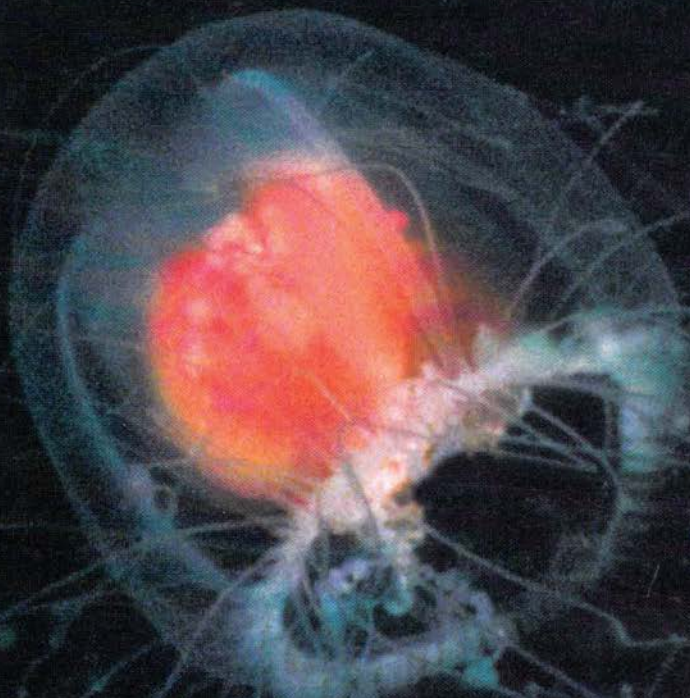


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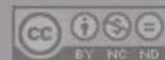


The Marine Fauna of New Zealand:

# Hydromedusae (Cnidaria: Hydrozoa)

J. Bouillon and T.J. Barnett

*NIWA Biodiversity Memoir 113*



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~~Map~~ of *Territopsis nutricula* McCrady, Bay of Islands. Photo: Kim Westerskov.



NATIONAL INSTITUTE OF  
WATER AND ATMOSPHERIC RESEARCH (NIWA)

**The Marine Fauna of New Zealand:  
Hydromedusae  
(Cnidaria: Hydrozoa)**

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# The Marine Fauna of New Zealand: Hydromedusae (Cnidaria: Hydrozoa)

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## ABSTRACT

This memoir comprises a systematic survey of all species of Hydromedusae recorded from New Zealand waters. Of the more than 134 species represented in the fauna, 124 are named to species and 10 are named to genus only. Each species entry is accompanied by: diagnostic characters and an illustration of the medusa, a short diagnosis of the hydroid stage where known, a summary of geographical distribution, and some key references. Keys for identification are given for the orders, families, genera, and described species. Approximately 76% are meropelagic (neritic, epipelagic, or slope species) and 23% are holopelagic. Approximately 55% of the meropelagic medusae (Anthomedusae, Leptomedusae, Limnomedusae, Laingiomedusae) have their life-cycle unknown, and, among the 49 species with known life-cycles, 16 are only imperfectly known from experimental rearing and are not yet known in the field.

**Keywords:** Hydromedusae, systematics, marine fauna, New Zealand



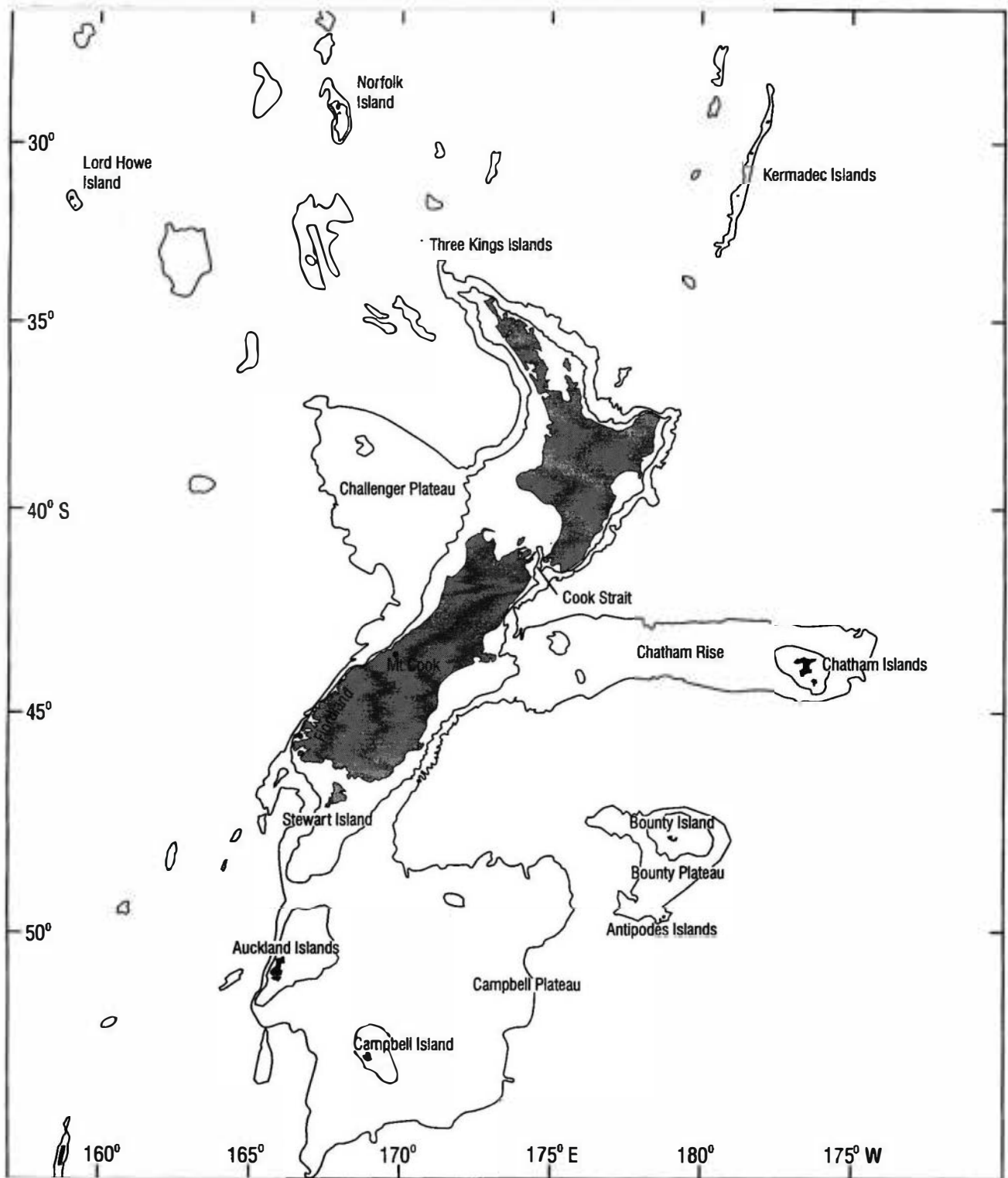


Fig. 1. Map of the New Zealand region which covers the study area (CANZ 1997).



## INTRODUCTION

The hydromedusae of New Zealand are poorly known and what is known is almost exclusively from the east coast. Previous studies of the hydromedusan fauna of New Zealand have been strongly biased towards the polyp stages of subclass Leptomedusae. The classical works of Ralph (1957, 1958, 1961a, b) on the thecate hydroids are standard papers for the New Zealand hydroid fauna, whereas the short paper by Ralph (1953) on athecate hydroids provides only a glimpse of what that fauna could contain. There has been an unnatural imbalance in favour of thecate hydroids in the recorded composition of the New Zealand hydromedusan fauna.

The medusa stages of Hydrozoa have received scant attention (see Barnett 1985). New studies however, have recently been undertaken (see Historical Review). They have improved the knowledge of the fauna and revealed its richness, partly filling the existing gap in our knowledge of the New Zealand pelagic Hydrozoa.

This work is not a systematical revision; it has been written mainly for non-hydromedusan specialists — ecologists, oceanographers, or specialists of other groups as a tool for identifying New Zealand hydromedusae. The descriptions are mostly compiled from the literature though some are based on preserved material supplied by the second author and Dr P. Schuchert (Geneva). The overall taxonomic system

adopted in the present work is the one defined by Bouillon (1985a, 1995a), and Bouillon *et al.* (1992). Several diagnoses have nevertheless been emended or corrected, taking into account recent observations and publications. No synonyms or reference lists are cited for the different species, as such information can easily be found in general reference books, e.g., Russell (1953, 1970), Kramp (1961, 1968), and Bouillon (1985a, 1995a), etc. Only some recent references have been selected for better understanding the taxon, or concerning some interesting or important biological or zoogeographical aspects of each species given under "Key References". The worldwide distribution is given for each species in Table 1. Seasonality has been indicated where possible. Except for a few long-term surveys like those of Barnett (1985), the seasonality data are fragmentary and incomplete, being the reflection of the vagaries of sampling opportunities. Where known, the cnidome is indicated as shown in Table 3.

The area studied is that defined by the boundaries of the New Zealand region (CANZ 1997; see Fig. 1), extending from 24° S to 57°30' S and from 157° E to 167° W. This is a very diverse geographical area containing tropical, temperate, and subantarctic regions.

## HISTORICAL REVIEW

The earliest record of marine hydromedusae in New Zealand seas was that of Coughtrey (1874) who reported reduced medusae of *Eucopella bilabiata* (*Orthopyxis crenata*) within the gonotheca of the parent hydroid. Five years later, Haeckel (1879) recorded *Liriope tetraphylla* (as *Glossocodon agaricus*) from New Zealand waters.

Lendenfeld (1884) described *Obelia australis* from the east coast and *Eucope* (*Phiallela*) *annulata* from Lyttleton Harbour; this species has subsequently been recorded as a "doubtful species" (Kramp 1961). The descriptions by Lendenfeld (1884) are generally held to be unreliable and most of his species are unrecognisable (Browne & Kramp 1939; Kramp 1965). *Eucopella* (*Orthopyxis*) *crenata*, was described again by Hartlaub (1901) from French Pass.

Dendy (1902) described a pelagic hydroid, *Pelagohydra mirabilis*, found washed up on Sumner Beach, near Christchurch. Examination showed contracting medusae buds on the free-swimming hydroid. After

observation of the live animal, Dendy (1902) carried out a detailed histological examination. Since this first record, Percival (1938) and Pilgrim (1967a, b) have recorded or described features of the morphology and behaviour of this endemic hydrozoan.

Benham (1909) described in detail *Bougainvillia macloviana*, under the name *Hippocrene*, from the Auckland Islands and a *Phialella* species, later described as *Phialella falklandica* (Browne & Kramp 1939), from both the Auckland Islands and Campbell Island.

Kramp (1928) published on medusae caught during Dr Thomas Mortensen's Pacific Expedition, recording two species from New Zealand waters, *Bougainvillia macloviana* from Campbell Island and *Turritopsis pacifica* (a synonym of *T. nutricula*) from Hawke Bay. Ralph (1947) recorded from Wellington *Staurocladia vallentini*, originally described from the Falkland Islands.

Russell (1953) recorded *Phialella quadrata* from specimens collected in Otago Harbour.

Ralph's (1953) "Guide to the Athecate (Gymno-

blastic) Hydroids and Medusae of New Zealand" recorded eleven species: *Staurocladia hodgsoni*, *Cladonema radiatum*, *Pelagohydra mirabilis*, *Sarsia exima*, *Endocrypta huntsmani*, *Hybocodon prolifer*, *Pennaria australis*, *Amphinema rugosa*, *Catablema vesicaria*, *Turritopsis nutricula*, and *Bougainvillia ramosa*. Three of her species were based on the hydroid only. Ralph later (1956) recorded, for the third time from New Zealand waters, the developing medusae of *Eucopeella bilabiata* = *Orthopyxis crenata*.

A new species of *Podocoryna*, *P. bella*, was described by Hand (1961). The medusae have been found only attached to the parent hydroid, which lives commensally on the pigfish *Congiopodus leucopaecilus*; their adult morphology is not known.

Wear (1965) recorded three species from Wellington Harbour, *Obelia geniculata* = *O. spp.*, *Phialella quadrata*, and *Octophialucium funerarium*. He also gave details of their seasonality.

Kramp (1965) studied several New Zealand hydromedusae from material of the *Dana* Expedition, collected September 1928 to January 1930, and from the *Galathea* Expedition in 1951–1952. Seventeen species of neritic hydromedusae were collected from New Zealand, 13 from coastal waters of the South Island and only 4 from the North Island, which Kramp (1968) considered not well investigated. Two of these species, *Turritopsis nutricula* and *Oceania armata*, are partly oceanic (epipelagic) and all, with the exception of *Pelagohydra mirabilis*, are widely distributed in the Indo-Pacific area (Kramp 1968). Kramp (1965) also recorded nineteen oceanic species from New Zealand waters.

Jillett (1971) recorded *Turritopsis nutricula* and *Obelia* spp. from the Hauraki Gulf.

Roberts (1972) recorded *O. geniculata* = *O. spp.*,

*Phialella quadrata*, and *Bougainvillia macloviana* from Campbell Island, giving seasonal details of all three species.

Mills (1982) reported and gave a pictorial key for some of the New Zealand hydromedusae she observed during a short stay and survey in New Zealand.

Roper *et al.* (1983) listed ten hydromedusae species from the Avon-Heathcote Estuary in Christchurch. Only six are identified to species: *Hybocodon prolifer*, *Pelagohydra mirabilis*, *Amphinema rugosum*, *Clytia hemisphaericum*, *Obelia geniculata* (= *O. spp.*), and *Phialella quadrata*.

The most comprehensive listing of New Zealand hydromedusae species is that of Barnett (1985) who increased the New Zealand hydromedusae faunal list to 91 species and described the seasonal occurrence of 37 of them.

Fulton and Wear (1985) studied predatory feeding in *Obelia geniculata* and *Phialella quadrata*.

Bouillon (1995b) studied a collection of hydromedusae from the New Zealand Oceanographic Institute (now NIWA) giving 15 new records from New Zealand waters including a new genus, two new species (*Boeromedusa auricogonia* and *Bougainvillia vervoorti*), and a new family, the Boeromedusidae.

Schuchert (1996) made an extensive survey of the systematics and life cycles of the New Zealand Anthomedusae. He defined a new family, the Eucodoniidae, two new genera, *Barnettia* and *Fabienna*, and nine new species (*Barnettia caprai*, *Bougainvillia dimorpha*, *Corymorpha intermedia*, *Euphysa problematica*, *Fabienna sphaerica*, *Hydractinia australis*, *Merga treubeli*, *Staurocladia wellingtoni*, *Zanclaea polymorpha*), and added four new records to the list of the New Zealand hydromedusae, increasing the fauna to 119 known species.

## GEOGRAPHIC DISTRIBUTION

In total, 134 species of hydromedusae (Table 1) have been listed from the New Zealand area, defined as extending from 24°S to 57°30' S and from 157°E to 167° W. Of these, 102 (76.1%) are meropelagic (neritic, epipelagic, or slope species), and 32 (23.4%) are holopelagic. Among the 102 meropelagic medusae (Anthomedusae, Leptomedusae, Limnomedusae, Laingiomedusae) 56 have their life cycle unknown and, among the 49 species with known life-cycles, 16 are only imperfectly known from experimental rearing and have not yet been found in the field.

The distribution of species among higher taxa is slightly different from that observed for other geographical areas (see Table 2; Bouillon 1999). The per-

centage of Anthomedusae is rather similar (44.8%, 60 species); the Leptomedusae appear less abundant (29.9%, 40 species) proportionally and numerically. The Laingiomedusae (1 species) and the Limnomedusae (1 species) (1.5% combined) are not representative. Further, the only species of Limnomedusae is freshwater. The percentage of Narcomedusae (10.4%, 14 species) is very similar to what is observed in the Mediterranean and the South Atlantic but higher than in the central Indo-Pacific area (Bismarck Sea). The Trachymedusae (13.4%, 18 species) appear proportionally more numerous than in the other geographical areas, with the exception of the South Atlantic region.

Of the 134 hydromedusan species described from

**Table 1.** Biogeographic distribution of the New Zealand Hydromedusae.  
Abbreviations: Atl = Atlantic; In-Pa = Indo-Pacific; Ant = Antarctic and subantarctic; Arc = Arctic;  
Med = Mediterranean. \* = endemic species.

Species	Atl.	In-Pa.	Ant.	Arc.	Med.	Species	Atl.	In-Pa.	Ant.	Arc.	Med.
Subclass Anthomedusae						Family Rathkeidae					
Order Filifera						<i>Rathkea formosissima</i>	+	+	-	-	-
Family Bougainvilliidae						<i>Rathkea octopunctata</i>	+	+	-	+	+
<i>Bougainvillia aurantiaca</i>	-	+	-	-	+	Order Capitata					
<i>Bougainvillia dimorpha</i>	-	+	-	-	-	Family Boeromedusidae					
<i>Bougainvillia fulva</i>	-	+	-	-	-	<i>Boeromedusa auricogonia</i>	-	+	-	-	-
<i>Bougainvillia macloviana</i>	+	+	+	-	-	Family Cladonematidae					
<i>Bougainvillia muscoides?</i>	+	+	-	-	-	<i>Cladonema radiatum</i>	+	+	-	-	+
<i>Bougainvillia muscus</i> (= <i>B. ramosa</i> )	+	+	-	+	+	Family Corynidae					
<i>Bougainvillia platygaster</i>	+	+	-	-	+	<i>Dipurena ophiogaster</i>	+	+	-	-	+
<i>Bougainvillia verwoorti</i>	-	+	-	-	-	<i>Sarsia eximia</i>	+	+	-	+	+
<i>Koellikerina maasi</i>	-	+	+	-	-	<i>Sarsia japonica</i>	-	+	-	-	-
Family Bythotiariidae						Family Corymorphidae					
<i>Bythotiara murrayi</i>	+	+	-	-	-	<i>Corymorpha intermedia</i>	-	+	-	-	-
<i>Bythotiara parasitica</i>	-	+	-	-	-	<i>Euphysora furcata</i>	+	+	+	+	-
<i>Bythotiara</i> sp.	?	+	?	?	?	<i>Vannuccia forbesii</i>	+	+	-	-	+
<i>Calycopsis bigelowi</i>	+	+	-	-	-	Family Eleutheriidae					
Family Clavidae						<i>Staurocladia vallentini</i>	+	+	-	-	-
<i>Oceania armata</i>	+	+	-	-	+	<i>Staurocladia wellingtoni</i>	-	+	-	+	-
<i>Turritopsis nutricula</i>	+	+	-	-	+	Family Euphysidae					
Family Cytaeidae						<i>Euphysa problematica</i>	-	+	-	-	-
<i>Cytaeis</i> sp.	+	+	-	-	+	Family Margelopsidae					
Family Eucodoniidae						<i>Pelagohydra mirabilis</i>	-	+	-	-	-
<i>Eucodonium brownei</i>	+	+	-	-	+	Family Pennariidae					
Family Hydractiniidae						<i>Pennaria disticha</i>	+	+	-	-	+
<i>Hydractinia australis</i>	-	+	-	-	-	Family Polyorchidae					
<i>Hydractinia bella</i>	-	+	-	-	-	<i>Tiaricodon</i> sp.	?	+	?	?	?
<i>Hydractinia minima</i>	+	+	-	-	+	Family Porpitiidae					
<i>Hydractinia minuta</i>	+	+	-	-	+	<i>Porpita porpita</i>	+	+	-	-	+
Family Pandeidae						<i>Veleva veleva</i>	+	+	-	-	+
<i>Amphinema dinema</i>	+	+	-	-	+	Family Tubulariidae					
<i>Amphinema rugosum</i>	+	+	-	-	+	<i>Ectopleura</i> spp.	+	+	-	-	+
<i>Annatiara affinis</i>	+	+	-	+	-	<i>Hybocodon prolifer</i>	+	+	-	+	+
<i>Barnettia caprai</i>	-	+	-	-	-	Family Zancleidae					
<i>Halitholus pauper</i>	+	+	-	+	-	<i>Zanclea polymorpha</i>	-	+	-	-	-
<i>Leuckartiara annexa</i>	-	+	-	-	-	<i>Zanclea</i> sp.	+	+	-	-	+
<i>Leuckartiara octona</i>	+	+	-	-	+	Subclass Leptomedusae					
<i>Leuckartiara</i> sp. 1	?	+	?	?	?	Order Conica					
<i>Leuckartiara</i> sp. 2	?	+	?	?	?	Family Aequoreidae					
<i>Merga treubeli</i>	-	+	-	-	-	<i>Aequorea australis</i>	-	+	-	-	-
<i>Neoturris papua</i>	-	+	-	-	-	<i>Aequorea forskalea</i>	+	+	-	-	+
<i>Pandea conica</i>	+	+	-	-	+	<i>Aequorea macrodactyla</i>	+	+	-	-	-
<i>Pandeopsis ikarii</i>	-	+	-	-	-	Family Cirrholoveniidae					
(unknown pandeids)	?	+	?	?	?	<i>Cirrholovenia polynema</i>	-	+	-	-	-
Family Proboscidactylidae											
<i>Proboscidactyla</i> sp.	?	+	?	?	?						
Family Protiaridae											
<i>Halitiara formosa</i>	+	+	-	-	+						
<i>Halitiara inflexa</i>	+	+	-	-	+						

Species	Atl.	In-Pa.	Ant.	Arc.	Med.	Species	Atl.	In-Pa.	Ant.	Arc.	Med.
Family Eirenidae						Family Phialuciidae					
<i>Eirene ceylonensis</i>	-	+	-	-	-	<i>Phialucium mbenga</i>	-	+	-	-	-
<i>Eirene menoni</i>	-	+	-	-	-	Subclass Laingiomedusae					
<i>Eirene proboscidea</i>	-	+	-	-	-	Family Laingiidae					
<i>Eirene tenuis</i>	-	+	-	-	-	<i>Fabienna sphaerica</i>	-	+	-	-	-
<i>Eutima curva</i>	-	+	-	-	-	Subclass Limnomedusae					
<i>Eutima mira (E. orientalis)</i>	+	+	-	-	+	Family Olindiidae					
<i>Phialopsis diegensis</i>	+	+	-	-	-	<i>Craspedacusta sowerbyi</i>	freshwater medusae				
Family Eucheilotidae						Subclass Narcomedusae					
<i>Eucheilota menomi</i>	-	+	-	-	-	Family Aeginidae					
<i>Eucheilota paradoxica</i>	+	+	-	-	+	<i>Aegina citrea</i>	+	+	+	+	+
<i>Eucheilota tropica</i>	-	+	-	-	-	<i>Aeginura grimaldii</i>	+	+	+	-	-
<i>Eucheilota</i> sp.	?	+	?	?	?	<i>Solmundella bitentaculata</i>	+	+	+	-	+
Family Laodiceidae						Family Solmarisidae					
<i>Laodicea indica</i>	+	+	-	-	-	<i>Pegantha clara</i>	+	+	+	-	-
<i>Staurodiscus gotoi</i>	-	+	-	-	-	<i>Pegantha laevis</i>	+	+	-	-	-
<i>Toxorhis polynema</i>	+	+	-	-	-	<i>Pegantha martagon</i>	+	+	+	-	-
Family Lovenellidae						<i>Pegantha triloba</i>	+	+	-	-	+
<i>Lovenella assimilis</i>	-	+	-	-	-	<i>Solmaris rhodoloma</i>	-	+	-	-	-
Family Malagazziidae						Family Cuninidae					
<i>Malagazzia carolinae</i>	+	+	-	-	-	<i>Cunina duplicata</i>	+	+	+	-	-
<i>Octophialucium indicum</i>	-	+	-	-	-	<i>Cunina frugifera</i>	+	+	-	-	+
Family Mitrocomidae						<i>Cunina globosa</i>	+	+	-	-	+
<i>Cosmetirella davisi</i>	+	+	+	-	-	<i>Cunina peregrina</i>	+	+	-	-	+
<i>Mitrocomella brownei</i>	+	+	-	-	+	<i>Solmissus incisa</i>	+	+	-	-	+
<i>Mitrocomella frigida</i>	+	+	+	-	-	<i>Solmissus marshali</i>	+	+	+	-	-
<i>Mitrocomella niwai</i>	-	+	+	-	+	Subclass Trachymedusae					
Family Phialellidae						Family Geryoniidae					
<i>Phialella falklandica</i>	+	+	+	-	-	<i>Geryonia proboscidalis</i>	+	+	-	-	+
<i>Phialella quadrata</i>	+	+	-	-	+	<i>Liriope tetraphylla</i>	+	+	-	-	+
Family Tiarannidae						Family Halicreatidae					
<i>Chromatonema rubrum</i>	+	+	+	-	-	<i>Botrynuma brucei</i>	+	+	+	+	-
<i>Modeeria rotunda</i>	+	+	+	+	+	<i>Halicreas minimum</i>	+	+	+	+	-
Family Tiaropsidae						<i>Haliscera bigelowi</i>	+	+	-	+	+
<i>Tiaropsidium japonicum</i>	-	+	-	-	-	<i>Haliscera racovitzae</i>	+	+	+	-	+
<i>Tiaropsidium roseum</i>	+	+	-	-	-	<i>Halitrephes maasi</i>	+	+	+	-	+
<i>Tiaropsis gordonii</i>	-	+	-	-	-	Family Rhopalonematidae					
Order Proboscoida						<i>Aglaura hemistoma</i>	+	+	-	-	+
Family Campanulariidae						<i>Amphogona apicata</i>	+	+	-	-	-
<i>Clytia gregaria</i>	-	+	-	-	-	<i>Colobonema sericeum</i>	+	+	+	-	-
<i>Clytia hemisphaericum</i>	+	+	-	-	+	<i>Crossota alba</i>	+	+	-	-	-
<i>Clytia malayense</i>	-	+	-	-	-	<i>Crossota brunnea</i>	+	+	+	-	-
<i>Clytia rangiroae</i>	-	+	-	-	-	<i>Pantachogon haeckeli</i>	+	+	+	+	+
<i>Clytia simplex</i>	+	+	+	-	-	<i>Persa incolorata</i>	+	+	-	-	+
<i>Obelia</i> spp.	+	+	+	+	+	<i>Rhopalonema funerarium</i>	+	+	-	-	+
<i>Orthopyxis crenata</i>	+	+	-	-	+	<i>Rhopalonema velatum</i>	+	+	+	-	+
(= <i>Eucopella bilabiata</i> , <i>E. crenata</i> )						<i>Sminthea eurygaster</i>	+	+	+	-	+
						<i>Tetrorchis erythrogaster</i>	+	+	-	-	+

**Table 2.** Percentage distribution of Hydromedusae.

	<b>Mediterranean</b> (193 spp.)	<b>Indo-Pacific</b> (Bismarck Sea) ( 200 spp.)	<b>South Atlantic</b> ( 197 spp.)	<b>New Zealand</b> (134 spp.)
Anthomedusae	87 = 45.1 %	91 = 45.5%	76 = 38.6%	60 = 44.8 %
Leptomedusae	61 = 31.6%	80 = 40.0%	59 = 29.9%	40 = 29.9%
Laingiomedusae	1 = 0.5%	2 = 1.0%	1 = 0.5%	1 = 0.75%
Limnomedusae	6 = 3.1%	3 = 1.5%	15 = 7.6%	1 = 0.75%
Narcomedusae	20 = 10.4%	14 = 7.0%	18 = 9.1%	14 = 10.4%
Trachymedusae	18 = 9.3%	10 = 5.0%	28 = 14.3%	18 = 13.4%

New Zealand waters, seven, mostly juveniles, are not formally diagnosed at the species level and one is freshwater, thus only 126 species will be considered here with respect to the geographical affinities of the fauna. Comparison of the distribution of New Zealand hydromedusae with the other geographical areas (Table 1) indicates —

- 38 (30.1%\*) are exclusively found in the Indo-Pacific, 16 (12.7%) of them being endemic to New Zealand waters;
- of the remaining 88 species, 86 (97.7%, or 68.2% of the total number of hydromedusae) are found in both the Atlantic and the Indo-Pacific regions and 52 (60.4%) of those 88 species also occur in Mediterranean waters;
- only two species are restricted to Indo-Pacific and Mediterranean waters—*Bougainvillia aurantiaca* and *Halitiara inflexa* — both being perhaps recent Lessepsian Mediterranean migrants, and only one species, *Koellikerina maasi*, is encountered solely in Indo-Pacific and Antarctic waters;
- a total of 27 (21.4% of the total number) New Zealand hydromedusan species occur elsewhere in Antarctic and subantarctic waters, but only one-third appear to be present in the Indo-Pacific sector of the Antarctic and subantarctic, i.e., 9 species or about 7%;
- 15 (11.9%) of the New Zealand hydromedusan species occur also in the Arctic area, mostly in the Atlantic sector; 7 (16.3%) of the 42 polar hydromedusae are bipolar.

Among the 38 species found exclusively in Indo-Pacific waters, 18 are Anthomedusae, 18 Lepto-

medusae, 1 Laingiomedusae, and 1 Narcomedusae. Of these, 16 are endemic, comprising 12 Anthomedusae, 3 Leptomedusae, and one Laingiomedusae (see Table 1).

The percentage of endemism in the New Zealand medusa fauna (12.7%) is lower than in the South Atlantic fauna (14.2%; Bouillon 1999) and even more so compared to the Mediterranean fauna (19.4%; see Boero & Bouillon 1993; Gili *et al.* 1998) but this last area is one of the most thoroughly studied regions in the world. The perceived endemic medusa fauna of New Zealand almost certainly contains many pseudo-endemics, as endemism often reflects only the scarcity and scatter of our observations.

It is clear from the above figures that the New Zealand hydromedusa fauna shows particular affiliation with a large Atlantico-Indo-Pacific faunal stock; most of the species which are found in the New Zealand subregion are common to the Indo-Pacific and to the Atlantic. More surprisingly, its affinities are greater with the Mediterranean fauna (41.2%) than with the nearer Antarctic and subantarctic fauna (9 species or 7%). In fact the New Zealand hydromedusa fauna does not exhibit a great subantarctic and Antarctic character.

Some of the New Zealand species found in the Atlantic and the Mediterranean regions could represent relicts of the old Tethys fauna, but this appears doubtful, most of the Mediterranean species having been eliminated during the Messinian Crisis in which only a few bathypelagic species may perhaps have been able to survive (see Gili *et al.* 1998). Those species presumably correspond to a later and secondary Mediterranean invasion through the Strait of Gibraltar by forms resulting from a previous large Atlantic and Indo-Pacific hydromedusan faunal interchange.

## LIST OF STATIONS

Stn No.	Date	Latitude (°S)	Longitude	Length of wire (m)	Stn No.	Date	Latitude (°S)	Longitude (°E)	Depth (m)
<b>Dana Stns (Kramp 1965)</b>									
3620	7.12.28	24 46.5'	170 18.5'E	100-300	N343	5.12.74	37 44.10	178 33.30	26
3621	8.12.28	2547'	172 24'E	1000-4000	N345	5.12.74	37 43.70	178 41.70	101
3622	8.12.28	2554'	172 36.9'E	100-300	N346	5.12.74	37 44.20	178 49.40	211
3623	9.12.28	27 21'	175 11'E	300-1000	N347	5.12.74	37 44.20	178 01.40	500
3624	10.12.28	28 17.5'	177 01'E	100-4000	N349	6.12.74	37 45.70	176 40.60	51
3625	11.12.28	29 40'	179 34'E	50-100	N350	6.12.74	37 40.80	176 44.00	101
3626	13.12.28	2700'	177 41'W	100-2000	N356	7.12.74	36 31.30	175 17.60	50
3627	14.12.28	30 08'	176 50'W	100-4000	N360	8.12.74	35 13.60	174 06.40	24
3629	16.12.28	33 36.5'	179 10'E	1000	N361	8.12.74	35 11.00	174 10.35	51
3630	17.12.28	34 24'	178 42.5'E	600-2000	N365	8.12.74	35 07.40	174 16.40	200
3631	18.12.28	3540'	176 40'E		N370	10.12.74	34 23.50	172 06.00	204
3634	2.1.29	3631'	174 50.5'E	0-200	N371	10.12.74	34 23.40	171 54.50	3807
3636	3.1.29	27 00'	177 41'W	1500	N374	11.12.74	36 22.10	173 50.45	100
3637	4.1.29	36 23.5'	176 26'E	100	N375	11.12.74	36 23.60	173 45.50	200
3638	4.1.29	37 00'	178 16'E	100	N376	11.12.74	36 28.90	173 34.00	500
3639	5.1.29	3919'	17918'E	Surface	N377	12.12.74	37 48.50	174 45.80	25
3640	7.1.29	41 47'	176 55'E	100-3000	N378	12.12.74	37 48.90	174 39.40	50
3641	8.1.29	43 40'	176 36'E	100-300	N382	13.12.74	39 15.00	173 43.40	25
3642	9.1.29	46 43'	176 08.5'E	1500-2500	N384	13.12.74	39 15.90	173 39.40	100
3643	10.1.29	46 58'	17214'E	300	N388	14.12.74	40 44.30	173 22.80	55
3644	11.1.29	44 40'	173 39'E	300-600	N391	15.12.74	41 12.60	173 51.90	36
3645	12.1.29	4232'	174 50'E	50-600	N396	15.12.74	40 55.80	174 03.50	100
3651	22.1.29	35 36'	171 52'E	2000	N397	15.12.74	40 55.10	174 08.40	40
3653	26.1.29	33 30.5'	165 53'E	50-600	N400	16.12.74	40 26.80	175 09.20	53
3654	27.1.29	33 28'	161 45'E	50	N401	16.12.74	40 24.00	174 52.00	100
3655	28.1.29	33 39.5'	159 00'E	200	N403	17.12.74	41 37.20	175 18.40	21
3656	29.1.29	33 26'	15702'E	1000-3000	N404	17.12.74	41 38.00	175 18.80	51
					N405	17.12.74	41 38.50	175 19.30	100
					N406	17.12.74	41 39.20	175 20.20	200
					N408	17.12.74	41 48.60	175 24.40	500
					N413	18.12.74	42 32.50	173 49.90	500
<b>Galathea Stns (Kramp 1965)</b>					N416	19.12.74	41 18.85	174 09.60	22
574	18.12.51	3945'	159 39'E	4850	N420	19.12.74	41 29.20	174 38.20	191
575	19.12.51	4011'	163 35'E	7500	N421	19.12.74	41 24.40	174 45.00	100
580	30.12.51	52 33'	169 09'E	—	N422	19.12.74	41 22.80	174 46.60	50
596	5.1.52	Campbell Island		—	N433	30.1.75	41 46.10	171 25.90	25
607	17.1.52	44 18'	166 00'E	6600	N435	30.1.75	41 43.60	171 20.70	111
611	18-19.1.52	44 37'	167 55'E	—	N439	31.1.75	43 20.70	169 57.00	25
629	24.1.52	41 46'	175 48'E	1700	N445	1.2.75	44 39.60	167 54.70	176
634	25.1.52	39 05'	178 20'E	1700	N446	1.2.75	44 37.20	167 52.60	290
645	1.11.52	36 43'	175 10.4'E	Surface	N447	1.2.75	44 35.50	167 48.90	135
656	29.2.52	35 20'	178 55'W	7830	N449	1.2.75	44 28.90	167 38.60	1750
668	29.2.52	3623'	177 41'E	2700	N452	2.2.75	45 56.80	166 39.40	372
677	4.3.52	28 28'	175 53'W	9130	N453	2.2.75	46 00.80	166 36.40	351
					N454	2.2.75	46 04.00	166 34.50	120
					N456	3.2.75	46 04.10	166 17.20	172
					N462	4.2.75	46 27.70	168 04.20	28
					N465	5.2.75	47 40.70	167 01.20	154
					N466	5.2.75	47 30.50	167 15.70	152
					N482	8.2.75	43 35.80	174 21.60	310
					U799	7.8.90	42 33.79	170 33.97	434
					X480		41 20.4	179 05.8	
					Z3258	14.4.64	42 26.00	173 48.50	0
					Z3259	30.4.64	42 26.00	173 48.50	0
<b>NIWA/NZOI Stns (Bouillon 1995) (°E)</b>									
B76	10.9.58	20 58.70	184 49.90	44					
B705	13.9.62	41 17.40	174 47.10	9					
B706	20.9.62	41 17.40	174 47.10	9					
B707	28.9.62	41 17.40	174 47.10	9					
N339	4.12.74	39 15.00	177 18.00	50					
N340	4.12.74	39 25.80	177 30.60	100					
N341	4.12.74	39 37.80	177 43.90	204					



## COLLECTING METHODS

Gelatinous plankton is very fragile and easily torn and damaged when collected. Hydromedusae can be caught by plankton nets towed very slowly (1–1.5 knots per hour) behind a large or a small powered vessel or a even a rowing boat for about 10–20 minutes depending on the abundance of the plankton. For hydromedusae the mesh size of the net should be about 200–250  $\mu\text{m}$ . Larger meshes let many small specimens escape. Smaller ones are too easily clogged and damage the specimens. In coastal waters the entrance of the net should be from 30 cm to 1 m depending on the power of the vessel. Much wider openings are used in open sea and deep waters where the fauna is sparser. In areas very rich in plankton, a hand net or even a bucket may be used. The richest catches are generally obtained in the early morning or at dusk and on rising tides. For qualitative horizontal subsurface sampling the plankton net is towed by a rope of 50 m or more behind the vessel to eliminate turbulence. For sampling a few metres below the surface, a buoy can be attached with a rope of known length to one side of the ring opening and a weight on the other side. Sampling between fixed depths requires closing nets.

Quantitative sampling is possible with plankton nets fitted with a flow-meter a little behind their front. After calibration this water-meter gives a measure of the quantity of water filtered.

If it is impossible to sort the medusae immediately, the catch should be fixed at once with formaldehyde so as to obtain a final solution of 5% fixative (see Fixation). If the material can be brought rapidly to the laboratory, the plankton samples, shielded from direct sunlight and kept as cool as possible, should be examined under stereo-microscope and the medusae individually removed with wide-mouthed pipettes and placed in finger bowls of clear seawater. After observation they can either be kept for rearing or anaesthetised and fixed as described below. This last method is of course the most fruitful, allowing observation of the live-animal characters and perfect fixation.

### FIXATION AND PRESERVATION OF MATERIAL

Hydromedusae should be anaesthetised before being fixed; most fixatives are the cause of shrinking and deformation. The animals should be allowed to extend in a vessel of seawater where the anaesthetic substance should be added slowly, crystal by crystal, or drop by drop. The commonest anaesthetic substances for marine medusae are menthol crystals, propylene phenoxetol, and magnesium chloride (about 7.5% in fresh

water), the last being the most recommended. For general taxonomic purposes hydromedusae can be fixed in 10% buffered formaldehyde in seawater (40% formaldehyde being considered as 100%) and preserved for short times in 5% formaldehyde. The effects of formaldehyde preservation on size and weight of hydromedusae have been studied by de Lafontaine and Leggett (1989). Buffering with borax or calcium carbonate should be avoided (since the medusae may adhere to any precipitate formed by those chemicals on the bottom of the containers), and so should hexamines which destroy the mesoglea. The best buffer seems to be sodium glycerophosphate. Alcohol should be avoided as a fixative because it leads to shrinkage, distortion, and contraction of the specimens. Nevertheless, for long-term preservation, for instance in museum collections, formaldehyde is not adequate as it causes automaceration of the tissues and should be replaced by 70% alcohol. The passage from formaldehyde to alcohol *must* be gradual, going from formaldehyde to a very dilute alcoholic solution (less than 10%) and then, step by step (10% by 10%), over several days, to the final 70% solution. Polythene containers should be avoided as chemical precipitates can damage the specimens. For histological studies the best fixative is, after anaesthetisation, cold (5–8° C) acidic Bouin's fixative (= 75% of a solution of saturated aqueous picric acid + 25% formaldehyde (at 40%); just prior to use 5% glacial acetic acid should be added to this solution). The material can afterwards be preserved for a long time in 5% formaldehyde; the specimens being less affected after this treatment by formaldehyde auto-maceration.

A method of long-term storage has been developed by Van Impe (1992) where the medusae are suspended in a solid agar-agar gel coloured with serva-blue and from which extraction is easy when required. This method is particularly useful for transportation and for long-term conservation. All holotypes should be stored in such a gel which, up to a certain point, also avoids drying out and nicely stains the protein of the medusa tissues in blue. In most museum collections the majority of the hydromedusae specimens, including holotypes, have been destroyed because of the disastrous habit of museum keepers putting card labels into storage jars containing specimens. Such a custom should be totally avoided because, after a few manipulations only the label remains. Cotton or paper material caps whose fibres adhere and damage the specimens should also be avoided.

