

Most of the salps that get caught in trawl nets will be damaged and patience is needed to try and identify them, even to genus level as described here. Ideally, specimens should be carefully illuminated from behind so that muscle bands can be distinguished, and they should be examined both from the top and from the side. This can be achieved by immersing them in seawater in a transparent glass or plastic container. It sometimes also helps to place the glass container on a very dark background and strongly illuminate from above.

As a general rule, oozoids are larger, more robust and regular in shape than individual blastozoids, and the latter will often have obvious tissue connections that extend through the body wall that would connect them to other colony members. This can best be seen if a specimen is examined from the dorsal view, in which case the oozoids can be distinguished by their generally laterally symmetrical body form around the long axis (running between the oral and atrial siphons). Individual blastozoids, by contrast are rarely symmetrical around the long axis owing to the aforementioned tissue connections that link aggregated individuals.

The approach we have taken to the identification of salps and pyrosomes differs from that taken with Scyphozoa. Here we only provide information that allows the user to identify taxa > 5 cm to the level of genus. The reason for this is that salps get so badly damaged in conventional fishing gears that any attempt to rigorously identify material, with confidence, to a lower level of taxonomic resolution is fraught. Should users of the guide be able to source "perfect" specimens by (e.g.) diving, then we urge them to consult the work of Godeaux (1998) or Esnal & Daponte (1999), in order to arrive at species-level information. While lateral views of representative Cyclosalpinx and Salpinx (see below) have been provided, which show the relative positions of key internal structures (gill bar, gut), illustrations are otherwise confined to the arrangement of muscle bands as these are the primary features used in identification. Attention is drawn to whether the muscle bands are complete or interrupted, dorsally and ventrally, and whether they meet in either view. Thus, MI-MII indicates that body muscle bands I-II touch in the mid-line. It should be emphasized that not all species within a genus will have the same number of muscle bands, but the combination of these and other highlighted features should allow the user to arrive at a suitable diagnosis. Remember too, that this is the first edition of this guide and it is hoped that with more sampling our understanding of the regional fauna will improve, so that future iterations will be more accurate in this regard.

Oozoids

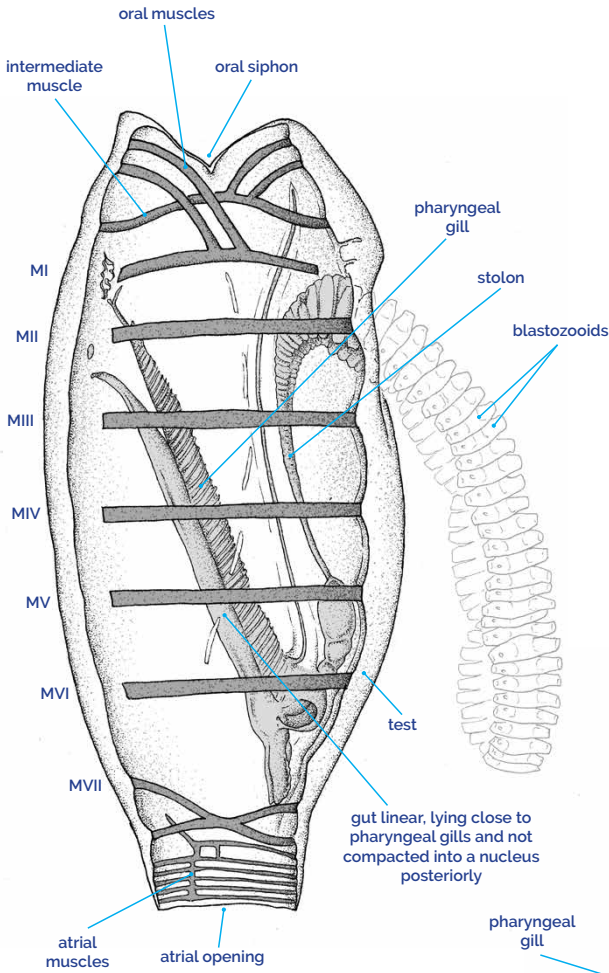
- 1a.** Gut linear, lying close to pharyngeal gills and not compacted into a nucleus posteriorly; seven, symmetrically arranged body muscles; test soft, smooth and lacking projections. subfamily Cyclosalpinx, genus Cyclosalpa (p. 172)
- 1b.** Gut horizontal, not lying close to gills and usually coiled/compacted posteriorly; variable number of body muscle bands; test may be stiff, rugose and with projections subfamily Salpinx genera *Ihleia* (p. 172), *Pegea, Salpa* (p. 173), *Soestia, Thetys* (p. 174)

Blastozoids

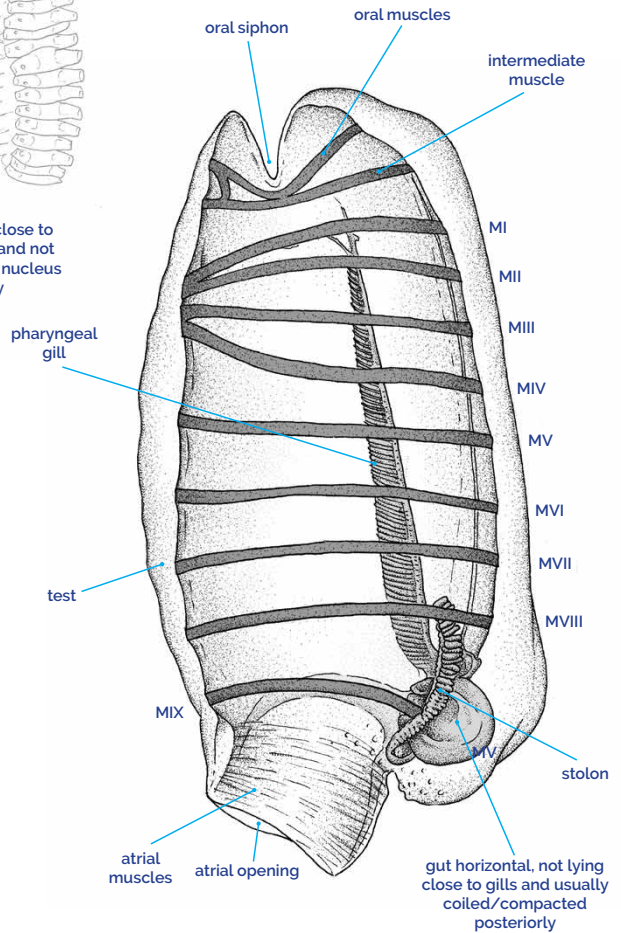
- 1a.** Gut linear or a widely open loop and not compacted into a nucleus posteriorly; with no more than four body muscles; test soft, smooth and lacking projections; may have a prominent anterior and ventral peduncle connecting to other aggregated individuals subfamily Cyclosalpinx, genus Cyclosalpa (p. 172)
- 1b.** Gut usually coiled/compacted posteriorly; with four or more body muscle bands; test may be stiff, rugose and with projections; without a ventral peduncle subfamily Salpinx genera *Ihleia* (p. 172), *Pegea, Salpa* (p. 173), *Soestia, Thetys* (p. 174)

ORDER SALPIDA

Illustrated glossary of technical terms



Cyclosalpinae
Oozoid (solitary form)



Salpinae
Oozoid (solitary form)

Cyclosalpa spp.

Oozoid (solitary form)

Body muscle bands: 7

Dorsal muscle connections:

variously continuous or interrupted mid-dorsally

Ventral muscle connections: none, all interrupted

Test shape: cylindrical, may have two atrial projections

Test texture: soft and smooth

Maximum length: 24 cm

Blastozoid (aggregate form)

Body muscle bands: 4

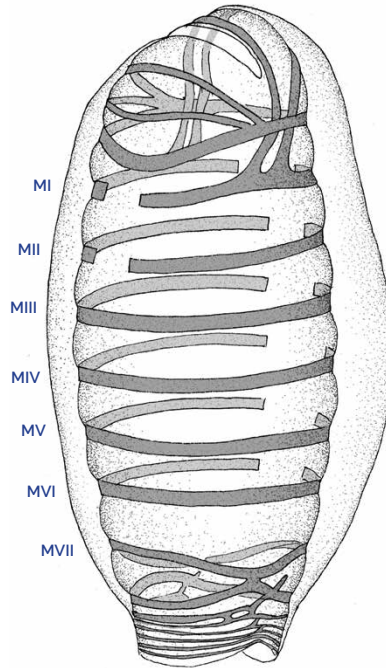
Dorsal muscle connections: all continuous

Ventral muscle connections: some may be interrupted

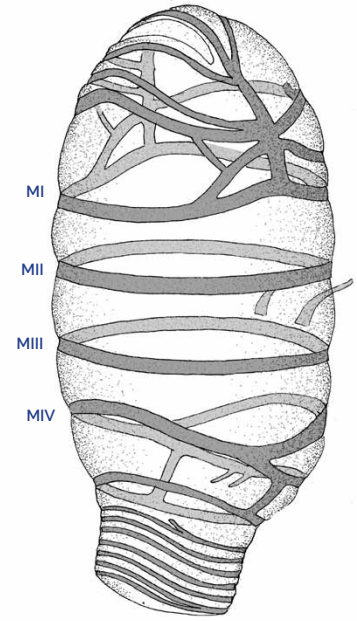
Test shape: cylindrical

Test texture: soft and smooth

Maximum length: 10 cm



Oozoid (solitary form)



Blastozoid (aggregate form)

Ihlea spp.