## GLOSSARY

- abaxial:** away from the main axis or on a site remote from it; in a marginal tentacle the abaxial side is the outer tentacular surface.
- abcauline:** on the side away from the caulus; the opposite is adcauline.
- aboral:** away, opposite from the mouth or oral end.
- actinopharynx:** in Hydrozoa, Cubozoa and Scyphozoa ectoderm and endoderm meet at the mouth rim; in the Anthozoa the ectoderm of the mouth rim is turned in for a considerable distance as a muscular introduction to the coelenteron or actinopharynx.
- adaxial:** position opposite to abaxial, facing towards the main axis; in a marginal tentacle the inner tentacular surface.
- adcauline:** see abcauline.
- adnate:** having part or all of one side in contact with or fixed to another structure (e.g., abaxial side of a marginal tentacle fixed to the exumbrella; in *Leuckartiara adnata* hydrothecae have part or all of one side in contact with the stem or another structure).
- adradial:** the axes or sectors lying between the per-radial and interradial ones; in a medusa with 4 radial canals there are 4 perradial axes, 4 interradial axes, and 8 adradial axes and sixteen sectors (Fig. 3B).
- amphicoronate:** hydranths having a single whorl of oral tentacles in which alternate ones are directed up and down.
- annulus:** in hydroids, one of a series of rings in the perisarc, typically in groups directly below hydranths, demarcating the internodes, at nodes or at point of branching of stalks.
- annular thickening:** see diaphragm.
- apical or umbilical canal:** during the development of a medusa bud, an opening provides continuity and exchanges between the "mother" gastric cavity and that of the bud (Fig. 4B: MGC). Generally this aperture disappears after liberation but in some medusae it remains as a small canal or duct projecting from the manubrium into the apical mesoglea and often leading upwards to the outside (*Sarsia producta*, *Corymorpha nutans*).
- apical knob or chamber:** small aboral chamber at the apex of the manubrium protruding into the apical umbrellar mesoglea (some *Sarsia*, *Amphinema rubra*, *Euphysora furcata*, *Plotocnide borealis*, etc.).
- apical projection or process:** a rounded or pointed, usually roughly conical mesoglear extension of the top of the umbrella (*Amphinema*, *Leuckartiara*).
- athecate:** term applied to the hydroids of the Anthomedusae; all lack a proper hydrotheca or chitinous cup partially or entirely surrounding their hydranths.
- bell:** = umbrella (Figs 2; 3A; 7D: UMe).
- bicoronate:** hydroid having two whorls of oral tentacles.
- blastostyle:** gonozooids or gastro-gonozooids reduced to a didermic axis or stalk bearing the developing medusae or their reduced derivatives medusoids or sporosacs.
- blind canal:** centrifugal canals or radial canals are blind when they do not proceed to the circular canal (*Toxorchis*); centripetal canals are blind when they do not join radial canals or the manubrium (some *Calycopsis*).
- campanulinid:** referable to hydroids not necessarily closely related but with a "*Campanulina*" type of hydrotheca, i.e., tubular with a conical operculum formed by several triangular, convergent pleats or cusps meeting centrally and which may or may not be sharply demarcated from the hydrothecal margin (cuspidellid, campanopsid, eirenid, etc.).
- capitate tentacle:** tentacle having a knobbed end richly armed with cnidocysts (Fig. 10A: F).
- centrifugal canal:** canal issuing from the manubrium and directed towards the umbrellar margin (= generally radial canals).
- centripetal canal:** canal issuing from the circular canal and directed to the manubrium (*Calycopsis*).
- chordal or chordoid tentacle or structure:** formed by a core of single disk-like or cylindrical cells placed end to end in a single row (e.g., solid tentacles, *Obelia*; Fig. 7C: TeS).
- circular or ring canal:** simple canal which runs around the umbrellar margin linking the ends of the radial canals; occasionally the circular canal is not hollow but consists of a solid core of endodermal cells (*Proboscidadactyla*, Laingiomedusae). In the Narcomedusae, in which the umbrella margin is deeply cleft into broad flaps, a circular canal may be present or not; when present the marginal canal follows the edge of the margin of the exumbrellar flaps and is called the "peripheral canal system", the vertical parts of which are the peronial canals (Figs 2; 3A; 6F; 7C, D, E: CC).
- cirri:** small tentacle-like organs situated on the umbrellar margin between the true marginal tentacles; they are devoid of swollen marginal bulbs and are solid. Two types are generally found:
- 1° **spiral cirri:** cirri which coil spirally and have scattered cnidocysts and a terminal cluster of cnidocysts, the most common (*Mitrocomella*) (Fig. 8C: SC)
- 2° **flexile cirri:** straight, do not coil and have the cnidocysts in rings (*Cosmetira*) (Fig. 7B: FC). Cirri may immediately be adjacent to the marginal bulbs and



are then called lateral cirri (*Eucheilota*) (Fig. 7A: LCi); they may also occur along the umbrellar margin in the interspaces between marginal tentacles, and are then called marginal cirri (*Cosmetira*, *Phialopsis*) (Fig. 7B: FC).

**clasp**: embracing part of a marginal bulb (*Leuckartiara*) (see exumbrellar spur).

**cnidocyst (nematocyst or stinging cell)**: stinging organelle characteristic of the Cnidaria. It consists of a capsule secreted by a particular cell called a cnidocyte within which is a refringent fluid and a coiled and folded tubule (thread) which everts and straightens on discharge. Following the structure of the internal tube, different types of cnidocysts are recognised. They are of great use in taxonomy (Figs 8B, E; 9.) Cnidocysts are used for prey capture, defence, and attachment.

**cnidome**: entire complement of cnidocyst types in one species or in a genus.

**cnidophore**: cnidocyst-filled cellular capsules covered by numerous long ciliae and attached to tentacles by elongated, filiform and very contractile stalks of special structure (*Zanclaea*, Fig. 10D: Cd); not to be confused with branched tentacles.

**compound sense organ**: marginal sense organ formed by an ecto-endodermal ocellus and an open statocyst (Tiaropsidae).

**coenosarc**: living tissue of a hydroid colony.

**cordylus**: minute marginal club-shaped structures situated on the umbrellar margin between the tentacles. They have a narrow peduncle and a thick distal portion. Cordyli may be hollow or completely filled by endoderm; they may have cnidocysts or not, and their function is unknown, probably sensory (Lao-diceidae, Tiarannidae) (Fig. 6B, F).

**crenulated**: having low rounded cusps or lobes separated by sharp but shallow notches, e.g., crenulated or crenated mouth lips.

**cruciform**: cross-shaped.

**cyst**: generally chitinous protected structure containing eggs, larvae or even portion of an organism in an inactive stage. Cysts are resting stages and usually very resistant to bad or unfavourable ecological conditions. They can be part of the normal life cycle of the animal or appear depending of the surrounding conditions.

**dactylozoid**: modified polyp serving to protect the colony (see tentaculozoid, nematophores, and spiral zoid).

**diaphragm**: protrusion of the endoderm partitioning the gastric cavity in some hydroids (Corymorphidae). In many thecate hydroids a thin inwardly projecting chitinous shelf at the base of the hydrotheca, sometimes an annular thickening of a less defined nature occupies the same position, both serving for attach-

ment of the hydranth to the thecae and possibly also to avoid the passage of large pieces of predigested prey from the digestive cavity of the hydranth to the stolonal system (see sphincter).

**diploblastic**: being composed of two epithelia; in hydroids formed by an outer ectoderm and an inner endoderm, separated by a kind of relatively undifferentiated connective layer, the mesoglea, usually not regarded as a real tissue layer.

**direct development**: development where the medusa stage will give rise to another medusa without passing through a hydroid phase (Trachymedusae, some Narcomedusae) or where a hydroid will directly produce another hydroid (*Hydra*) (Fig. 4A: above).

**distal**: at the far end, near the end.

**ectoderm**: outermost cellular layer (epidermis).

**ectodermal statocyst**: marginal sense organs of orientation and equilibration developed in the velum and entirely ectodermal; they are formed in depressions or pockets of the velum and may remain open (Mitrocomidae, Tiaropsidae) (Figs 7F; 8C, D1) or the velar tissue seals completely the sense organ (other Leptomedusae) (Figs 6A; 7A: Cst, St; 8D2). Each statocyst contains one or more tiny polygonal or spherical concretion (statolith) (Figs 6A; 7A: Sh) and the closed statocyst has a basal cushion of cells with sensory ciliae (Fig. 6A: S).

**ecto-endodermal ocelli**: photoreceptors in the Tiaropsidae where the cup-shaped mass of pigment is formed by the endoderm of the circular canal, the nerve elements being ectodermal. The ocelli of the other Hydromedusae are completely ectodermal in origin. In the Tiaropsidae the ocelli are associated with open ectodermal statocysts forming a compound sense organ (Fig. 6E).

**ecto-endodermal statocyst**: club-like sense organs of orientation and equilibration growing out of the umbrellar margin in the fashion of a tentacle. Each is formed by an endodermal axis originating from the circular canal and covered by the umbrellar ectoderm. In their distal portion there are one or more large endoderm cells (lithocytes) each containing a solid concretion (statolith). In this form they are called free ecto-endodermal statocysts (Narcomedusae, some Limnomedusae and Trachymedusae; Figs 7C, D; 8D3, G; + *Pegantha triloba*: St), but in some species the sensory clubs are entirely enveloped by an ectodermal vesicle and are then called closed ecto-endodermal statocysts (some Limnomedusae and a few Trachymedusae) (Fig. 8D4).

**embayment**: a rounded or pointed gap between one cusp and the next along the rim of a hydrotheca.

**endoderm**: innermost cellular layer, lining the gastro-vascular cavities (Figs 2; 3: En).

**endodermal lamella or "cathamnal" lamella**: a uni-

stratified endodermal membrane crossing the mesoglea and interconnecting the radial canals; it likewise connects the manubrium with the circular canal. It delimits two mesoglean levels—one, thin, subumbrellar, the other well developed, exumbrellar (Figs 1, 2A: CL).

**entocodon, glockenkern or medusary nodule:** the entocodon is one of the most important and characteristic features of hydrozoan development. In the morphogenesis of medusa buds, of fixed gonophores or a eumedusoid, an invagination of the ectoderm of the apical budding zone produce a solid multi-stratified nodule, the entocodon, which later develops a cavity, the future subumbrellar cavity. As a general rule the entocodon will give rise only to ectodermal components (the manubrial ectoderm, the subumbrellar ectoderm, and the internal layer of the velum and their striated muscles), the endodermal components of the buds (manubrium, gastrovascular canals) being formed by an evagination of the "mother" endoderm (spadix) (Fig. 10B: NM). In only a very few medusae is budding exclusively ectodermal (*Bougainvillia niobe*, *Lizzia blondina*, *Podocoryna minima*, *Rathkea octopunctata*) and the entocodon will develop both ectodermal and endodermal components of the buds.

**excretory papillae:** papillae situated in some medusae either between the marginal tentacles or at the base of some marginal structures (tentacular bulbs, non-tentacular or rudimentary bulbs or marginal warts) or on the radial canals. They present an opening or pore in contact with the cavity of the bulbs or of the gastrovascular system; they are regarded as having an excretory function.

**excretory pore:** opening of the excretory papillae. Sometimes there are no papillae and only the pores are present as slits.

**exumbrella:** upper, aboral convex surface of the umbrella (see umbrella) (Figs 2; 3A: Ex)

**exumbrellar cnidocyst cluster or band:** exumbrellar specialised tissue in the form of oval, club-shaped, spoon-shaped, or elongated patches containing cnidocysts, localised immediately above the marginal bulbs (*Zanclaea*, Fig. 10D: EB) or on exumbrellar margin between tentacles (*Proboscidactylu*).

**exumbrellar spur:** the marginal tentacular bulbs may grow upwards for a short distance and clasp the margin of the umbrella forming an exumbrellar spur (*Leuckartiara*).

**fascicled:** stem comprising two or many coenosarc tubes united in a composite single stem structure (= polysiphonic).

**filiform tentacle:** a tentacle that is straight-sided throughout, lacking prominent cnidocyst clusters along its length and terminally, the cnidocyst being

evenly distributed (Fig. 10A: B).

**flexuose:** hydroid with hydrocauli or hydroclades with successive internodes directed alternately left and right, in zigzag.

**frustule:** little didermic portion of hydroid, exceptionally of medusae tissues formed asexually by budding or nipped off the individuals (propagules) and acting as dormant and/or dispersion stages.

**gastric peduncle or peduncle:** in some medusae, a cone-shaped thickening from the subumbrellar mesoglea projecting centrally downwards into the subumbrellar cavity and to the end of which the manubrium is attached; the radial canals run down the peduncle to the manubrium at its end. The peduncle may be varied in shape and size (long and narrow in *Eutima mira*; large and pyramidal in *Bougainvillia macloviana*; very short in *Phialopsis diegensis*).

**gastric cavity:** see manubrial cavity.

**gastric pouches:** see manubrial pouches.

**gastrovascular system:** the coelenteron or enteron, comprising the manubrium cavity and the gastrovascular canals, i.e., the radial and circular canals and their derivatives.

**gastrozoid:** normal feeding polyp, with mouth and normally with tentacles, without reproductive organs

**gonad:** there are no real organs in Hydrozoa, so this term is inappropriate although largely used. In medusae it indicates the place where the sex cells become mature. This may happen on manubrium walls or/and at the level of the radial canals. The position of the germ cells has considerable value as a taxonomic character. When the "gonads" are on the manubrium they may completely surround it, being cylindrical, or be in interradial, adradial, or perradial positions. When situated on the radial canals they usually develop on the lateral walls of the canals but in some medusae they are also continuous over the ventral wall (*Clytia hemisphaerica*). Their position along the course of the radial canals is often a diagnostic character, as is their shape and size (Figs 2; 3A: G).

**gonophore:** reproductive structure, formed during polyp stage, that develops medusa buds. In many Hydrozoa the medusa stage is reduced to a varying degree and is not liberated any more, remaining attached to the hydroid; it is then called a fixed gonophore or sporosac or, since it is not released, it is often called a fixed sporosac ( Fig. 10C: 2).

**gonotheca:** chitinous structure surrounding and protecting a gonophore.

**gonozoid:** reproductive polyp bearing gonophores; usually a modified gastrozoid that shows various stages of reduction.

**hollow tentacle:** tentacle either with a central cavity in continuity with the circular canal, or without any

lumen but with an endodermal core formed by several peripheral rows of cells (parenchymatic). The basal regions of such tentacles often disclose central cavities (Fig. 7E: TeH). In the Bythotiaridae the tentacles are hollow but the mesoglea of the distal part of the tentacles is often enlarged, strongly reducing the endodermal axis (see Bouillon 1988a, pl. 3, figs 11–12).

**hydranth:** the feeding polyp of a hydroid colony.

**hydroclade:** a lateral hydranth-bearing branch of the main stem or hydrocaulus in a fixed, erect hydroid colony.

**hydroid:** the polyp stage of a hydrozoan life cycle (Fig. 4A: H).

**hydrotheca:** chitinous structure entirely or partially surrounding a hydranth (Fig. 5B: Thc)

**hydrocaulus:** main stem of a fixed, erect hydroid colony, typically bearing branches or hydroclades with hydranths.

**hydrorhiza:** all structures by which fixed hydroids are attached to the substratum. Normally it takes the form of a network of branching, anastomosed, creeping tubes or stolons; the hydrorhiza tubes may fuse in a mat, become encrusting, or form other structures.

**hypostome:** terminal region of a hydranth in which the mouth opens (Fig. 5A; 5B: Hp).

**internode:** the hydrocauli and hydroclades are often divided into segments or internodes by partitions or nodes, often delimited above and below by perisarc annexations.

**interradial:** the radial axes between the perradii, between the radial canals (Fig. 3B).

**intertentacular web (basal web):** in some thecate families the base of the tentacles may be connected by a thin transparent sheet often containing cnidocysts.

**intrathecal septa:** internal and transverse shelves or ridges of perisarc inside the hydrotheca.

**lappet:** see marginal lappet.

**Lateral cirri:** see cirri (Fig. 7: LCi).

**lip:** in medusa, lobe-like extensions of the manubrium margin surrounding the mouth opening (see mouth). The lips may be simple or complicated, crenulated, folded, short, or elongated, pointed or rounded, and armed or not with cnidocysts distributed uniformly or in clusters. In the Rathkeidae the lips are elongated, simple or branched, and armed with terminal and usually also lateral cnidocysts knobs (Figs 3A: Lp; 7A).

**manubrial or gastric cavity (= stomach):** central cavity of the manubrium in connection with the exterior by the mouth and ending in the radial canal openings. The gastric cavity is delimited by an endodermal layer histologically divided into several regions de-

pending on their activity: oral, digestive, stomachal, or reproductive, and cnidoblastic when the gonads develop on the manubrium. In hydromedusae this structure is rather uniform throughout the varied subclasses except in *Koellikerina* (Bougainvilliidae) where the endoderm of the gastric cavity presents numerous conspicuous endodermal expansions sustained by a mesoglean axis and containing excretory vacuoles (see Bouillon 1988a).

**manubrial or gastric pouch or pocket:** lateral per-radial or interradial extensions of the manubrial cavity (Narcomedusae, Tiarranidae, *Gotoea*) (Fig. 2: GP).

**manubrium:** median projection of the subumbrella surrounding the gastric cavity, distally bearing the terminal mouth and proximally leading to the radial canals. The manubrium is greatly varied in shape and size and may be tubular, cruciform, quadrate, fusiform, barrel-shaped, flask-shaped, short, long, narrow, or very large, etc. (Figs 2; 3A; 7D; 10D: Ma).

**marginal cirri:** see cirri.

**marginal lappet:** one in a series of lobe-like extensions around the umbrellar margin (Narcomedusae) (Fig. 7C, D: L).

**marginal tentacle:** a tentacle situated at the edge of the umbrella.

**marginal vesicle:** see statocyst.

**marginal wart or swelling:** small wart-like swellings of the umbrella margin never destined to carry tentacles (*Eutima mira*) (Fig. 7A: W).

**medusa budding:** asexual budding of medusae. In hydroids, medusa budding occurs on the lateral wall of the polyp, on the hydrorhiza, on the hydrocauli, on the hydroclades, or on specialised structures. Medusa budding is a common phenomenon among hydromedusae too; the medusa buds are formed either on the manubrium, the radial canals, the marginal bulbs, or the subumbrellar rim.

**medusary nodule:** see entocodon.

**mesentery:** in some species, a perradial tissue layer attaching the lateral walls of the manubrium to the subumbrella (*Leuckartiara octona*, *Neoturris papua*, *Pandeopsis ikarii*).

**mesoglea:** in Hydrozoa a non-cellular substance lying between the ectoderm and the endoderm, forming the gelatinous bulk of the umbrella in the medusa stage (the jelly of jellyfish) (Figs 2; 3A; 7D: UMe) and a lamella-like layer (mesolamella) in polypoid forms.

**modular:** consisting of a series of morphologically similar structural units.

**moniliform tentacle:** tentacles with a terminal knob of cnidocytes and with conspicuous clumps of cnidocyst in bands, spaced rather regularly along their length (Fig. 10A: G).

**mouth:** opening of the manubrium to the exterior. It

can be simple and circular or may present simple or complicated lips (see lips) (Figs 2; 3A: Mo).

**mouth arm:** expansions or dilatations of the perradial corners of the manubrial mouth rim armed with cnidocyst clusters; usually open, groove-shaped (Hydractiniidae) (Fig. 8A: F; 8F)

**nematotheca:** small chitinous theca surrounding defensive polyps or nematophores.

**nematophore:** highly extensible structure representing a reduced hydranth, without mouth or tentacles, richly armed with cnidocysts (dactylozooids).

**non-tentacular marginal bulb:** sometimes marginal bulbs are developed on the umbrella margin without bearing tentacles. They have either never developed tentacles or they represent reduced tentacles. It is necessary to distinguish between bulbs which are permanently without tentacles (permanent non-tentacular marginal bulbs, rudimentary marginal bulbs) (*Cirrhitiara superba*, *Aequorea macrodactyla*) and those bulbs on which marginal tentacles will develop later on depending on the growth of the medusa (developing tentacular marginal bulbs) (Malagazziidae).

**nodes:** see internode.

**ocelli:** photoreceptor found in some hydromedusae, most common in the Anthomedusae. They are usually situated on the marginal bulbs in abaxial or adaxial positions. Exteriorly they appear as round, oblong, or elongated black, brown, yellow, or red spots. They consist of a small mass or cupule of pigmented cells associated with nerve cells; a lens may or not be present. Ocelli are of ectodermal origin except in the Tiaropsidae (see ecto-endodermal ocelli) (Figs 2; 6C, D, E, F: O).

**octant:** an eighth of the umbrella, a space between the interradial in a medusa with 4 radial canals (Fig. 3B).

**operculum:** lid-like structure closing the end of the hydrotheca or gonotheca. Some opercula comprise a single flap, others have two, three, four, or many flaps meeting in the centre; the opercular valves may be simply inward folds of the distal part of the hydrothecae (pleated) or segments of the primary covering of the hydrotheca seated and hinged in embayments (with prominent crease-lines) of the hydrothecal margin; they may be cast away during growth of the hydranths or after liberation of medusa buds.

**oral tentacle:** in some medusae with a circular mouth there are oral tentacles arising above the mouth rim. In the Cytaeidae they are simple and located just above the mouth rim; in the Bougainvilliidae they are simple or branched and situated well above the mouth rim (Figs 2: OT; 8A: G, H.).

**otoporpa:** in some Narcomedusae, vertical, elongated, oval or even rounded ectodermal tracts with bristles and cnidocysts running upwards from each

statocyst over the exumbrellar margin (Fig. 7C, D: Opt).

**pedicel:** stalk of a hydrotheca, a gonotheca or a hydranth (= stem, hydroclade).

**peduncle:** see gastric peduncle.

**peripheral canal system:** see circular canal (Fig. 7C: PC).

**perisarc:** the chitinous exoskeleton of a hydroid.

**peronia:** in Narcomedusae and some Laingiomedusae the tentacles leave the umbrella at some distance from the margin just above the clefts separating the marginal lappets. At the edges of the clefts, the sub-umbrellar and exumbrellar ectoderm fuse without interposition of mesoglea, forming the peronial grooves which are invaded by tentacular ectoderm making up together an ectodermal strand rich in cnidocysts, muscles, and nerves: the peronia. At the base of the peronia the margin of the umbrellar lappets remains curved giving the umbrella its lobed appearance (Fig. 6C, D: P).

**peronial canal:** in Narcomedusae the part of the peripheral canal system running vertically along the peronia (see circular canal).

**perradial:** the main radial axes of a medusa, corresponding in most species to the radial canals (Fig. 3B)

**pharynx:** embryologically the pharynx is a stomodeum and as such is lined by an integument of ectodermal origin. A real pharynx does not exist in Hydrozoa where ectoderm and endoderm meet at the mouth rim but is present in Anthozoa (see actinopharynx)

**pinnate:** stem like a plume.

**planula:** typically the primary free-swimming gastrula larva of the Hydrozoa (Fig. 4: Pl).

**podocyst:** multicellular capsules from nipped-off portions of coenosarc, functioning as cysts.

**polyp:** basic individual of hydroids; may be isolated or forming colonies, may be of different types i.e., hydranths, gonozooids and dactylozooids.

**primary polyp:** the hydranth formed by the development of a newly settled planula.

**polymorphic:** ability to exist in different forms (in hydroids: gastrozooids, gonozooids, dactylozooids, etc.).

**polyp reduction:** In some Campanulinida, e.g., the Eirenidae. In the Eucheilotidae only newly developed polyps present the family characteristics and have their hydrothecae completely developed; gradually with age the hydrothecae become reduced, losing their operculum and apical part, and are no longer high enough to accommodate the hydranths (haleciid-like).

**proximal:** at the near end, at the base.

**pseudohydrothecae:** in some anthomedusan hydroids a flexible film-like periderm, covering part or all of

the hydranth body, not homologous to hydrothecae but apparently similar in function (some bougainvilliids and pandeids).

**quadrant:** one-quarter of the umbrella, the space between perradial structures in a medusa with four radial canals.

**radial canals (centripetal canals):** in medusae the canals leading from the aboral perradial corners of the manubrium to the circular canal. Usually they are straight and narrow with smooth sides but in some species they are large and ribbon-like (*Amphinema*) and have jagged outgrowths (*Leuckartiara*). Their typical number is four but in many medusae they may be more numerous, even more than a hundred (*Aequorea*). They are normally simple, but in certain species they may be branched and sometimes their branches never reach the circular canal (*Staurodiscus*). Generally the radial canals grow centrifugally from the manubrium to the circular canal, except in a few species where they arise centripetally (*Melicertum*) (Figs 2; 3A; 6F; 7E: RC).

**ring canal:** see circular canal.

**rudimentary bulb:** see non-tentacular marginal bulb.

**solid tentacle:** tentacle without any central cavity, with an endodermal core formed of a single row of disk or cylindrical-like vacuolated cells placed end by end (see chordal) (Fig. 7C: TeS).

**spadix:** in hydrozoan medusa- or gonophoral budding, the central finger-shaped core formed by an evagination of the "mother" endoderm, covered by entocodonal ectoderm, which will form the manubrium in a medusa or on whose surface sex cells ripen in most gonophores; its central cavity is continuous with that of the colony (Figs 4B: MGC, FRC; 10C: Sp).

**spherule:** a globular region of pedicel directly beneath a hydrotheca, formed from two annular constrictions close together.

**sphincter:** in hydroids, cellular or skeletal structures of the distal part of hydranths preventing the transfer of too large pieces of prey from the gastric cavity of the hydranth to the lumen of the stolonal system; in campanulariids this term is applied also to the constriction of the base of the hypostome.

**spiral zooid:** modified polyp, without mouth or tentacles but with a gastral cavity, tending to twist into spiral, armed with cnidocysts, characteristic of some Hydractiniidae.

**sporosac:** see gonophore.

**statocyst:** see ectodermal statocyst and ecto-endodermal statocyst

**stem:** any erect structure bearing hydranths.

**stolon:** in hydroids, creeping or erect tubes protected by perisarc and containing the same ecto-endodermal tissues as the polyps (coenosarc); they

generally adhere to the substratum forming a complex system or hydrorhiza. In unfavourable conditions only the stolons of many colonies survive, acting as resting stages until better conditions prevail.

**stolonal colonies:** colonies where the growth is horizontal, and the hydranths arise directly or from short unbranched pedicels from a common creeping hydrorhiza.

**subumbrella:** see umbrella.

**subumbrellar cavity:** see umbrella.

**subumbrellar surface:** see umbrella.

**tentacle:** see marginal tentacle.

**tentaculæ:** small solid marginal tentacles (usually without marginal bulbs) located between normal hollow tentacles (*Amphinema rugosa*).

**tentacular marginal bulb:** in most Antho- and Leptomedusae, a dilated portion of the proximal part of a marginal tentacle, adjacent to the umbrellar margin (Figs 3A; 6F; 7A, B, E: B). The marginal tentacle bulbs contain a cavity in communication with the circular canal and with the tentacular cavity of the tentacles when they are hollow. They are of various shapes; most bulbs are simple but in some medusae they are compound and several tentacles may arise from a single tentacular bulb (*Bougainvillia*). They function in digestion and cnidoblast formation and may bear an ocellus. During the growth of a medusa a new marginal tentacle is normally preceded by the formation of a bulb on which it develops (see marginal bulb). In some medusae, however, there are no true tentacular bulbs (Limnomedusae, Narcomedusae, Trachymedusae, and most Bythotiaridae); *Eugotoea petalina* and *Rhabdoon singularis* (Anthomedusae) also lack tentacular marginal bulbs.

**tentaculiform structure:** solid marginal structures resembling tentaculæ without marginal bulbs but without any contact with the circular canal (exclusively in the Orchistomatidae) (Fig. 7E: T).

**tentacular roots:** projection of the endodermal tentacular core into the umbrella mesoglea (*Blackfordia*, *Obelia*, Narcomedusae) (Fig. 7C: TR).

**tentaculozooid (dactylozooid):** polyp similar to tentacle in structure, with a solid core of chordal endoderm and no mouth, richly armed with cnidocysts.

**thecate:** describing the hydroid stage of the Leptomedusae; usually all have thecae protecting their polyps (Fig. 5A, B).

**theca:** chitinous extension typically protecting a polyp of any kind.

**umbilical canal:** see apical canal.

**umbrella:** main body, generally resembling a bell, of the medusa, excluding manubrium and tentacles. The outer, generally convex, surface of the umbrella is the exumbrellar surface (exumbrella), the inner

concave surface is the subumbrellar surface (sub-umbrella), and the cavity bounded by the sub-umbrellar surface is the subumbrellar cavity. The marginal edge of the umbrella is the umbrellar margin (Figs 2; 3A; 7C, D: Ex, SU, UM)

**vasiform:** shaped like a vase with a broad base and slender top.

**velar:** see velum.

**velum:** horizontal fold projecting inwards from the umbrellar margin leaving a central circular aperture, the velar opening. It consist of two layers of ectoderm separated by a thin mesoglean lamella; the inner ectoderm, of subumbrellar origin, possesses striated muscles. The velum serves in the propulsion and the orientation of the medusa, acting like a photographic diaphragm. During swimming the medusa can adjust the diameter of its aperture which can become as wide as the umbrella or almost closed (Figs 2; 3A; 6A, B, E; 7C: V).

### Abbreviations:

AT = adhesive part of a branched marginal tentacle  
 B = marginal tentacular bulb  
 C = pigmented cupule of an endodermal ocellus  
 CC = circular or ring gastrovascular canal  
 Cd = cnidophore  
 Ci = cilium  
 C = endodermal or "cathamnal" lamella  
 Co = cordylus  
 CSt = closed statocyst  
 Cy = cyst  
 D = diaphragm or sphincter  
 EB = exumbrellar cnidocyst band  
 Ec = ectoderm  
 Ecb = ectoblastic cells  
 En = endoderm  
 EnC = endoderm of the circular canal  
 Ex = exumbrella  
 F = frustule  
 FC = flexile marginal cirri  
 FRC = future outline of radial canal  
 G = "gonad" (place of maturation of the germ cells)  
 GC = gastric cavity  
 GP = gastric pouch  
 H = hydroid stage  
 Hp = hypostome  
 L = marginal lappet of a narcomedusa

LCi = lateral marginal cirri  
 Le = lens of a complex ocellus  
 Li = lithocyte  
 LN = lower nerve ring  
 LO = endodermal lamella  
 Lp = lip  
 Ma = manubrium  
 Me = mesoglea  
 Med = medusa stage  
 MGC = mother gastric cavity  
 MN = medusary nodule = entocodon = glokenkern  
 Mo = mouth  
 NR = nerve ring  
 O = ocellus  
 OC = oral cavity  
 Opt = otoporpa  
 OR = opening of the radial canal  
 OSt = open statocyst  
 OT = oral tentacle  
 P = peronia  
 PC = peripheral canal  
 Pi = pigmented cells of ectodermal ocelli  
 Pl = planula  
 R = endodermal tentacular root  
 RC = radial gastrovascular canal  
 S = sensory cells of the ocelli  
 SC = spiral marginal cirri  
 Se = stereocilium  
 Sh = statolith  
 Sp = spadix  
 St = statocyst  
 SU = subumbrella  
 T = tentaculiform structure of the Orchistomidae  
 TC = tentacular cavity  
 TeH = hollow marginal tentacle  
 TeS = solid marginal tentacle  
 Thc = hydrotheca  
 Te = marginal tentacle of the medusae or oral tentacle of the hydranth  
 TR = tentacular roots of Narcomedusae  
 UM = umbrella margin  
 UMe = umbrellar mesoglea  
 UN = upper nerve ring  
 UR = cnidocyst ring  
 UT = stinging part of a branched marginal tentacle  
 V = velum  
 W = marginal wart  
 Y = young narcomedusa

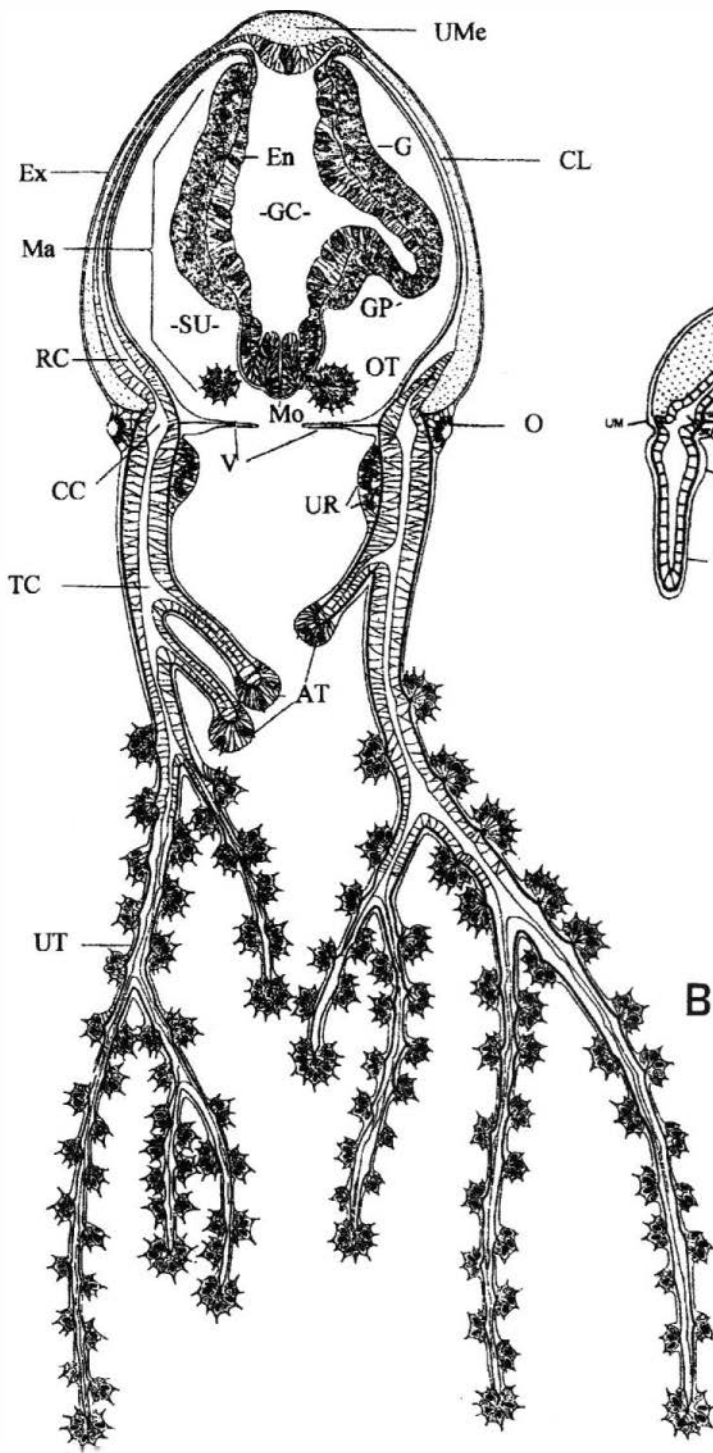


Fig. 2. Diagrammatic optical section across a medusa of *Cladonema radiatum* (Anthomedusae). Left side a radial section, right side an interradial one. Redrawn from Bouillon and Houvenhagel (1970).

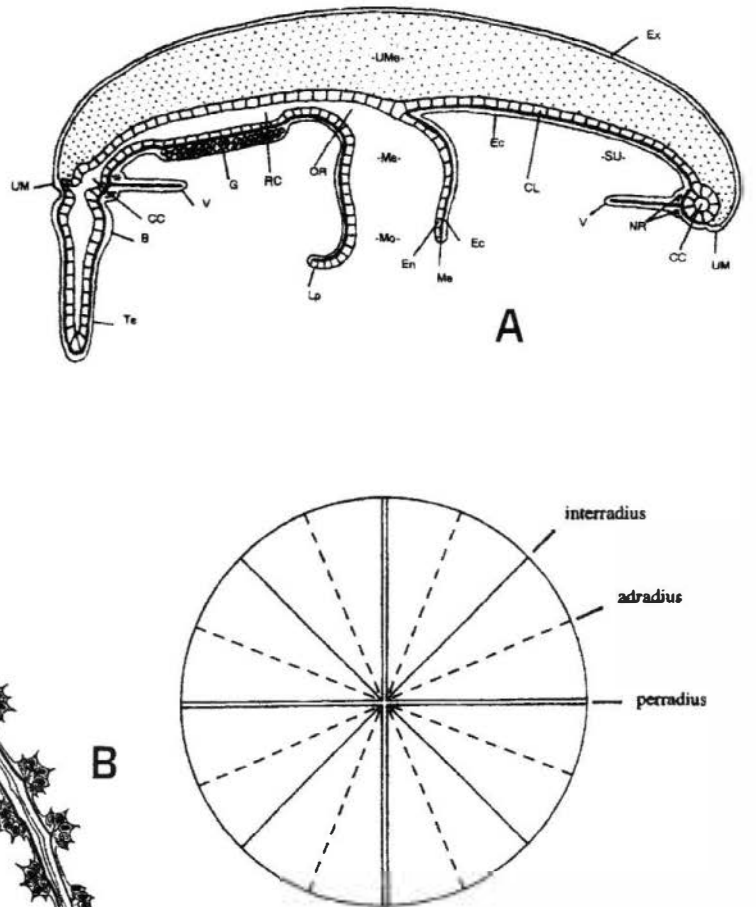


Fig. 3. A. Diagrammatic section of a hypothetical leptomedusa; left side a radial section, right side an interradial one. Redrawn from Kramp (1919). B. Diagram defining the radii of a hydromedusa with four radial canals. Redrawn from Russell (1953).

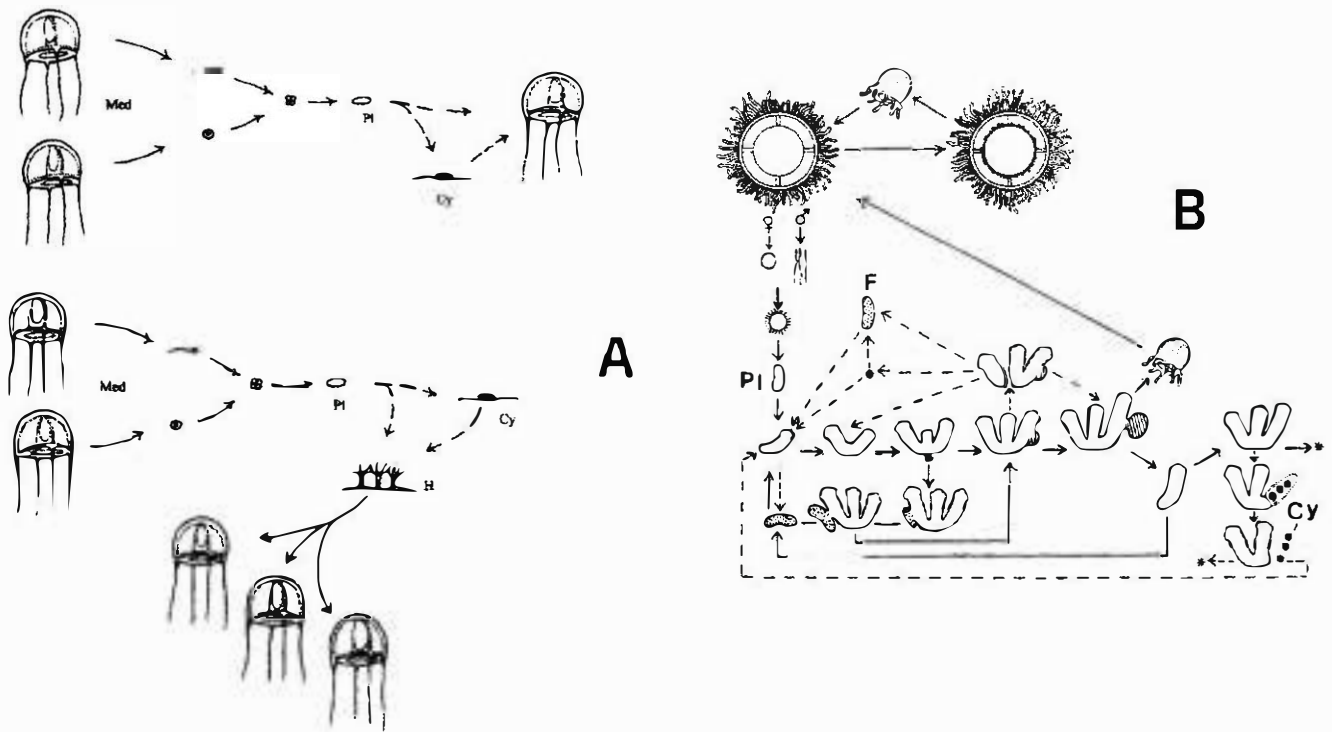


Fig. 4. A. Life-cycle pattern of hydromedusae —above, with direct development (no hydroid stage); below, with a hydroid stage. Redrawn from Boero, Bouillon and Piraino (1992). B. Schema of the life cycle of *Linnocnida tanganyicae*. The dashed lines show the parts of the cycle that occur in unfavourable conditions. Stippled areas indicate frustules (normal, resistant, and dispersive stages); large dots indicate resistant cysts (able to survive 40 years completely desiccated); hatched areas show medusa budding. Redrawn from Bouillon (1957).

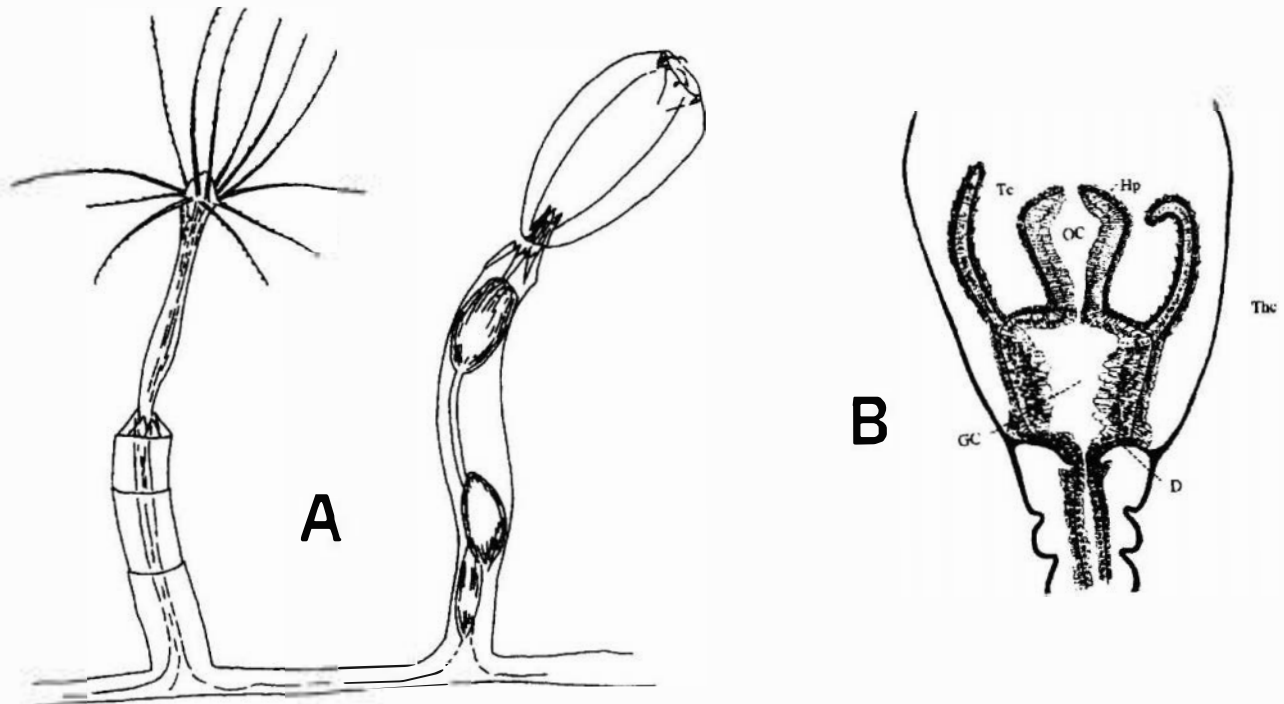


Fig. 5. A. Diagram of part of a colony of *Laodicea undulata* showing at left a hydranth with a typical conical hypostome (Order Conica); at right a gonotheca with medusa buds. Redrawn from Russell (1936). B. Diagrammatic view of a hydranth of *Laomedea flexuosa* showing the globose hypostome characteristic of the Order Proboscoidea. Redrawn from Kühn (1913).



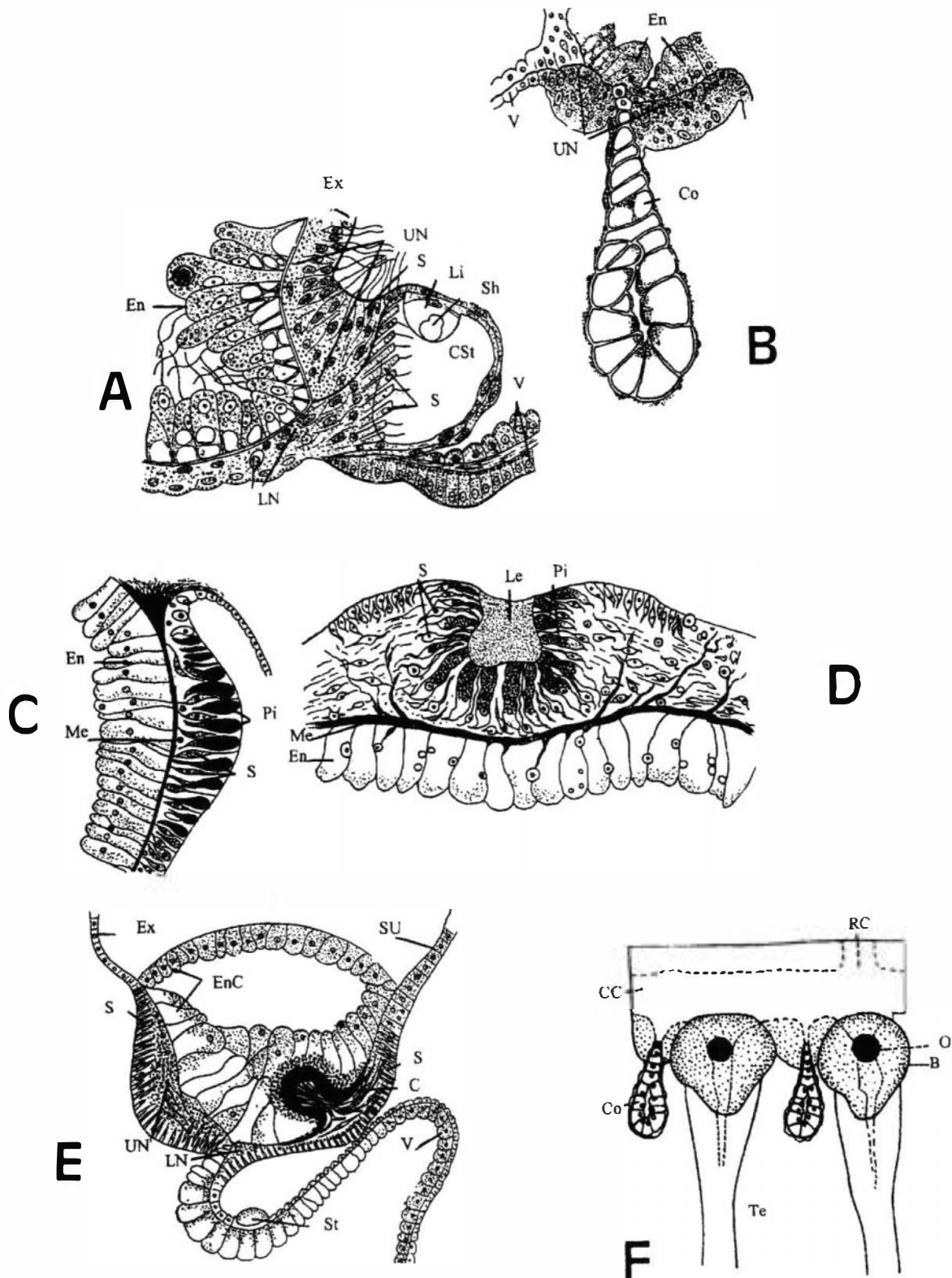


Fig. 6. **A**, section through bell margin of *Aequorea* showing a closed statocyst. Redrawn from Hertwig and Hertwig (1878). **B**, cordylus from *Laodicea*. Redrawn from Hyman (1940). **C**, simple ocellus from *Neoturris*. Redrawn from Linko (1900). **D**, complex ocellus from *Sarsia*. Redrawn from Hyman (1940). **E**, open statocyst with ecto-endodermal ocellus from *Tiaropsis*. Redrawn from Linko (1900). **F**, part of bell margin of *Laodicea*. Redrawn from Kramp (1919).

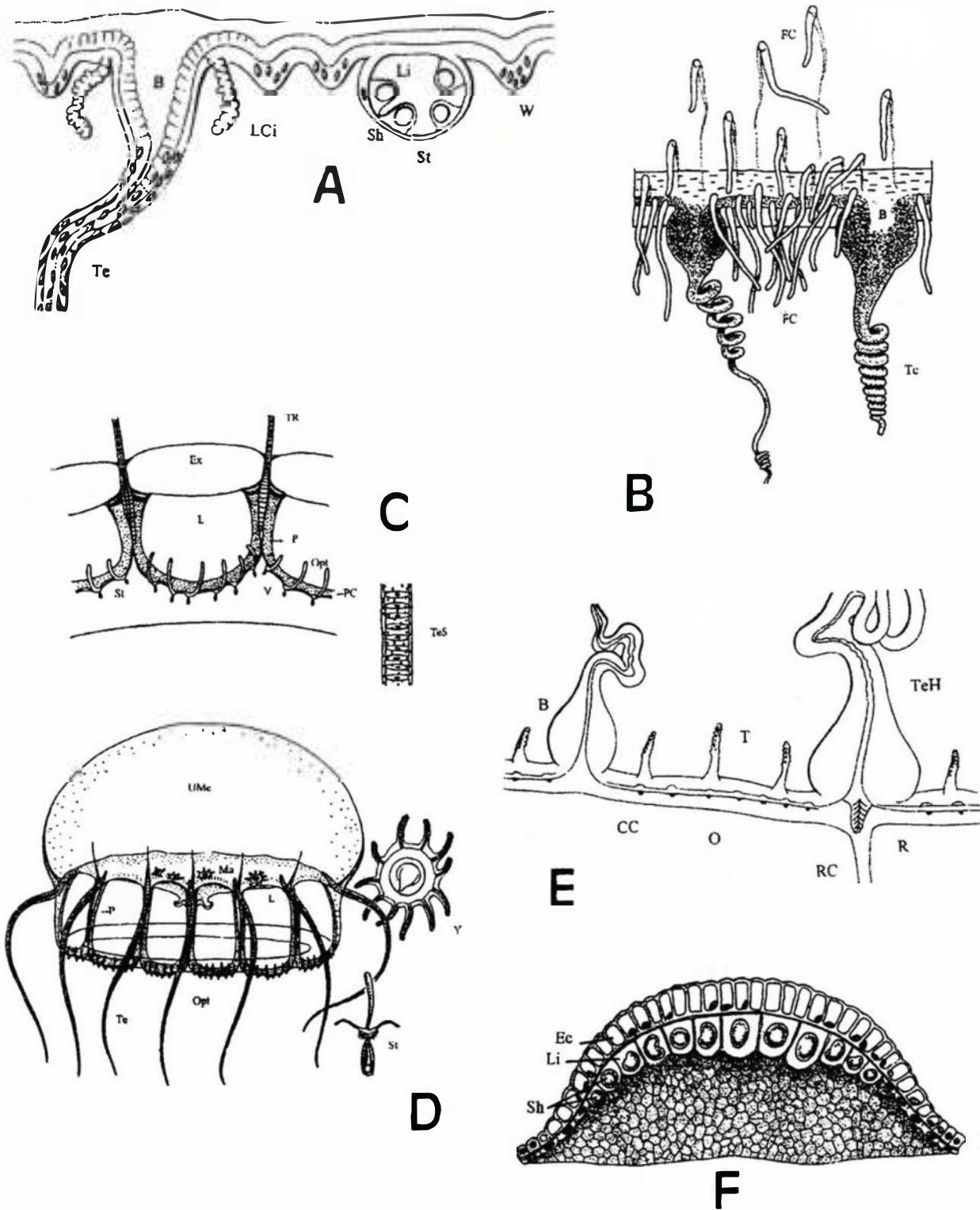


Fig. 7. A, part of bell margin of *Eutima coerulea* showing: a closed statocyst (St), margin warts (W), and lateral cirri (LCi). Redrawn from Mayer (1910). B, portion of umbrellar margin of *Cosmetira pilosella* showing marginal flexile cirri. Redrawn from Russell (1953). C, bell margin of narcomedusan *Pegantha rubiginosa* showing marginal lappets (L), peronia (P) and otoporphae (Opt). Redrawn from Mayer (1910). D, side view of *Pegantha rubiginosa*. Redrawn from Mayer (1910). E, part of bell margin of *Orchistoma pileus* showing tentaculiform structures. Redrawn from Mayer (1910). F, open statocyst of *Mitrocoma*. Redrawn from Hertwig and Hertwig (1878).

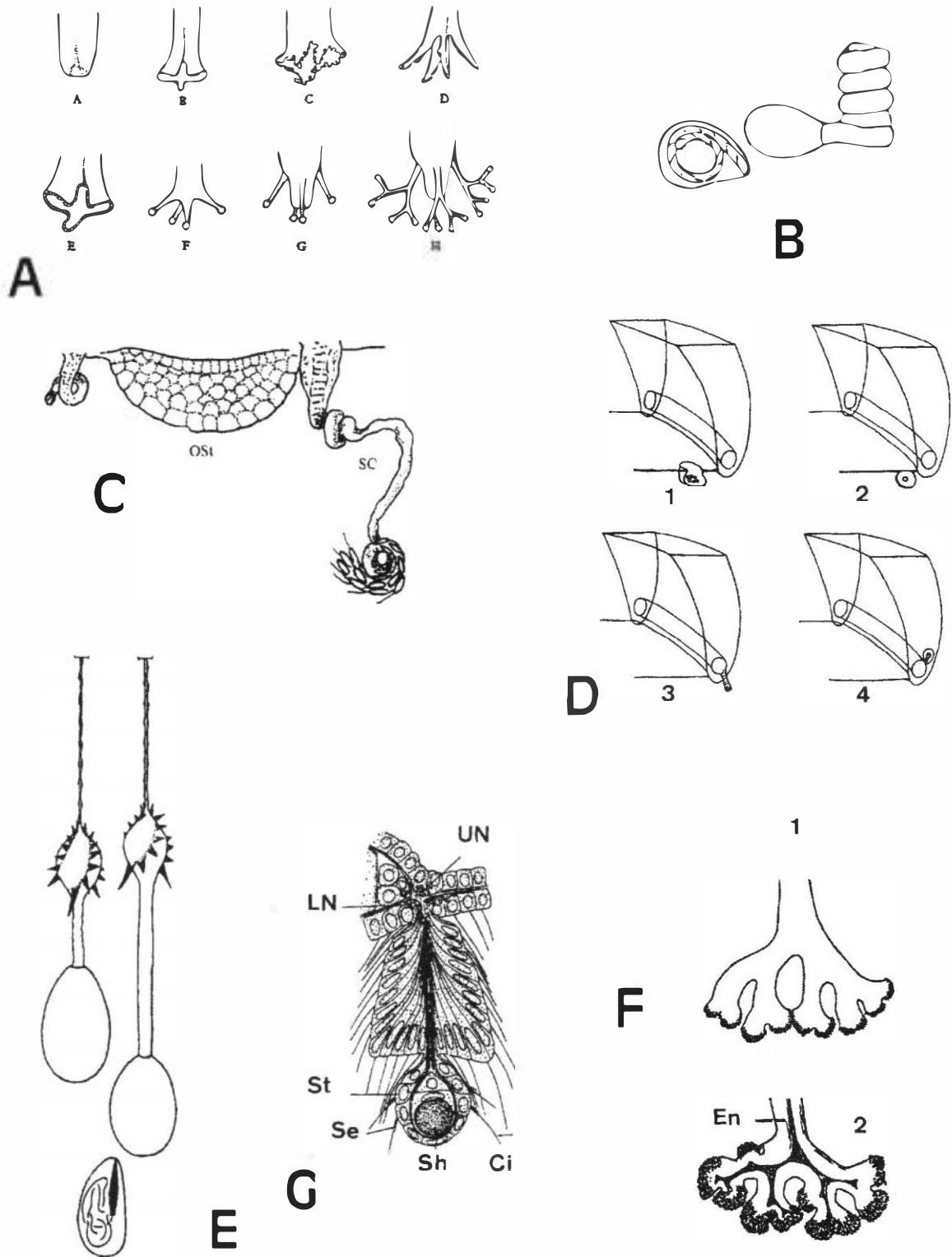
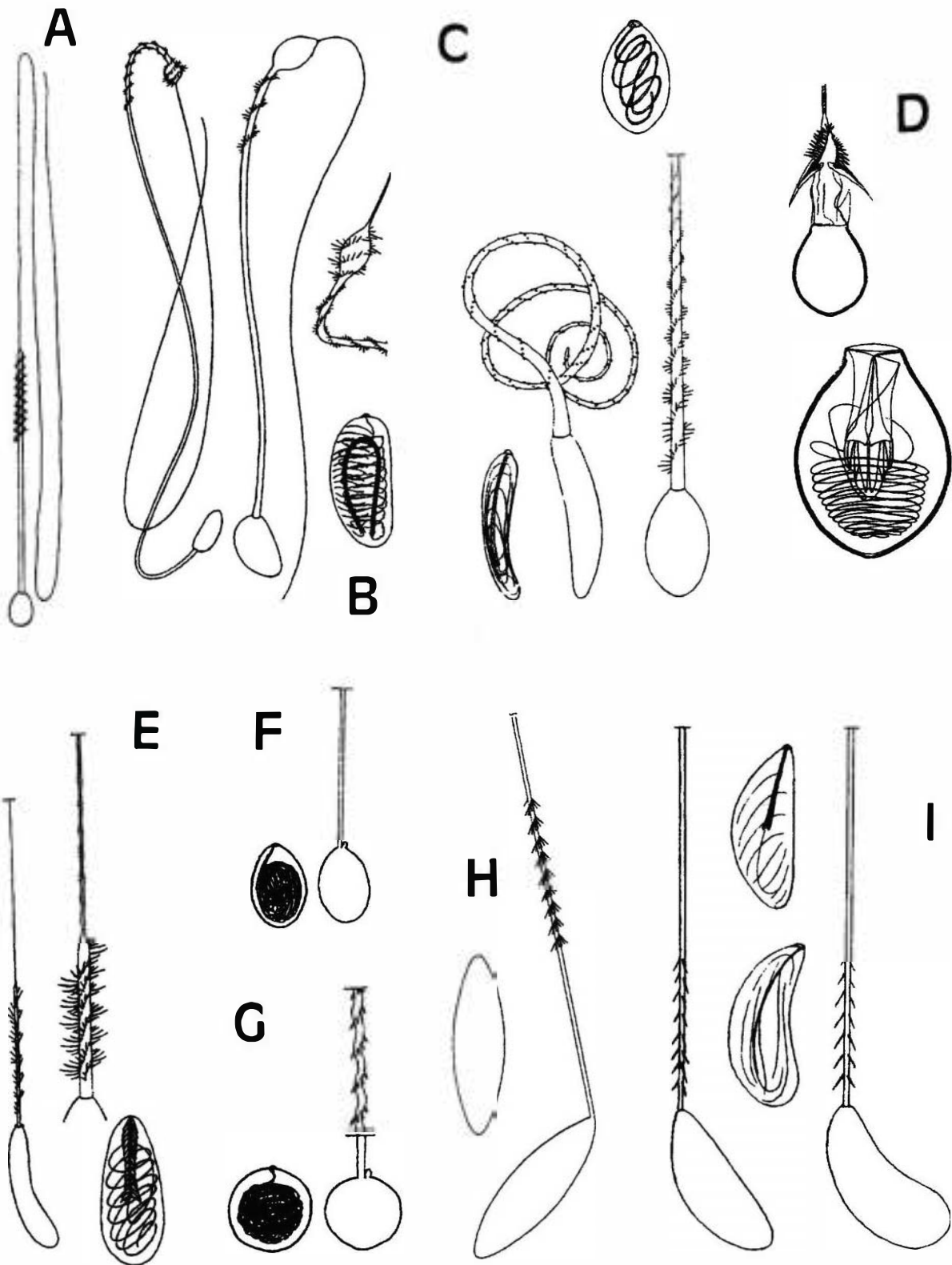


Fig. 8. A, diagrams of mouth structure of different Hydromedusae: A, *Sarsia*; B, *Clytia*; C, *Cosmetira*; D, *Eirene*; E, *Turritopsis*; F, *Hydractinia*; G, *Lizzia*; H, *Bougainwillia*. Redrawn from Russell (1953). B, diagram of undischarged and discharged desmoneme cnidocyte. Redrawn from Weill (1934). C, bell margin of *Mitrocomella brownei* showing an open statocyst and a marginal cirrus. Redrawn after Russell (1953). D, diagrammatic figures showing the different types of statocyst: 1, open marginal statocyst; 2, closed marginal statocyst; 3, free ecto-endodermal statocyst originating from the circular canal; 4, enclosed ecto-endodermal statocyst. Redrawn after Russell (1953). E, microbasic eurytele cnidocytes. Redrawn from Weill (1934). F, oral arm of *Hydractinia areolata*: 1, outer side; 2, inner side showing the free gastric endoderm. Redrawn from Kramp and Damas (1925). G, free ecto-endodermal statocysts of *Solmissus marshalli*. Redrawn from Singla (1975) and Bouillon (1995a).



**Fig. 9.** Different common types of cnidocysts. **A**, macrobasal mastigophore; **B**, macrobasal eurytele; **C**, anisorhiza; **D**, stenotele; **E**, microbasal mastigophore; **F**, atrichous isorhiza; **G**, apotrichous isorhiza (Narcomedusae), redrawn from Mackie and Mackie (1963). **H**, merothrichous isorhiza, redrawn from Bouillon *et al.* (1988b). **I**, basitrichous isorhiza. **A**, **B**, **C**, **D**, **E**, **F**, **I**, redrawn from Weill (1934).

**Table 3.** Cnidocysts of the New Zealand hydromedusae

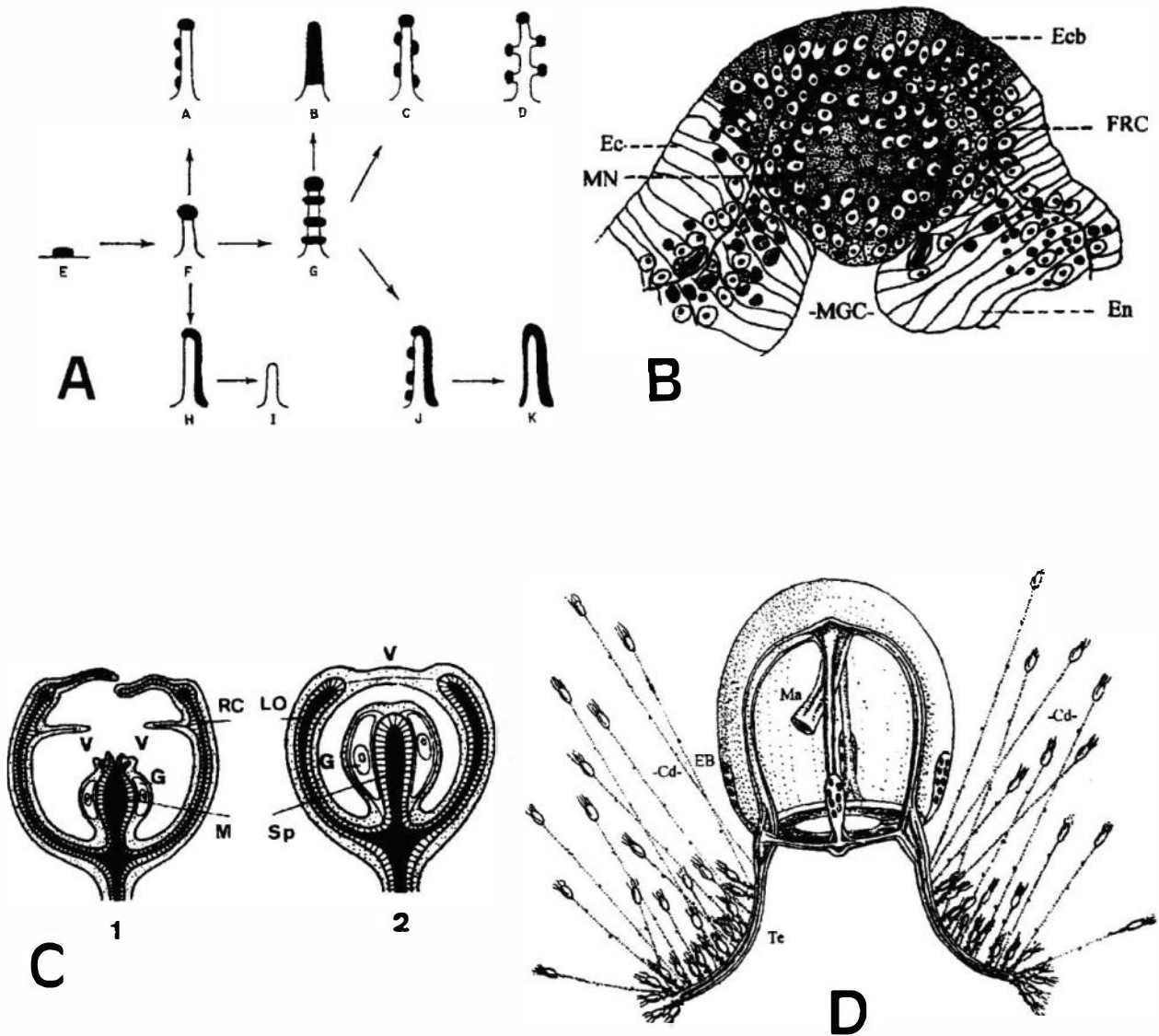
Anis. = anisorhiza; Apo. = apotrichous isorhiza; Atr. = atrichous isorhiza; Bas. = basitrichous isorhiza; Des. = desmonemes; Eur. micr. = microbasic euryteles; Eur. macr. = macrobasic euryteles; Het. = heteronemes; Mast. micr. = microbasic mastigophores; Mast. macr. = macrobasic mastigophores; Mero. = merotrichous isorhiza; Sten. = stenoteles.

**Authors :** B. 1985a = Bouillon 1985a; B. 1988b = Bouillon *et al.* 1988b; B.u. = Bouillon unpublished; C. 1989 = Carré *et al.* 1989; P. & M. = Purcell & Mills 1988; Sch. = Schuchert 1996; Xu = Xu & Wang 1991.

Species											Sten.	Authors
	Des.	Apo.	Atr.	Bas.	Mero.	Anis.	Mast. micr.	Mast. macr.	Eur. micr.	Eur. macr.		
<b>Anthomedusae</b>												
<b>Order Filifera</b>												
Family Bougainvillidae												
<i>Bougainvillia aurantiaca</i>	*								*			B. 1985a
<i>Bougainvillia dimorpha</i>	*								*			Sch.
<i>Bougainvillia fulva</i>	*								*			B. 1985a
<i>Bougainvillia macloviana</i>	*								*			B. 1985a
<i>Bougainvillia muscus</i>	*								*			B. 1985a
<i>Bougainvillia vervoorti</i>	*								*			B. 1985a
<i>Koellikerina maasi</i>	*								*			B.u.
Family Bythotiaridae												
<i>Bythotiar murrayi</i>	*								* ?			B. 1985a
<i>Bythotiar parasitica</i>	*							* ?	*			Sch.
<i>Bythotiar sp.</i>	*								*			Sch.
<i>Calycopsis bigelowi</i>	+	+										
Family Clavidae												
<i>Oceania armata</i>	*								*			B. 1985a
<i>Turritopsis nutricula</i>	*								*			B. 1985a
Family Cytaeidae												
<i>Cytaeis sp.</i>	*							*	*			B. 1985a
Family Eucodoniidae												
<i>Eucodonium brownei</i>	*								*			Sch.
Family Hydractiniidae												
<i>Hydractinia australis</i>	*								*			Sch.
<i>Hydractinia bella</i>	*								*			B. 1985a
<i>Hydractinia minima</i>	*								*			B. 1985a
<i>Hydractinia minuta</i>	*								*			Sch.
Family Pandeidae												
<i>Amphinema dinema</i>	* juv.								*			B. 1985a; Sch.
<i>Amphinema rugosum</i>	*								*			Sch.
<i>Barnettia caprai</i>	*							* ?	*			Sch.
<i>Leuckartiara octona</i>								*	*			B. 1985a
<i>Merga treubeli</i>									*			Sch.
<i>Pandea conica</i>			*	* ?					*			Sch.
<i>Pandeopsis ikarii</i>									*			B. 1985a
Family Proboscidactylidae												
<i>Proboscidactyla sp.</i>						*			*			Sch.
Family Protiaridae												
<i>Halitiara inflexa</i>			*		*		*					B. 1988
Family Rathkeidae												
<i>Rathkea octopunctata</i>	*								*			B. 1985a

Species	Des.	Apo.	Atr.	Bas.	Mero.	Mast.		Eur.		Sten.	Authors
						Anis.	micr.	macro.	micr.		
Order Capitata											
Family Boeromedusidae											
<i>Boeromedusa auricogonia</i>	*							*		*	B. 1995
Family Cladonematidae											
<i>Cladonema radiatum</i>	*									*	B. 1985a
Family Corynidae											
<i>Dipurena ophiogaster</i>	*									*	B. 1985a
<i>Sarsia eximia</i>	*									*	B. 1985a
<i>Sarsia japonica</i>	*									*	B. 1985a
Family Corymorphidae											
<i>Corymorpha intermedia</i>	*		*	*				*		*	Sch.
<i>Vannuccia forbesii</i>	*		*	*				*		*	B. 1985a
Family Eleutheriidae											
<i>Staurocladia vallentini</i>	*									*	B. 1985a
<i>Staurocladia wellingtoni</i>	*									*	Sch.
Family Euphysidae											
? <i>Euphysa problematica</i>	*									*	x ?; Sch.
Family Margelopsidae											
<i>Pelagohydra mirabilis</i>	*			*				*		*	B. 1985a; Sch.
Family Polyorchidae											
<i>Tiaricodon</i> sp.	*									*	Het. +; Sch.
Family Porpitidae											
<i>Porpita porpita</i>	* rare									*	B. 1985a
<i>Velella velella</i>	*									*	B. 1985a
Family Tubulariidae											
<i>Hybocodon prolifer</i>	*		*					*		*	B. 1985a; Sch.
Family Zancleidae											
<i>Zanclea polymorpha</i>										*	Sch.
Subclass Leptomedusae											
Order Conica											
Family Aequoreidae											
<i>Aequorea forskalea</i>			*	* ?						* ?	B. 1985a
<i>Aequorea macrodactyla</i>				*	*						B.u.
Family Eirenidae											
<i>Eirene menoni</i>			*		*			*			B. 1985a
<i>Eutima curva</i>			*		*			*			B. 1988b
<i>Eutima mira</i> ( <i>E. orientalis</i> )			*		*			*			B. 1988b
Family Eucheilotidae											
<i>Eucheilota menomi</i>			*		*			*			B. 1988b
<i>Eucheilota paradoxa</i>			*		*			*			B. 1988b
<i>Eucheilota tropica</i>			*		*			*			B. 1988b
Family Laodiceidae											
<i>Laodicea indica</i>			*					*			B. 1985a
<i>Staurodiscus gotoi</i>					*			*			B.u.
Family Lovenellidae											
<i>Lovenella assimilis</i>			*		*			*			B. 1988b

Species	Des.	Apo.	Atr.	Bas.	Mero.	Anis.	Mast. micr.	Mast. macro.	Eur. micr.	Eur. macro.	Sten.	Authors
Family Malagazziidae												
<i>Malagazzia carolinae</i>			*				*					B. 1988b
<i>Octophialucium indicum</i>							*					Xu
Family Mitrocomidae												
<i>Mitrocomella brownei</i>			*	*								B. 1985a
Family Phialellidae												
<i>Phialella quadrata</i>				* or **			**					B. 1985a
Family Tiarannidae												
<i>Chromatonema rubrum</i>									*			B. 1985a
<i>Modeeria rotunda</i>									*			B. 1985a
Family Tiaropsidae												
<i>Tiaropsidium roseum</i>				*			*					B. 1985a
Order Proboscoida												
Family Campanulariidae												
<i>Clytia gregaria</i>							*					P. & M.
<i>Clytia hemisphaericum</i>			*				*					B. 1985a
Family Phialuciidae												
<i>Phialucium mbenga</i>							*					B. 1985a
Subclass Laingiomedusae												
Family Laingiidae												
<i>Fabienna sphaerica</i>									*	*		is?; Sch.
Subclass Limnomedusae												
Family Olindiidae												
<i>Craspedacusta sowerbyi</i>									*			B. 1985a
Subclass Narcomedusae												
Family Aeginidae												
<i>Aegina citrea</i>			*									C. 1989
<i>Solmundella bitentaculata</i>			*									C. 1989
Family Cuninidae												
<i>Cunina globosa</i>				*								B. 1985a
<i>Solmissus marshalli</i>			*									C. 1989
Subclass Trachymedusae												
Family Geryoriidae												
<i>Geryonia proboscidalis</i>			*						*			B. 1985a
<i>Liriope tetrphylla</i>			*						*			B. 1985a
Family Halicreatidae												
<i>Halicreas minimum</i>												
<i>Haliscera bigelowi</i>				* or **					**		*	B. 1985a
Family Rhopalonematidae												
<i>Aglaura hemistoma</i>									*		*	B. 1985a
<i>Persa incolorata</i>									*		*	B. 1985a
<i>Rhopalonema velatum</i>									*		*	B. 1985a
<i>Sminthea eurygaster</i>			* or **						**		*	B. 1985a



**Fig. 10.** **A**, schema of the different types of tentacular structures and their possible evolution:  $\Lambda$ , semimoniliform;  $\text{B}$ , filiform;  $\text{C}$ , cateniform;  $\text{D}$ , ramified=capitate;  $\text{E}$ , primordial cnidocyst button;  $\text{F}$ , capitate;  $\text{G}$ , moniliform;  $\text{H}$ , semifiliform;  $\text{I}$ , acnide;  $\text{J}$ , monilifiliform;  $\text{K}$ , pseudofiliform. Redrawn from Prevot (1959) and Bouillon (1968a). **B**, section through a medusa bud of *Limnocyda tanganyicae*. Redrawn from Bouillon (1957). **C**, regressive evolution of hydromedusae: 1, normal medusa, 2, cryptomedusoid showing the origin of the spadi. Redrawn from Kühn (1913). **D**, medusae of *Zanclaea* sp. showing the cnidophores (cd) and the exumbrellar cnidocyst bands (EB). Redrawn from Allman (1871–1872).



## SYSTEMATICS

The Hydromedusae belong to the phylum Cnidaria which is usually considered as one of the most primitive metazoa phyla. They are deprived of real organs, having a tissue grade of construction. Their digestive system or coelenteron is sac-like or branched but has only one orifice, serving as both mouth and anus. They have usually a radial, more rarely a bilateral, symmetry and the primary body axis is oral-aboral. Cnidaria fundamentally bear tentacles covered with stinging structures or cnidae (cnidocysts, spirocysts, and ptychocysts) diagnostic of the phylum which is named after them (Figs 8B, E; 9).

The phylum Cnidaria can be classified as follows (see Bouillon 1985a, 1995a).

Phylum Cnidaria  
Subphylum **Anthozoaria**  
Class Anthozoa

Never a medusa phase. Polyp large, sexual; with an actinopharynx; with a cellular mesoglea; with coelenteron partitioned by septa.

Subphylum **Medusozoa**

Medusa stage important in the life cycle, although it may be secondarily lost; hydranths usually small, without pharynx, with acellular mesoglea, without septa; the polyps are normally the larval asexual stage, the medusa being the adult sexual one, but by paedomorphosis the polyps can become secondarily sexual.

Class Scyphozoa  
Class Cubozoa  
Class **Hydrozoa**

The hydroids — hydromedusae — have a tetramerous, polymeric, or rarely bilateral symmetry.

They typically undergo a polymorphic succession of developmental stages during their life cycle, the starting point of which is a ciliated motile gastrula. Planula larvae develop into a benthic, usually sessile, larval stage, the polyp. Polyps will later on, by asexual budding, give rise to a planktonic, free-swimming and solitary stage, the hydromedusa, representing the sexual adult state (Fig. 4A, B). In many forms the medusae are reduced to gonophores which no longer

leave the hydroids, which thus, by paedomorphosis, become secondarily the sexual stages. In other species the medusae immediately give rise to other medusae via planula larvae, skipping the polyp stage (Fig. 4A).

In Hydrozoa the asexual budding of a new medusa or of a gonophore usually involves the formation of a medusary nodule or entocodon, forming the coelom-like subumbrellar cavity, lined by striated muscle cells (Fig. 10B: MN). In the Narcomedusae and Trachymedusae, however, the larval or polypoidal structures metamorphose directly and completely into young medusae without medusary nodule formation.

Both larval stages, the planula and the polyp, have a typical diploblastic structure. The adult sexual stage or hydromedusa appears to have acquired during embryonic development a triploblastic kind of organisation. (Boero *et al.* 1998) The hydroid phase can be solitary but generally forms modular colonies by budding. Colonies often produce individual polyps specialised for different functions, all having an interconnected coelenteron (defensive dactylozooids, reproductive gonozooids, feeding gastrozooids, etc.). The hydromedusae are provided with a velum (except *Obelia*) (Figs 2; 3A; 7C: V) that occludes the umbrellar aperture (craspedote medusae).

Hydromedusae have, with a few exceptions, separated sexes. The sex cells generally mature in the ectoderm (Figs 2; 3A: G). Hydromedusae have a simple mouth which opens directly into the gastrovascular cavity without the formation of an actinopharynx and the cavity presents no septa similar to those of the Scyphozoa and Anthozoa (Figs 2; 3A; 7D). The mesoglea is acellular; the cnidocysts are usually restricted to the ectoderm. Hydromedusae are mostly marine organisms but some live in brackish or fresh water. They are present at all latitudes and depths. Hydromedusae have frequently only a seasonal existence, presenting several types of resting or dormancy stages (frustules, propagules, cysts, stolon system) allowing them to overcome unfavourable ecological conditions (Fig. 4A, B).

### Hydromedusan Morphology

The hydromedusae present essentially a tetramerous radial symmetry.

Their body has generally the form of a mushroom, a bell, or a disk (Figs 2; 3A; 7D). The main part of its

volume is occupied by a gelatinous mass, the mesoglea, the jelly of the jellyfish, which confers form and buoyancy (Figs 2; 3; 7D: UMe). The convex upper (aboral) umbrellar surface is called the exumbrella (Figs 2; 3: Ex), the concave lower (oral) surface is termed the subumbrella (Figs 2; 3: SU), and the space enclosed by the umbrella is the subumbrellar cavity. Its opening is narrowed by a muscular horizontal diaphragm or velum, leaving only a central circular aperture, the velar opening (Figs 2; 3; 7C: V). The velum plays an important role in the locomotory activities of the medusae. The free rim of the umbrella bears marginal tentacles and sense organs (ocelli, statocysts, cordyli: Figs 2: O; 6; 7C; 8D, G: Co, O, CSt, St). The tentacles may be solid (Fig. 7C: TeS) or hollow containing an extension of the circular canal (tentacular cavity: Fig. 2: TC). The base of each tentacle is commonly swollen into an enlargement, the tentacular bulb (Figs 3A; 6F; 7A, B, E: B). There are different tentacle types according to the mode of distribution of the cnidocysts. Figure 10A summarises most of them and their possible relationships.

From the centre of the subumbrella hangs, like the clapper of a bell, a tubular or quadrangular projection of various lengths, the manubrium or stomach (Figs 2; 3A; 7D; 10D: Ma). The cavity of the manubrium or gastric cavity opens distally by the mouth (Figs 2; 3A: Mo) and proximally extends into the radial gastrovascular canals (Figs 2; 3A; RC). These canals are generally four in number but are sometimes more numerous, and connect through the mesoglea the gastric cavity to the circular canal which runs along the marginal rim of the umbrella (Figs 2; 3A; 6F; 7E: CC). The gastric cavity, the radial canals, the circular canal, and the tentacular canals when they exist form the gastrovascular system which serves both for digestion and for distribution of food, waste, cnidoblasts, or even gametes. The mouth can be simple or may be provided with lips, lobes, or tentacles (Fig. 8A, F.).

The radii corresponding to the radial canals are named the perradii. Intermediate between them lie the interradii and midway between the perradii and the interradii are the adradii (Fig. 3B).

Crossing the mesoglea, an unistratified membrane, the "cathamnal" or endodermal lamella, interconnects the radial canals and, like these, connects the gastric cavity with the circular canal. It delimits two mesoglean levels, one, thin, subumbrellar, the other well-developed, exumbrellar (Figs 2; 3A: CL).

These cells may develop and mature either on the manubrium, or on the radial canals or on both. Fertilisation is usually external but in a few species internal fertilisation may occur. The resulting embryo develops into a planula larva which settles and metamor-

phoses into a new polyp stage or more rarely directly into a new medusa (Fig. 4A, B).

Hydromedusae comprise some of the most important planktonic predators. When abundant they are major consumers of fish larvae, crustaceans, and other planktonic organisms. Some hydromedusae may feed on bacteria, protozoans, phytoplankton, and even dissolved organic matter. Other species harbour symbiotic intracellular algae from which they evidently derive some nutrients. Hydromedusae have been used as biological indicators to predict movements of oceanic waters. Several species are known as indicators of upwelling systems.

## CLASSIFICATION

### Subclass *Anthomedusae* Haeckel, 1879

#### Order *Filifera* Kühn, 1913

##### Suborder *Margelina* Haeckel, 1879

- Family Bougainvilliidae Lütken, 1850
- Family Clavidae McCrady, 1859
- Family Cytaeidae L. Agassiz, 1862
- Family Eucodoniidae Schuchert, 1996
- Family Hydractiniidae L. Agassiz, 1862
- Family Rathkeidae Russell, 1953

##### Suborder *Pandeida* Haeckel, 1879

- Family Bythotiaridae Maas, 1905
- Family Pandeidae Haeckel, 1879
- Family Proboscidactylidae Hand & Hendrickson, 1950
- Family Protiaridae Haeckel, 1879

#### Order *Capitata* Kühn, 1913

##### Suborder *Moerisiida* Poche, 1914

- Family Polyorchidae A. Agassiz, 1862

##### Suborder *Tubulariida* Fleming, 1828

- Family Boeromedusidae Bouillon, 1995a
- Family Cladonematidae Gegenbaur, 1857
- Family Corynidae Johnston, 1836
- Family Corymorphidae Allman, 1872
- Family Eleutheriidae Russell, 1953
- Family Euphysidae Haeckel, 1879
- Family Margelopsidae Uchida, 1927
- Family Pennariidae McCrady, 1859
- Family Tubulariidae Fleming, 1828

##### Suborder *Zancleida* Russell, 1953

- Family Porpitiidae Goldfuss, 1818
- Family Zancleidae Russell, 1953

Subclass **Leptomedusae** Haeckel, 1866

Order **Conica** Broch, 1910

- Family Aequoreidae Eschscholtz, 1829
- Family Cirrholoveniidae Bouillon, 1984a
- Family Eirenidae Haeckel, 1879
- Family Eucheilotidae Bouillon, 1984a
- Family Laodiceidae Agassiz, 1862
- Family Lovenellidae Russell, 1953
- Family Malagazziidae Bouillon, 1984a
- Family Mitrocomidae Haeckel, 1879
- Family Phialellidae Russell, 1953
- Family Tiarannidae Russell, 1940
- Family Tiaropsidae Boero, Bouillon & Danovaro, 1987

Order **Proboscoidea** Broch, 1910

- Family Campanulariidae Johnston, 1836
- Family Phialuciidae Kramp, 1955

Subclass **Laingiomedusae** Bouillon, 1978

- Family Laingiidae Bouillon, 1978c

Subclass **Limnomedusae** Kramp, 1938

- Family Olindiidae Haeckel, 1879

Subclass **Narcomedusae** Haeckel, 1879

- Family Aeginidae Gegenbaur, 1857
- Family Cuninidae Bigelow, 1913
- Family Solmarisidae Haeckel, 1879

Subclass **Trachymedusae** Haeckel, 1866

- Family Geryoniidae Eschscholtz, 1829
- Family Halicreatidae Fewkes, 1886
- Family Rhopalonematidae Russell, 1953

**DIAGNOSES OF THE  
NEW ZEALAND HYDROMEDUSAE**

Subclass **Anthomedusae** Haeckel, 1879

Medusae typically bell-shaped. Gonads confined to manubrium, sometimes extending on the most proximal parts of radial canals. Marginal sense organs, if present, ocelli, never statocysts or cordyli. Marginal

tentacles hollow or solid, with tentacular bulbs (except most Bythotiaridae, *Eugotoea petalina*, and *Rhabdoon singularis*).

Hydroid: "Athebate" hydroids having their body not covered by rigid perisarc. Cnidome normally includes desmonemes (Fig. 7B).

Subclass **Leptomedusae** Haeckel, 1866

Medusae flatter than bell-shaped, typically with hemispherical or flattened umbrella. Gonads confined to radial canals, exceptionally extending onto proximal part of manubrium. Marginal sense organs when present in form of ectodermal velar statocysts, rarely cordyli, occasionally adaxial ocelli. Marginal tentacles peripheral and hollow (except in *Obelia*), with tentacular bulbs. Cnidome: often microbasic mastigophores and merotrichous isorhiza (Fig. 9E, H).

Hydroid: "Thecate" hydroids generally protected by rigid perisarc: hydrotheca, nematotheca, and gonotheca (Fig. 5) rarely with naked hydranths.

Subclass **Laingiomedusae** Bouillon, 1978

Medusae with an almost hemispherical umbrella divided by peronial grooves or similar structures so that umbrellar margin is lobed. Four radial canals. No typical circular canal but a solid core of endodermal cells around umbrellar margin. Tentacles solid, inserted on exumbrellar surface above margin; tentacular bulbs in, or not in, direct contact with the endodermal circular core. Alternating with tentacles there may be narrow exumbrellar cnidocyst bands or triangular ciliated fields. Manubrium simple, quadrangular, tubular, or conical; mouth opening simple, quadrangular to circular. Gonads in four masses on manubrium or as epidermal lining of interradial pockets of manubrium. Marginal sense organs apparently missing. Cnidome: include macrobasic mastigophores or macrobasic euryteles (Fig. 9A, B).

Reproduction unknown.

Subclass **Limnomedusae** Kramp, 1938

Medusae with gonads either on manubrium or on manubrial wall with perradial continuation along radial canals or on radial canals only. Marginal tentacles peripheral, hollow, without true basal bulb, base of tentacles presenting a parenchymatic endodermal core embedded in the umbrellar mesoglea. Marginal sense organs when present ecto-endodermal closed statocysts.

Hydroid: Solitary or colonial; small, sessile; with or without tentacles; no perisarc thecae.