Oozoid (solitary form)

Body muscle bands: 5-7, broad

Dorsal muscle connections:

various; all continuous

Ventral muscle connections: most; all continuous

Test shape: cylindrical, without projections

Test texture: soft, thin, smooth

Maximum length: 7 cm

Blastozoid (aggregate form)

Body muscle bands: 5, broad

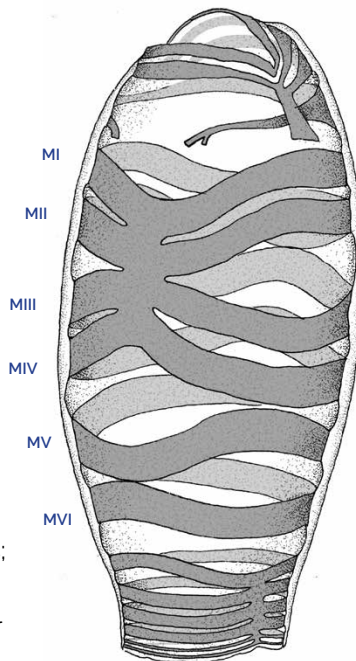
Dorsal muscle connections: strongly asymmetric; MI-MIII; MV bifurcates laterally; bands continuous

Ventral muscle connections: various; bands continuous

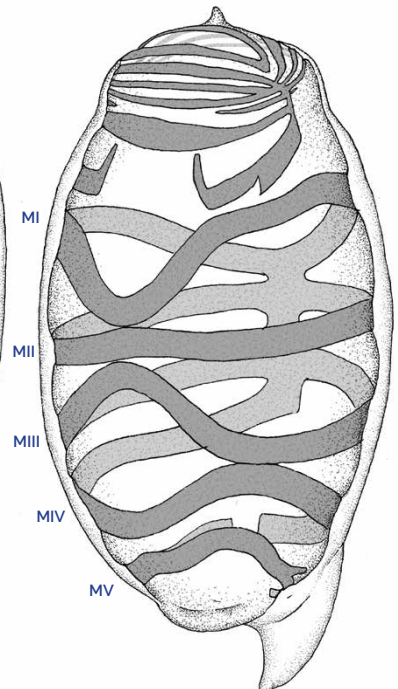
Test shape: strongly asymmetric, oval

Test texture: soft, thin, smooth

Maximum length: 3 cm



Oozoid (solitary form)



Blastozoid (aggregate form)

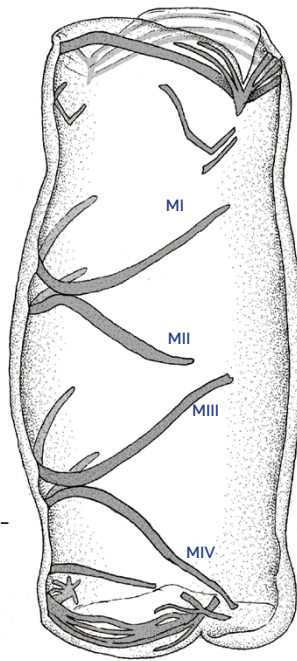
Pegea spp.

Oozoid (solitary form)

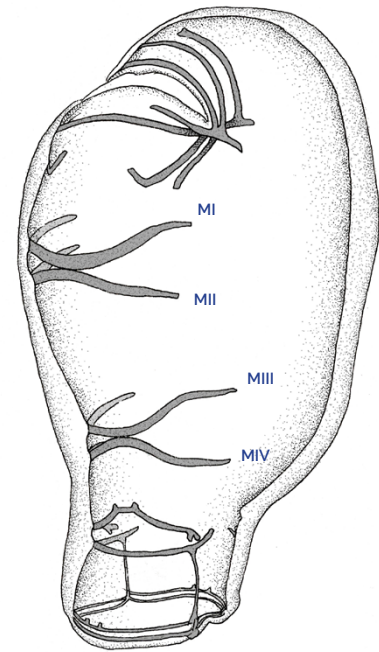
Body muscle bands: 4, short
Dorsal muscle connections: MI-MII, MIII-MIV; all continuous
Ventral muscle connections: none
Test shape: approx. cylindrical, without projections
Test texture: soft, thick, smooth
Maximum length: 15 cm

Blastozoid (aggregate form)

Body muscle bands: 4, very short
Dorsal muscle connections: MI-MII, MIII-MIV; all continuous
Ventral muscle connections: none
Test shape: approx. cylindrical; plump; may have short posterior projections.
Test texture: soft, thick, smooth
Maximum length: 13 cm



Oozoid (solitary form)



Blastozoid (aggregate form)

Salpa spp.

Oozoid (solitary form) form

Body muscle bands: 9
Dorsal muscle connections: various; all bands continuous
Ventral muscle connections: none; variously interrupted
Test shape: cylindrical, with or without longitudinal ridges
Test texture: soft, firm, thick
Maximum length: 14 cm

Blastozoid (aggregate form)

Body muscle bands: 6
Dorsal muscle connections: MI-MIV, MV-MVI; all bands continuous
Ventral muscle connections: none; variously interrupted
Test shape: oval; test drawn into short anterior and posterior processes
Test texture: soft, firm, thick
Maximum length: 15 cm



Oozoid (solitary form)

Soestia spp.

Oozoid (solitary form)

Body muscle bands: 5, broad. Intermediate muscle band may resemble others, giving impression of six broad bands. MV slightly narrower than others.