Subclass **Narcomedusae** Haeckel, 1879

Medusae usually flattened with a central lens-shaped mass of mesoglea and much thinner sides. Margin of umbrella divided by peronial grooves so that umbrella margin is lobed. Tentacles solid, inserted on exumbrella at some distance of margin, just above peronial grooves, without tentacular bulbs, their endodermal core continuing in the mesoglea of the umbrella as "roots"; sometimes small secondary tentacles on margin itself. Manubrium very broad and short with entire circular periphery or with perradial or interrarial peripheral pouches. Generally without radial canals; circular canal absent or looped into marginal flaps to form a "peripheral canal system". Gonads on manubrium walls and/or on manubrial pouches. Marginal sense organs in form of free ecto-endodermal statocysts. With or without otoporphae. Cnidome: atrichous isorhizae and apotrichous isorhizae (Fig. 9F; G).

Reproduction: by direct development, by reduced polyps, or by complex parasitic larval development.

Subclass **Trachymedusae** Haeckel, 1866

Medusae with hemispherical or deep bell-shaped umbrella. Margin entire with a thickened peripheral cnidocyst ring. Radial canals and circular canal present. With solid marginal tentacles or with a mixture of solid and hollow ones, without true tentacular bulbs, their endodermal core continuing in the mesoglea of the umbrella as short "roots"; sometimes small secondary tentacles on margin itself. With or without centripetal canals. Manubrium with or without peduncle. Gonads usually on radial canals. Marginal sense organs as open or closed ecto-endodermal statocysts. Cnidome: generally stenoteles associated with microbasic euryteles or/and atrichous isorhizae (Figs 8E; 9D, F).

Reproduction: by direct development, without polyp stage.

Subclass **ANTHOMEDUSAE**  
Order **FILIFERA** Kühn, 1913

Medusae with gonads forming separated interrarial, adradial, or perradial longitudinal masses on walls of manubrium (exceptionally encircling entire manubrium). Mouth either with four simple or complex lips, or circular and surmounted by oral manubrial tentacles. Marginal tentacles solid or hollow. Cnidome including usually desmonemes and microbasic euryteles, never

stenoteles.

Hydroids with filiform tentacles (except in dactylozooids of Ptilocodiidae).

Suborder **MARGELINA** Haeckel, 1879

Filifera medusae with solid tentacles; ocelli when present adaxial; with oral tentacles armed with cnidocyst clusters or with mouth presenting arms, knobs, or clusters armed with cnidocysts.

- 1 with oral tentacles ..... 2
- 1a without oral tentacles ..... 3
- 2 with oral tentacles simple, situated on/or very near mouth rim ..... CYTAEIDIDAE
- 2a with oral tentacles simple or branched, distinctly inserted above mouth rim ..... BOUGAINVILLIIDAE
- 3 mouth with 4 distinct lips ..... 4
- 3a mouth with 4 inconspicuous lips, each containing a group of about 100 cnidocysts ..... EUCODONIIDAE
- 4 mouth rim and lips covered with a continuous row of cnidocyst clusters along their margin .... CLAVIDAE
- 4a mouth lips elongated to form perradial mouth arms with one or many distinct cnidocyst clusters ..... 5
- 5 marginal tentacles solitary ..... HYDRACTINIIDAE
- 5a marginal tentacles in 8 groups ..... RATHKEIDAE

Family **BOUGAINVILLIIDAE** Lütken, 1850

Medusae usually bell-shaped; with short manubrium and simple circular mouth; oral tentacles simple or dichotomously branched, inserted distinctly above mouth rim and armed with cnidocyst clusters; 4 radial canals and circular canal; solid marginal tentacles either solitary or in clusters, borne on 4, 8, or 16 tentacle bulbs. Gonads on manubrium either forming a continuous ring or on adradial, interrarial, or perradial axes; adaxial ocelli absent or present.

Hydroid: Colonies stolonial or erect, branching. Perisarc terminating either at base of hydranths or forming a pseudohydrotheca. Hydranths with one or more distal whorls of filiform tentacles. Free medusae or sporosacs developing mostly on hydrocauli. Hydroclades occasionally on hydrorhiza and rarely from modified hydranths.

- 1 marginal tentacles in 4 perradial groups .....  
..... *Bougainvillia*
- 1a marginal tentacles in 8 groups, 4 perradial, 4 interrarial .....  
..... *Koellikerina*



*Bougainvillia* Lesson, 1830

Free medusae with four radially placed clusters of solid marginal tentacles; the tentacles of each cluster all alike; with four perradial oral tentacles dichotomously branching in normally developed medusae. Gonads on manubrium in adradial, interradial, or perradial position; with or without ocelli.

Hydroid: Usually forming erect, branching, or unbranched colonies, more rarely stolonal. Hydranth may be covered by a pseudohydrotheca, with one whorl of tentacles that are never enveloped by the perisarc of the pseudohydrotheca.

- 1 gastric peduncle broad, well-developed, gonads extending on perradial sides of peduncle ..... *Bougainvillia macloviana*
- 1a gastric peduncle absent or very weakly developed ..... 2
- 2 gonads eight adradial, well separated in the interradial and perradial ..... *Bougainvillia fulva*
- 2 gonads different ..... 3
- 3 manubrium with perradial lobes ..... 7
- 3 manubrium without perradial lobes, gonads interradial ..... 4
- 4 marginal tentacles with adaxial ocelli ..... 5
- 4 marginal tentacles without ocelli ..... 6
- 5 manubrium particularly broad and flat, quadrangular, basal trunk of the oral tentacles very short, almost divided 5 or 6 times immediately from base ..... *Bougainvillia platygaster*
- 5a manubrium not particularly flat, bulbous; basal trunk of the oral tentacles fairly long, divided 1 or 2 times ..... *Bougainvillia muscus*
- 6 2-4 tentacles per marginal bulb, basal trunk of oral tentacles very long, medusa up to 1.5 mm ..... *Bougainvillia aurantiaca*
- 6a 5-7 tentacles per marginal bulb, basal trunk of oral tentacles of moderate length, medusa up to 3 mm ..... *Bougainvillia muscoides*
- 7 marginal bulbs with more than 10 tentacles (18-30) ... *Bougainvillia vervoorti*
- 7a marginal bulbs with less than 10 tentacles (7-10) ..... *Bougainvillia dimorpha*

*Bougainvillia aurantiaca* Bouillon, 1980 (Fig. 11)

Umbrella up to 1.9 mm, bell-shaped, mesoglea slightly thicker at the apex; manubrium conical, half to two-thirds of subumbrellar cavity; with a very slight peduncle; oral tentacles with very long basal trunk and branching 2 to 3 times; gonads as interradial pads;

tentacular bulbs broad, hemispherical with 2 to 3 marginal tentacles; no ocelli; marginal bulbs and gonads coloured in orange in living animals.

N.Z. RECORDS: Leigh Marine Reserve (Barnett 1985).

SEASONALITY: June, July.

DISTRIBUTION: Indo-Pacific, Mediterranean.

KEY REFERENCES: Goy *et al.* (1991), Schuchert (1996).

HYDROID: Unknown.

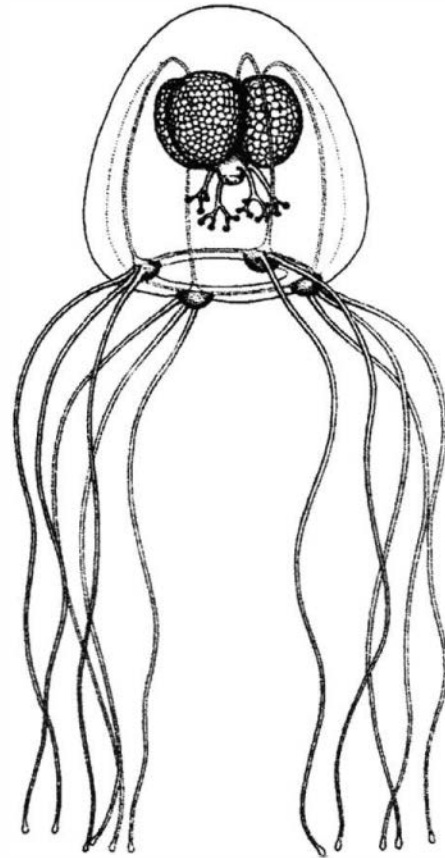


Fig. 11. *Bougainvillia aurantiaca*. After Bouillon (1980).

*Bougainvillia dimorpha* Schuchert, 1996 (Fig. 12)

Umbrella 3-4 mm (up to 6 mm) high, about as broad as high, bell-shaped, apical mesoglea up to one-third of umbrella height; a shallow peduncle may be indicated. Manubrium cone-shaped, shorter than one-third of bell height, less in males, with laterally compressed perradial extensions; oral tentacles with short basal trunk and branching 3 times. Gonads on lateral extensions of manubrium, in contact interradially in females, well separated from manubrium in males. Marginal bulbs triangular to heart-shaped with 7-10 marginal tentacles; dark red ocelli. Eggs covered by a layer of cnidocytes (microbasic euryteles).

N.Z. RECORDS: Evans Bay (Schuchert 1996).

SEASONALITY: February to April.

DISTRIBUTION: Endemic to New Zealand.

HYDROID: Hydroid colonies arising from attached ramified stolons, hydrocauli branching only once. Hydranth with a pseudohydrotheca, spindle-shaped, with 6–10 amphicoronate filiform tentacles in one whorl. Medusae buds arising at right angles from stolons and cauli. (Schuchert 1996)

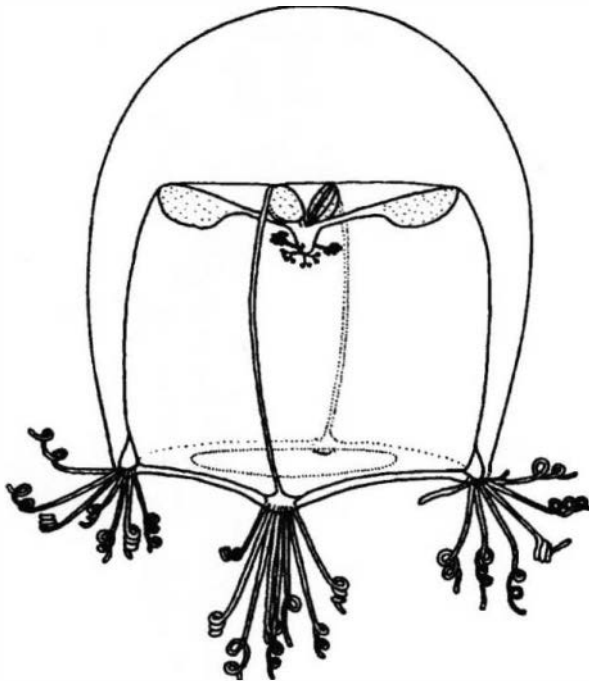


Fig. 12. *Bougainvillia dimorpha*. After Schuchert (1996).

*Bougainvillia fulva* Agassiz & Mayer, 1899 (Fig. 13)

Umbrella up to 11 mm wide and 14 mm high, cylindrical with flat rounded top; mesoglea very thick, bell margin lobed by 4 perradial furrows. Manubrium broad, cruciform in cross section, one-quarter to one-third of subumbrellar cavity height; basal trunk of oral tentacles short, each tentacle divided 5–8 times. Gonads 8 adradial pads distinctly separated interradially and peradially. 4 crescent-shaped marginal bulbs with 10–20 short tentacles; ocelli small, black on base of marginal tentacles. Medusa buds on manubrium.

N.Z. RECORDS: Dana Stn 3641; NZOI Stn 421.

SEASONALITY: January, December.

DISTRIBUTION: Indo-Pacific.

KEY REFERENCES: van der Spoel & Bleeker (1988), He Zhenwu & Xu Renhe (1996).

HYDROID: Unknown.

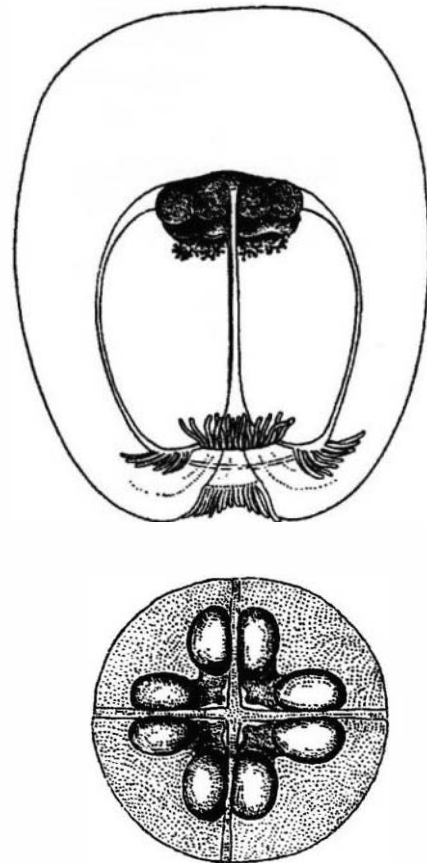


Fig. 13. *Bougainvillia fulva*. After Kramp (1968).

*Bougainvillia macloviana* (Lesson, 1830) (Fig. 14)

Umbrella 13 mm wide, 15 mm high, cylindrical with quadrangular margin, with fairly thick walls and rounded top; deep longitudinal furrows in umbrella. Manubrium short with narrow perradial lobes, on a broad cone-shaped gastric peduncle; oral tentacles with very short trunk, divided 5–7 times. Gonads slightly folded, extending along perradial lobes of manubrium upwards on gastric peduncle. Marginal bulbs crescentic to V-shaped, about half as wide as interradial space; each marginal bulb with 35–65 tentacles in a double row; ocelli yellow, red, or brownish-black.

N.Z. RECORDS: NZOI Stn N453; Musgrave Harbour, Auckland Islands (Benham 1909); Perseverance Harbour, Campbell Island (Roberts 1972); Perseverance Harbour, Campbell Island (Barnett 1985).

SEASONALITY: February, March, December.

DISTRIBUTION: Atlantic, Indo-Pacific, Antarctic.

KEY REFERENCES: Russell (1953), Edwards (1966b), Pagès *et al.* (1992).

HYDROID: Stolonal colonies, infrequently and irregularly branched. A thin pseudohydrotheca over base

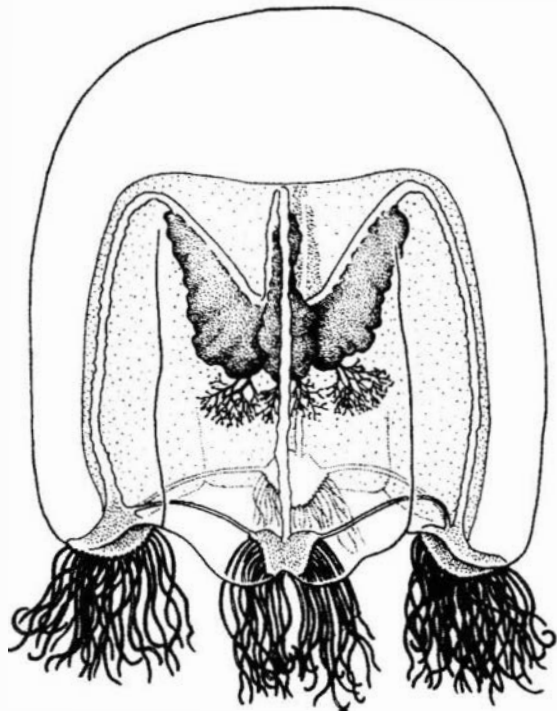


Fig. 14. *Bougainvillia macloviana*. After Pagès *et al.* (1992).

of hydranths; hydranths with up to 16 filiform tentacles. Medusae buds originating from hydrorhiza, hydrocauli, or hydroclades.

(Millard 1975; Schuchert 1996)

***Bougainvillia muscoides* (M. Sars, 1846) (Fig. 15)**

Umbrella 4–5 mm high and wide, oval, mesoglea not very thick; a shallow peduncle may be indicated. Manubrium fairly long, about half the height of subumbrellar cavity, narrowed at base; basal trunk of oral tentacles of moderate length, each tentacle divided 4 or 5 times. Gonads interradial, well separated in periradii. Marginal bulbs small, rounded triangular, with 5–7 tentacles with basal swellings; no ocelli.

REMARKS: Schuchert (1996) doubts the record of this species.

N.Z. RECORDS: NZOI Stn N449.

SEASONALITY: February

DISTRIBUTION: Atlantic, Indo-Pacific.

KEY REFERENCES: Edwards (1964, 1966b), Bouillon *et al.* (1986), van der Spoel & Bleeker (1988).

HYDROID: Erected, fascicled colonies arising at intervals from a network of tubular stolons; not much branched. Hydranths have up to 12 filiform tentacles, with a small

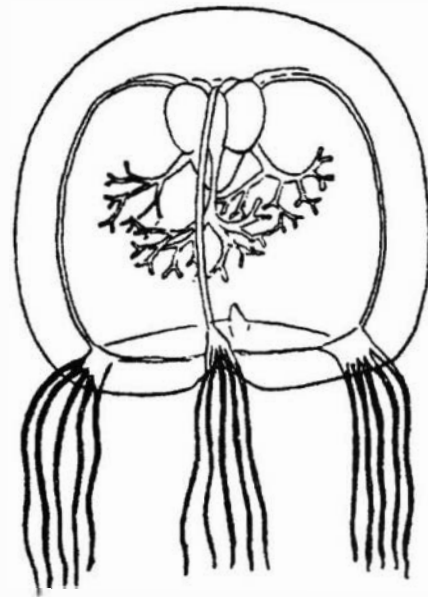


Fig. 15. *Bougainvillia muscoides*. After Kramp (1968).

pseudohydrotheca. Gonophores pear-shaped on very short stalks, arising from rhizocaulome and its branches. (Edwards 1966b)

***Bougainvillia muscus* Allman, 1863 (Fig. 16)  
(= *B. ramosa* van Beneden, 1844)**

Umbrella 2–3.5 mm wide and high, semiglobular, mesoglea fairly thick. Manubrium bulbous, half of subumbrellar height; oral tentacles fairly long, divided 1 or 2 (rarely 3 or 4) times. 4 interradial gonads reaching periradii, globular in females and prolonged along periradial side of peduncle in males. Marginal bulbs small, with 3–5 (rarely 6–9) long marginal tentacles; ocelli round. Mature eggs covered with a layer of cnidocysts (microbasic euryteles).

N.Z. RECORDS: Whangateau Harbour; near Goat Island, Leigh (Barnett 1985); Wellington Harbour, Evans Bay (Schuchert 1996).

SEASONALITY: February to August, November.

DISTRIBUTION: Atlantic, Indo-Pacific, Mediterranean, Arctic.

KEY REFERENCES: Edwards (1966b), Calder (1988), Ballard & Myers (1996), He Zhenwu & Xu Renhe (1996).

HYDROID: Colonies arising from an irregular network of tubular stolons; hydroids variable in growth and form, from dwarf non-fascicled little-branched colonies to tall, tree-like colonies with profusely, irregularly, branched fascicled hydrocauli. Perisarc corrugated at base of hydroclades, thinning out over hydranths,

forming a thin pseudohydrotheca very variable in development; perisarc of hydrocauli and hydroclades often infested by various detritus. Hydranths cylindrical to fusiform, terminal on hydrocauli and hydroclades; hypostome short, conical; up to 20 amphicoronate, filiform tentacles. Medusa buds on moderately long stalks, arising singly or in groups on hydroclades just below the hydranths.

(Vannucci & Rees 1961; Edwards 1964, 1966; Russell 1953, 1970)

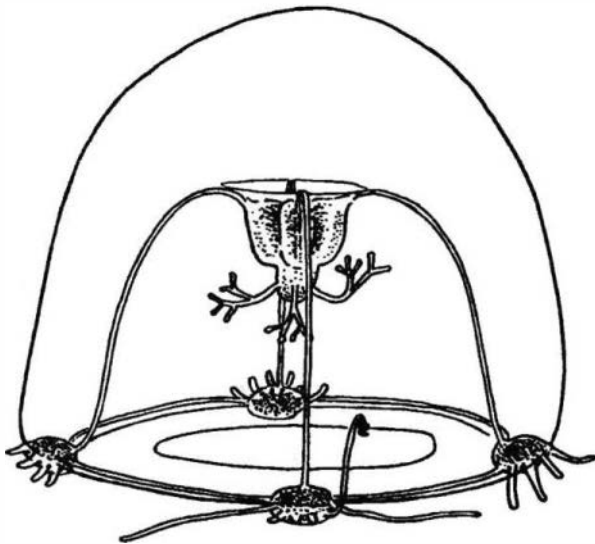


Fig. 11. *Bougainvillia muscus*. After Allman (1863).

***Bougainvillia platygaster*** (Haeckel, 1879) (Fig.17)

Umbrella up to 12 mm wide and high, globe-shaped to cubical, with thick walls and flat top; exumbrella with perradial notches. Manubrium quadrangular, very flat and broad, 4 times wider than high; oral tentacles divided 5 or 6 times almost from base. Gonads flat, as interradiar pads. Marginal bulbs small but broad, triangular, with 10–13 short tentacles; adaxial ocelli crescent-shaped. Medusa buds produced directly from manubrium or from polypoid structures developed on manubrium.

N.Z. RECORDS: NZOIS t n 404.

SEASONALITY: December.

DISTRIBUTION: Atlantic, Indo-Pacific, Mediterranean.

KEY REFERENCES: Winkler (1982), Pagès *et al.* (1992), Bouillon (1995b), He Zhenwu & Xu Renhe (1996).

HYDROID: Unknown.

***Bougainvillia vervoorti*** Bouillon, 1995b (Fig.18)

Umbrella slightly higher than wide, 4–10 mm high, 4–

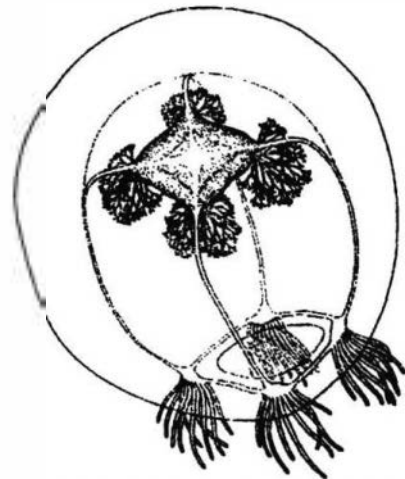
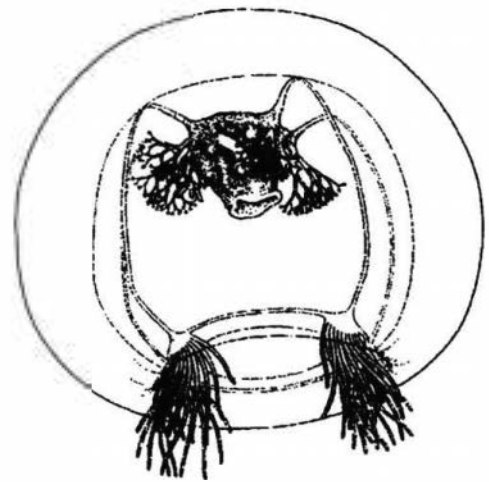


Fig. 17. *Bougainvillia platygaster*. After Bouillon (1995b). Top, lateral view, with medusa buds and a hydranth on manubrium. Bottom, latero-apical view.

6 mm wide; almost subglobular with rounded top, basal part of bell quadrangular; jelly thick, mainly in upper part of umbrella but thinning down towards umbrella margin. Manubrium short, one-quarter of bell cavity height, conical, cruciform in cross section, with 4 well-developed perradial extensions along course of radial canals; a slight peduncle may be indicated; basal trunk of oral arms moderately short, each tentacle branching 5–7 times. Polypoid structures on manubrium. Gonads situated in interradii of manubrium and extending largely on perradial lobes, eggs covered with cnidocysts (microbasic euryteles). Marginal bulbs rounded-triangular to U-shaped, less than half as wide as interradiar spaces, bell margin between bulbs concave; usually from 18 to 30 marginal tentacles; ocelli dark red on tentacle bulbs near base of tentacles.



N.Z. RECORDS: NZOI Stns B705, B706; Wellington Harbour; Portobello (Schuchert 1996).

SEASONALITY: January, April, September, November, December.

DISTRIBUTION: Endemic to New Zealand.

KEY REFERENCES: Bouillon (1995b), Schuchert (1996).

HYDROID: Colonies arising from an attached, ramifying stolon; mostly stolonial, rarely branched. Pseudohydrothecae forming thin film over hydranths, often absent in older polyps; hydranths with one whorl of 8–12 amphicoronate filiform tentacles of unequal length. Medusae buds arising on short stalks from either cauli or stolons. (Schuchert 1996)

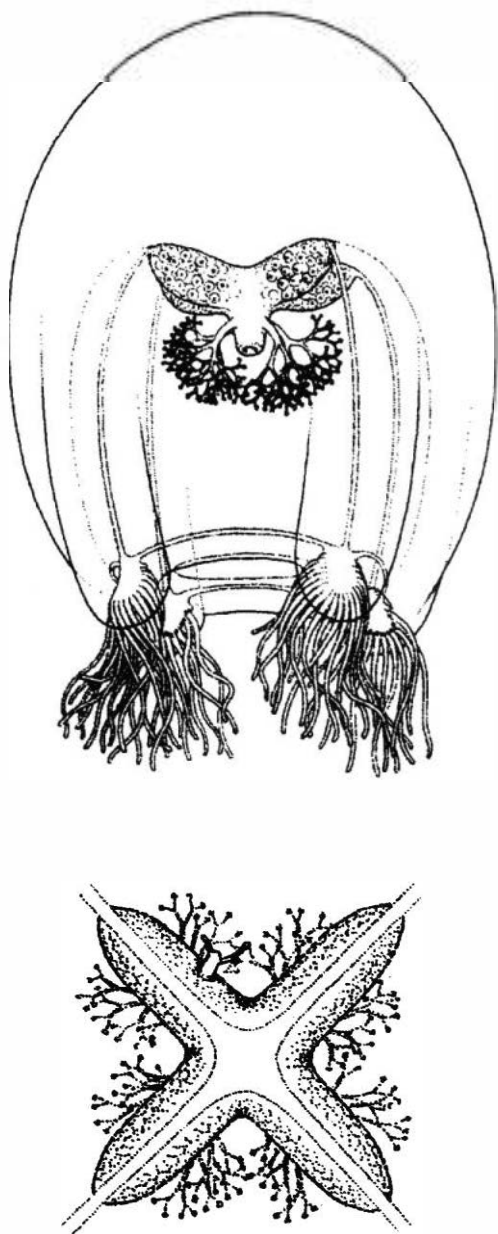


Fig. 18. *Bougainvillia vervoorti*. After Bouillon (1995b).

### *Koellikerina* Kramp, 1939

Medusae with 8 groups of marginal tentacles, 4 perradial and 4 interradial, all alike in structure; with 4 oral perradial tentacles dichotomously branched. Gonads on manubrium in adradial; interradial or perradial position. With or without ocelli.

Hydroid: Only known for *K. fasciculata*.

### *Koellikerina maasi* (Browne, 1910) (Fig. 19)

Umbrella 10 mm high, 9 mm wide, cylindrical, walls very thick, no gastric peduncle. Manubrium fairly large and high, about half as long as bell cavity, cross-shaped in section. Oral tentacles with a short basal trunk, divided 7 or 8 times, ending in very small terminal cnidocyst clusters. Gonads in four voluminous masses covering nearly the interradial wall of manubrium, separated perradially, smooth or with irregular folds. 8 groups of 5–7 marginal tentacles decreasing in length from median one towards both sides. Marginal bulbs scarcely visible, linear, sometimes presenting a triangular thickening; no ocelli.

N.Z. RECORDS: NZOI Stn N465.

SEASONALITY: February.

DISTRIBUTION: Antarctic, Indo-Pacific.

KEY REFERENCES: Bouillon *et al.* (1986, 1988a), Bouillon (1995b).

HYDROID: Unknown.

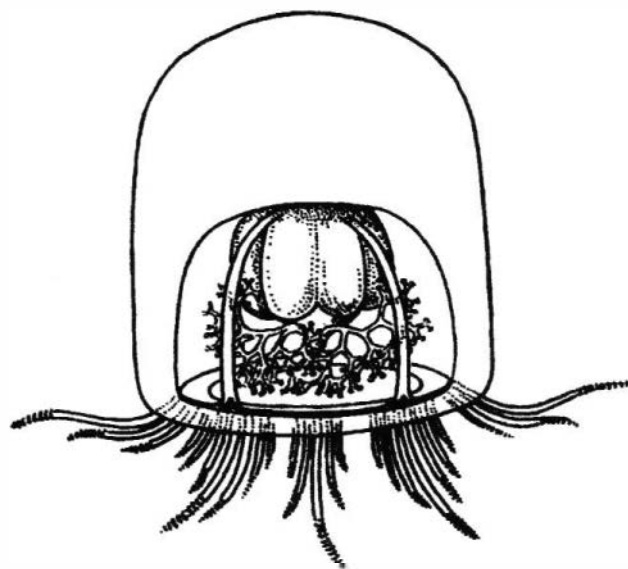


Fig. 19. *Koellikerina maasi*. After Kramp (1968).

Family **CLAVIDAE** McCrady, 1859

Anthomedusae with bell-shaped umbrella. Short manubrium; a gastric gelatinous peduncle or with vacuolated endodermal cells forming a pseudopeduncle; mouth armed with a continuous row of sessile cnidocyst clusters along whole margin. 4 radial canals and circular canal. Solitary solid tentacles, numerous in adults. Gonads on interradial walls of manubrium; adaxial ocelli.

Hydroid: Stolonal or erect ramifying colonies. Hydranths sessile or pedicellated, naked, occasionally with a thin perisarc cone or tube into which hydranth can retract (*Merona*, *Rhizogeton*, *Tubiclava*); with filiform tentacles scattered over hydranth body. Nematophores present or absent. Free medusae or sporosacs developing from hydrorhiza, hydrocaulus, or from reduced hydranths (blastotyles).

- 1 with manubrium mounted upon a short, solid, pyramidal, gelatinous, peduncle without endodermal vacuolated cells ..... *Oceania*
- 1a with manubrium mounted upon a pseudopeduncle formed by highly vacuolated endodermal cells ..... *Turritopsis*

***Oceania*** Kölliker, 1853

Medusae with a short, solid, pyramidal, gelatinous, peduncle without endodermal vacuolated cells.

Hydroid: not known from field, see below.

***Oceania armata*** Kölliker, 1853 (Fig. 20)

Umbrella 8–10 mm wide and high, bell-shaped to pyriform, with flat top, walls uniformly thin; manubrium flask-shaped, cruciform in transverse section, on a shallow mesogleal peduncle; mouth rim crenulated, with a continuous row of spherical sessile cnidocyst clusters. 100–200 solid marginal tentacles, densely crowded, marginal bulbs elongated, alternately slightly displaced adaxially and abaxially. Gonads on interradial walls of manubrium; adaxial ocelli.

N.Z. RECORDS: *Dana* Stns 3620, 3621, 3622, 3623, 3625, 3626, 3627, 3631, 3637, 3653, 3654, 3655; NZOI Stn 404  
SEASONALITY: January, December.

DISTRIBUTION: Atlantic, Indo-Pacific, Mediterranean.  
KEY REFERENCES: Metschnikoff (1886), Schuchert (1996).  
HYDROID: Hydroid not known from field; the development of *Oceania armata* was followed by Metschnikoff (1886) who obtained ramifying colonies with claviform hydranths having up to 13 filiform tentacles alternating in 3 to 4 whorls; gonophores not known.

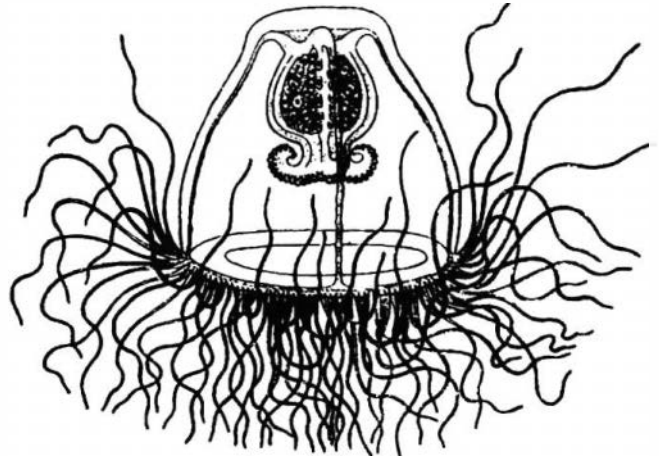


Fig. 20. *Oceania armata*. After Kramp (1968).

***Turritopsis*** McCrady, 1859

Medusae with a pseudopeduncle formed by highly vacuolated endodermal cells.

Hydroid: known only in *Turritopsis nutricula*, see below.

***Turritopsis nutricula*** McCrady, 1859 (Fig. 21)

Umbrella 4–11 mm high, bell-shaped to pyriform, higher than wide, mesoglea thicker at apex. Manubrium large, cross-shaped in transverse section, red in colour. 4 radial canals which continue through the 4 compact vacuolated endodermal masses situated above digestive part of manubrium; 4-lipped mouth with a continuous row of sessile cnidocyst clusters along margin. 80–120 closely spaced marginal tentacles. Gonads interradial, mature females often with developing embryos and planulae; adaxial ocelli.

N.Z. RECORDS: *Galathea* Stn 645; NZOI Stns N356, N384, N400, N421; Bare Island, Hawke Bay (Kramp 1928); Cook Strait (Kaberry 1937); Auckland (Jillett 1971); Leigh Marine Reserve, Whangateau Harbour (Barnett 1985); Auckland, Wellington, Leigh Marine Reserve (Schuchert 1996).

SEASONALITY: January, April, May, July, August, October, November, December,

DISTRIBUTION: Atlantic, Indo-Pacific, Mediterranean.  
KEY REFERENCES: Bavestrello *et al.* (1992), Schuchert (1996), He Zhenwu & Xu Renhe (1996), Piraino *et al.* (1996).

HYDROID: Colonies stolonal or erect, then irregularly branched and increasing in diameter from base to distal

end; hydrocaulus monosiphonic in small colonies, polysiphonic in larger; branches adnate and parallel to hydrocaulus or to other branches for some distance before curving away at an acute angle and becoming free; hydrocaulus and hydroclades covered by a firm perisarc mostly infested with detritus and algae, without annulations and terminating below hydranth base. Hydranths terminal, naked, elongated, fusiform, with 12–38 filiform tentacles scattered over distal three-quarters of hydranth, proximal ones shorter than distal; hypostome elongated conical. Medusae buds arising mostly one by one from short stems below hydranths, pear-shaped, enclosed in perisarc.

(Millard 1975; Calder 1988; Schuchert 1996)

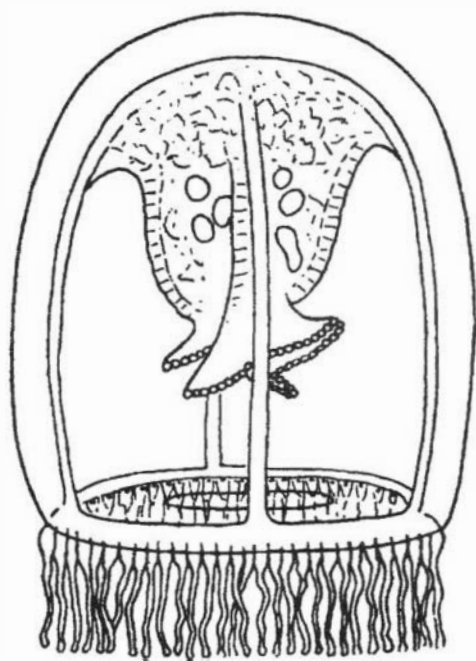


Fig. 21. *Turritopsis nutricula*. After Kramp (1968).

#### Family CYTAEIDIDAE L. Agassiz, 1862

Medusae with a bell-shaped umbrella. Manubrium bulbous, with simple, circular mouth; 4 or more unbranched oral arms on or very near mouth rim. 4 radial canals and circular canal; 4 or 8 marginal solid tentacles. Gonads in interradial position or encircling manubrium; without ocelli.

Hydroid: Hydroids forming non-polymorphic colonies arising from reticulate stolons covered by perisarc. Hydranths sessile, with one whorl of filiform tentacles below conical hypostome; naked but base of hydranths often with a perisarc collar; spines absent. Free medusa or sporosacs develop on hydrorhiza.

#### *Cytaeis* Eschscholtz, 1829

With the characters of the family; only 4 marginal tentacles.

#### *Cytaeis* sp.\*

(Fig. 22)

Umbrella up to 5 mm wide, 6 mm high, pear-shaped to globular, apical mesoglea about twice as thick as lateral walls; with or without a slight peduncle. Manubrium large, pear-shaped; mouth with up to 32 simple, more or less capitate and adnate oral tentacles; 4 broad radial canals. Marginal tentacle bulbs large, pyriform to triangular, attached to exumbrella. Medusae buds on base of manubrium.

N.Z. RECORDS: *Galathea* Stn 677.

SEASONALITY: March.

DISTRIBUTION OF THE GENUS: Atlantic, Indo-Pacific, Mediterranean.

KEY REFERENCES: Rees (1962), Bouillon *et al.* (1986), Calder (1988), van der Spoel & Bleeker (1988), Bouillon *et al.* (1991).

HYDROID: Hydroids forming non-polymorphic stolonial colonies; hydrorhiza of anastomosing perisarc covered stolons. Hydranths sessile, naked, clavate to columnar, often with a perisarc collar, with one whorl of filiform tentacles surrounding a conical hypostome. Gonophores developing directly on hydrorhiza in the form of free medusae; fixed sporosacs.

(Millard 1975; Bouillon 1985; Calder 1988)

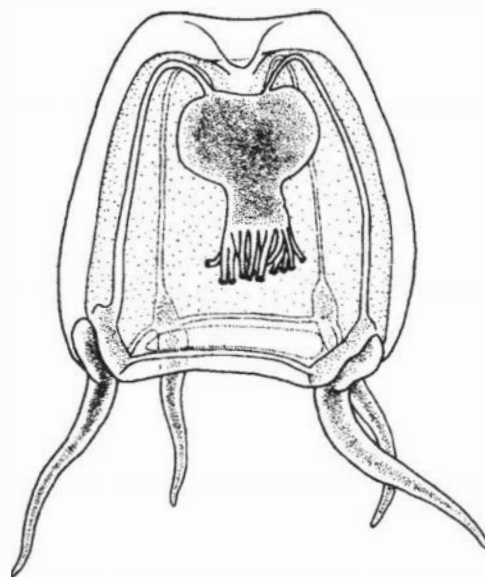


Fig. 22. *Cytaeis* sp. After Pagès *et al.* (1992).

(\* several polyp known species with very similar medusae)

Family EUCODONIIDAE Schuchert, 1996

Medusae with a bell-shaped umbrella with thickened apex. Manubrium cylindrical, with conical gastric peduncle; mouth quadrangular with 4 inconspicuous lips armed with cnidocysts; 4 radial canals and circular canal. Gonads encircling manubrium. 4 solid marginal tentacles with a terminal swelling; marginal bulbs small; without ocelli.

Hydroids: not known.

*Eucodonium* Hartlaub, 1907

With the characters of the family.

*Eucodonium brownei* Hartlaub, 1907 (Fig. 23)

Umbrella up to 1 mm high and wide; mouth lips each containing each a group of about 100 cnidocysts; marginal bulbs with blackish pigment granules; cnidocysts along the entire tentacle surface and in terminal swellings. Medusae buds arising from middle region of manubrium.

N.Z. RECORDS: Leigh Marine Reserve, Whangateau Harbour (Barnett 1985).

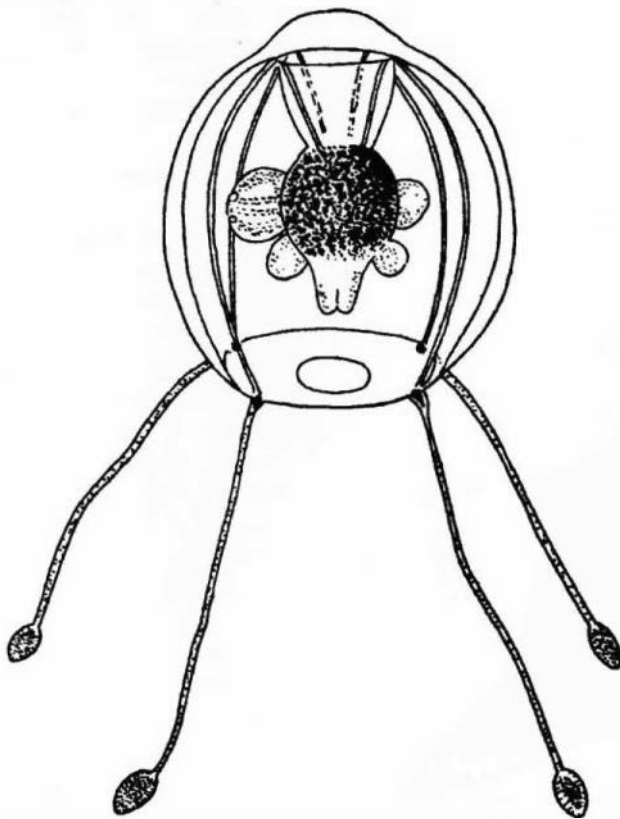


Fig. 23. *Eucodonium brownei*. After Browne (1906).

SEASONALITY: February, March, December.

DISTRIBUTION: Atlantic, Indo-Pacific, Mediterranean.

KEY REFERENCES: Picard (1955), Brinckmann-Voss (1970), Schuchert (1996).

HYDROID: Unknown.

Family HYDRACTINIIDAE L. Agassiz, 1862

Medusae more or less bell-shaped; with or without slight apical process. Manubrium tubular to sac-shaped, not extending beyond umbrellar margin; with or without gastric peduncle; mouth with 4 simple or branched oral lips elongated to form arms armed with terminal clusters of cnidocysts (exceptionally mouth rim simple and armed with a cnidocyst ring: *Kinetocodium*, not present in New Zealand). 4, 8 or more solitary, solid, marginal tentacles. 4 radial canals and circular canal. Gonads on manubrium, interradial, sometimes extending along proximal portions of radial canals with or without ocelli

( Bouillon *et al.* 1997; Boero *et al.* 1998).

Hydroid: Colonies with hydrorhiza either stolonal and reticular, formed by stolonal tubes covered with perisarc, sometimes forming protective tubes (*Clavactinia protecta*), or encrusting, covered with naked coenosarc, or forming a calcareous hydrorhizal skeleton, frequently with chitinous or calcareous spines; sometimes forming branches. Hydranths sessile, naked, polymorphic. Gastrozooids with one or more whorls of oral filiform tentacles, or with scattered tentacles on distal half of body. Gonozooids with one or more whorls of oral tentacles or without tentacles and mouth, giving rise to free medusae or sporosacs. Dactylozooids, when present, without tentacles. Vesicles of unknown function present or not. Reproduction by fixed sporosacs, eumedusoids, or free medusae generally borne on gonozooids, exceptionally on hydrorhiza.

*Hydractinia* (van Beneden, 1841)  
(junior synonym = *Podocoryna*)

Hydractiniid medusae with 4 or more solid, simple marginal tentacles, not in groups. Usually 4 or 8 simple or slightly branched mouth arms (which are dilatations of the periradial corners of the mouth rim) armed with clusters of cnidocysts; with or without gastric peduncle. Gonads on manubrium, interradial, but sometimes extending along proximal parts of radial canals; with or without ocelli. Sometimes asexual reproduction by medusa budding on manubrium.

Hydroid: Colonies with a stolonal reticular hydro-

rhiza formed by tubes covered with perisarc, or with an encrusting hydrorhiza covered with perisarc or with naked coenosarc; frequently with simple, canaliculated or branched spines. Hydranths sessile, naked, polymorphic: gastrozooids, gonozooids, and occasionally dactylozooids. Gastrozooids with one or more close whorls of tentacles encircling the hypostome. Gonozooids with one or more close whorls of tentacles or without tentacles and/or hypostome, being reduced to blastostyles. Dactylozooids without tentacles. Gonophores either fixed sporosacs, liberable or retained eumedusoids, or free medusae, arising from varyingly developed gonozooids or directly from the hydrorhiza.

- 1 mouth with 4 short lips each with a cluster of cnidocysts, not prolonged as mouth-arm; adult medusa not known ..... *Hydractinia bella*
- 1a oral arms well developed, simple, undivided ..... 2
- 2 with 4 marginal tentacles ..... *Hydractinia minima*
- 2a with more than 4 marginal tentacles ..... 3
- 3 with 8 marginal tentacles ..... *Hydractinia minuta*
- 3a with 10 to 14 marginal tentacles ..... *Hydractinia australis*

***Hydractinia australis*** (Schuchert, 1996) (Fig. 24)

Umbrella bell-shaped, up to 1.6 mm, higher than wide to as wide as high, mesoglea thicker at apex, velum when dilated half radius width, slight peduncle (up to one-tenth of manubrium length) may be present or not. Manubrium tubular, length half to two-thirds of bell cavity, with 4 simple perradial clusters of elongated microbasic euryteles at mouth margin. Gonads interradial; 4 radial canals ending in conspicuous marginal bulbs; 4 interradial bulbs mostly present. Tentacle number normally 10–14 (8–16 range).

N.Z. RECORDS: Whangateau Harbour; Leigh Marine Reserve (Barnett 1985 as *Podocoryne* sp. 2) Wellington Harbour (Schuchert 1996).

SEASONALITY: January, February, March, April, November, December.

DISTRIBUTION: Endemic.

KEY REFERENCES: Schuchert (1996).

HYDROID: Hydroid colonies growing on living gastropod shells or on gastropod shells inhabited by hermit crabs. Hydranths arising from an encrusting hydrorhiza covered with a layer of naked perisarc; polymorphic. Gastrozooids with 10–20 unequal filiform tentacles; small thin gonozooids with 3–6 filiform tentacles and somewhat below them a zone of medusae buds (1–8 buds); and rarely with long slender tentaculozooids; spines isolated and smooth.

(Schuchert 1996)

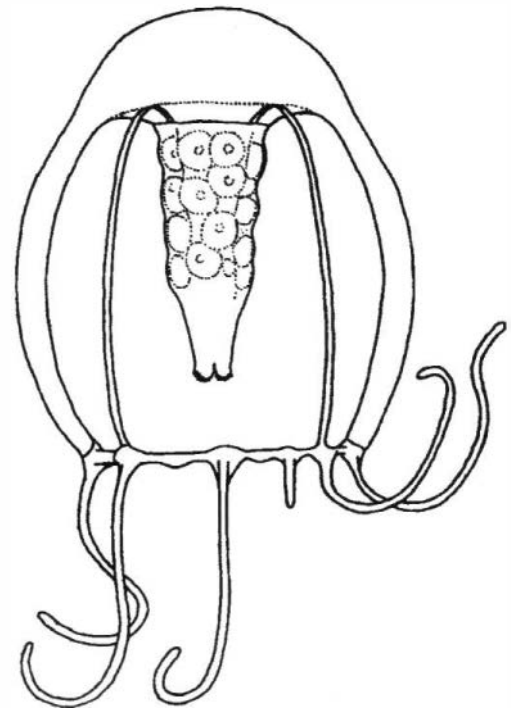


Fig. 24. *Hydractinia australis*. After Schuchert (1996).

***Hydractinia bella*** Hand, 1961 (Fig. 25)

Only young medusae are known, collected from the hydroid phase which occurs epizoically on the pigfish *Congiopodus leucopaecilus*. Umbrella hemispherical, 0.8 mm high and 1 mm broad, without apical projection; mesoglea rather thin, of uniform thickness; no peduncle present. Manubrium about half length of umbrella cavity, cylindrical; mouth with 4 perradial clusters of elongated microbasic euryteles; lips not elongated to oral arms. No incipient gonads visible; 4 radial canals and circular canal present, these rather thin. 4 perradial marginal tentacles and 4 interradial marginal tentacles, all of similar length; all with a tentacle bulb; no ocelli observed, cnidocysts arranged in rings.

Adult medusa: Unknown. According to Schuchert (1996) the medusa resembles those of *Hydractinia australis* Schuchert, 1996.

N.Z. Records: Otago Harbour (Hand 1961).

SEASONALITY: January, October, November.

DISTRIBUTION: Not known outside New Zealand.

KEY REFERENCES: Mills (1982), Schuchert (1996).

HYDROID: Colonies growing on pigfish. Hydranths sessile, arising from ramifying, loosely adhering stolons, covered by a very thin perisarc, no basal plate. Gastrozooids with one whorl of 6–15 filiform tentacles. Gonozooids scattered in the centre of colonies, half size of



gastrozooids, with 6–8 tentacles only; gonophores in the middle of the gonozooid body.

(Hand 1961; Schuchert 1996)

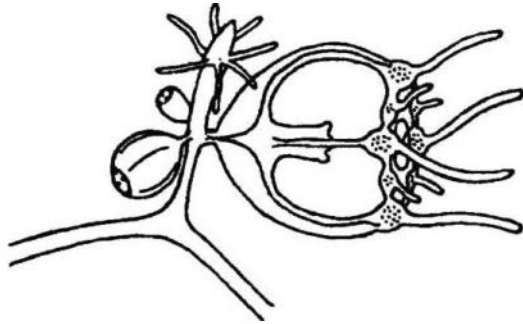


Fig. 25. *Hydractinia bella*. After Kramp (1968).

*Hydractinia minima* (Trinci, 1903) (Fig. 26)

Umbrella globular or dome-shaped, about as high as wide, 0.3–1 mm; mesoglea thin, soft, a slight apical thickening. Manubrium barrel-shaped, length half of umbrella cavity, circular in cross-section; 4 perradial lips elongated to form oral tentacles each terminating in a single spherical cluster of cnidocysts; gastric peduncle short; velum well developed. 4 interradial gonads surrounding manubrium when mature; asexual reproduction by budding from manubrium wall; buds and gonads can be present at the same time. 4 distinct narrow radial canals, circular canal indistinct. 4 solid perradial tentacles each with an oval marginal bulb; no ocelli.

N.Z. RECORDS: Leigh Marine Reserve (Barnett 1985).

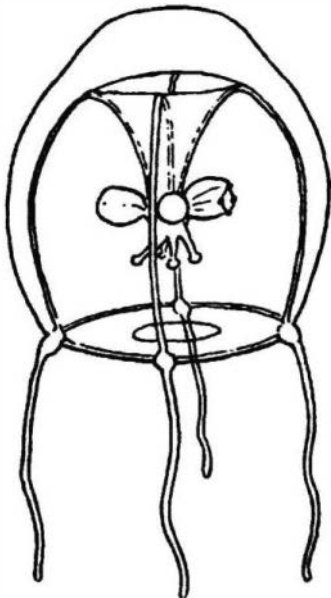


Fig. 26. *Hydractinia minima*. After Kramp (1968).

SEASONALITY: June, July.

DISTRIBUTION: Atlantic; Indo-Pacific; Mediterranean.

KEY REFERENCES: Uchida & Sugiura (1977), Bouillon (1980), Mills (1982), Goy *et al.* (1991), Benovic & Lucic (1996), He Zhenwu & Xu Renhe (1996), Schuchert (1996).

HYDROID: Unknown.

*Hydractinia minuta* (Mayer, 1900) (Fig. 27)

Umbrella 0.5–2 mm high, slightly higher than broad, oval to pear-shaped, with apical projection. Mesoglea moderately thick; velum well developed. Manubrium short, circular in cross-section, on a well-developed gastric peduncle; mouth with 4 perradial lips elongated to form oral arms terminating with a knob of cnidocysts. Medusa buds on interradial walls of manubrium; narrow radial canals and circular canal. 4 perradial and 4 interradial marginal tentacles each with a small oval bulb; no ocelli. Newly released medusa buds with 8 tentacles

N.Z. RECORDS: Whangateau Harbour; Leigh Marine Reserve (Barnett 1985 as = *Podocoryne* sp. 1).

SEASONALITY: January–April, June, July, December.

DISTRIBUTION: Atlantic; Indo-Pacific; Mediterranean.

KEY REFERENCES: Goy (1972), Goy *et al.* (1991), Benovic & Lucic (1996), Schuchert (1996).

HYDROID: Unknown.

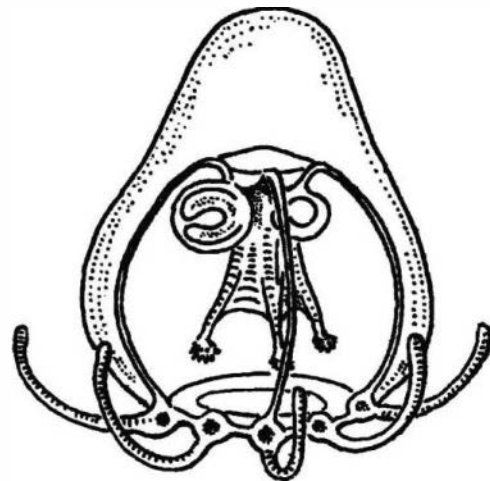


Fig. 27. *Hydractinia minuta*. After Kramp (1959).

Family RATHKEIDAE Russell, 1953

Medusae with somewhat globular umbrella, with slight apical process. Manubrium, short, cylindrical, not extending beyond umbrella margin; with gastric

peduncle; mouth with 4 lips elongated to form either simple or branched oral arms armed with terminal and usually also lateral clusters of cnidocysts; 4–8 radial canals and circular canal. Gonads generally completely surrounding manubrium. 8 groups of solid marginal tentacles; without ocelli.

**Hydroid:** Colonial hydroids arising from ramifying, creeping stolons. Hydranths monomorphic, sessile, with one whorl of filiform tentacles surrounding a rounded hypostome. Free medusa developing on hydrorhiza or more rarely at the base of hydranths.

*Rathkea* Brandt, 1838

Medusa with four radial canals and four oral arms armed with clusters of cnidocysts.

**Hydroid:** with the characters of the family.

- 1 oral armsshort, bifid, each end with a terminal cnidocyst cluster; each arm with one or two pairs of lateral cnidocyst clusters ..... *Rathkea octopunctata*
- 1a oral arms elongated, simple, with a terminal cnidocyst cluster; each arm with 7–11 cnidocyst clusters in a double row ..... *Rathkea formosissima*

*Rathkea formosissima* (Browne, 1902) (Fig. 28)

Umbrella 2.5 mm wide and 3 mm high, pyriform to bell-shaped, with large rounded or dome-shaped, solid, apical projection; mesoglea thin. Manubrium small, short, quadrangular; with a broad gastric peduncle; mouth with 4 oral arms elongated, each with 7–11 cnidocyst clusters in a double row and 1 terminal

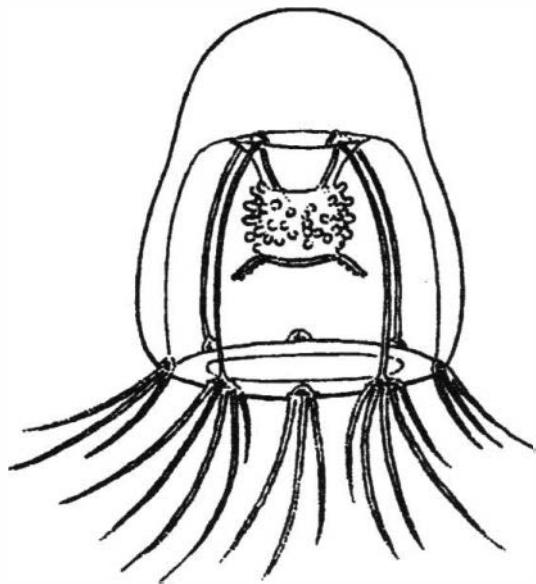


Fig. 28. *Rathkea formosissima*. After Kramp (1959).

cluster; perradial bulbs with 3–5 tentacles, interradial bulbs with 3 tentacles. Gonads interradial in males, divided by 4 narrow furrows, completely covering manubrium in females; young medusae with interradial medusa buds. No ocelli.

**N.Z. RECORDS:** Leigh Marine Reserve (Barnett 1985).

**SEASONALITY:** June.

**DISTRIBUTION:** Atlantic; Indo-Pacific; subantarctic.

**KEY REFERENCES:** O'Sullivan (1984), Schuchert (1996).

**HYDROID:** Unknown.

*Rathkea octopunctata* (M. Sars, 1835) (Fig. 29)

Umbrella somewhat globular, up to 3–4 mm high and 4 mm wide, with rounded or dome-shaped apical process, mesoglea moderately thick, especially in apical region; velum broad. Manubrium short, cylindrical or or 4-sided, with conical peduncle, one-third to one-quarter length of umbrella cavity, not reaching beyond umbrella margin in full extension; mouth with 4 lips, when fully developed each divided at its extremity into 2 short-stalked cnidocyst-knobbed arms and having 1–2 pairs of lateral stalked cnidocyst clusters and one central cluster between the 2 terminal arms. 4 radial canals, circular canal narrow. Gonads completely surrounding manubrium; asexual reproduction by ectodermal budding from manubrium wall. 8 marginal tentacular bulbs; 4 perradial, each with up to 5 tentacles; 4 interradial bulbs each with up to 3 tentacles, at full development; no ocelli.

**N.Z. RECORDS:** Whangateau Harbour; Leigh Marine Reserve (Barnett 1985; Schuchert 1996).

**SEASONALITY:** May–September, November, December.

**DISTRIBUTION:** Atlantic; Indo-Pacific; Arctic; Mediterranean.

**KEY REFERENCES:** Bouillon (1961), Bouillon & Werner (1965), Russell (1970), Arai & Brinckmann-Voss (1980), Purcell (1991), Schuchert (1996).

**HYDROID:** Colonies arising from ramifying creeping stolons. Hydranths small, sessile, cylindrical, naked except at their base where surrounded by a thin gelatinous envelope; hypostome rounded-conical, one whorl of 4–6 thread-like filiform tentacles. Medusa buds arising from stolons, exceptionally from hydranth.

(Rees & Russell 1937; Werner 1956, 1958)

Suborder **PANDEIDA** Haeckel, 1879

The name *Tiarida* Haeckel, 1879 is invalid, *Tiara* Lesson, 1843 being a junior homonym of *Tiara* Swainson, 1832, a mollusc (see Calder 1988). The name *Pandeida* is therefore here chosen for the suborder.



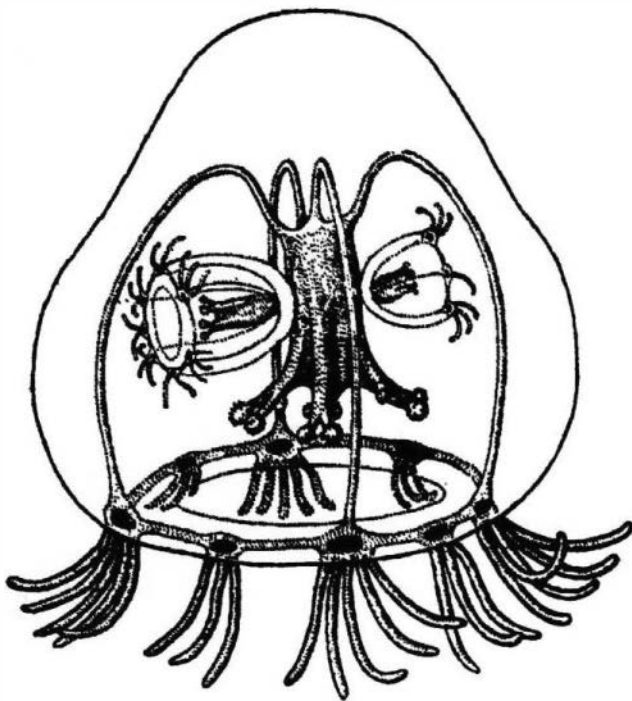


Fig. 29. *Rathkea octopunctata*.  
Top, after Kramp (1968), bottom, after Russell (1953).

Medusae: With hollow tentacles; ocelli when present abaxial. Mouth simple, lips without specialised cnidocyst-armed structures, lacking oral tentacles armed with cnidocyst clusters.

Hydroid: Colonies generally stolonial, not branching, monomorphic. Hydranths when known with conical hypostome; usually with one whorl of filiform

tentacles, exceptionally with 2 or 3 or scattered (*Stomotoca atra*).

- 1 marginal tentacles without basal bulbs or swellings, terminating in a large cnidocyst cluster BYTHOTIARIDAE
- 1a marginal tentacles with basal bulbs, without terminal cnidocyst clusters or capitations ..... 2
- 2 4 marginal tentacles in adults and without rudimentary bulbs; cnidome with merotrichous isorhizas ..... PROTIARIDAE
- 2a 2 or more tentacles in adults; with or without rudimentary bulbs; cnidome without merotrichous isorhizas .... 3
- 3 4-6 or more branched radial canals; manubrium with radial gastric pouches; umbrella with exumbrellar cnidocyst tracks; with usually no circular canal; without rudimentary bulbs ..... PROBOSCIDACTYLIDAE
- 3a 4 unbranched radial canals (rarely 8, *Octotiar*, not present in N.Z. waters); manubrium usually without radial gastric pouches (except *Annatiara*); a typical circular canal; no exumbrellar cnidocyst tracks; with or without rudimentary bulbs ..... PANDEIDAE

Family BYTHOTIARIDAE Maas, 1905

Medusae without apical projection and gastric peduncle; mouth with 4 simple or crenulated lips; with or without centripetal canals. Simple or folded, adradial or interradial gonads on manubrial wall; with 4 or 8 simple or branching radial canals and circular canal. 4 or 8 or more hollow marginal tentacles, either with highly reduced or without basal marginal bulbs, each terminating in a large cnidocyst cluster, their basal portion often adnate to exumbrella; with or without rudimentary or dwarf tentacles; rarely with abaxial ocelli. Mesoglea of distal part of tentacles is often enlarged, strongly reducing the endodermal axis (see Figs 11 and 12, Bouillon 1988a).

Hydroid: When known, living in the prebranchial cavity of ascidians; hydrorhiza formed as a plate giving rise to unbranched colonies. Hydranths sessile with up to 5 irregular whorls of filiform tentacles. Medusae arise from polyps.

- 1 with centripetal canals, blind or joining base of manubrium ..... *Calycopsis*
- 1a without centripetal canals ..... *Bythotiar*

*Bythotiar* Günther, 1903

Medusa with four simple or branching radial canals; without centripetal canals. Gonads interradial with transverse furrows; with or without rudimentary or dwarfed tentacles entirely covered with cnidocysts.

Hydroid: Where known, see family diagnosis.





- 1 with at least 8 marginal tentacles ... *Bythotiara murrayi*  
 1a with 4 marginal tentacles ..... 2
- 2 mature medusa known ..... *Bythotiara* sp.  
 2a only juvenile medusa known .... *Bythotiara parasitica*

*Bythotiara murrayi* Günther, 1903 (Fig. 30)

Umbrella up to about 20 mm wide and high, globe-shaped, with thick walls. Manubrium small, barrel-shaped; mouth with 4 simple lips; generally 4 radial canals bifurcating near point of origin in 8 straight canals joining circular canal (occasionally branching again). In adults 8 long primary tentacles at ends of radial canals, ending in terminal swellings; some secondary tentacles and minute dwarf tentacles. 4 interradial gonads, with transverse furrows.

N.Z. RECORDS: *Dana* Stn 3627.

SEASONALITY: December.

DISTRIBUTION: Atlantic; Indo-Pacific; Mediterranean.

KEY REFERENCES: Bouillon *et al.* (1988a), Pagès *et al.* (1991, 1992), Schuchert (1996).

HYDROID: Unknown.

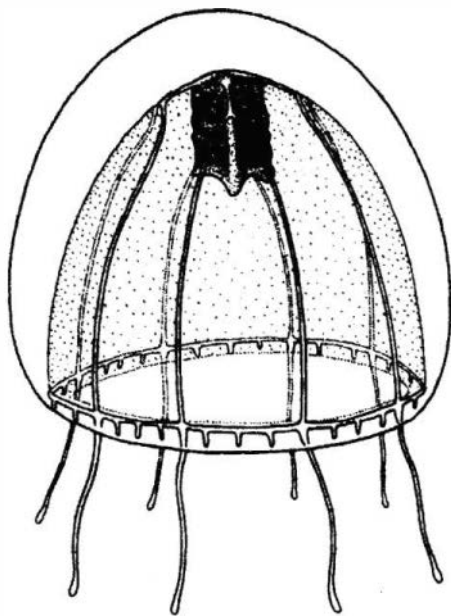


Fig. 30. *Bythotiara murrayi*. After Pagès *et al.* (1992).

*Bythotiara parasitica* (Kirk, 1915) (Fig. 31)

Only newly released medusa known, bell-shaped, 1 mm high, higher than wide; mesoglea moderately thick; exumbrella covered with cnidocytes, which are lost during further development; dilated velum span-

ning one-third of radius. Manubrium somewhat less than half of subumbrellar height, cruciform in cross-section; mouth simple, cruciform; 4 radial canals and circular canal present; tentacle bulbs absent; with 4 perradial tentacles, these shorter than bell height, ending in an intensively orange-coloured terminal swelling; no ocelli present. Perhaps juveniles of *Bythotiara* sp.? (see below).

N.Z. RECORDS: Wellington Harbour (Schuchert 1996).

SEASONALITY: September, October.

DISTRIBUTION: ?

KEY REFERENCES: Schuchert (1996).

HYDROID: Non-branching colonies, living on ascidians, loosely attached to the feather-like buccal tentacles and also around their base. Polyps arising from a plate-like hydrorhiza not covered with perisarc; hydranths on a cylindrical stem, as long as hydranth body, with 20–30 filiform tentacles in 3–4 whorls. Gonophores at the limit between hydranth and caulus. (Schuchert 1996)

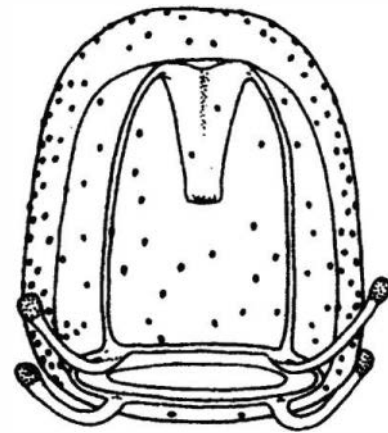


Fig. 31. *Bythotiara parasitica*. After Schuchert (1996).

*Bythotiara* sp. (Fig. 32)

Umbrella 3.0–3.8 mm high, bell-shaped, with thick apical mesoglea (thickness one-quarter of height), lateral walls moderately thick; dilated velum spanning one-third of radius. Manubrium half as long as subumbrellar height, cruciform in cross-section, with 4 simple perradial lips; mouth margin provided with many tightly set cnidocyst clusters and long cilia. Gonads on upper half of manubrium, only slightly separated in perradial position, with an interradial furrow and, in males, with 2 or 3 horizontal folds that are quite variable from animal to animal and can be absent in females. 4 simple, smooth radial canals and a circular canal present; no tentacle bulbs present; 4 perradial tentacles, without basal swelling, adnate to

exumbrella for some distance, shorter than bell height, terminating in an intensively orange-coloured knob with cnidocysts; no ocelli.

N.Z. RECORDS: NZOI Stn B706 (as ?*B. huntsmani*); Wellington, Portobello (Schuchert 1996).

SEASONALITY: January, April, May, July–October, December.

DISTRIBUTION: ?

KEY REFERENCES: Bouillon (1995b), Schuchert (1996).

HYDROID: Unknown.

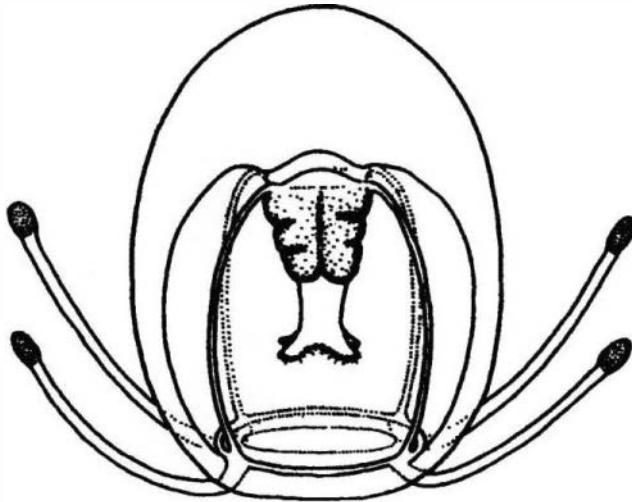


Fig. 32. *Bythotiarra* sp. After Schuchert (1996).

### *Calyropsis* Fewkes, 1882

Medusa with unbranched radial canals; with centripetal canals. Gonads transversely folded, often forming eight adradial rows; marginal tentacles of similar structure with cnidocysts only on the terminal knob and with adnate base. Hydroid unknown.

### *Calyropsis bigelowi* Vanhöffen, 1911 (Fig. 33)

Umbrella up to 16 mm wide and high, almost spherical, mesoglea thick. Manubrium length two-thirds that of subumbrellar cavity; mouth with 4 small lips. 8 long perradial and interradial tentacles and up to 40 smaller marginal tentacles of different length; base of tentacles adnate on exumbrella, short tentacles without terminal swellings. 4 radial canals, connected to manubrium by mesenteries; with 1 interradial blind centripetal canal in each quadrant. Gonads interradial, with 8 adradial rows each with about 16 transverse folds.

N.Z. RECORDS: NZOI Stn X480.

SEASONALITY: October.

DISTRIBUTION: Atlantic; Indo-Pacific.

KEY REFERENCES: Bouillon *et al.* (1988a), He Zhenwu & Xu Renhe (1996), Schuchert (1996).

HYDROID: Unknown.

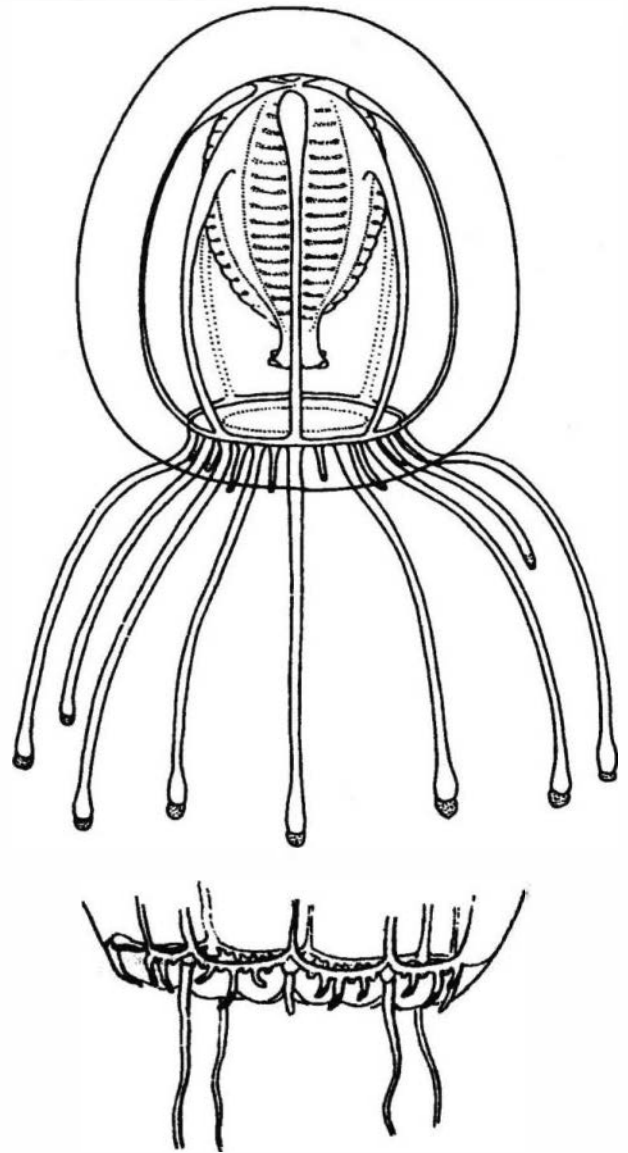


Fig. 33. *Calyropsis bigelowi*. Top, after Schuchert (1996), bottom, after Kramp (1968).

### Family PANDEIDAE Haeckel, 1879

Medusae with or without an apical projection. Manubrium quadrate, usually large; with or without gastric peduncle; mouth with either 4 simple, or crenulated, or complexly folded lips. 4 radial canals (exceptionally 8 as in *Octotiarra*, not present in New Zealand), often broadened or ribbon-like or with jagged margin; rarely centripetal canals; with or without mesenteries. Gonads, either with smooth surface or

complexly folded, on manubrium walls in adradial or interradial positions, sometimes extending along radial canals. 2 or more hollow marginal tentacles, mostly with tapering, elongated, conical (almost carrot-shaped), and often laterally compressed bulbs; with or without rudimentary tentacles, tentaculæ or marginal warts; with or without abaxial ocelli. Cnidome usually containing microbasic euryteles.

Hydroid: Colonies usually stolonial, not branching. Hydranths bearing one whorl of filiform tentacles, exceptionally 2 whorls, scattered tentacles, or no tentacles; perisarc developed to a variable degree, occasionally forming a pseudohydrotheca or missing completely.

Reproduction mainly by free medusae except in some genera of questionable affinity like *Nudiclava*.

- 1 with only 2 well-developed marginal tentacles in adults ..... *Amphinema*
- 1a with more than 2 well developed tentacles in adults 2
- 2 without mesenteries ..... 3
- 2a with mesenteries ..... 5
- 3 with 4 perradial manubrial lobes ..... *Amatiara*
- 3a without perradial manubrial lobes ..... 4
- 4 gonads oval, smooth ..... *Barnettia*
- 4a gonads horse shoeshaped, folded ..... *Halitholus*
- 5 gonads smooth or corrugated; 4 fairly simple lips 8
- 5a gonads reticulate or folded, or both; oral lips more or less folded or crenulated ..... 6
- 6 gonads reticulate, with isolated interradial pits 7
- 6a gonads reticulate, without isolated interradial pits, horseshoe-shaped, with diverging horizontal folds, connected by interradial transverse bridge *Leuckartiara*
- 7 gonads reticulate, without surrounding folds *Pandea*
- 7a gonads with horizontal adradial folds directed towards interradial ..... *Neoturris*
- 8 manubrium quadrangular, very short and broad, with large base, its entire upper surface attached to the sub-umbrella; gonads large, sheet-like, smooth, completely covering all interradial surface and provided in living specimens with 3–4 dark red spots ..... *Pandopsis*
- 8a manubrium cruciform, fairly long, flask-shaped; gonads usually adradial, smooth or exceptionally weakly corrugated ..... *Merga*

### *Amphinema* Haeckel, 1879

Medusa generally with a considerable apical projection; never with more than 2 opposite hollow marginal tentacles; marginal warts or tentaculæ; with-

out gastric peduncle. Manubrium with broad base; with or without mesenteries; mouth with 4 simple lips; gonads adradial or interradial, occasionally extending along radial canals; with or without ocelli.

Hydroid: When known, forming stolonial colonies with creeping hydrorhiza, giving rise to well-developed unbranched hydrocauli with a terminal hydranth, the hydrocaulus perisarc often infested by detritus and extending to the base or the middle of the hydranths body but not developing a real pseudohydrotheca. Hydranths with one whorl of amphicoronate filiform oral tentacles; polyps bending back with mouth facing towards substratum when stressed; medusa buds borne on short peduncles arising from hydrorhiza, from hydrocauli or from both.

- 1 gonads simple, without folds; with marginal warts, no marginal tentaculæ ..... *Amphinema dinema*
- 1a gonads folded; with short marginal tentaculæ ..... *Amphinema rugosum*

### *Amphinema dinema* (Péron & Lesueur, 1810)

(Fig. 34)

Umbrella up to 4 mm wide and 6 mm high, bell-shaped, with a large, conical, solid, apical projection, mesoglea of uniform thickness besides top. Manubrium cross-like in section, flask-shaped, almost as long as bell cavity; mouth cruciform with 4 prominent, recurved lips. 2 very long tapering opposed marginal tentacles with large elongated conical basal bulbs and 12–24 small marginal warts, without tentaculæ. 8 simple adradial smooth gonads. No ocelli.

RECORDS FROM N.Z.: Wellington Harbour (Schuchert 1996).

SEASONALITY: January.

DISTRIBUTION: Atlantic; Indo-Pacific; Mediterranean.

KEY REFERENCES: He Zhenwu & Xu Renhe (1996); Schuchert (1996).

HYDROID: Colonies stolonial, with creeping hydrorhiza, giving rise to well-developed unbranched hydrocauli with a terminal hydranth, hydrocauli longer than hydranths and covered by thin perisarc, with or without basal annulations, often infested by detritus and extending to base of hydranths but not developing a pseudohydrotheca. Distal perisarc margin on hydranth body difficult to observe; hydranths spindle-shaped with a rounded-conical hypostome, with one whorl of 8–14 amphicoronate filiform tentacles. Medusa buds borne singly on short peduncles arising from hydrorhiza. (Rees & Russell 1937; Russell 1953; Schuchert 1996)



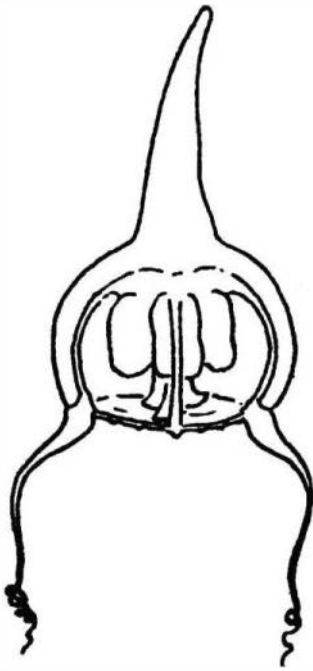


Fig. 34. *Amphinema dinema*. After Kramp (1968).

*Amphinema rugosum* (Mayer, 1900a) (Fig 35)

Umbrella up to 6 mm high, slightly higher than wide, bell-shaped, with a large conical to hemispherical apical projection, mesoglea uniformly thin besides top; with slight perradial furrows in top umbrella. Manubrium flask-shaped, cruciform in section, reaching almost to umbrella margin; mouth cruciform, with 4 prominent, slightly recurved lips. 8 gonads in adradial pairs, with 3 or 4 characteristic folds directed interradially; 4 broad radial canals with jagged and smooth margins. 2 diametrically opposed marginal tentacles with large, hollow, conical, tapering very long bulbs; with 14–24 small marginal tentaculæ; no ocelli.

RECORDS FROM N.Z.: *Dana* Stns 3620, 3641, 3645; NZOI Stns N356, N420; Cook Strait (Kaberry 1937); Avon-Heathcote Estuary (Roper *et al.* 1983); Goat Island, Leigh; Whangateau Harbour (Barnett 1985); Wellington Harbour (Schuchert 1996).

SEASONALITY: January–July, October, December.

DISTRIBUTION: Atlantic; Indo-Pacific; Mediterranean.

KEY REFERENCES: Bouillon (1995b); Schuchert (1996).

HYDROID: Colonies stolonial, with creeping hydrorhiza, giving rise to single or slightly branched hydrocauli with terminal hydranths; perisarc with 2–5 annulations at hydrocauli base and extending to middle of the hydranth body where it adheres to polyp with a well-marked end, perisarc often infested with detritus. Hydranths spindle shaped, with a dome-shaped hypo-

stome and one whorl of 8–12 amphicoronate filiform oral tentacles. 1–3 medusa buds borne on short stems from hydrorhiza and from hydrocauli.

(Rees & Russell 1937, Russell 1953; Schuchert 1996)

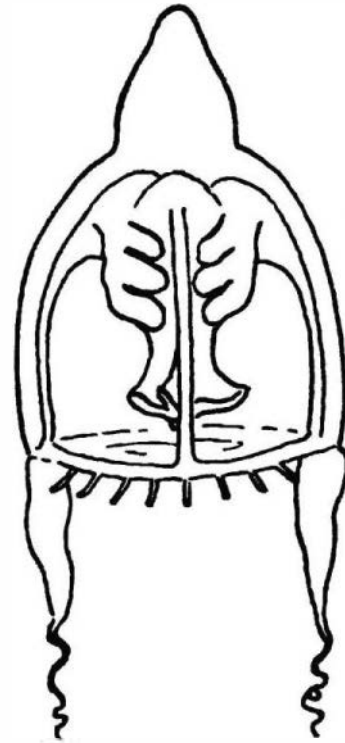


Fig. 35. *Amphinema rugosum*. After Kramp (1968).

*Annatiara* Russell, 1940

Medusa without apical projection; exumbrella with cnidocyst tracks. Manubrium short, very broad, cruciform, with 4 large lobes closely connected with proximal half or more of 4 radial canals; without mesenteries; mouth very broad, cruciform, with folded margin. Several hollow marginal tentacles of two sizes regularly alternating, rudimentary tentacles present; without marginal warts or tentaculæ; with abaxial ocelli.

Only one species.

*Annatiara affinis* (Hartlaub, 1914) (Fig 36)

Umbrella up to 25 mm wide and high, bell-shaped, mesoglea uniformly thick, no apical projection, exumbrella with meridional cnidocyst tracks. Manubrium short, very broad, cruciform, with 4 large perradial lobes closely connected with proximal half or more of 4 radial canals; mouth very broad, cruciform, with much-folded margin. Up to 44 large marginal tentacles with laterally compressed basal bulbs claspung umbrella margin but without true abaxial spurs; alternating

with rudimentary marginal bulbs or small marginal tentacles, all with an abaxial ocellus. Gonads interradial with several irregular vertical folds, well developed adradially and regularly arranged along sides of per-radial lobes.

RECORDS FROM N.Z.: *Dana* Stns 3626, 3630, 3631, 3656; NZOI Stns N371, U799.

SEASONALITY: January, December.

DISTRIBUTION: Atlantic; Indo-Pacific; Arctic.

KEY REFERENCES: Bouillon (1980, 1985b); Winkler (1982); Bleeker & van der Spoel (1988); Schuchert (1996).

HYDROID: Unknown.

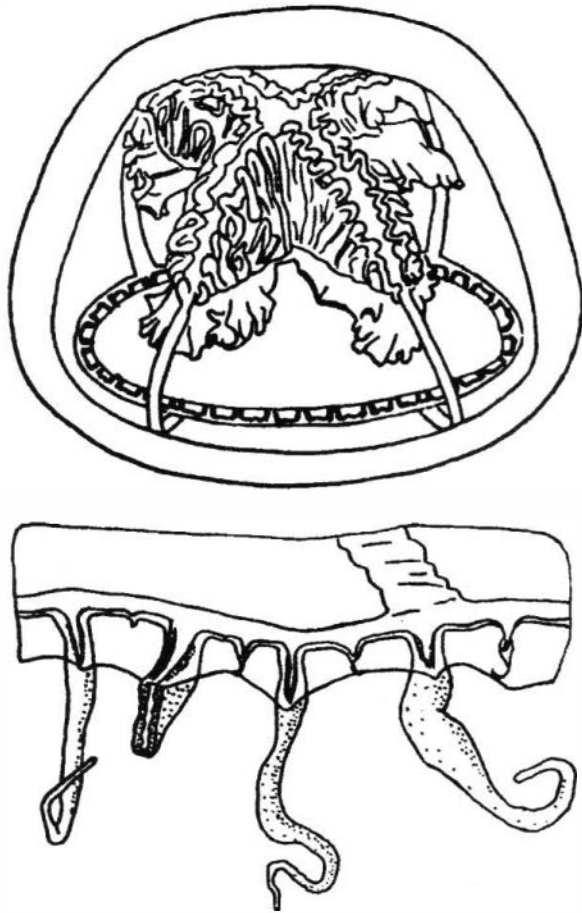


Fig. 36. *Amatiara affinis*. Top, after Kramp (1968); bottom, after Kramp (1926).

*Barnettia* Schuchert, 1996

Medusa with eight hollow, long tentacles between each pair of which are cirri-like small tentacles without bulbs, with chordoid endoderm; the cirri-like tentacles are evenly spaced and not associated with the larger tentacles. Manubrium small, with 4 simple perradial lips. Gonads interradial, smooth. 4 radial canals

present, without mesenteries; apical projection may be present; ocelli lacking.

*Barnettia caprai* Schuchert, 1996 (Fig. 37)

Umbrella up to 2 mm, but mostly smaller, bell-shaped, varying from as broad as high to higher than broad; mesoglea thick, forming a blunt apical projection. Manubrium about half length of bell cavity, with 4 simple perradial lips without cnidocysts. 4 large, inter-radial gonads covering almost the whole manubrium, with a smooth surface and margin. 4 radial canals, moderately thin and smooth; circular canal broader than radial canals; no mesenteries present, or these only indicated. In adults 4 perradial and 4 interradial long tentacles, length up to 1 mm (preserved material); tentacles with large conical bulbs tapering into the tentacles which are proximally hollow and distally filled with parenchymatic endoderm; between each pair of these large tentacles 2 (sometimes 3) evenly spaced, small, cirri-like tentacles with chordoid endoderm; no ocelli.

RECORDS FROM N.Z.: Near Goat Island, Leigh Marine Reserve; Whangateau Harbour (Barnett 1985).

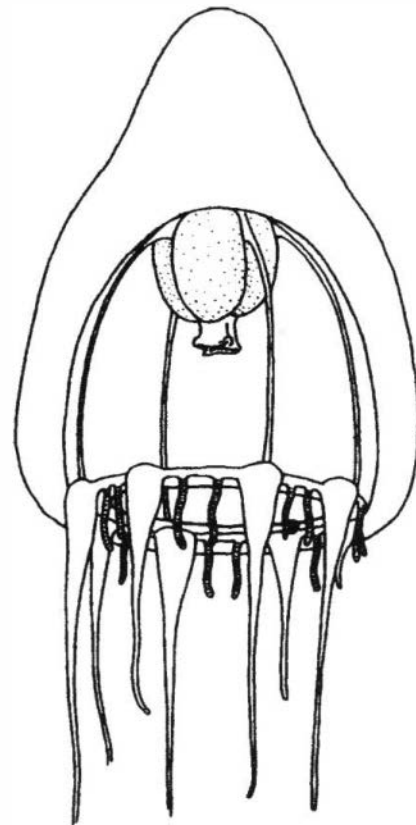


Fig. 37. *Barnettia caprai*. After Schuchert (1996).