Dorsal muscle connections: none; all interrupted

Ventral muscle connections: none; all interrupted

Test shape: cylindrical; with single atrial projection

Test texture: rigid, thick

Maximum length: 10 cm

Blastozoid (aggregate form)

Body muscle bands: 5, broad

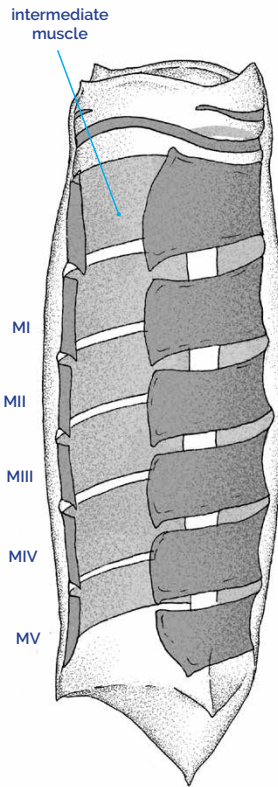
Dorsal muscle connections: none, MI only interrupted dorsally

Ventral muscle connections: none; all interrupted

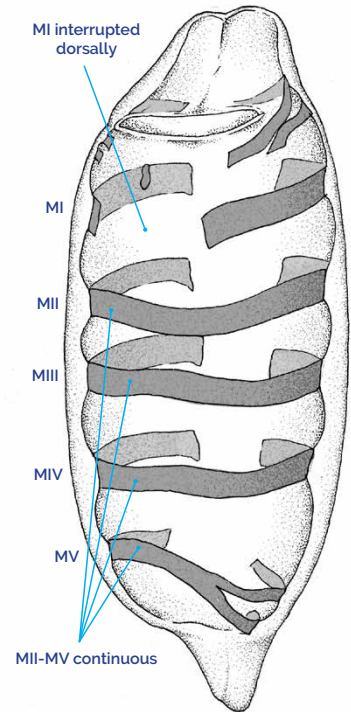
Test shape: asymmetric, elongate oval; obliquely truncated anteriorly, with obvious projection posteriorly

Test texture: rigid, thick

Maximum length: 5 cm



Oozoid (solitary form)



Blastozoid (aggregate form)

Thetys spp.

Oozoid (solitary form)

Body muscle bands: > 16, short, weak

Dorsal muscle connections: none, all interrupted

Ventral muscle connections: none; all interrupted

Test shape: cylindrical, with 2 atrial projections

Test texture: firm, thick, rugose

Maximum length: 24 cm

Blastozoid (aggregate form)

Body muscle bands: 5, short, narrow

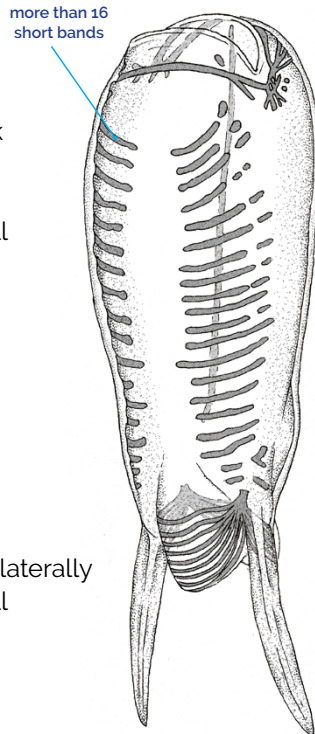
Dorsal muscle connections: none, all interrupted; MV may be split into two laterally

Ventral muscle connections: none; all interrupted

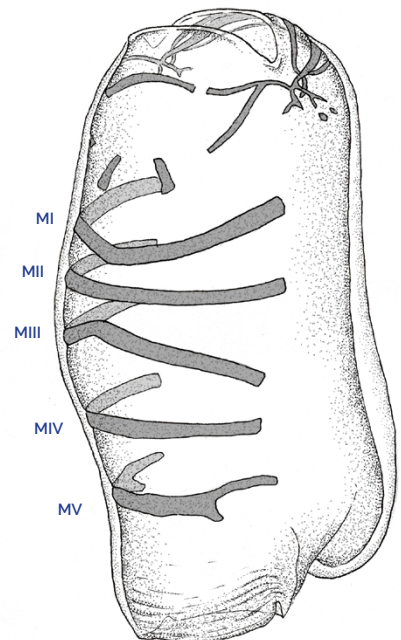
Test shape: cylindrical, pear-shaped

Test texture: firm, thick, rugose

Maximum length: 20 cm



Oozoid (solitary form)



Blastozoid (aggregate form)

ORDER PYROSOMATIDA

A small group of thaliaceans, in which the asexual (cyathozooids) and sexual (ascidiozooids) zooids are embedded in the test of hollow, finger-like colonies that are closed at one end and open at the other. Ascidiozooids are the most conspicuous of the zooids seen in colonies and their individual oral siphons are directed outwards, water being pumped through the branchial basket and into the central hollow via the atrial siphon; the collective filtrate is used to propel the colony forward, and this may be controlled/regulated by a diaphragm at the open-end of the colony. The test is generally transparent and gelatinous, of variable rigidity and with variable numbers of tooth-like projections.

The order Pyrosomatida is represented by a single family Pyrosomatidae, two sub-families, three genera and eight species. Most species have a very wide distribution and are confined to tropical, subtropical and warm temperate waters. They are rarely common in strictly neritic waters, but can occur abundantly in offshore areas, where most are thought to display diel vertical migration. All species are bioluminescent. Like other Thaliacea, pyrosomes are filter feeders, specializing on phyto- and microzooplankton and their faecal-pellets (and bodies) make a significant contribution to benthic carbon flux. Pyrosomes are eaten by a number of pelagic and demersal fish. Although colonies of *Pyrostremma spinosum* can reach 20 m, most species are no more than 5 cm in length. That said, the latter may nevertheless be caught and recognized in fishing trawls owing to their rugose and rigid test.

Seven of the eight species can be found in the Atlantic, and one (*Pyrosoma atlanticum*) can be very abundant in the Gulf of Guinea. The identification of pyrosomes to genus is fairly straightforward:

- 1a. Colony relatively flaccid, without diaphragm at open-end . . . *Pyrostremma* (p. 176)
- 1b. Colony relatively rigid, with diaphragm at open-end. 2
- 2a. Colony test rough, zooids densely packed. *Pyrosoma* (p. 176)
- 2b. Colony test smooth, zooids arranged in clear parallel rows/verticils
. *Pyrosomella* (p. 177)

Pyrostremma spp.

Two species (*P. spinosum*, *P. agassizi*), both of which can be found in the Atlantic. Colonies tapering from a narrow closed-end (with ridges, *P. spinosum*) to a broad open-end, with either a single long filament (*P. spinosum*) or four short ridged filaments (*P. agassizi*); open-end without diaphragm.

Test with small teeth; flaccid; transparent (*P. agassizi*) or reddish (*P. spinosum*), colonies generally collapsing on capture; up to 20 m (*P. spinosum*) or 50 cm (*P. agassizi*) in length. Zooids frequently red/brown in colour.

*Pyrosoma* spp.

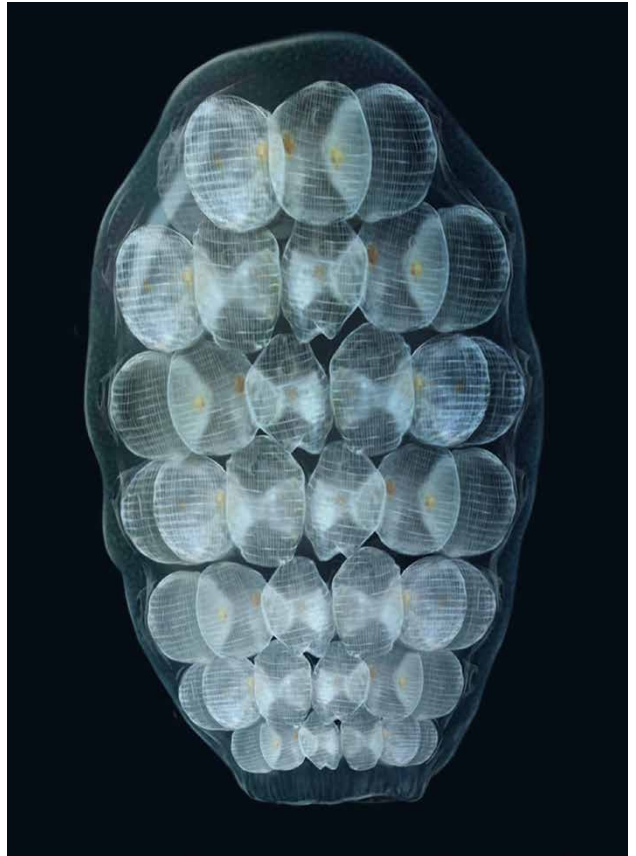
Four species (*P. godeauxi*, *P. atlanticum*, *P. aherniosum*, *P. ovatum*), latter three of which can be found in the Atlantic Ocean. Colonies generally transparent but those of *P. atlanticum* may be tinged with hues of yellow/pink. Colonies may taper slightly from a narrow closed-end to a broader open-end, resembling a finger (*P. atlanticum*), up to 60 cm in length; or resemble barrels (*P. aherniosum*, *P. ovatum*) up to 5 cm in length.

Open-end of colony with diaphragm. **Test rigid and rough**; with long, acanthous blunt projections (*P. ovatum*) or bluntly truncated (*P. aherniosum*) or tapered (*P. atlanticum*) projections. **Zooids densely packed** in mature specimens.



Pyrosomella spp.

Two species (*P. verticillata*, *P. operculata*), one from the Atlantic (*P. verticillata*). Colonies are transparent and resemble barrels, rarely exceeding 5 cm in length; open-end with diaphragm. **Test smooth.** **Zooids arranged in regular parallel rows/verticils; largest at closed-end and smallest at open end.**



GLOSSARY

Adradius, adradial: four body axes that lie mid-way between the perradius and the interradius; do not run through opposite rhopalia.