Seasonality: February–July.  
 DISTRIBUTION: Endemic.  
 KEY REFERENCES: Schuchert (1996).  
 HYDROID: Unknown.

*Halitholus* Hartlaub, 1914

Medusa with large dome-like apical projection. Manubrium cubical. Gonads more or less horse-shoe-shaped, folded; mouth rim faintly crenulated. Radial canals comparatively narrow, not or very faintly jagged; no mesenteries. 4 or more hollow marginal tentacles; with or without ocelli.

*Halitholus pauper* Hartlaub, 1914 (Fig. 38)

Umbrella up to 10 mm high, 9 mm wide, with a low rounded apical projection about half the height of exumbrella, lateral mesoglea thin. Manubrium flask-shaped, massive, half as long as umbrella cavity; mouth cruciform, moderately crenulated; radial canals broad, jagged, entering manubrium from aboral side, no mesenteries. Gonads adradial, with 4–6 perradially directed folds and with conspicuous interradiation connection (giving a general horse-shoe appearance). 4 large perradial marginal tentacles with thick base, then tapering, clasping umbrella margin and with 4 interradial marginal tentacles usually smaller; with very few, 1–3, rudimentary bulbs between adjacent tentacles; all bulbs with adaxial ocelli.

RECORDS FROM N.Z.: Wellington Harbour (Schuchert 1996).  
 SEASONALITY: December.  
 DISTRIBUTION: Atlantic; Indo-Pacific; Arctic.  
 KEY REFERENCES: Arai & Brinckmann-Voss (1980); Schuchert (1996).  
 HYDROID: Unknown.

*Leuckartiara* Hartlaub, 1914

Medusa usually with an apical projection of varying shape. Large manubrium connected to radial canals by mesenteries; mouth with extensively folded or crenulated margin. Gonads interradiation, bipartite but connected interradially, typically horseshoe-shaped, with folds directed perradially. Radial canals broad and ribbon-like, often with jagged edges. Numerous hollow tentacles with elongated, laterally compressed basal bulbs; often with rudimentary tentacles; with or without ocelli.

Hydroid: When known, forming stolonial colonies;

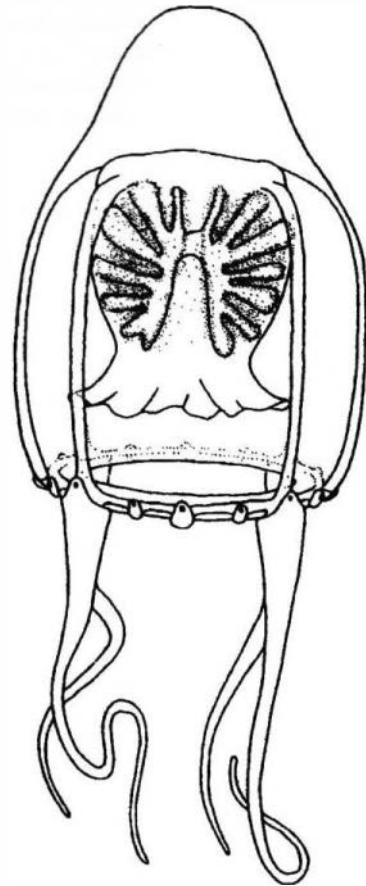


Fig. 38. *Halitholus pauper*. After Schuchert (1996).

hydrocauli not or sparingly branched, covered by perisarc extending onto hydranth body forming a more or less gelatinous pseudohydrotheca that does not envelop the tentacles; hydranths with one whorl of oral filiform tentacles. Medusae develop on hydrocauli or hydrorhiza and are covered by a thin perisarc.

- 1 with 8 large marginal tentacles and 8 small adradial, filiform tentacles, their proximal part adnate to umbrella margin and continued upwards on exumbrella; no apical projection ..... *Leuckartiara annexa*
- 1a all tentacles of equal structure; with apical projection ..  
 ..... *Leuckartiara octona*

*Leuckartiara* species are often difficult to distinguish, especially when immature (see diagnostic tables in Xu *et al.* 1991, Pagès *et al.* 1992); two *Leuckartiara* species have been described from New Zealand waters (see below).

*Leuckartiara annexa* Kramp, 1957 (Fig. 39)

Umbrella 11 mm high and 9 mm wide, domeshaped,



without apical projection; mesoglea fairly thin. Manubrium very large, connected with radial canals by mesenteries in upper half. Gonads interradial, typically on whole surface of manubrium, with a transverse bridge in the middle part of manubrium wall. 8 large tentacles with large, elongated basal bulbs, each with a short abaxial spur; also 8 small adradial tentacles without basal swelling, their proximal part narrow, adnate to umbrella margin and continuing upwards on exumbrella from where short filiform tentacles project upwards and outwards; 16 minute rudimentary marginal bulbs; ocelli not seen.

REMARKS: Recorded at limit of area of investigation.

RECORDS FROM N.Z.: *Dana* Stns 3620, 3622, 3654.

SEASONALITY: January, December.

DISTRIBUTION: Indo-Pacific.

KEY REFERENCES: Kramp (1965, 1968), Bouillon (1980), Larson & Harbison (1990), Pagès *et al.* (1992).

HYDROID: Unknown.

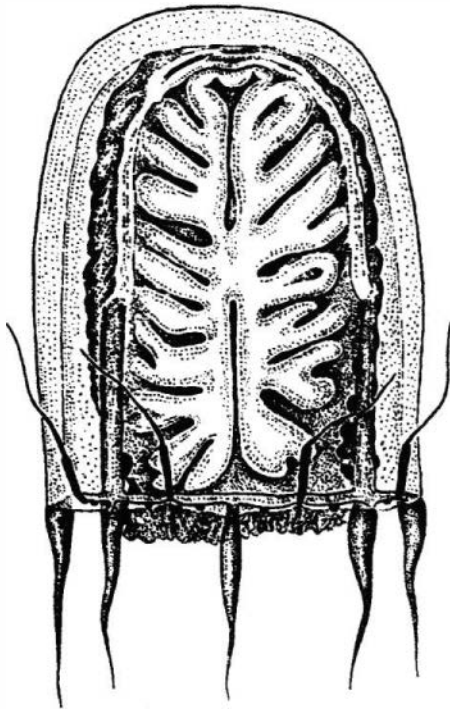


Fig. 39. *Leuckartiara annexa*. After Kramp (1968).

*Leuckartiara octona* (Fleming, 1823) (Fig. 40)

Umbrella up to 20 mm high, higher than wide, bell-shaped, with a generally well-developed conical or spherical solid apical projection, lateral walls thin. Manubrium of varying length, with broad base, flask-shaped. Gonads interradial, typically horseshoe-shaped on whole surface of manubrium, with folds

directed towards perradii; radial canals with smooth or slightly jagged edges; mesenteries along about half the length of manubrium. 12–32, usually 16, long marginal tentacles with long conical laterally compressed marginal bulbs clasping umbrella and forming a pronounced abaxial spur and with 16 or more club-shaped marginal rudimentary bulbs, all bulbs with abaxial ocelli.

RECORDS FROM N.Z.: *Dana* Stns 3620, 3645; NZOI Stn N356; Whangateau Harbour; Leigh Marine Reserve; Cape Rodney (Barnett 1985).

SEASONALITY: January, February–July, December.

DISTRIBUTION: Atlantic; Indo-Pacific; Mediterranean.

KEY REFERENCES: Bouillon (1980), Larson & Harbison (1990), Pagès *et al.* (1992).

HYDROID: Colonies generally epizoitic, growing on various animals (gastropod shells, crabs, fishes, other hydroids) or on rocks; stolonal, formed by single or slightly branched hydrocauli arising from a creeping hydrorhiza and bearing a terminal hydranth and occasionally 1–3 lateral ones as well or, sometimes, with sessile hydranths; hydrocauli increasing in diameter from base distally; perisarc surrounding hydrocauli, firm, often annulated or wrinkled, especially at base and expending over the hydranth body in form of a gelatinous pseudohydrotheca reaching the base of

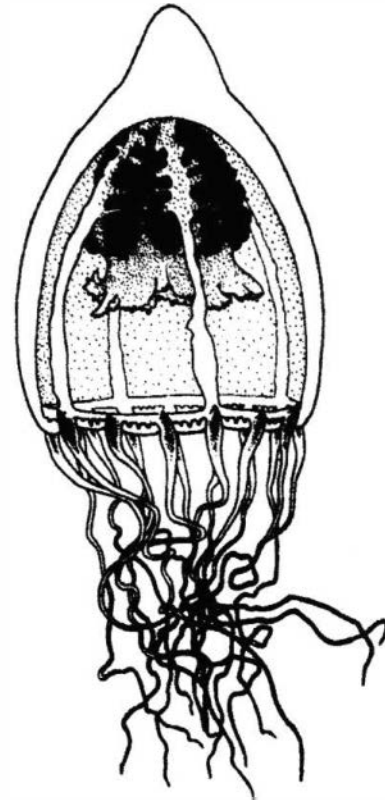


Fig. 40. *Leuckartiara octona*. After Pagès *et al.* (1992).

tentacles but not investing them; pseudohydrothecae often covered by detritus. Hydranths with a single whorl of 6–12 filiform tentacles and a conical hypostome. Medusa buds borne on short peduncles completely invested by perisarc, arising from hydrorhiza and hydrocaulus.

(Rees 1938; Russell 1953; Millard 1975; Bouillon 1985b)

*Leuckartiara* sp. 1.

Umbrella up to 12–17 mm high and about 12 mm in diameter; 20–28 tentacles, all nearly equal in size and structure, and with an abaxial spur, but there are no exumbrellar canals; one small, knob-shaped rudiment between each successive pair of tentacles; radial canals are jagged.

RECORDS FROM N.Z.: *Dana* Stn 3641.

SEASONALITY: January.

KEY REFERENCES: Kramp (1965).

*Leuckartiara* sp. 2

(Fig. 41)

Umbrella elongate bell-shaped, 3 mm high, 2 mm wide; apical projection?; velum narrow; radial canals broad, with smooth or slightly jagged edges, circular canal narrower; radial canals joining manubrium half way down length of manubrium as mesenteries. Manubrium wide, reaching half to two-thirds length of sub-umbrellar cavity; large folded mouth, with crenulated lips. Gonads interradial, with horizontal folds, covered with large spherical eggs; 4 long perradial tentacles with horizontally elongate basal bulbs, no abaxial spur; no ocelli; possibly minute rudimentary bulb between successive pairs of tentacles.

RECORDS FROM N.Z.: Leigh Marine Reserve; 1 specimen; May 1984.

KEY REFERENCES: Barnett (1985).

*Merga* Hartlaub, 1914

Medusa with cruciform manubrium, the perradial edges of manubrium connected with radial canals by long mesenteries. Smooth or exceptionally weakly corrugated gonads, generally adradial; with simple or faintly crenulated oral lips. 4–8 or more marginal tentacles, with or without rudimentary bulbs or tentaculæ; with or without ocelli.

Hydroid: Where known, colonial, stolonial, arising from a ramifying hydrorhiza; hydrocauli slightly branched or not. Hydranths on hydrocauli or almost sessile; with or without pseudohydrotheca which

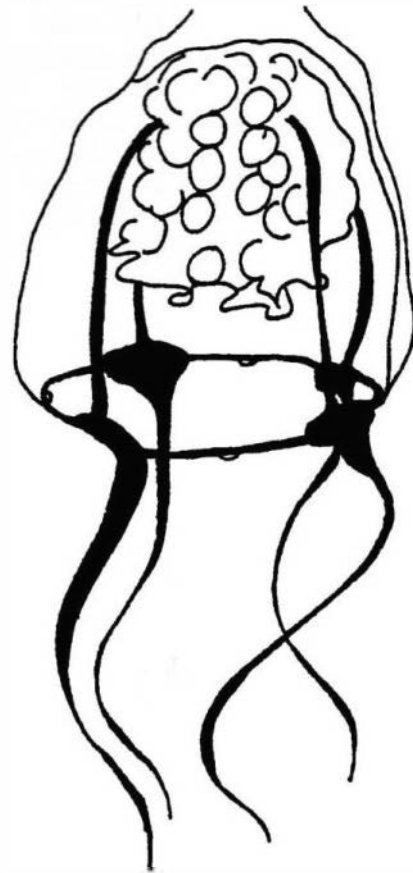


Fig. 41. *Leuckartiara* sp. 2. After Barnett (1985).

which when present does not envelop the tentacles; with one whorl of filiform tentacles. Free medusae arising from hydrocauli and hydrorhiza.

*Merga treubeli* Schuchert, 1996

(Fig. 42)

Umbrella up to 4 mm high and wide, spherical, with very thick mesoglea; apical mesoglea can reach half total height; with dilated velum covering two-thirds of radius. Manubrium half as long as bell cavity; with cross-shaped base extending in 4 triangular, laterally compressed perradial extensions that continue as radial canals; at beginning of each radial canal a triangular process of variable height projecting upwards into apical mesoglea; mouth small and cruciform; radial canals smooth. Gonads covering basal extensions of manubrium in 8 adradial sheets which are in contact interradially but are separated perradially. 4 perradial, 4 interradial, and 8 shorter adradial tentacles; in adults no rudiments of bulbs or tentaculæ; tentacles hollow, evenly covered with cnidocysts, bulbs small, without ocelli.



RECORDS FROM N.Z.: Wellington Harbour (Schuchert 1996).

SEASONALITY: January, March.

DISTRIBUTION: Endemic.

KEY REFERENCES: Schuchert (1996).

HYDROID: Unknown.

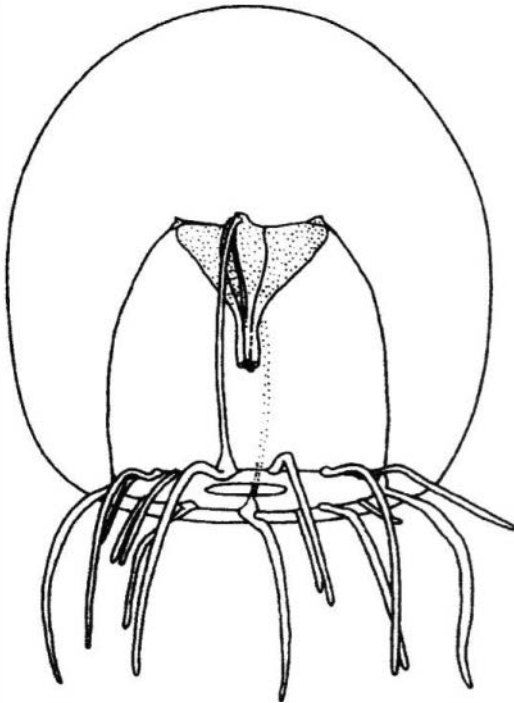


Fig. 42. *Merga treubeli*. After Schuchert (1996).

*Neoturris* Hartlaub, 1914

Medusa with apical projection varying much in shape and size, often reduced; manubrium very large and broad, with well-developed mesenteries. Gonads in 8 adradial series with transverse folds directed towards interradial parts of manubrium; depressed interradial parts of manubrium with isolated pits of gonads. 8 or more hollow marginal tentacles with laterally compressed basal bulbs; without rudimentary tentacles or marginal warts; mostly without ocelli.

Hydroid: Where known, colonial from stolonial hydrorhiza; hydrocauli not branching. Hydranth terminal; perisarc of hydrocauli continuing up to hydranth body but not surrounding the tentacles; one whorl of filiform oral tentacles. Free medusae developing from hydrocauli sometimes from hydrorhiza, gonophores completely covered with perisarc.

*Neoturris papua* (Lesson, 1843)

(Fig. 43)

Umbrella up to 18 mm high and 15mm wide, higher than wide, conical to mitre-shaped bell with small apical projection containing an apical canal; mesoglea uniformly thin; exumbrella with pigmented longitudinal ridges containing cnidocysts; as many ridges as normal tentacle bulbs. Manubrium very voluminous, two-thirds as long as bell cavity, connected to radial canals by mesenteries as long as half umbrella height; lips very complexly folded. 8 gonads in adradial position, covering three-quarters of its length, with a series of horizontal folds that are directed towards interradial parts; interradial portion of manubrium free of gonads; 4 very broad radial canals with smooth margins and a much narrower circular canal. Up to 12 large marginal tentacles, periradial ones longer than others; tentacle bulbs long, conical, laterally compressed and clasping umbrellar margin; between successive marginal tentacles 3 thin short tentaculæ with reduced bulbs; all tentacles and tentaculæ with ocelli.

RECORDS FROM N.Z.: NZOI Stn N400.

SEASONALITY: December.

DISTRIBUTION: Indo-Pacific.

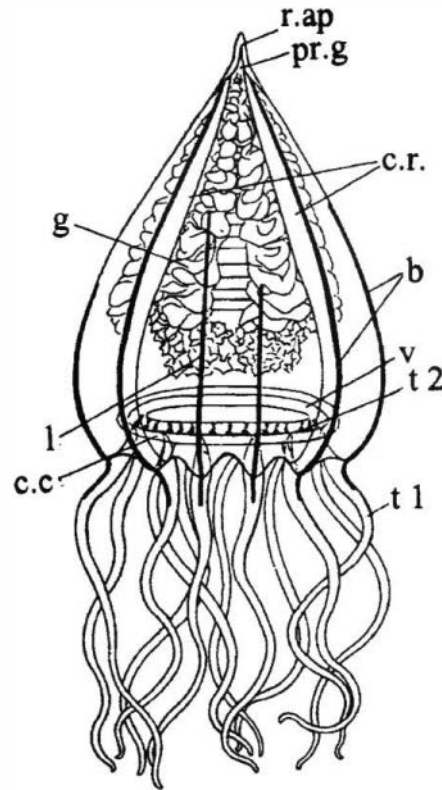


Fig. 43. *Neoturris papua*. After Ranson (1929) b, longitudinal exumbrellar pigmented ridges; c.c., circular canal; c.r., radial canal; g, gonads; l, lips; pr.g., apical canal; r.ap., apical projection; t1, marginal tentacle; t2, tentaculæ; v, velum.

KEY REFERENCES: Ranson (1929); vanderSpoel & Bleeker (1988); Bouillon (1980, 1995b); Schuchert (1996).  
HYDROID: Unknown.

*Pandea* Lesson, 1843

Medusa with or without apical projection; with or without longitudinal exumbrellar cnidocyst ribs. Gonads at first in the adradial and eventually encircling manubrium, forming a complex network; lips wide and folded; radial canals ribbon-like; with long mesenteries. More than 8 hollow marginal tentacles; without rudimentary marginal tentacles or marginal warts; with or without ocelli.

Hydroid: Where known, forming stolonial colonies arising from a creeping, ramifying hydrorhiza on the holoplanktonic gastropod *Clio cuspidata*. Hydranths naked, almost sessile, with filiform oral tentacles in 2 closely set whorls. Free medusae borne on short pedicels covered by perisarc and arising directly from hydrorhiza.

*Pandea conica* (Quoy & Gaimard, 1827) (Fig. 44)

Umbrella up to 10 mm wide and 21 (sometimes 30 mm) high, bell-shaped, with a rounded, blunt or conical projection variable in length and ending in a peculiar opaque ectodermal thickening; mesoglea fairly thick mainly at top; with 16–24 (up to 44) longitudinal exumbrellar cnidocyst tracks that correspond to the number of marginal tentacles and originate from each tentacular bulb. Manubrium large, pyramidal, almost filling upper half of subumbrellar cavity; mouth with short oral tube and 4 per radial much folded and highly crenulated lips; radial canals fairly narrow, smooth, slightly jagged, circular canal narrow; mesenteries about four-fifths of manubrium length. Gonad large, on entire interradial walls of manubrium, forming a coarse meshed-network of ridges with pits between. 16–24 (sometimes up to 44) marginal tentacles, with conical, laterally compressed bulbs clasping the umbrellar margin but devoid of well-developed abaxial spurs, no secondary tentacles; with ocelli.

RECORDS FROM N.Z.: *Dana* Stn 3644; NZOI Stns N449, X480F; about 43–44°S (Navas-Pereira & Vannucci 1994).

SEASONALITY: January, February, October.

DISTRIBUTION: Atlantic; Indo-Pacific; Mediterranean.

KEY REFERENCES: Winkler (1982), O'Sullivan (1982), Alvarinõ (1988), Bleeker & van der Spoel (1988), Pagès *et al.* (1992), Navas Pereira & Vannucci (1994), Bouillon

(1995b), Mills *et al.* (1996), Schuchert (1996).

HYDROID: Colonies arising from a creeping, ramifying, stolonial hydrorhiza on the holoplanktonic gastropod *Clio cuspidata*; stolons thin, covered by a fine perisarc. Hydranths naked, on a short stem, almost sessile; hypostome conical; 8 filiform oral tentacles of variable length in 2 closely set whorls. Medusae buds borne on short pedicels covered by perisarc and arising directly from hydrorhiza. (Picard 1956)

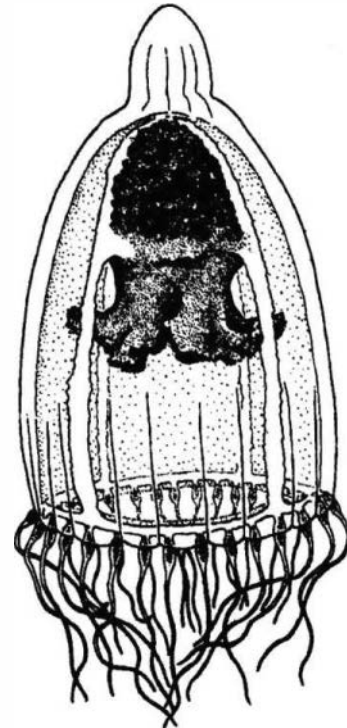


Fig. 44. *Pandea conica*. After Pagès *et al.* (1992).

*Pandeopsis* Kramp, 1959

Medusa with voluminous, quadrangular manubrium with large base attached to subumbrella; long mesenteries. Gonads sheet-like, smooth, covering all interradial surface of manubrium; mouth with 4 simple lips. Up to 16 marginal tentacles and up to 24 rudimentary bulbs; tentacular cirri or reduced tentacles absent; tentacle bulbs without spur, with abaxial ocelli.

Hydroid: See below.

*Pandeopsis ikarii* (Uchida, 1927) (Fig. 44)

Umbrella up to 10 mm high, almost globular, mesoglea thick, especially in apical region. Manubrium short, half as long as umbrella cavity, very broad, quadrangular, with large base attached to subumbrella; long mesenteries; mouth rim almost smooth, with 4 short,

simple lips armed with cnidocysts. 4 smooth interradial gonads (more irregularly in females at sexual maturity or in specimens involved in asexual budding), each like a large flat sheet completely covering all manubrium surface; the distal, free portions of radial canals short and narrow; circular canal and velum narrow. 8–16 marginal tentacles, with broad heart-shaped bulbs, no abaxial spur; 8–24 small, adradial rudimentary bulbs; all bulbs bearing abaxial ocelli. In living specimens or recently preserved specimens each gonad is provided with 3 or 4 small dark red spots; medusa-budding on manubrium usual.

Often parasitised by *Phyllinchoe* molluscs.

RECORD FROM N.Z.: *Dana* Stn 3626

DISTRIBUTION: Indo-Pacific.

KEY REFERENCES: Kramp (1965); Bouillon (1980, 1985b); Schuchert (1996).

HYDROID: Not known from nature, only from rearing; planulae aggregating and attaching to substratum, forming a common hydrorhiza producing numerous hydranths with one whorl of three filiform tentacles. Medusae buds unknown; hydrorhiza forming long stolons giving rise to dispersal buds.

(Bouillon 1985b)

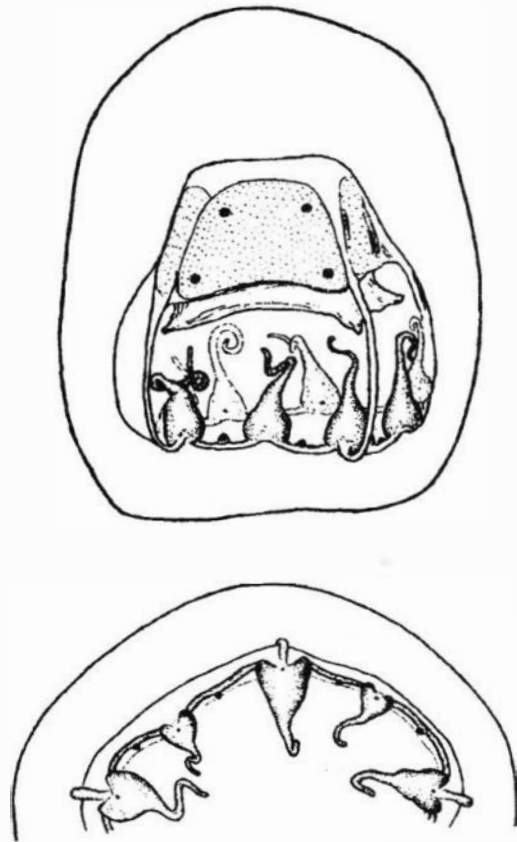


Fig. 45. *Paudeopsis ikarii*. After Kramp (1968).

## Family PROBOSCIDACTYLIDAE

Hand & Hendrickson, 1950

Anthomedusae without statocysts and ocelli; without centripetal canals. Manubrium with 4–6 or more radial gastric lobes extending along proximal portions of radial canals. Gonads surrounding manubrium and extending onto the gastric lobes; radial canals branched, obliterated canals may be present; usually without circular canal but with a solid endodermal marginal core. Numerous exumbrellar cnidocyst clusters or bands alternating with tentacles; marginal tentacles hollow, with swollen hollow base connected to lumen of radial canals.

Hydroid: Colonies of single hydroids arising from creeping naked stolons located around the lips of sabellid polychaete tubes. Hydranths almost sessile; polymorphic with gastrozooids and gonozooids, sometimes dactylozooids; gastrozooids with rounded hypostome, separated from the body by a constriction, with a large cluster of cnidocysts or "cap" somewhat displaced onto one side of the hypostome, with 2 filiform tentacles arising close together, under the hypostomial constriction, opposite to cnidocyst cluster; gonozooids and dactylozooids without tentacles, mouthless and smaller than gastrozooids. Free medusae lying very close to tip of gonozooid.

The systematic position of the Proboscidactylidae is not clear; they have traditionally been included in the Limnomedusae, mostly by convenience and ignorance of their real affinities. Several authors consider that, from some characters, mainly the structure of their tentacular base and the presence of desmonemes, they should be referred to the Anthomedusae Filifera (see Werner 1984; Petersen 1990; Schuchert 1996). We tentatively follow this suggestion here and include them in the Pandeida because of their hollow tentacles, but even in this suborder their relationships with the other families are not obvious. If the presence of desmonemes appears a valid argument to include this family in the Anthomedusae Filifera, the presence of macrobasic euryteles in most *Proboscidactyla* species is confusing — this type of cnidocyst having been found only inside the Filifera in some species of Eudendriidae.

### *Proboscidactyla* Brandt, 1834

Medusa with manubrium presenting radial gastric lobes; gonads on manubrium and gastric lobes; with 4–6 or more branched radial canals, with clusters or bands of cnidocysts on the exumbrella; usually without circular canal; marginal tentacles hollow.

*Proboscidactyla* sp.

(Fig 46)

Umbrella up to 1 mm high, wider than high, bell almost hemispherical, jelly moderately thick, slightly thicker at apex; velum spans approximately one-fifth of radius; exumbrella bears 4 interradial clusters of cnidocysts from where a fine line leads to umbrellar margin, about 12 cnidocysts capsules per cluster. Manubrium about half the height of bell cavity; mouth either simple or with 4 irregular perradial lips, mouth rim with cnidocysts; medusae buds arise from manubrium base at origin of radial canals, with short stem but not on blastostyles; 4 radial canals and a very thin, solid circular strand present; no circular canal as such; 4 large perradial marginal bulbs with black pigment granules; 4 perradial tentacles longer than bell height, tapering, with evenly distributed cnidocysts; no ocelli present; no gonads present.

RECORDS FROM N.Z.: Leigh Marine Reserve (Barnett 1985).

SEASONALITY: February–August.

KEY REFERENCES: Schuchert (1996).

HYDROID: Unknown.

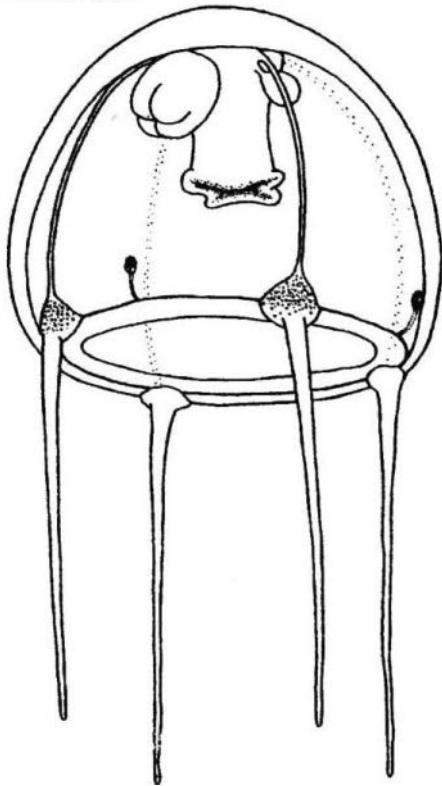


Fig. 46. *Proboscidactyla* sp. After Schuchert (1996).

Family **PROTIARIDAE** Haeckel, 1879

Medusae with only 4 fully developed marginal

tentacles arising from well-developed hollow tentacular bulbs, 4 simple radial canals and a circular canal, mouth with 4 simple lips. Gonads with smooth surface, interradial; with or without mesenteries; without rudimentary bulbs; margin with or without cirri-like tentacles; exceptionally with ocelli.

Hydroid: Known only in *Halitiara inflexa* (Bouillon 1985a, b; Bouillon *et al.* 1988b) and *Halitiara formosa* (Brinckmann-Voss, pers. comm.) Colonies arising from creeping stolons, hydranths issuing from very short hydrocauli; hydrorhiza and hydrocauli covered by perisarc which forms a cup at the base of the hydranths. Hydranths with one whorl of filiform tentacles, large cnidocysts alternating with the tentacles; gonophores unknown.

The differences between the diagnoses of the Protiaridae and Pandeidae appear at first sight rather small but the cnidome of the Protiaridae is very distinctive, containing, among others, merotrichous isorhizas (Fig. 9H), a type of cnidocyst that normally characterises only Leptomedusae families (Eirenidae, Eucheilotidae, Lovenellidae and Tiaropsidae). The hydroids are also very different from pandeid polyps, showing some resemblance to certain campanulinid species and particularly with *Trichydra* polyps (Bouillon *et al.* 1988b).

*Halitiara* Fewkes, 1882

Medusa with 4 straight radial canals. 4 perradial marginal tentacles and several intermediate, solid cirrus-like marginal tentacles; without rudimentary marginal bulbs. Mouth a simple cruciform opening, with or without mesenteries. Interradial gonads. No ocelli. Cnidome with merotrichous isorhizas.

Hydroid: See *Halitiara inflexa* below.

- 1 with apical projection, without mesenteries ..... *Halitiara formosa*
- 1a without apical projection, with mesenteries ..... *Halitiara inflexa*

*Halitiara formosa* Fewkes, 1882

(Fig 47)

Umbrella about 3 mm high, pear-shaped, with solid apical projection, about half as long as bell cavity; no mesenteries. Manubrium pyriform, about half as long as subumbrellar cavity; 4 long, hollow marginal tentacles and 24–35 short, solid, tightly coiled marginal cirrus-like tentacles. Gonads interradial smooth; no ocelli.

REMARKS: Schuchert (1996) regarded records of *H.*



*formosa* in New Zealand as doubtful, but possible.

RECORDS FROM N.Z.: Dana Stn 3641; NZOI Stns N401, N413.

SEASONALITY: January, December.

DISTRIBUTION: Atlantic; Indo-Pacific; Mediterranean.

KEY REFERENCES: Goy (1972), Bouillon (1980, 1995b), Goy *et al.* (1991), Schuchert (1996).

HYDROID: As for *H. inflexa* (below).

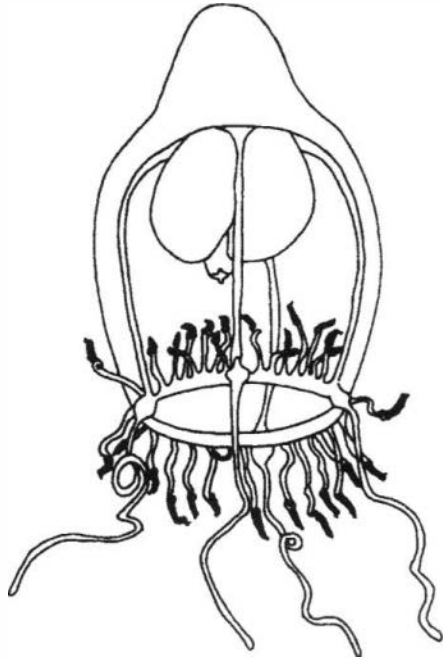


Fig. 47. *Halitiara formosa*. After Bouillon (1995b).

*Halitiara inflexa* Bouillon, 1980 (Fig. 48)

Umbrella bell-shaped, 1.6 mm high and 1.2 mm in diameter; mesoglea moderately thick, gradually thickening towards top to about twice the thickness of the lateral walls. Manubrium voluminous, quadrangular, length about two-thirds of bell cavity, joined to radial canals by mesenteries for half of their length; mouth with 4 simple lips. Gonads large, bulging, filling inter-radial position completely, leaving free only a small perradial band of manubrium and the mouth region; 4 radial canals and circular canal, all narrow and with smooth margins. 4 long perradial marginal tentacles with broad conical tapering base, not laterally compressed; between each pair of marginal tentacles 3–6 short solid coiled cirri-like tentacles without bulbs.

RECORDS FROM N.Z.: NZOI Stn N404.

SEASONALITY: 12.

DISTRIBUTION: Indo-Pacific; Mediterranean.

KEY REFERENCES: Bouillon (1980, 1985b, 1995b), Bouillon *et al.* (1988b), Goy *et al.* (1991), Schuchert (1996).

HYDROID: Colonies arising from creeping stolons. Hydranths issuing from very short hydrocauli; hydro-rhiza and hydrocauli covered by perisarc that forms a cup at the base of the hydranths in which they can almost completely retract; hydranths very slender, elongated, cylindrical, with short and conical hypostome, with one whorl of about 10 long filiform tentacles with irregular clusters of cnidocysts, large cnidocysts alternating with the tentacles. Gonophores unknown. (Bouillon, 1985a, b; Bouillon *et al.*, 1988b)

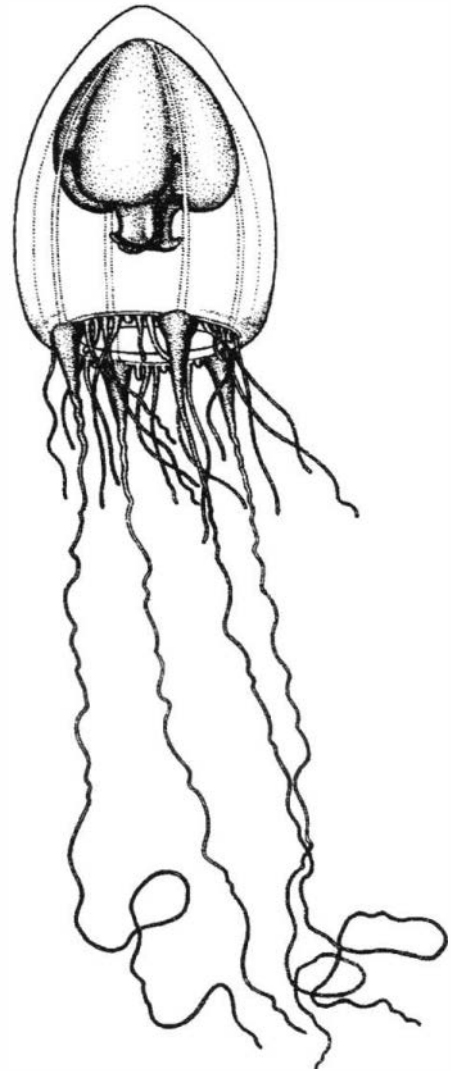


Fig. 48. *Halitiara inflexa*. After Bouillon (1980).

#### Order CAPITATA Kühn, 1913

Medusae with gonads generally completely surrounding the manubrium (exception in New Zealand forms: *Zanclaea*). Mouth simple and circular. Marginal tentacles usually hollow (except in Margelopsidae and Porpitiidae where they are solid). Cnidome of the medusae

characterised by stenoteles. Hydroids usually with capitate tentacles either in the adults or during their larval life.

#### Suborder **MOERISIIDA** Poche, 1914

Medusae with quadrate manubrium forming radial lobes; mouth cruciform. Interradial gonads on manubrium and radial lobes or on radial lobes only. Marginal tentacles developed at junctions between radial canals and circular canal and along entire circular canal (except *Tiaricodon*) tentacle bulbs usually with abaxial ocelli.

Hydroid: Hydroids claviform, with long hypostome. Tentacles scattered or in one or more whorls under hypostome. Free medusae or reduced gonophores.

#### Family **POLYORCHIDAE** A. Agassiz, 1862

Medusae with gastric peduncle and a prismatic manubrium; mouth with 4 oral lips crowded with cnidocysts; 4 sac-shaped, or spiral, or several sausage-shaped manubrial pouches on peduncle only. Gonads surrounding manubrial pouches; 4 radial canals with or without blind side branches. 4–260 tentacles with stout, elongated bulbs; with abaxial ocelli.

Hydroid: Unknown.

#### *Tiaricodon* Browne, 1902

Medusa with 4 radial canals lacking diverticulae. Manubrium with short sac-like perradial lobes extending along a broad peduncle; mouth with 4 distinct frilled lips with cnidocyst band. 4 perradial, imperfectly moniliform tentacles with stout elongated bulbs surrounded by a thickened, cnidocyst-studded epidermis. Gonads on manubrium and perradial lobes; with abaxial ocelli.

*Tiaricodon* sp. (see Schuchert, 1996) (Fig. 49)

Only premature medusa known. Umbrella 7 mm high and 4 mm wide, bell-shaped with rounded apex, mesoglea thick, at apex three times as thick as lateral walls; with shallow gastric peduncle. Manubrium almost as long as umbrellar cavity, prismatic, with cruciform base and with small perradial pouches that also differ in colour from radial canals; mouth with 4 perradial lips, with margin thickened by cnidocysts; 4 radial canals and circular canal all thin and smooth; epider-

mal ring beneath circular canal not observable. Incipient gonad tissue (oocytes) visible on manubrial pouches. 4 hollow marginal tentacles, tapering, with many cnidocyst clasps and bullet-shaped terminal cnidocyst cluster, base of tentacles free of cnidocysts and with an abaxial process adhering to exumbrella; ocelli on abaxial process of tentacle bulb.

According to Schuchert (1996) this immature medusa most probably corresponds to *Tiaricodon coeruleus* Browne, 1902.

RECORDS FROM N.Z.: 1 young medusa stage obtained from Evans Bay, Wellington (Schuchert 1996).

SEASONALITY: June–August.

DISTRIBUTION: Not known.

KEY REFERENCES: Schuchert (1996).

HYDROID: Unknown.

#### Suborder **TUBULARIIDA** Fleming, 1828

Medusae generally with cylindrical manubrium with circular base; mouth usually simple and circular; gonads normally completely surrounding manubrium; marginal tentacles developed only at junction between radial canals and circular canal (except in some Eleutheriidae); with 1, 4, rarely 8 or more marginal tentacles.

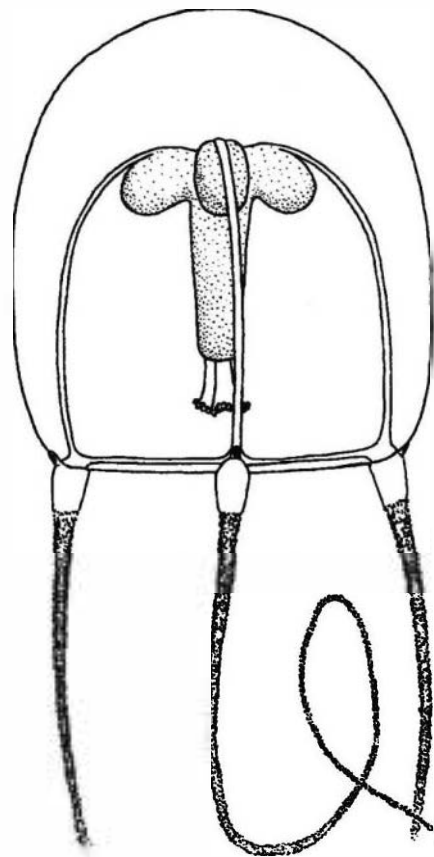


Fig. 49. *Tiaricodon* sp. After Schuchert (1996).

Hydroid: Oral tentacles solid or parenchymatous, in one whorl around hypostome or spreading down over hydranth body. Aboral tentacles solid or parenchymatous, in one or three whorls or absent. Free medusae or sporosacs.

- 1 reduced medusae, with 4 permanently rudimentary bulbs ..... PENNARIIDAE
- 1a medusae not reduced, exceptionally without tentacles ..... 2
- 2 marginal tentacles simple ..... 3
- 2a marginal tentacles branched ..... 8
- 3 marginal tentacles solitary ..... 4
- 3a marginal tentacles in 4 groups ..... MARGELOPSIDAE
- 4 marginal tentacle bulbs with ocelli ..... CORYNIDAE
- 4a marginal tentacle bulbs without ocelli ..... 5
- 5 exumbrella without exumbrellar cnidocyst tracks .. 6
- 5a exumbrella with exumbrellar cnidocyst tracks ..... \*TUBULARIIDAE
- 6 4 equal marginal tentacles; gonads in 4 pedunculate pendant perradial pouches hanging in the subumbrellar cavity ..... BOEROMEDUSIDAE
- 6a 1-4 marginal tentacles; gonads different from 6 .. 7
- 7 1-4 marginal tentacles unequally developed or of the same length but all of same structure; without apical projection ..... \*EUPHYSIDAE
- 7a up to 4 marginal tentacles of different size and structure ..... \*CORYMORPHIDAE
- 8 marginal tentacles bifurcating only ... ELEUTHERIIDAE
- 8a marginal tentacles with several branches ..... CLADONEMATIDAE

Family **BOEROMEDUSIDAE** Bouillon, 1995

Medusae with apical projection. Manubrium cylindrical, with simple tubular mouth. Gonads as four large perradial pouches hanging freely in the bell cavity, each linked to the aboral part of the manubrium by a short peduncle. 4 radial canals and circular canal; four marginal bulbs; 4 simple hollow tentacles with many cnidocyst clusters and a large ovoid terminal cluster.