Anastomose: joining and fusing.

Apex: denoting the extreme of a certain structure.

Bell: the umbrella or body of the medusa. Maybe saucer-shaped, cuboidal or hemispherical.

Bell Diameter (Scyphozoa): distance between opposite rhopalia or lappets of Scyphozoa and opposite margins of Hydrozoa. Conventions vary with taxon.

Bell Height (Scyphozoa and Cubozoa): vertical height from apex of umbrella to bell margin. Precise measurements may be taxon specific.

Bell Width (Cubozoa): distance between opposite pedalia on a flattened specimen, at the height where the pedalum joins the exumbrella of the bell.

Bifurcating: splitting in two.

Capitate: in reference to tentacles bearing a nematocyst cluster terminally as a slight knob or swelling.

Chitinous: containing chitin.

Circular canal: canal running around bell margin of hydrozoans, linking the distal ends of radial canals.

Cnida (s), Cnidae (pl): the explosive organelle found within cnidocytes, which delivers venom via an eversible tubule for protective or predatory purposes. Often uncritically referred to as a nematocyst.

Colonial: living in a colony of more than one individual.

Coronal groove: a circular furrow in the exumbrella of Coronamedusae, separating an inner bell (central disc) with tetra-radial symmetry from the peripheral bell with a

generally octo-radial symmetry (this might vary with taxon).

Cryptomedusoid: a briefly free-swimming, highly regressed hydrozoan medusa lacking feeding structures and radial canals: solely responsible for reproduction.

Dactylozoid: see Gastrozoid.

Distal: situated away from the point of attachment; the opposite of proximal.

Dorsal tubercle: an opening of the neural gland located beneath the dorsal nervous ganglion in salps: its shape may assist in species identification, though it needs to be remembered that this may change with individual age.

Ectoderm: the outer of the two body tissue layers of cnidarians, also referred as epidermis.

Endoderm: the inner of the two body tissue layers of cnidarians: it lines the gut (hence also known as the gastrodermis) and from which the gonads develop. In the Hydrozoa, although the gonad cells might have their origin in the gastrodermis, the gonads develop in the epidermis.

Endostyle: ciliated, u-shaped tube found ventrally in Thaliacea that is responsible for the production of mucous (and possibly digestive enzymes), which is used to trap food particles passing across the gills.

Envenomation: the process of being stung. A jellyfish can sting you causing an envenomation.

Ephyra (s), ephyrae (pl): the free-swimming product of asexual reproduction that will develop into a medusa. Ephyrae are typically released following the strobilation of polyps, but may be released by viviparous medusae or through changes from the planula larva.

Exumbrella: upper surface of bell, often strongly pigmented and eventually with warts.

Frenulum: in Cubomedusae it is the vertical mesentery near the bell margin that supports the velarium (located in the subumbrella).

Gastric canals: see gastrovascular canals.

Gastric filaments: fine, thread-like filaments of endodermal tissue responsible for the secretion of digestive enzymes into the gastric cavity. May occur in clusters interradially, or on gastric septa. Usually lost on collection and ironically most conspicuous on ephyrae.

Gastric ostia: subgenital ostia

Gastric peduncle: variously cone-shaped extension of subumbrella in hydrozoans; bearing manubrium terminally; radial canals run from manubrium along its length.

Gastric phacellum/ae: see gastric filaments, used for Cubomedusae.

Gastric pouch: in Coronamedusae/Pelagiidae the peripheral parts of the gastrovascular system divided by the radial septa forming a series of relative discrete areas or pouches.

Gastric saccule: appendages of the subumbrella of Chirodropida enveloped by gonadal tissue in mature cubomedusae. Vary in shape from finger-like to cock's comb.

Gastric septa: crescent-shaped fusions between upper and lower layers of the endoderm in the gastrovascular cavity of Coronamedusae that partially separate the central part of the stomach from the periphery. Interradial in position.

Gastrozoid: although all the polyps in a colony of hydrozoans are genetically identical (they are clones), they may have different morphologies. Different genes are expressed in different polyps so that they perform different functions, in so far as the overall colony is concerned. Gastrozooids will have tentacles with nematocysts, a mouth and an "alimentary canal" that

connects with others in the colony. Their function is to catch prey. Dactylozooids possess tentacles loaded with nematocysts, but lack a mouth, and their function is largely defensive. Gonozooids lack tentacles and a mouth, and are solely responsible for reproduction: equipped with germ cells they form gonophores, which may remain attached to the colony or become detached. Gastro-gonozooids have a mouth, but no tentacle, and are otherwise responsible for reproduction: found only (here) in *Veleva* and *Porpita*.

Gastro-gonozoid: see Gastrozoid.

Gastrovascular canals: system of canals that distribute food from the centrally situated "stomach" to the bell margin. The radial canals are marginally extended, radially distributed canals arising directly from the stomach. In Scyphozoa, the ring canal (not present in all taxa) is a canal of variable width, that runs around the bell at some distance from, but relatively close to, the bell margin; while in contact with radial canals from the central gastrovascular cavity and with canals that run to the bell margin, it may itself give rise to a system of blind-ending canals that extend centrally. The ring canal in Hydrozoa may occur at the bell margin.

Gastrovascular cavity: food enters the body through the mouth/mouthlets and passes into the gastrovascular system where extracellular digestion takes place. The gastrovascular cavity is often referred to as the "stomach" and effectively forms a cavity, lined by endoderm, that is sandwiched between the mesoglea and the ectoderm of the subumbrella. In Discomedusae, the gastrovascular cavity may be broad and extend to the bell margin uninterrupted (except by radial septa), or it may become progressively finely divided to the margins by a system of gastrovascular canals. In Coronamedusae, the central part of the gastrovascular cavity may be partially separate from that closer to the margin by four interradiial crescent-shaped septa (gastric septa).

Gonads: the testes or ovaries, generally located within the gastrovascular cavity, and derived from the endoderm. There are four discrete gonads in Discomedusae, and they are distributed interradially around the mouth: the eight discrete gonads observed in Coronamedusae are approximately adradially distributed and occur towards the bell margin. All gonads tend to comprise complexly folded tissue and are opaque, if variable in colour. In fully mature specimens, the gonads may occupy much of gastrovascular cavity.

Gonozoid: see Gastrozoid.

Hermaphrodite: an individual that develops both male and female gonads. In some cases, individuals may be simultaneously male and female, whilst in others they may be sequentially male and then female. Also referred as monoecious or monoic.

Holopelagic: living entirely in the pelagos from birth to death. Most calanoid copepods are holopelagic, as are euphausiids and sardines, whereas most scyphozoans are not (they have a biphasic life cycle).

Hood (referred to rhopalium in *Atolla*): the covering scale of the rhopalium of some scyphomedusae, mostly Coronamedusae.

Interradius, interradial: two body axes, at 45° to the perradius, again running through opposite rhopalia.

Lappets: scalloped flaps of ectodermal tissue at bell margin. The number of lappets per octant, their relative size and shape, pigmentation and internal canal extensions can provide useful information for separating taxa at the species level. Those lappets that flank the rhopalia tend to have a different character to the balance and are referred to as rhopalial lappets, as opposed to velar lappets. All are regarded as marginal lappets.

Manubrium: mouth tube; frequently with a thick mesoglea; of variable length and supporting oral arms distally.

Marginal: at the margin or edge.

Medusa: free swimming cnidarian – classical jellyfish.

Mesentery: sheet-like partitions that extend into the gastrovascular cavity from the body wall.

Mesoglea: jelly-like layer sandwiched between endo- and ectoderm. Rich in collagen and supportive in function. Essentially the jelly of jellyfish.

Metagenesis: life cycle alteration between a pelagic free-swimming medusa stage that reproduces sexually and a benthic sessile polyp stage that reproduces asexually.

Mouth: external opening to the gastrovascular system. Open, and located centrally on the subumbrella surface of Cubomedusae, Coronamedusae, and Semaestomeae, but closed off in Rhizostomeae where it is relocated as numerous mouthlets on the oral arms.

Nectophore: zooid of siphonophores, often resembling a bell, that is specialised for “swimming” by muscular contraction.

Nematocysts: see cnidae.

Nucleus: visceral mass of Salpidae, comprising compacted sections of the gut and associated glands: situated posteriorly in the midline, frequently strongly pigmented.

Ocellus (s, ocelli pl): minute mass of photosensitive cells, frequently pigmented, found at the bell margin of hydrozoans.

Octant: an eighth. Scyphozoans typically have eight (8) rhopalia and the “pizza-slice” bounded by each is known as an octant.

Oral arms: extensions of the mouth tube or manubrium; effectively long, thin and often coiled-lips bearing cnidae in the case of Semaestomeae that surround an open mouth centrally; or, in the case of Cepheida and Rhizostomida, much

thickened and supporting numerous mouthlets externally, and with a branching gastrovascular network internally.

Pedaliium: interradial extensions of the bell margin in which tentacles are attached. It has an internal **pedalial canal** which is connected to the gastrovascular cavity. In its upper part some species present a **knee-bend** which has taxonomic value.

Perisarc: protective, non-living ("chitinous") layer that encases living tissue of hydrozoans.

Perradius, Perradial: the two main body axes, at 90° to each other, which effectively divide the body into four. In line with the naturally extended oral arms, between subgenital ostia and passing through opposite rhopalia.

Pillars: the most basal portion of the mouth arms, attached to the bell (subumbrella).

Pinnate gland: feather-like gland of Chirodopida; it is located between the attachment point of the gastric saccules.

Planktotrophic: feeding in (and on) the plankton. A term generally used in the context of larvae.

Pneumatophore: the gas-filled float of siphonophores, formed by a modified zooid and filled with a gaseous mix that approximates air.

Polyp: the generally sessile phase in the life cycle of cnidarians, resembling a sea-anemone, typically with tentacles around its mouth. In hydrozoans, polyps may occur in colonies of clones that display polymorphism. The polyp may be protected by a chitinous tube (some Hydrozoa and Coronamedusae), or be naked. Also known as a scyphistoma in Scyphozoa.