Hydroid: Unknown.

\* The differences between the medusae of Corymorphidae, Euphysidae, and Tubulariidae are rather minor. Separation of these families is mainly based on their hydroid phase.

*Boeromedusa* Bouillon, 1995b

Diagnosis as for the family. One species.

*Boeromedusa auricogonia* Bouillon, 1995 (Fig. 50)

Umbrella 7 mm high and 4 mm wide, pyriform, with widest diameter in the upper half, with shallow rounded apical process; mesoglea thick mainly at apex, slowly increasing in thickness from margin towards top; roof of subumbrella with 4 interradial, conical,

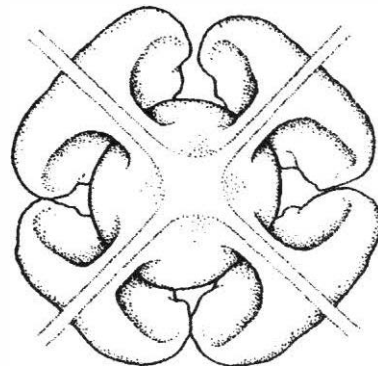
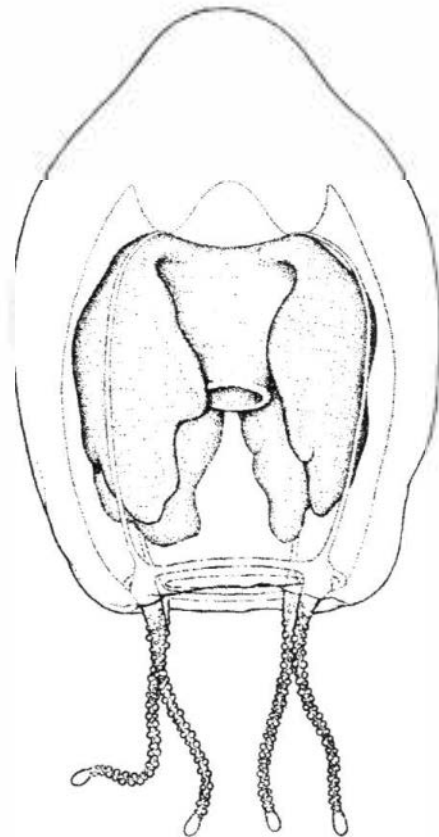


Fig. 50. *Boeromedusa auricogonia*. After Bouillon (1995b).

solid, projections into the mesoglea. Manubrium barrel-shaped, length about half of subumbrellar cavity, circular in cross-section; mouth, simple, circular with an inconspicuous ring of cnidocyst. Gonads forming 4 perradial, large, smooth, flattened sac-like pouches, hanging freely into the subumbrellar cavity and reaching almost bell margin, distal end lobed; each gonad pouch connected to the base of the manubrium by a short, curved, and fairly narrower root; 4 radial canals and circular canal present, all narrow and smooth; radial canals widening slightly on entering circular canal. 4 conical perradial tentacle bulbs extending without transition into 4 short hollow marginal tentacles covered by numerous prominent cnidocyst clusters and ending in a large ovoid cnidocyst swelling; no ocelli observed; colour orange.

RECORDS FROM N.Z.: NZOI Stn N433.

SEASONALITY: January.

DISTRIBUTION: Endemic to New Zealand.

KEY REFERENCES: Bouillon (1995b), Schuchert (1996).

HYDROID: Unknown.

#### Family CLADONEMATIDAE Gegenbaur, 1857

Creeping and swimming Anthomedusae. Mouth with short lips armed with 4–6 cnidocyst clusters or with ramifying oral tentacles; with or without apical chamber above manubrium. Cylindrical manubrium with perradial pouches; variable number of radial canals, some branched, some simple, final number of canals entering circular canal usually of same number as marginal tentacles. Gonads completely surrounding manubrium. Variable number of hollow branching marginal tentacles, each furnished with 1–10 branches ending in organs of adhesion and 1–10 branches with clusters of cnidocysts; with ocelli.

Hydroid: Colonial, stolons creeping; stems sparingly branched or unbranched. Hydranth with one whorl of 4 or 5 oral capitate tentacles, with or without an aboral whorl of filiform tentacles; mouth with oral ectodermal gland cells forming a preoral chamber. Free medusae.

#### *Cladonema* Dujardin, 1843

Cladonematidae with simple mouth armed with cnidocyst clusters; without an apical chamber.

Hydroid: With the characters of the family.

#### *Cladonema radiatum* Dujardin, 1843 (Fig. 51)

Umbrella, when fully grown, about 4 mm high, 3 mm

wide, bell-shaped, slightly higher than broad; mesoglea moderately thin, sometimes with a slight apical projection; velum rather broad. Manubrium spindle-shaped, not extending beyond umbrellar margin, with usually 5, sometimes 4, perradial pouch-like outgrowths in its middle region; mouth with usually 5, sometimes 4, short protuberances or lobes, each armed with cnidocyst clusters; usually 5, sometimes 4, thin primary radial canals, some of which bifurcate to form 10, sometimes 8, radial canals in all; circular canal narrow. Gonads on the upper two-thirds of manubrium and on the perradial pouches. Marginal tentacles usually 10, sometimes 8, corresponding to the number of radial canals; tentacles branched, with elongated thickened bases from the under side of which grow 1–4 (up to 10) short tentacles with adhesive organs; the branched upper portions of the marginal tentacles are beset with numerous cnidocyst clusters; each with a black or deep crimson abaxial ocellus at the base. Colour of manubrium and marginal tentacles red, bright red, or brown.

RECORDS FROM N.Z.: Wellington (Ralph 1953).

SEASONALITY: ?

DISTRIBUTION: Atlantic; Indo-Pacific; Mediterranean.

KEY REFERENCES: Bodo (1970), Bouillon (1966, 1968b), Bouillon & Houvenhaghel (1970), Bouillon & Nielsen (1974), Rees (1979a), Calder (1988), He Zhenwu & Xu Renhe (1996), Schuchert (1996).

HYDROID: Colonies slender, simple, or slightly branching from creeping ramifying stolons; perisarc smooth, terminating shortly below hydranth. Hydrocaulus with terminal hydranths; these clavate with a rounded hypostome; apical ectoderm of hypostome presenting a well-developed glandular perioral cavity. An oral whorl of 4 or 5 capitate tentacles and a basal whorl of 4 or 5 aboral filiform tentacles alternating with capitate tentacles and with a slight terminal swelling. Medusa

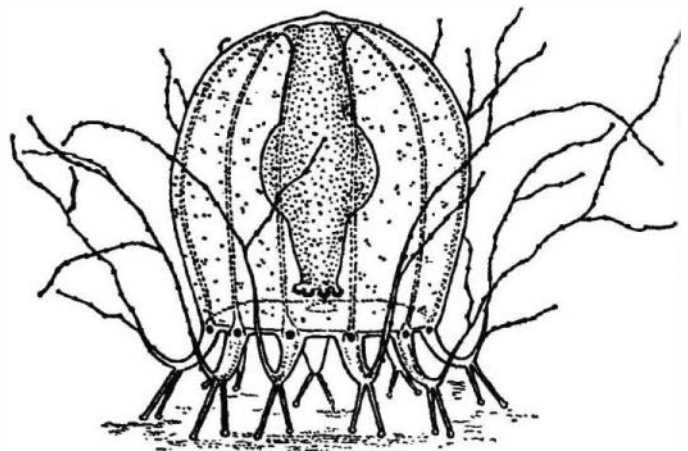


Fig. 51. *Cladonema radiatum*. After Hincks (1868).



buds naked, borne singly on hydranth just above filiform tentacles.

(Allman 1872; Russell 1953; Bouillon 1966; Brinckmann-Voss 1970; Calder 1988)

#### Family CORYNIDAE Johnston, 1836

Medusae with bell-shaped umbrella; no cnidocyst tracks. Manubrium tubular, simple circular mouth; 4 radial canals and circular canal. 2-4 hollow marginal tentacles. Gonads completely encircling the manubrium in one or more rings; mostly with abaxial ocelli.

Hydroid: Branched or unbranched, rising from a creeping stolon or encrusting base. Hydranths with an oral whorl of capitate tentacles and often below them more capitate tentacles in whorls or scattered; filiform tentacles may occur below the capitate ones. Gonophores usually develop on polyps, either as a sessile sporosac or free medusae.

- |   |                                       |       |                 |
|---|---------------------------------------|-------|-----------------|
| 1 | gonads divided into two or more rings | ....  | <i>Dipurena</i> |
| 1 | gonads not interrupted, undivided     | ..... | <i>Sarsia</i>   |

#### *Dipurena* McCrady, 1859

Medusa with gonads divided into two or more rings around manubrium; endoderm of sexual parts digestive, endoderm of non-sexual parts chordal. Manubrium usually extending well beyond umbrellar margin; with ocelli.

Hydroid: With general characters of the family. A button of ectodermal gland cells occurs around the mouth. Medusae free.

#### *Dipurena ophiogaster* Haeckel, 1879 (Fig. 52)

Umbrella bell-shaped, 4–5.5 mm high, 1.5 times higher than wide; mesoglea becoming gradually thicker from margin towards apex which is three times as thick as lateral wall; relaxed velum spanning half to two-fifths of radius. Manubrium very long, up to three times umbrellar height, with a long thin proximal part, a broader distal extremity, and a distinct rounded apical chamber; mouth simple, tube-like. Gonads distributed in 2–9 broad rings, completely encircling manubrium, leaving upper third free; 4 narrow radial canals and circular canal; 4 marginal bulbs, rather flat, each with cnidocyst pads and an abaxial dark-brown ocellus, the bulb cavity egg-shaped; circular canal entering bulbs adaxially. 4 very long thin tentacles, length up to five times umbrellar height, with numerous irregularly distributed cnidocyst

clusters and a small terminal cluster.

RECORDS FROM N.Z.: Whangateau Harbour; Leigh Marine Reserve (Barnett 1985); Wellington Harbour (Schuchert 1996).

SEASONALITY: January, March, November, December.

DISTRIBUTION: Atlantic; Indo-Pacific; Mediterranean.

REFERENCES: Bouillon (1971, 1978b, 1985b, 1995a), Pagès *et al.* (1992), Schuchert (1996).

HYDROID: Colonies simple, generally unbranched, arising from a creeping, ramifying hydrorhiza; perisarc smooth, covering stolons and hydrocaulus, the latter with a wide perisarc into which the basal part of the hydranth can retract. Hydranth cylindrical, with large rounded hypostome whose ectoderm is differentiated into a well-developed cap of gland cells. 10–18 capitate tentacles, scattered or in indistinct whorls, with one aboral whorl of 2–6 filiform tentacles (often reduced or absent). Medusa buds single or in clusters of 3 or 4 anterior to filiform tentacles.

(Bouillon 1966, 1971; Brinckmann-Voss 1970, Pagès *et al.* 1992)

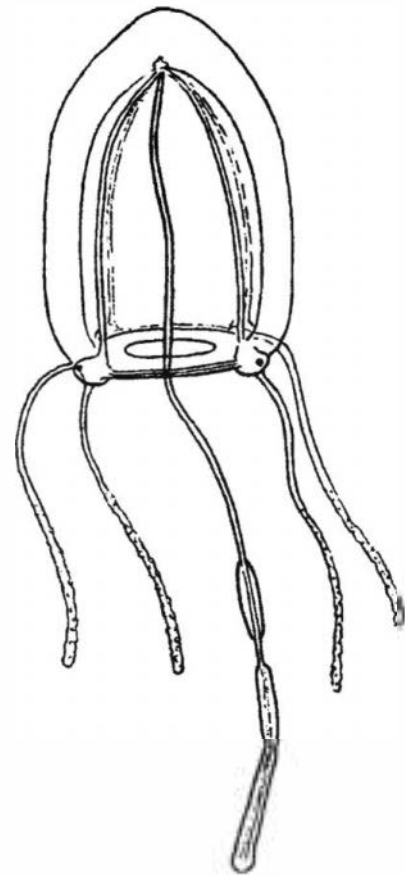


Fig. 52. *Dipurena ophiogaster*. After Kramp (1968).

Medusa with undivided gonads. *Sarsia* medusae are highly varied and there is some confusion about species identities. Without knowledge of life cycles and cnidocysts it is often difficult determining species.

Hydroid: With the general characters of the family; no ectodermal oral gland cells. Medusae free.

**Medusa stage:**

- 1 adult generally with a short conical or round apical manubrial chamber; marginal tentacles with tufts of stiff cilia ..... *Sarsia japonica*
- 1a manubrium without apical chamber; marginal tentacles without a tufts of stiff cilia ..... *Sarsia eximia*

**Polyp stage:**

- 1 colonies branching, without filiform tentacles ..... *Sarsia eximia*
- 1a colonies mostly stolonal, with filiform tentacles ..... *Sarsia japonica*

***Sarsia eximia* (Allman, 1859) (Fig. 53)**

Umbrella 3-4 mm high, a little higher than wide, bell-shaped to cylindrical, the mesoglea thicker at the apex. Manubrium cylindrical, in full extension about as long as subumbrellar cavity; mouth simple, circular. Gonads almost completely surround the manubrium; eggs few and large. 4 simple moderately broad radial canals, circular canal narrower, radial canals entering marginal bulbs adaxially. 4 marginal tentacles fairly extensible, beset with numerous cnidocyst clasps in an indistinct spiral and a rather small terminal cluster.

RECORDS FROM N.Z.: Cook Strait (Kaberry 1937); Oamaru Harbour (Ralph 1953); Whangateau Harbour; Leigh Marine Reserve (Barnett 1985 as *S. gracilis* and *S. sp.*); Wellington Harbour (Schuchert 1996 as *S. sp.* Bouillon, 1995b).

SEASONALITY: January-December.

DISTRIBUTION: Atlantic; Indo-Pacific; Arctic; Mediterranean.

KEY REFERENCES: Mills (1982), Brinckmann-Voss (1989), Petersen (1990), Kubota & Takashima (1992), Pagès *et al.* (1992), Schuchert (1996).

HYDROID: Colonies arising from creeping ramifying hydrorhiza, stolonal or erect; erect colonies profusely and irregularly branched, the final hydrocauli with a tendency to a unilateral arrangement; perisarc of hydrocaulus terminating as a very delicate layer or sometimes in a basal cup at the base of the hydranth, perisarc mainly smooth but ringed at base of hydrocauli and hydrocladia. Hydranth cylindrical to spindle-shaped; hypostome conical-rounded, with an oral

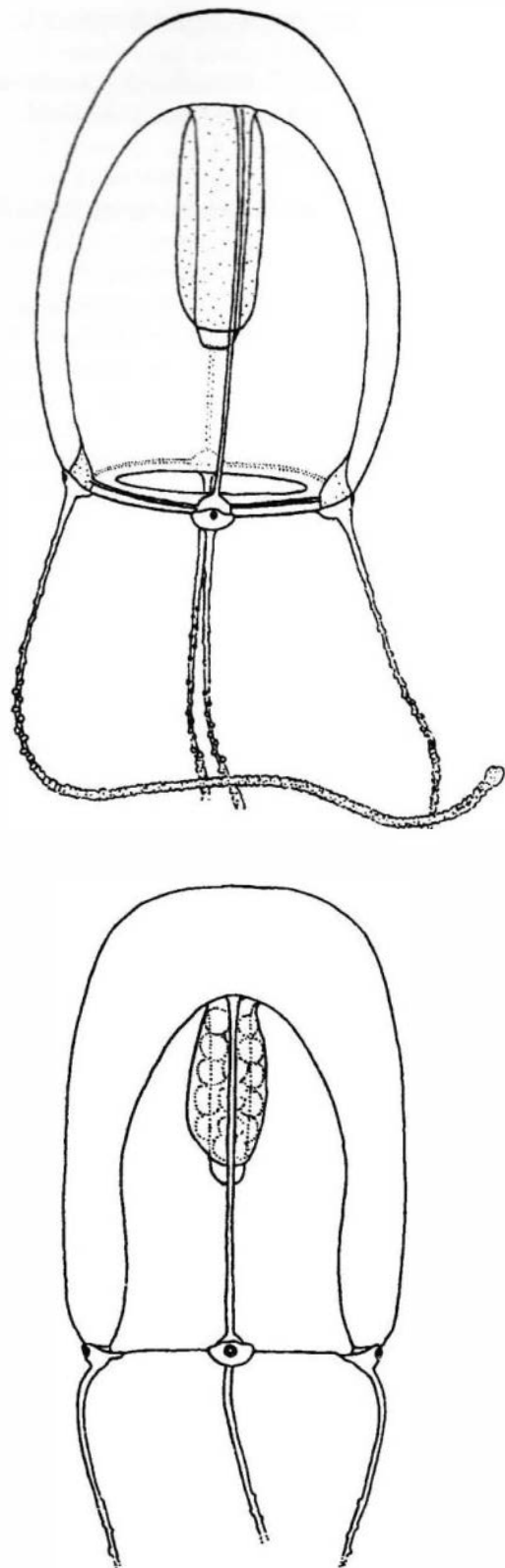


Fig. 53. *Sarsia eximia*. After Schuchert (1996).



whorl of 4 or 5 capitate tentacles and 20–35 capitate tentacles scattered or in indistinct whorl over body of hydranth. Medusa buds borne on single pedicels in upper axils of tentacles over proximal two-thirds of hydranths.

(Allman 1872; Russell 1953; Brinckmann-Voss 1989; Schuchert 1996)

*Sarsia japonica* (Nagao, 1962)

(Fig. 54)

Umbrella up to 6 mm high, higher than wide, bell-shaped, the apex slightly flattened with thicker mesoglea; velum broad, half of radius. Manubrium half to two-thirds of subumbrellar height, the apex generally with a small conical or round apical knob; mouth simple, circular. Gonads almost completely surround the manubrium, leaving only free short upper and distal portions of manubrium; radial canals thin, circular canal narrow; tentacle bulbs large, with thick ectodermal cnidocyst pad, and abaxial red or black ocelli. 4 long marginal tentacles with numerous cnidocyst clusters apparently encircling tentacle (moniliform) in relaxed specimens and one terminal cluster similar to others; marginal tentacles inserted nearly in the central part of the tentacular bulbs; several cnidocysts clusters have an adaxial tuft of long stiff cilia.

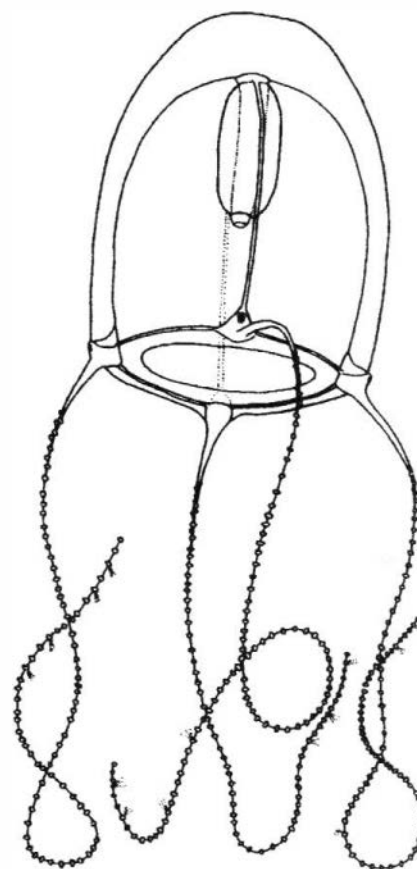


Fig. 54. *Sarsia japonica*. After Schuchert (1996).

RECORDS FROM N.Z.: Lyall Bay; Evans Bay; Wellington (Schuchert 1996).

SEASONALITY: June, July, September.

DISTRIBUTION: Indo-Pacific.

REFERENCES: Arai & Brinckmann-Voss (1980), Mills (1982), Brinckmann-Voss (1989), Petersen (1990), Kubota & Takashima (1992), Pagès *et al.* (1992), Schuchert (1996).

HYDROID: Colonies arising from a creeping ramifying hydrorhiza, mostly stolonial, only occasionally branched. Hydranths claviform with a distal whorl of 4 or 5 capitate tentacles. Below them 3 or 4 whorls, each with 4 capitate tentacles and below these a whorl of 4 or 5 filiform tentacles. Medusa buds arising singly or in groups among the lowest capitate tentacles, some of which may arise in the upper axil of those tentacles.

(Schuchert 1996)

#### Family CORYMORPHIDAE Allman, 1872

Medusae usually with a dome-shaped or acute apex; no exumbrellar cnidocyst tracks. Manubrium not extending beyond umbrellar margin, sausage-shaped, or exceptionally with sac-like processes; mouth simple circular, or with flared rim. 1–4 capitate or marginal moniliform tentacles of different size and structure,

exceptionally branched and rudimentary. Gonads surrounding whole length of manubrium.

This family comprises the following genera: *Branchiocerianthus* Mark, 1898; \**Corymorpha* (= *Amalthaea*) Sars, 1835; \**Euphysora* Maas, 1905; \**Eugotoea* Margulis, 1989; *Fukaurahydra* Yamada *et al.*, 1977; \**Gotoea* Uchida, 1927; *Gymnogonos* Bonnevie, 1898; \**Paragotoea* Kramp, 1942; \**Vannuccia*, Brinckmann-Voss, 1967; \**Yakovia* Margulis, 1989. The asterisked genera have a medusa stage.

Hydroid: Solitary, with one whorl of moniliform or capitate oral tentacles or several whorls of filiform aboral tentacles. Hydrocaulus long, distally acute or rounded, hollow or more or less filled by parenchymatous endoderm; short papillae or longer didermic filaments. Medusae free or with fixed sporosacs.

Present in New Zealand

- 1 with only 1 marginal tentacle . . . . . 2
- 1a with 3 short or rudimentary and 1 long marginal tentacles different in structure . . . . . *Euphysora*



- 2 marginal tentacle thick, ending in long, large, oval ectodermal swelling containing numerous cnidocysts; umbrella with no apical process . . . . . *Vannuccia*  
 2a marginal tentacle slender, long, moniliform; umbrella with pointed apical process . . . . . *Corymorpha*

*Corymorpha* M. Sars, 1835

Medusa with a dome-shaped or pointed apical process, usually with an apical canal; one long moniliform tentacle and three rudimentary bulbs.

Hydroid: With general characters of the family. Hydranth vasiform with one or several close sets of oral whorls of moniliform or filiform tentacles, and one whorl of aboral filiform tentacles; parenchymatous diaphragm; hydrocaulus with parenchymatous endoderm with longitudinal peripheral canals. Free medusae or fixed gonophores.

*Corymorpha intermedia* Schuchert, 1996 (Fig. 55)

Umbrella up to 3 mm high, with an apical process of variable shape and height that may reach one-third of the total height; umbrella shape varies from almost spherical to higher than wide; mesoglea thin; gastric peduncle absent; umbrella margin at right angle to main axis; apical canal absent; no cnidocyst tracks on exumbrella; relaxed velum spanning one-third to half of radius. Manubrium tubular, measuring half to three-quarters of the subumbrellar height, the mouth margin with cnidocysts, sometimes flaring in preserved specimens; with large oil droplet at base of manubrium. Gonads encircle manubrium for almost its entire length, leaving only a small part near mouth free. 4 narrow radial canals ending in 1 large and 3 smaller marginal bulbs, all connected by narrow a circular canal; only largest bulb bears a single moniliform tentacle; no ocelli.

RECORDS FROM N.Z.: Whangateau Harbour; Leigh Marine Reserve (Mills 1982 = *Steenstrupia* sp.); Whangateau Harbour; Goat Island, Leigh Marine Reserve (Barnett 1985 = *Steenstrupia* sp.); Wellington Harbour (Schuchert 1996).

SEASONALITY: April–July, August, October, November, December.

DISTRIBUTION: Endemic to New Zealand.

KEY REFERENCE: Schuchert (1996).

HYDROID: Unknown.

*Euphysora* Maas, 1905

Medusa usually with 3 short or rudimentary ten-

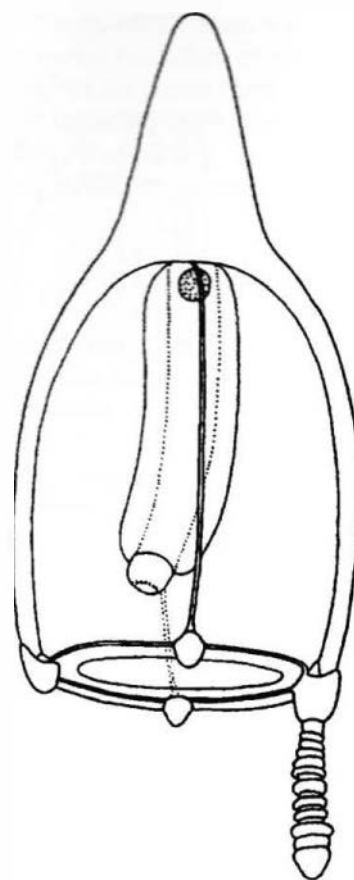


Fig. 55. *Corymorpha intermedia*. After Schuchert (1996).

tacles and one long tentacle that differs from the others not only in size, but also in structure.

Hydroid: With the characters of the family. Hydranths vasiform, with 35 more or less distinctly capitate oral tentacles set in irregular rows on hypostome, and 15–20 aboral elongated non-contractile filiform tentacles; a parenchymatous diaphragm separates the hypostome from the polyp body; hydrocaulus cavity filled by parenchymatous endoderm with a limited number of simple peripheral endodermal canals. Medusa buds borne in clusters on slightly branched inflated pedicels arising above aboral tentacles.

*Euphysora furcata* Kramp, 1948 (Fig. 56)

Umbrella up to 6.5 mm wide, 8 mm high, bell-shaped with pointed apex and fairly thin walls; no apical canal. Manubrium barrel shaped, two-thirds of umbrellar cavity, with broad apical chamber; radial canals thick, with large vacuolated endodermal cells. Gonads encircling manubrium, with perradial longitudinal depressions indicating gonad division (after Schuchert 1996), or in 4 perradial masses separated in interradii



(re-examination of South African material shows perradial gonads). Main marginal tentacle very long, up to twice umbrellar height, very contractile, its terminal end bifurcated twice in 4 knobs covered with cnidocysts; opposite this a fairly long filiform tentacle; two short, conical lateral tentacles.

RECORDS FROM N.Z.: *Dana* Stn 3624.

DISTRIBUTION: Atlantic; Indo-Pacific; Antarctic; Arctic.

KEY REFERENCES: Goy (1979); Navas-Pereira & Vannucci (1991); Pagès *et al.* (1992); Schuchert (1996).

HYDROID: Unknown.

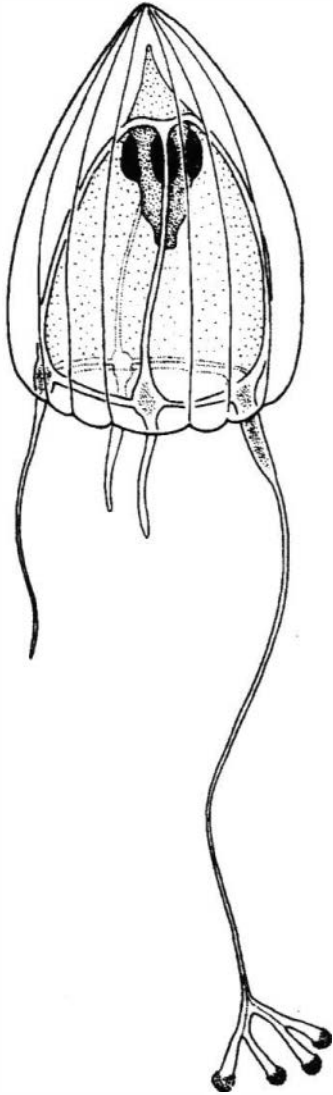


Fig. 56. *Euphysora furcata*. After Pagès *et al.* (1992).

*Vannuccia* Brinckman n-Voss, 1967

Medusa usually with a slightly asymmetrical umbrellar margin, with small marginal bulbs. One marginal tentacle, hollow for half its length, ending in a long,

large, oval cnidocyst swelling.

Hydroid: See characters of the unique species.

*Vannuccia forbesii* (Mayer, 1894)

(Fig. 57)

Umbrella 3 mm high, bell-shaped, ellipsoidal, with slightly asymmetrical margin; mesoglea evenly thin, without apical process or apical canal; no exumbrellar tracks of cnidocysts. Manubrium cylindrical, half to two-thirds of umbrellar height. Gonads encircling manubrium for almost all its length; 4 narrow radial canals and circular canal; one voluminous marginal tentacle at base of longest radial canal, hollow for half its length, ending in a long, large, oval cnidocyst swelling; 3 marginal bulbs, the one opposite the tentacle larger than other ones.

RECORDS FROM N.Z.: Leigh Marine Reserve; Whangateau Harbour (Barnett 1985).

SEASONALITY: March–June

DISTRIBUTION: Atlantic; Indo-Pacific; Mediterranean.

KEY REFERENCES: Brinckmann-Voss (1967), Bouillon (1978a), Navas-Pereira (1980), Navas-Pereira & Vannucci (1991), He Zhenwu & Xu Renhe (1996), Schuchert (1996).

HYDROID: Solitary, the hydrocaulus long and cylindrical, slightly enlarged at its two extremities, the aboral third with papillae and, more aborally, numer-

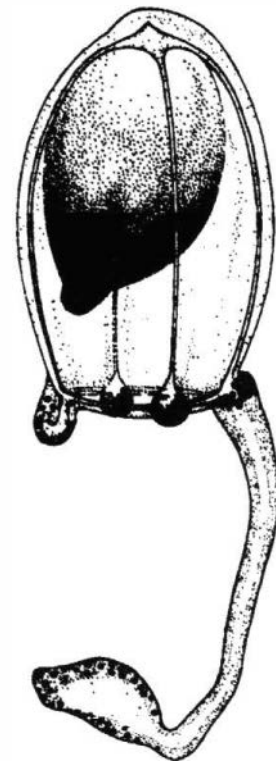


Fig. 57. *Vannuccia forbesii*. After Bouillon, original.

ous rooting anchoring filaments; hydrocaulus filled with parenchymatic endodermal cells presenting numerous peripheral longitudinal canals; surrounded by a flexible perisarc extending slightly below hydranth. Hydranth vasiform, with 12–14 oral moniliform tentacles carrying 4–6 cnidocyst clusters. 16–20 very long aboral filiform tentacles with a more or less developed terminal swelling; diaphragm parenchymatous. Medusa buds borne naked in clusters on short blastostyles just above aboral whorl of tentacles; asexual reproduction by transverse constriction of the basal part of the hydrocaulus.

(Brinckmann-Voss, 1967, 1970)

Family **ELEUTHERIIDAE** Russell, 1953

Medusae usually with a thickened continuous or broken ring of cnidocysts around umbrellar margin. Mouth circular, simple or armed with cnidocyst knobs. A variable number of radial canals, which may or not branch. Gonads on manubrium, on subumbrellar surface, or in specialised dorsal brooding pouches. Marginal tentacles hollow, variable in number, bifurcating in an upper branch armed with cnidocyst clusters or knobs and a lower unarmed branch terminating in an adhesive pad; with abaxial ocelli.

Hydroid: Colonies comprising ramifying stolons from which arise hydroids that are almost sessile. Hydranths with an oral whorl of capitate tentacles and with or without aboral whorl of filiform tentacles; mouth with oral ectodermal mucus gland cells forming a preoral cavity. Medusae free.

*Staurocladia* Hartlaub, 1917

Medusa adapted for crawling and walking; without brood pouch above manubrium. Gonads around manubrium or developed in ectodermal manubrial pockets; 6–11 radial canals some bifurcating shortly distal to manubrium. Mouth circular, with or without 5 or 6 cnidocyst knobs. Up to 60 marginal tentacles, dichotomous, the upper branch with several cnidocyst clusters, the lower with an adhesive organ; ocelli present. Asexual reproduction by medusa budding or by fission.

Hydroid: Hydranths with an oral whorl of capitate tentacles and with or without aboral filiform tentacles; mouth with oral ectodermal mucus gland cells forming a preoral cavity.

- 1 upper marginal tentacular branch without lateral cnidocyst clusters ..... *Staurocladia vallentini*
- 1a upper marginal tentacular branches with lateral cnidocyst clusters ..... *Staurocladia hodgsoni*

*Staurocladia vallentini* (Browne, 1902) (Fig. 58)

Umbrella 3 mm wide, 2 mm high, a flat bell shape. Manubrium small, pear-shaped, almost filling subumbrellar cavity; mouth simple, circular, without cnidocyst knobs; velum very broad; with a continuous marginal cnidocyst ring. Gonads bulging from manubrium; usually 8 (6–11) simple radial canals. Up to 30 marginal tentacles, each with an abaxial ocellus, upper marginal tentacular branch shorter than lower branch, the upper branch with 2 or 3 cnidocyst clusters on aboral tentacular side, 1 or 2 on oral side, and 1 terminal cluster. Medusa budding at the level of marginal ring.

RECORDS FROM N.Z.: Leigh Marine Reserve (Barnett 1985); Wellington area (Schuchert 1996).

SEASONALITY: January–October.

DISTRIBUTION: Atlantic; Indo-Pacific.

REFERENCES: Bouillon (1978a); Mills (1982); Hirohito (1988); Schuchert (1996).

HYDROID: Hydranths born on slender hydrocauli arising directly from a tubular hydrorhiza. 3 or 4 capitate oral tentacles and 4–6 filiform aboral tentacles. Medusa buds developing slightly above filiform tentacles.

(Millard 1975; Schuchert 1996)

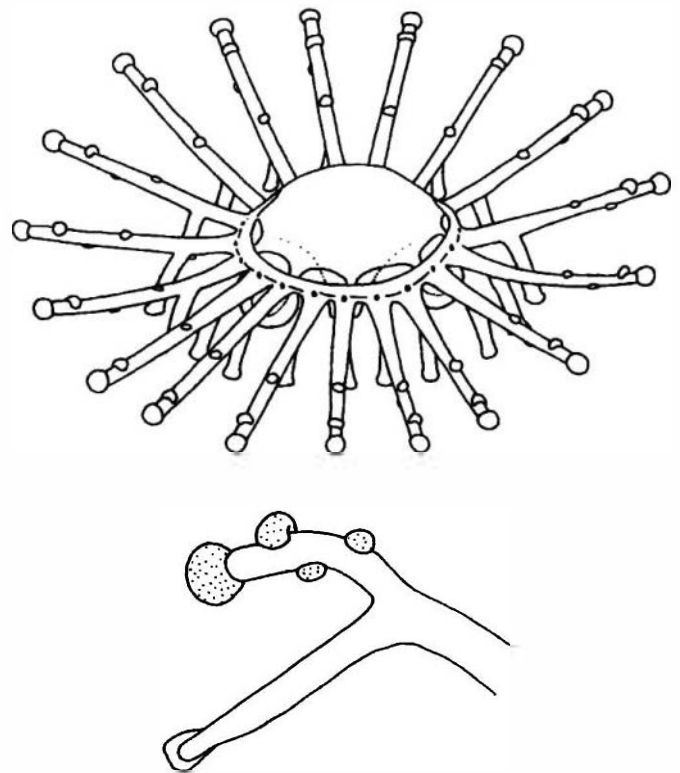


Fig. 58. *Staurocladia vallentini*. After Schuchert (1996). Below, lateral view of tentacle.



*Staurocladia wellingtoni* Schuchert, 1996 (Fig. 59)

Umbrella 4 mm wide, shallow bell-shaped, much wider than high; mesoglea fairly thin; velum broad, fitting closely around manubrium. Manubrium tubular, with 5 or 6 lateral, large, oval, free pouches covered by gonads; female gonads with numerous small eggs; mouth rim lined by 6 conspicuous cnidocyst knobs. 8 long radial canals; between radial canals 2-4 centripetal incomplete canals, the radial canals not in phase with the gonads. Up to 55 bifurcated, hollow marginal tentacles, each up to 3 mm long with a red abaxial ocellus; lower branch ending in an adhesive organ; upper branch longer than the lower one, bearing a terminal spherical cluster and up to 6 lateral clasps of cnidocysts alternating on each side; no marginal cnidocyst ring.

RECORDS FROM N.Z.: Wellington south coast (Schuchert 1996).

SEASONALITY: January, March, April, May, July, August.

DISTRIBUTION: Endemic.

REFERENCES: Schuchert (1996).

HYDROID: Colonies arising from attached ramifying stolons; hydranths sessile, with 4 or 5 oral capitate tentacles, no filiform tentacles. Medusa buds in the middle of the hydranth body. (Schuchert 1996)

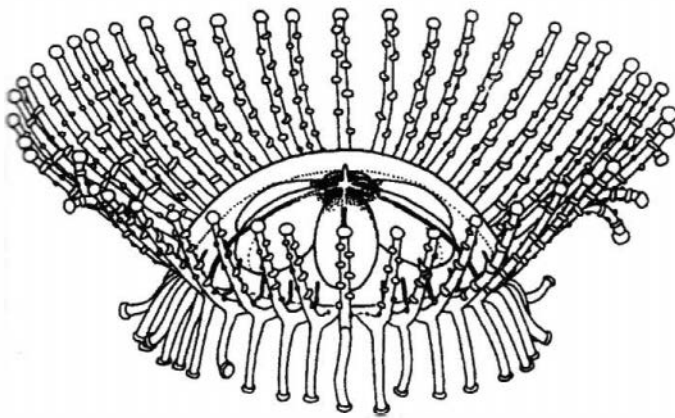


Fig. 59. *Staurocladia wellingtoni*. After Schuchert (1996).

Family **EUPHYSIDAE** Haeckel, 1879

Medusae generally with an evenly rounded umbrella, lacking apical canal and exumbrellar cnidocyst tracks. Manubrium stoutly cylindrical, not extending beyond umbrellar margin; mouth simple, circular. 1-4 marginal tentacles, either unequally developed or of similar length but all of the same structure, moniliform or modified moniliform. Gonads encircling almost entire length of manubrium.

Diagnoses after Bouillon (1995a) slightly emended; the Euphysidae comprises the following genera:

*Euphysa* Forbes, 1848 (= *Heteractis* Allman, 1864; *Hypolytus* Murbach, 1899); *Euphysilla* Kramp, 1955; *Euphysomma* Kramp, 1962; *Siphonohydra* Salvini-Plawen, 1966; *Meiorhopalon* Salvini-Plawen, 1987; *Pinushydra* Bouillon & Gromann, 1990. Only *Euphysa*, *Euphysilla*, and *Euphysomma* have medusa stages.

Hydroid: Solitary, hydrocaulus surrounded by a reduced perisarc often of more or less gelatinous consistency or naked; without parenchymatous endoderm and peripheral canals. Hydranth without parenchymatous diaphragm, an oral whorl of short moniliform, capitate, or filiform tentacles; aboral tentacles moniliform or filiform in 1 or 3 close-set whorls or dispersed; often with a irregular whorl of 4-16 short papillae each with an endodermal statocyst or with an adhesive mucus organ. Free medusae or fixed sporosacs.

*Euphysa* Forbes, 1848

Medusa with the characters of the family.

*Euphysa problematica* Schuchert, 1996 (Fig. 60)

Umbrella up to 1 mm high, almost spherical; mesoglea thin, slightly thicker at apex. Manubrium cylindrical, as long or longer than subumbrellar cavity; with a small apical chamber; mouth simple circular. Gonads completely encircling distal part of manubrium leaving distal two-thirds free. 4 moderately broad radial canals and circular canal present; broad perradial marginal bulbs with identical marginal tentacles, each with about 10 cnidocyst clusters and a large terminal cluster of cnidocysts; ocelli absent.

REMARKS: Schuchert (1996) adopted Petersen's (1990) definition of the Corymorphidae that comprised only two genera with medusae: *Corymorpha* and *Euphysa*. *Euphysa* medusae were defined as follows: "Medusa with evenly rounded umbrella, without apical canal; with one to four tentacles unequally developed, but all of same structure, moniliform or modified moniliform; manubrium stout, cylindrical, with small round mouth, shorter than bell cavity."

The following genera were put in synonymy with *Euphysa* by Petersen: *Euphysomma*, *Heteractis*; *Hypolytus*; *Meiorhopalon*. This proposition appears not well-founded, and is not seriously supported if not inconsistent in Petersen's own text. For instance, *Euphysa flammea*, *E. japonica*, and *Euphysomma brevia* have four identical tentacles and no unequally developed ones. Schuchert (1996) only provisionally assigned *E. problematica* to *Euphysa* and had to make some amendments,

not only at the genus but also at the family level, to accommodate it in Petersen's system — in particular, the length of the manubrium; also the restriction of the gonads to the distal portion of the manubrium (almost recalling that observed in *Dipurena*) although the Corymorphidae normally have the gonads surrounding the entire manubrium length; the fact that the four marginal tentacles are identically developed, differing from Petersen's definition; the structure of the tentacles which are not moniliform or modified moniliform but with dispersed cnidocyst clusters, and a terminal button very similar to those in corynids. The attribution of this species to *Euphysa* is thus not very convincing; if it were not for the absence of ocelli, it shows closer affinities with the Corynidae than with the Corymorphidae. Even the absence of ocelli is not necessarily a valuable character, however — after several years of preservation they could have faded. Our proposal is to keep this species in the Capitata as incertae sedis until more information is available.

RECORDS FROM N.Z.: Whangateau Harbour (Barnett 1985, as *Plotocnide*).

SEASONALITY: February.

DISTRIBUTION: Not known outside New Zealand.

KEY REFERENCES: Bouillon (1978b, 1995a); Petersen (1990); Schuchert (1996).

HYDROID: Unknown.

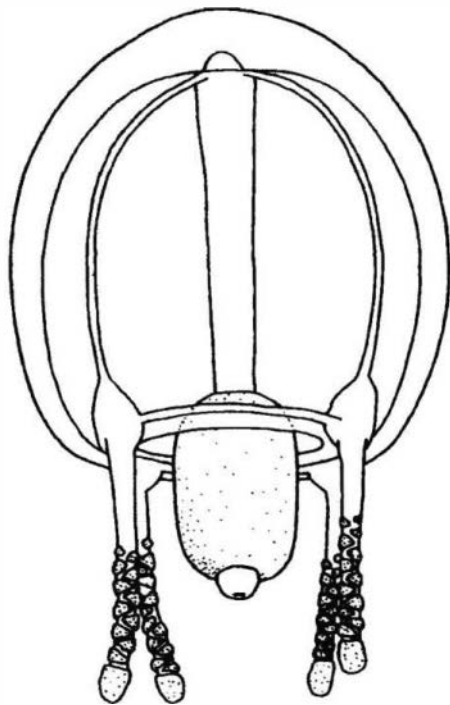


Fig. 60. *Euphysa problematica*. After Schuchert (1996).