Proliferation: increase.

Protogynous hermaphrodite: a sequential hermaphrodite that functions first as a female then develops into a male after releasing eggs.

Proximal: situated close to the point of attachment, basal: opposite to distal.

Quadralinga: thickened columns of mesoglea extending from mouth to distal wall of gonadal pouch; only observed in some Pelagiidae.

Radial septa: radially distributed fusions between the upper and lower layers of endodermis in the gastrovascular cavity. Their function, like those of the gastric septa, is likely to control the movement of materials in the stomach and to increase the surface area for absorption. The shape, size and arrangement of the radial septa can be useful in taxon identification.

Radial symmetry: a form of symmetry in which the body plan is divisible into similar parts around a central axis.

Rhopalial niche openings (covering scales): an indentation of the side of the bell in Cubomedusae, where rhopalia are located (four in number). The shape of the opening and presence of covering scales is of taxonomic value.

Rhopalium: collection of sense organs (ocelli, light; statocysts, "balance") into a single body, generally at or close to the bell margin.

Ring canal: see gastrovascular system.

Scapulets: eight short, rigid, pairs of mouthlet-bearing outgrowths at the base of manubrium in some Rhizostomeae.

Stalk or Peduncle: the stem or basal part of a certain structure.

Statocyst: organelle used to maintain equilibrium or "balance", akin to the otoliths of bony fishes. Confined to the rhopalia in Scyphozoa and Cubozoa, but distributed around the bell margin in Hydrozoa. In Scyphozoa the crystals are comprised of calcium sulphate hemihydrate (basanite - statoliths) that interact with sensory cilia; whereas in Hydrozoa they are made of calcium magnesium phosphate.

Stolon: undifferentiated string of tissue

in the oozoids of salps that buds off aggregated chains of blastozoids by asexual reproduction. May be coiled around the nucleus.

Strobila: a polyp that is undergoing strobilation.

Strobilation: the process of asexual reproduction by a polyp that gives rise to ephyrae (through transversal fissions of the body).

Subgenital cavity: the gonads of Discomedusae develop from endodermal tissue that has grown into the mesoglea, which (in some species) may be further supported by thickened outgrowths of mesoglea from the pillars of the manubrium to give the impression of a cavity. In some Rhizostomeae species it is the space between the floor of the gastric cavity and the roof of the mouth arms disc.

Subgenital ostia: interradially distributed openings to the subgenital cavity, the space between adjacent pillars; of variable shape; in some species there might be warts, papillae, or membranous flaps at the opening.

Subumbrella: lower surface of bell.

Symbionts: organisms that are symbiotic (parasite, mutualistic). Symbionts of jellyfish may include hyperiid amphipods and the phyllosoma larvae of Palinurid crustaceans as well as some brittle-stars and even barnacles. They also include the photosynthetic zooxanthellae associated with some species of *Cassiopea*, *Phyllorhiza* and *Mastigias*.

Taxon: any unit of taxonomy; species, genus, family.

Taxonomy: the study of the classification of organisms.

Tentacles: threads (hollow or solid) of ectodermal tissue arising from the bell margin/subumbrella surface (Hydrozoa, Scyphozoa), or from pedalia (Cubozoa), which are laden with nematocysts

and used for prey capture. Generally retractile; of variable length. The number and arrangement of tentacles are useful characters in taxon identification, though it should be remembered that they are frequently lost on rough collection. The designation primary, secondary, etc. refers to the order in which tentacles develop in some Semaestomeae, with the primary tentacles forming first from between velar lappets at the centre of each octant.

Tentacular bulb: a variously shaped expansion of the tentacle at its base noted in hydrozoans.

Terminal appendage: the oral arms of some Rhizostomeae may have a non-mouthlet-bearing extension at the distal end or throughout the length, of variable length size and form.

Tetradial: radiating outwards in four directions.

Theca (s; thecae pl): protective structure formed from thickened periscarc and located around polyps of leptothebate hydroids. Preface indicates role: hydrotheca (around gastrozooids), nematotheca (around dactylozooids) and gonotheca (around gonophores).

Velarium: in Cubomedusae it is a sheet-like tissue located right at the bell margin. It typically possesses gastrovascular canals that can be used as a taxonomic character.

Viviparous: giving "birth" to live young, without laying eggs.

Warts (or Papillae): raised, nematocyst-rich areas on the exumbrellar surface.

Zooxanthellae: single-celled dinoflagellates that live within the cells of many marine organisms.

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This identification guide includes 56 species of macro (> 5 cm in diameter) jellyfishes (cnidarians, ctenophores, and thaliaceans) that are known to occur off the coast of West Africa. It provides fully illustrated dichotomous keys to all taxa, an illustrated glossary of technical terms for each main group, and species accounts including the scientific name, diagnostic features, colour, size, ecology, stinging, geographical distribution, and one or more illustrations. The guide is intended for both specialists, and non-specialists who have a working knowledge of biology.