#### Family MARGELOPSIDAE Uchida, 1927

Medusae lacking apical projection and cnidocyst tracks. Gonads surrounding manubrium; a simple circular mouth. 4 radial canals. Solid, generally moniliform tentacles in marginal clusters, or at different levels on exumbrella; no ocelli. Eggs may develop into actinulae on manubrium.

#### *Pelagohydra* Dendy, 1902

Pelagic hydroid with aboral half transformed as a floating body, without hydrocaulus. Medusae only known as newly liberated buds, not seen free; with 4 groups of 5–7 marginal tentacles, each group formed at least of 2 long abaxial and 3 short adaxial tentacles.

#### *Pelagohydra mirabilis* Dendy, 1902 (Fig. 61)

Polyp stage: Solitary hydroid freely floating in the sea, up to 35 mm long; body of hydranth divided into a larger oval part (float) and a smaller, tubular oral part (proboscis); float bears up to 150 scattered, tapering tentacles; oral part of hydranth provided with up to 80 tentacles scattered over the distal three-quarters of its length, adnate to proboscis wall; along the mouth rim some very short, differently coloured tentacles. Float has a complicated internal anatomy consisting of an intricate structure of mesogleal lamellae and endodermal chambers. Gonophores develop on branched blastostyles which are dispersed between the aboral tentacles, up to 300 per animal; the blastostyles may bear up to 5 gonophores which develop into free medusae.

SEASONALITY: March, August.

Young medusa: Umbrella bell-shaped to quadrangular, 1.4 mm diameter when preserved, mesoglea rather thick, apex only slightly thicker; exumbrella with many scattered cnidocysts: stenoteles and haplonemes. Manubrium cylindrical, reaching velum or projecting beyond it, the base quadrate, with apical canal; mouth simple. No gonads visible; with 4 radial canals and a circular canal; 4 large perradial marginal bulbs, these extend from velum around umbrellar margin onto exumbrella; each tentacle bulb has 6 or 7 slightly capitate, solid tentacles in a special arrangement: the most abaxial pair points sideways, the next pair projects downwards and is followed adaxially by a single median tentacle which also projects downwards and then 1 or 2 small tentacles projecting adaxially.



Family PENNARIIDAE McCrady, 1859

Medusae reduced to short-lived abortive medusae or eumedusoids. Manubrium not extending beyond umbrellar margin; a simple circular mouth or no mouth. 4 radial canals; gonads completely surrounding manubrium. 4 permanently rudimentary tentacles, usually reduced to mere bulbs, with or without ocelli. Many of the reduced medusoid species described in this family could be eumedusoids belonging to several Tubulariida or Zancleoida families; only the few species which have their cycle known can be considered as belonging to the Pennariidae.

Polyp stages: Colonial with creeping hydrorhiza and upright, pinnately branched hydrocauli bearing branches on upper side only; perisarc tubular, thick, firm. Hydranths terminal, clavate to pear-shaped, each with an aboral whorl of long filiform or slightly capitate tentacles, an oral whorl of short capitate tentacles, and one or more distinct or indistinct whorls of short capitate tentacles between. Gonophores borne just above aboral tentacles, either liberated as short-lived medusae or remaining attached to hydranth as eumedusoids.

*Pennaria* Goldfuss, 1820

With characters of the family.

*Pennaria disticha* Goldfuss, 1820 (Fig. 62)

Umbrella 2 mm high, ellipsoidal, thin. Gonads encircling manubrium; 4 small rudimentary bulbs; no ocelli. Eumedusoid seldom set free, discharging sexual products without liberation or immediately after liberation and not swimming after being released.

RECORDS FROM N.Z.: Auckland Harbour (Treblicock 1928; Ralph 1953; Schuchert 1996). Only hydroids with eumedusoids.

SEASONALITY: February.

DISTRIBUTION: Atlantic; Indo-Pacific; Mediterranean.

KEY REFERENCES: Calder (1988), Hirohito (1988), Gibbons & Ryland (1989), Schuchert (1996).

HYDROID: Feather-like colonies up to 50 mm high arising from a network-like hydrorhiza, growth monopodial; hydrocaulus monosiphonic, giving rise alternately from opposite sides to two series of numerous hydroclades lying in one plane; longest hydroclade in middle of colonies, gradually decreasing in length upwards and downwards; each hydroclade bears a terminal hydranth and numerous hydranths on pedicels on the upper side, or secondary hydroclades with

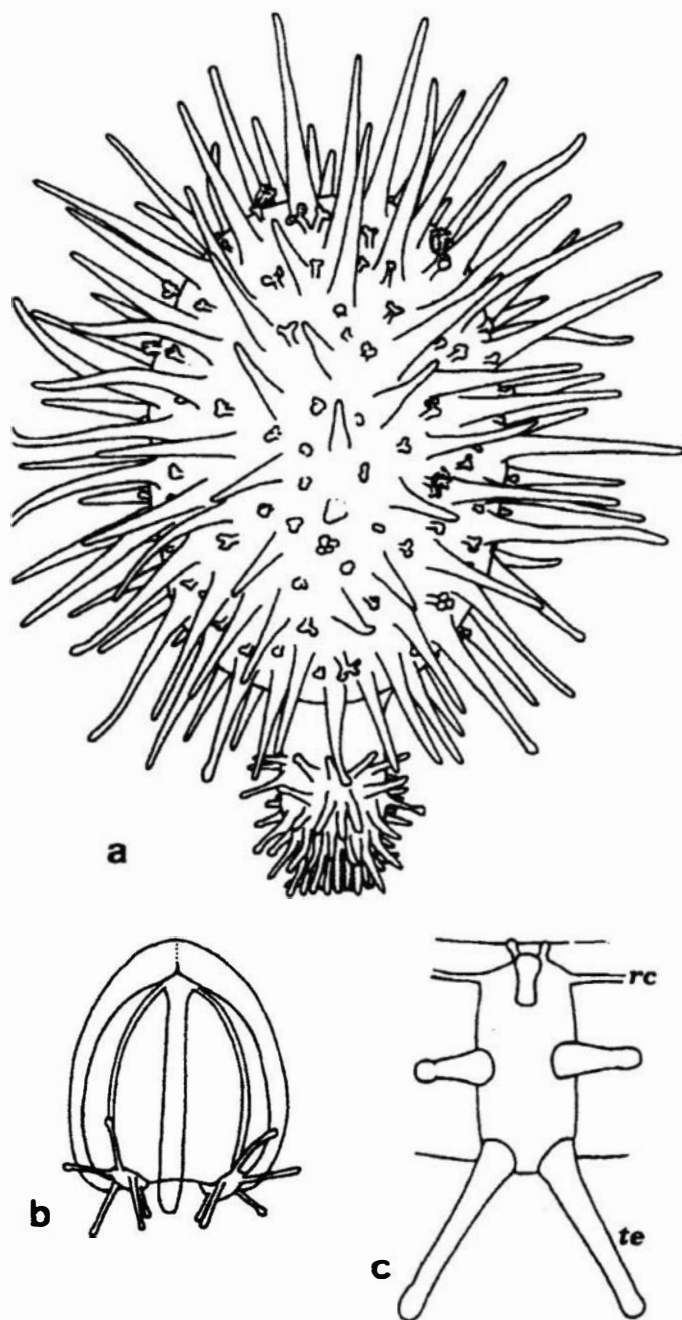


Fig. 61. *Pelagohydra mirabilis*. After Schuchert (1996). a, floating polyp; b, young medusa; c, oral view of tentacle bulb of young medusae, adaxial side upwards. rc = radial canal, te = tentacle.

RECORDS FROM N.Z.: Christchurch area; Portobello. (See Barnett, 1985 for details about records.)

SEASONALITY: March, April, August.

DISTRIBUTION: Endemic.

KEY REFERENCES: Rees & Ralph (1970); Bouillon (1974a); Roper *et al.* (1983); Schuchert (1996).

hydranths again on pedicels. Hydranths with aboral whorl of 12 long semifiliform tentacles and up to 16 scattered short capitate tentacles on distal half of body. Gonophores arising just above filiform tentacles. (Brinckmann-Voss 1970; Schuchert 1996)

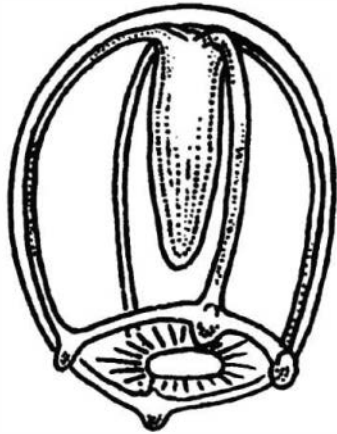


Fig. 62. *Pennaria disticha*. After Kramp (1959).

Family TUBULARIIDAE Fleming, 1828

Medusae usually with exumbrellar cnidocyst tracks; 4 radial canals; usually with a circular mouth. Gonads completely encircling manubrium. 14 marginal tentacles; no ocelli.

Hydroid: Solitary or colonial. Hydranths vaseiform with two sets of tentacles; oral tentacles capitate, moniliform, filiform or pseudofiliform in one to several close-set whorls, often slightly capitate or capitate in juvenile stages, with one whorl of long pseudofiliform or filiform aboral tentacles; a more or less developed parenchymatous cushion under aboral tentacle whorl; hydrocaulus divided into a distal neck region covered by thin periderm and a proximal region that may be short and thick with tuber-like aboral processes, or long, cylindrical, or cone-shaped with basal disc or stolons covered by thicker perisarc. Free medusae or sporosacs.

- 1 umbrella normal, symmetrical ..... *Ectopleura*
- 1a umbrella asymmetrical, margin oblique to vertical axis  
..... *Hybocodon*

*Ectopleura* L. Agassiz, 1862

Medusa with normal, symmetrical, rounded umbrella. Manubrium short, at most reaching bell margin, with 2 opposite or 4 equally developed, simple mar-

ginal tentacles, moniliform or with abaxial cnidocyst clusters. 4 radial canals; with 8 longitudinal exumbrellar cnidocyst rows, in pairs, from tentacle bulbs.

Hydroid: Solitary or colonial, with high stems; oral tentacles in one whorl; perisarc originates from collar on neck region and does not cover whole neck; hydrocaulus simple, with two, rarely up to five, internal longitudinal endodermal ridges.

*Ectopleura* spp.

(Fig. 63)

Umbrella 2.5 mm high, pear-shaped to conical bell-shaped, narrowing at base; mesoglea thicker apically but lacking clear apical projection; exumbrella with 4 pairs of longitudinal cnidocyst tracks originating from marginal bulbs. Manubrium tubular, about two-thirds length of umbrellar cavity, with short conical apical chamber and apical canal, the size of both depending on age and preservation; mouth simple, tubular. Radial canals and circular canal narrow; 2 moderately broad marginal tentacular bulbs opposite each other and 2 slightly smaller non-tentacular bulbs; the 2 opposite perradial marginal tentacles each with 6–9 abaxial cnidocyst clusters and a larger terminal one. Gonads completely surrounding manubrium, leaving distal-most part free.

REMARKS: Medusae recorded as *Ectopleura minerva* Mayer, 1900 were described by Barnett (1985). Medusae of *Ectopleura minerva* have been reported from Florida, Bermuda, the Mediterranean, Seychelles, India, China, and the Bismarck Sea. The New Zealand specimens (Barnett material) appear identical to those of the Seychelles and Papua New Guinea and seem to correspond to *Ectopleura minerva* auctt. Schuchert (1996) nevertheless concluded that the New Zealand medusae differ slightly from those from the Atlantic type locality. The hydroid stage of *Ectopleura minerva* is unknown. Several *Ectopleura*-type hydroids have been described producing unreleased or just-released 2-tentacled medusae, particularly *E. pacifica* Thornely, 1900 from Papua New Guinea, but for none is the adult stage known, and rearing experiments will thus be necessary to elucidate and clarify the complex and confused synonymy.

New Zealand "*Ectopleura minerva*" are therefore here referred as *Ectopleura* spp.

RECORDS FROM N.Z.: Whangateau Harbour (Barnett 1985); Leigh Marine Reserve (Schuchert 1996 = *Ectopleura* sp.)

SEASONALITY: March–July.

DISTRIBUTION: Atlantic; Indo-Pacific; Mediterranean.



KEY REFERENCES: Bouillon (1978a, b), Calder (1988), Hirohito (1988), Petersen (1990), Goy *et al.* (1991), He Zhenwu & Xu Renhe (1996), Schuchert (1996).

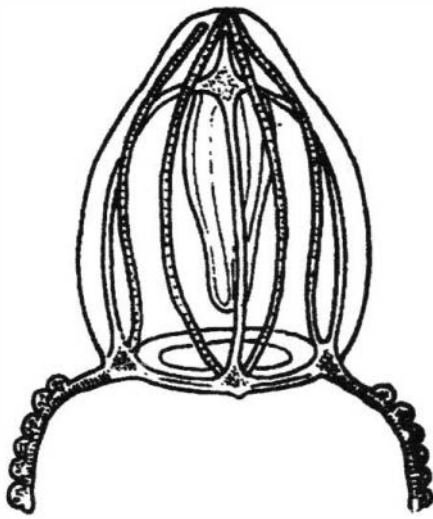


Fig. 63. *Ectopleura minerva*. After Kramp (1968).

*Hybocodon* L. Agassiz, 1862

Medusa bilaterally symmetrical, umbrellar margin at oblique angle to vertical axis; lacking pointed apical process; with or without exumbrellar cnidocyst tracks. Manubrium cylindrical on short peduncle, not extending beyond umbrellar margin. 4 radial canal, 1 short, 2 medium-sized and 1 longer; 1 simple or compound marginal bulb with 1–3 moniliform tentacles corresponding to the longest radial canal; the 3 remaining perradial bulbs rudimentary.

Hydroid: Solitary with long stems; oral tentacles in 2 whorls; perisarc originating just below hydranth and covering the whole neck region; 8 or more longitudinal endodermal ridges.

*Hybocodon prolifer* L. Agassiz, 1862 (Fig. 64)

Umbrella 3 mm wide, up to 5 mm high, bell-shaped, evenly rounded, umbrellar margin oblique to vertical axis, mesoglea moderately thick; usually 5 meridional exumbrellar cnidocyst tracks, 2 from the tentacular bulb, 1 from each non-tentacular bulb; velum moderately broad. Manubrium large, cylindrical, mounted on a short peduncle that never reaches beyond bell margin even in full extension; mouth with a narrow ring of cnidocysts; 1 tentacular bulb with 1 or more moniliform tentacles (with adaxial clasps according to Schuchert (1996), 3 non-tentacular bulbs

and medusa buds reduced. Gonads completely surrounding manubrium, leaving peduncle and distal-most portion free; eggs developing into actinulae.

RECORDS FROM N.Z.: NZOI Stn N384; Avon-Heathcote Estuary, Christchurch (Roper *et al.* 1983); Whangateau Harbour; Leigh Marine Reserve (Barnett 1985); Wellington Harbour (Schuchert 1996).

SEASONALITY: March, April–July–September, December. DISTRIBUTION: Atlantic; Indo-Pacific; Antarctic, Arctic; Mediterranean.

KEY REFERENCES: Arai & Brinckmann-Voss (1980), Bouillon (1995b), He Zhenwu & Xu Renhe (1996), Medel & Lopez-Gonzales (1996), Schuchert (1996).

HYDROID: Colonies with hydrorhiza of branching stolons embedded in sponges; hydrocaulus solitary or sparingly aggregated, long, gradually enlarging to just below hydranth, with firm perisarc; endoderm of hydrocaulus with central lumen and several longitudinal ridges; neck region between hydrocaulus and hydranth surrounded by a loose filmy, wrinkled perisarc. Hydranth pear-shaped with rounded hypostome, and up to 50 short oral filiform tentacles in 2 closely set whorls, the distal-most shorter, and up to 31 longer aboral filiform tentacles in one whorl, the base of aboral tentacles adnate to basal part of hydranth. Medusa buds on branching blastostyles, bearing numerous buds just above aboral tentacles; the older medusa buds themselves carrying buds while still fixed on hydranths. (Russell 1953; Schuchert 1996)

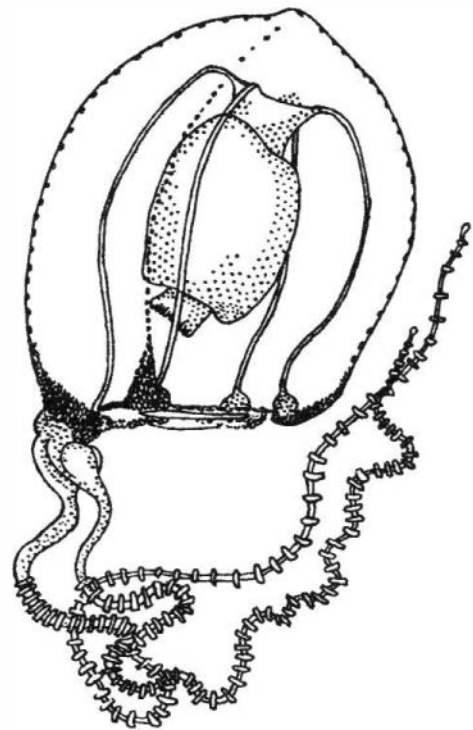


Fig. 64. *Hybocodon prolifer*. After Hartlaub (1907).

Suborder ZANCLEIDA Russell, 1953

Medusa with flask-shaped manubrium with quadrate base and cylindrical mouth tube; interradial gonads; with or without exumbrellar cnidocyst pouches. 2-4 marginal tentacles developed only at junction between radial and circular canals, with or without cnidophores or capitate side branches; with or without ocelli.

Hydroid: Colonial, floating, or comprising a fixed ramifying hydrorhiza of stolonial tubes that makes an encrusting mat or a calcified exoskeleton. Hydranths monomorphic or polymorphic, with capitate oral tentacles and capitate, moniliform or branching-capitate aboral tentacles or without tentacles. Free medusae, eumedusoids, or sporosacs.

- 1 marginal tentacles terminating in a single large spherical cnidocyst knob ..... PORPITIDAE
- 1a marginal tentacles with numerous stalked capsules containing cnidocysts, the capsule stalk thread-like, very extensible (cnidophores: Fig. 9D: Cd) .... ZANCLEIDAE

Family PORPITIDAE Goldfuss, 1818

Medusa umbrella presenting 4 or 8 tracks of cnidocysts issuing from marginal bulbs; 4 or 8 radial canals and a circular canal. Manubrium short, conical, with a circular mouth. Gonads perradial or interradial, often split. 2 opposite perradial, capitate marginal tentacles; with or without 2 additional smaller capitate tentacles adaxial to the first; zooxanthellae generally present. Cnidocysts: stenoteles, macrobasic euryteles.

Hydroid: See below, *Porpita porpita* and *Verella vellella*.

- 1 4 radial canals; 2 pairs of opposing capitate tentacles . . . . . *Verella*
- 1a 8 radial canals; 2 capitate tentacles ..... *Porpita*

*Porpita* Lamarck, 1801

Medusa with 8 radial canals. Manubrium conical with octagonal base. 2 opposite marginal capitate tentacles and 6 non-tentacular bulbs, short exumbrellar cnidocyst tracks above each bulb. Gonads 8, perradial.

*Porpita porpita* (Linnaeus, 1758) (Fig. 65)

Adult medusa: Umbrella up to 2.5 mm high and 2 mm diameter, bell rather conical, with jelly of even thickness; exumbrella with 8 radial tracks of cnidocysts,

only 1 cnidocyst capsule wide. Manubrium conical, length one-third of bell cavity; with circular, hardly visible mouth. Gonads normally in 4 perradial masses on manubrium, often split, 3-8 gonads may be present. 8 large radial canals with zooxanthellae; circular canal present; 8 little-developed marginal bulbs. Only 2 opposite tentacles present, long, fragile and ending in a voluminous spherical cnidocyst swelling; tentacles may develop unequally and be of different length; often only one tentacle present; ocelli absent.

RECORDS FROM N.Z.: Only the floating polyps are known from New Zealand; adult medusa not yet collected.

DISTRIBUTION: Indo-Pacific; Mediterranean.

KEY REFERENCES: Bouillon (1984c).

Hydroid: Colony dark blue, floating on water surface, diameter up to 30 mm, mostly smaller, with disk-shaped mantle and internal float, margin soft, sinuated, flexible; central region firm, slightly convex, with a central pore and numerous stigmata; mantle with radiating endodermal canals; internal chitinous float consisting of a series of concentric chambers; a disk-shaped reservoir of cnidocysts lying between float and central gastrozoid. Under-surface with one large central gastrozoid, a median circle of gastro-gonozooids, and a peripheral circle of dactylozooids; central gastrozoid short and broad with a terminal mouth, without tentacles or prominent cnidocyst clusters; gastro-gonozooids clavate, lacking tentacles but with prominent cnidocyst clusters scattered over body; medusae develop near base in clusters; dactylozooids with a distal whorl of 4 capitate tentacles, body with varying number of short, small capitate tentacles in 3 vertical rows.

RECORDS FROM N.Z. (Polyp): Muriwai Beach (Powell 1947); Tawharanui Peninsula (Gordon *in* Schuchert (1996).

SEASONALITY: Winter.

DISTRIBUTION : Atlantic; Indo-Pacific; Mediterranean.

KEY REFERENCES: Leloup (1929); Brinckmann-Voss (1970); Daniel (1976); Calder (1988); Pagès *et al.* (1992); Schuchert (1996).

*Verella* Lamarck, 1801

Medusa with 4 exumbrellar cnidocyst rows and 4 radial canals. 2 pairs of opposite, perradial tentacles, each with a large terminal cnidocyst cluster; 2 perradial marginal bulbs without tentacles. Manubrium conical with quadrate base, mouth tubular. Gonads irregularly arranged, divided in male; female with 1 egg.



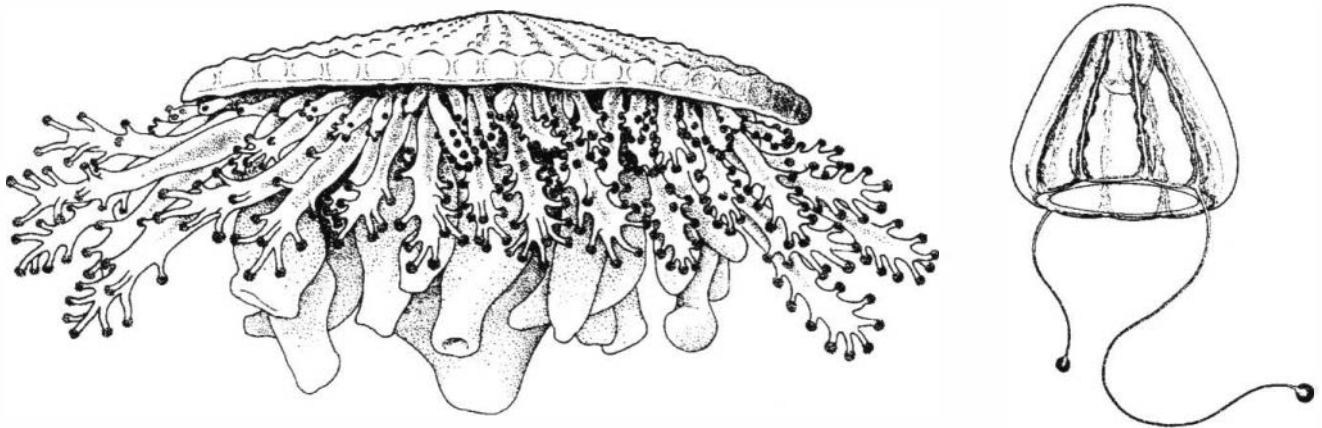


Fig. 65. *Porpita porpita*. Left, after Pagès *et al.* (1992); right, after Bouillon (1984c).

*Velella velella* (Linnaeus, 1758) (Fig. 66)

Adult medusa: Umbrella up to 2.8 mm high and 2 mm wide, cylindrical with flat top, dark brown owing to zooxanthellae, jelly evenly thin; exumbrella with numerous papillae. Manubrium conical, length half to two-thirds of bell cavity. Gonads on manubrium as 4 longitudinal swellings in perradial position. 4 marginal bulbs; 2 opposite bulbs lack tentacles, the 2 other have 2 tentacles each, a short stout adaxial capitate tentacle, and a longer axially directed capitate tentacle; tentacles with chordal endoderm; on the abaxial side of each tentaculate marginal bulb is an exumbrellar triangular patch of about 50 stenotele cnidocysts that extends in an irregular line to the bell apex; on the abaxial side of each atentaculate bulb 15–20 stenotele cnidocysts form a vertical, irregular double exumbrellar row extending a short distance from the bell margin and continuing as an irregular line to the bell apex; marginal sense organs absent. Cnidocysts: stenoteles, macrobasic euryteles.

RECORDS FROM N.Z.: Only the floating polyps are known from New Zealand; adult medusae not yet collected. DISTRIBUTION : Atlantic, Indo-Pacific; Mediterranean. Bouillon (1978b) and Larson (1980) described the only adult medusae known from nature.

KEY REFERENCES: Brinckmann-Voss (1964, 1970); Edwards (1966a); Larson (1980); Bouillon (1978b, 1984c). HYDROID: Hydroid colonies floating on water surface, with flattened, deep blue, elliptical float and triangular sail; up to 40 mm long and 20 mm wide, higher in the centre than at the edges; there are two mirror forms of the animal (left- and right-sailing); float and sail are kept rigid by a chitinous support covered by mantle tissue; margin of float soft and flexible, oval to slightly S-shaped with concentric air chambers; mantle tissue with network of endodermal canals. Gastrozoid

single, large, in centre of underside or "siphon" encircled by a ring of medusae producing gastro-gonozooids and a peripheral band of dactylozooids; central feeding zooid broadly oval with an elongated hypostome, no tentacles or medusa buds; gastro-gonozooids spindle-shaped with a swollen mouth region, lacking tentacles but with warts of cnidocyst clusters concentrated in distal half; on proximal half of hydranth numerous medusa buds growing in groups from short blastostyles; dactylozooids long and tapering, oval in cross section with cnidocysts concentrated on the narrow sides, mouth lacking. Medusa buds yellow-olive from symbiotic algae.

RECORDS FROM N.Z.: North Island (Powell 1947); South Island (Schuchert 1996; almost all colonies observed by Schuchert had their sail in "right-sailing" position). The prevalence of one form in a region may be due to sorting by prevailing winds (Edwards 1966a).

SEASONALITY: January, March–May, August, December. DISTRIBUTION: Atlantic; Indo-Pacific; Mediterranean. KEY REFERENCES: Mackie (1959, 1960), Edwards (1966a), Brinckmann-Voss (1970), Daniel (1976), Calder (1988), Pagès *et al.* (1992), Bouillon (1995a), Schuchert (1996).

Family ZANCLEIDAE Russell, 1953

Medusae with bell-shaped umbrella; with or without exumbrellar oval or clavate patches or elongate tracts of cnidocysts; a simple circular mouth. With or without oral tentacles; 4 radial canals exceptionally bifurcated; marginal tentacles when present, 2 or 4, hollow, each bearing numerous abaxial cnidophores. Gonads usually interradian, rarely in a single mass around manubrium; no ocelli.

Hydroid: Colonial, with creeping hydrorhiza, hydrocaulus unbranched; polyps monomorphic or

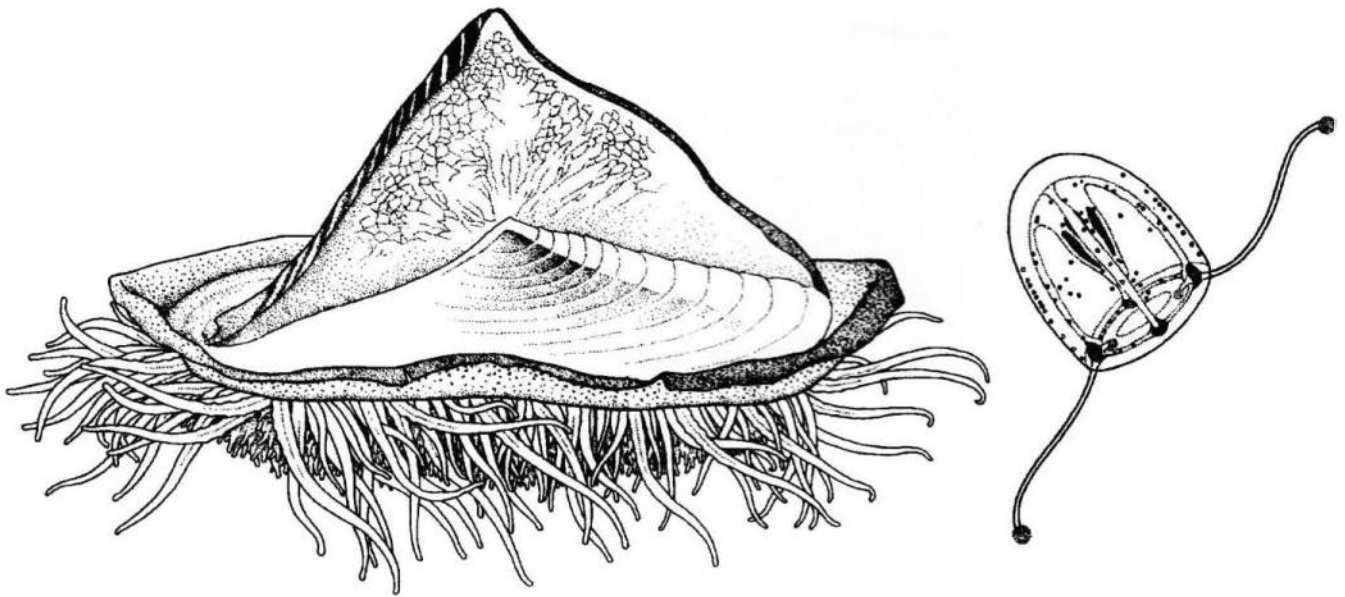


Fig. 66. *Verella verella*. Left, after Pagès *et al.* (1992); right, after Brinckmann-Voss (1964).

polymorphic; gastrozooids, or with oral and aboral capitate tentacles, reduced capitate tentacles, or no tentacles; gonozooids and dactylozooids, when present, varied in expression.

*Zanckea* Gegenbaur, 1857

Medusa bell-shaped, lateral walls evenly thin, mesoglea slightly thicker at the apex; with exumbrellar perradial cnidocyst patches or tracts; mouth simple, circular. 4 simple radial canals; marginal tentacles when present 2 or 4, with numerous abaxial cnidophores. Gonads interradial. Cnidome generally stenoteles and macrobasal euryteles, no desmonemes. No ocelli.

Hydroid: Colonial stolonial hydroids, often associated with bryozoans or molluscs; hydranths monomorphic or polymorphic. Polymorphic colonies may present gastrozooids, dactylozooids, tentaculozooids, and sometimes gastro-gonozooids; gastrozooids on unbranched short pedicels, often almost sessile, elongated, cylindrical or claviform with an oral whorl of capitate tentacles and numerous aboral capitate tentacles scattered or in several whorls over entire body; tentacles rarely reduced to mere cnidocyst patches; perisarc covering hydrohiza and entire hydrocaulus or confined to lower part of hydrocaulus only; dactylozooids and tentaculozooids when present varied in expression. Medusa buds carried singly or in clusters on short pedicels, either scattered among or under the aboral tentacles, on hydrorhiza or on hydranths reduced to blastostyles.

*Zanckea polymorpha* Schuchert, 1996 (Fig. 67)

This species is clearly distinguished from other *Zanckea* species by its polymorphic polyps. Schuchert (1996) stated that "the medusa alone is indistinguishable from medusae commonly referred to *Zanckea costata*." Most *Zanckea* medusae, including that of *Z. costata*, are actually not identifiable without a detailed study of the structure of the macrobasal eurytele cnidocysts of the polyp stage and a knowledge of their complete life cycle. They may be referred generally to *Zanckea* spp. According to Schuchert, *Z. polymorpha* may be the only species of *Zanckea* known in New Zealand waters. Nevertheless, despite the widespread claim that *Zanckea* is represented world-wide by a single species, the genus comprises at least three species in the Mediterranean alone (Gravili *et al.* 1996; Cerrano *et al.* 1997) and there are many more phylogenetically significant species in Papua New Guinea (Boero & Bouillon in press). Until more information is available we prefer to put all zanckeid medusae with unknown life cycles in *Zanckea* spp.

*Zanckea polymorpha* Schuchert, 1996 (Fig. 67)

Diagnosis as for the genus; 1.0–1.6 mm wide; exumbrellar cnidocyst patches reduced to narrow tracts.

RECORDS FROM N.Z.: Wellington Harbour (Schuchert 1996); South Island? (Gordon & Mawatari 1992).  
SEASONALITY: April, October, November.



DISTRIBUTION: Endemic to New Zealand.

KEY REFERENCES: Schuchert (1966).

HYDROID: Colonies growing on Bryozoa; polyps polymorphic, sessile, without marked caulus, arising from stolons partly embedded in the bryozoans or wholly covered by calcified material secreted by the bryozoa; the polyps cannot completely withdraw into the bryozoan colony; differentiated into gastrozooids, dactylozooids and rarely gonozooids; gastrozooids claviform with 4–6 capitate oral tentacles and 8–14 scattered capitate tentacles below them, tentacles become progressively shorter towards hydranth base; dactylozooids very long and thin, very extensible, more frequently present near margin of host colonies, with swollen oral region and white hypostome; 1–4 short capitate tentacles scattered on body, some with a mouth. Gonophores normally arising from stolons, occasionally on gastrozoid-like polyps below the tentacle zone. (Schuchert, 1996)

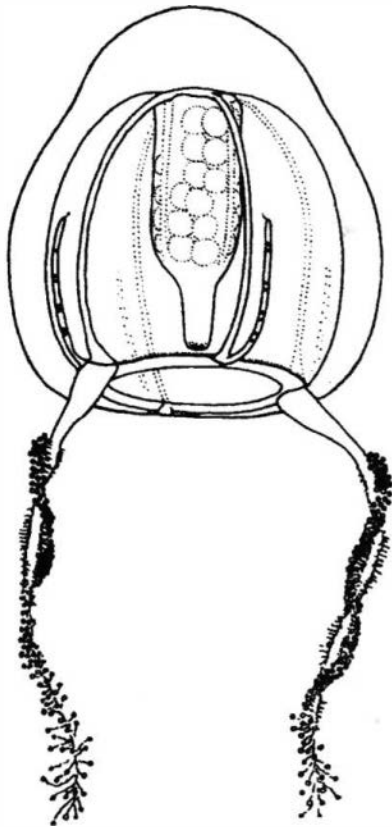


Fig. 67. *Zanclea polymorpha*. After Schuchert (1996).

*Zanclea* spp.  
(Fig. 68)

Diagnosis as for the genus.

RECORDS FROM N.Z.: Barnett, 1985: Whangateau Harbour; Leigh Marine Reserve and all other *Zanclea* medusa records of New Zealand for which the cycle is not known.

SEASONALITY: January, March–July.

DISTRIBUTION OF THE GENUS: Atlantic; Indo-Pacific; Mediterranean.

REFERENCES: Russell & Rees (1936), Millard & Bouillon (1973), Bouillon (1974a), Calder (1992), Gravili *et al.* (1996), Cerrano *et al.* (1997), Boero & Bouillon (in press).

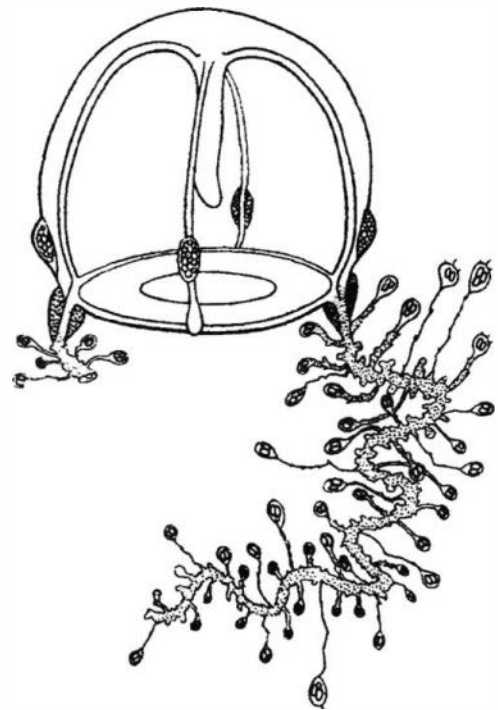


Fig. 68. *Zanclea* sp. After Hargitt (1904).

Subclass LEPTOMEDUSAE  
Order CONICA Broch, 1910

Hydranths with a simple, generally conical or rounded-conical hypostome, without a "buccal cavity" beneath the mouth opening; medusa varied in expression.

- |    |  |             |
|----|--|-------------|
| 1  | with cordyli or cordyli-like structures  | 2           |
| 1a | with statocysts  | 3           |
| 2  | manubrium with 4 perradial lobes connected with sub-umbrella; gonads on manubrium and extending on perradial lobes | TIARANIDAE  |
| 2a | manubrium without perradial lobes; gonads on radial canals usually contiguous with manubrium                       | LAODICEIDAE |
| 3  | with open statocysts   | 4           |
| 3a | with closed statocysts   | 5           |



- 4 open statocysts associated with ocelli    .. TIAROPSIDAE
- 4a open statocysts without ocelli    .. MITROCOMIDAE
- 5 distinct gastric peduncle; 8 or many statocysts .....
- ..... EIRENIDAE
- 5a without distinct gastric peduncle    .. 6
- 6 manubrium very broad; many (>8) radial canals; tentacle  
bulbs with excretory pores on or not on excretory papillae  
..... AEQUOREIDAE
- 6a manubrium narrow; normally 4–8 radial canals    .. 7
- 7 tentacle bulbs with excretory pores, 4–8 radial canals  
(sometimes 11)    .. MALAGAZZIIDAE
- 7a tentacle bulbs without excretory pores    .. 8
- 8 tentacle bulbs with lateral cirri    .. 9
- 8a tentacle bulbs without lateral cirri    .. 10
- 9 8 statocysts (exceptionally 12–14)    .. EUCHEILOTIIDAE
- 9a numerous statocysts (16 or more)    .. LOVENELLIDAE
- 10 exumbrella with marginal cirri    .. CIRRHOLOVENIIDAE
- 10a exumbrella lacking marginal cirri    .. 11
- 11 gonads divided in two lateral parts separated by a median  
groove; 8 marginal statocysts    .. PHIALELLIDAE
- 11a gonads completely surrounding radial canals; 8 or more  
statocysts    .. see under Proboscoida:  
..... CAMPANULARIIDAE and PHIALUCIIDAE

Family **AEQUOREIDAE** Eschscholtz, 1829

Medusae with very wide, circular manubrium, usually without gastric peduncle. Many simple or branched radial canals. Gonads on radial canal separated from manubrium. Hollow marginal tentacles, usually with excretory pores or papillae; no marginal or lateral cirri; closed statocysts; no ocelli.

Hydroid: When known, colonies stolonial or erect; if the latter, then only little branched with sympodial growth. Hydrothecae delicate, tubular, elongate, radially symmetrical, with an operculum formed by several triangular convergent segments, being a continuation of the hydrothecae wall and not delimited basally by crease-line; hydranth contractile, with basal intertentacular web; no nematophores. Gonothecae pedicellate, budding 1 or 2 medusae.

*Aequorea* Péron & Lesueur, 1810

Medusa with numerous simple radial canals; sub-umbrella without rows of gelatinous papillae.

Hydroid: When known, with the characters of the family. The hydroids are inadequate for identification (see Cornelius 1995).

- 1 gonads no more than half as long as radial canals; 16–50  
radial canals    .. *Aequorea australis*
- 1a gonads along almost whole length of radial canals    .. 2
- 2 ca. 4–10 or more times as many radial canals as tentacles;  
tentacle bulbs broad with abaxial keel; bulbs numerous,  
small    .. *Aequorea macrodactyla*
- 2a at least half as many tentacles as radial canals; tentacle  
bulbs conical, very elongated; small bulbs few, scattered  
..... *Aequorea forskalea*

*Aequorea australis* Uchida, 1947

(Fig. 67)

Umbrella 11–25 mm, up to 40 mm wide, flatter than a hemisphere; central mesoglea thick; margins rather thin. Manubrium small for genus, diameter less than half of that of subumbrella; lips fairly short, approximately the same number as radial canals; 16–50 radial canals. Gonads about half as long as radial canals, nearer to margin than to manubrium. 16–40 marginal tentacles and a varying number of small conical bulbs; tentacle bulbs with distinct adaxial excretory papillae; statocysts about the same number as tentacles.

RECORDS FROM N.Z.: Whangateau Harbour; Leigh Marine Reserve (Barnett 1985).

SEASONALITY: February, April.

DISTRIBUTION: Indo-Pacific.

KEY REFERENCES: Kramp (1953), Bouillon (1984b); He Zhenwu & Xu Renhe (1996).

HYDROID: Unknown.

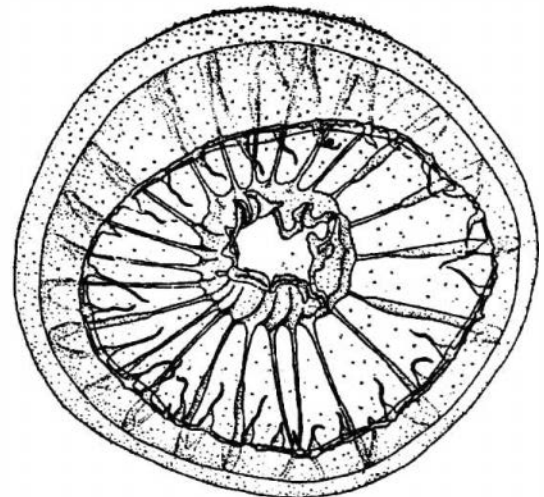


Fig. 69. *Aequorea australis*. After Kramp (1968).

*Aequorea forskalea* Péron & Lesueur, 1810 (Fig. 70)

Umbrella large, up to 175 mm wide, saucer-shaped, thick in centre, gradually thinning towards margin.



Manubrium half as wide as umbrella. Radial canals usually 60–80, sometimes fewer or up to 160. Gonads along almost whole length of radial canals. Tentacles generally fewer than radial canals but varying from half to twice as many; tentacle bulbs elongate, conical; small bulbs few, scattered; excretory pores on short papillae; 5–10 statocysts between successive radial canals.

RECORDS FROM N.Z.: *Dana* Stn 3623.

SEASONALITY: December.

DISTRIBUTION: Atlantic; Indo-Pacific, Mediterranean.

KEY REFERENCES: Kramp (1965); Cornelius (1995).

HYDROID: Colonies minute, stolonal with single or slightly branching erect hydrocauli which are imperfectly annulated or spirally grooved throughout their length. Hydrothecae cylindrical, with a long conical folded operculum tapering to a fine sharp point, the

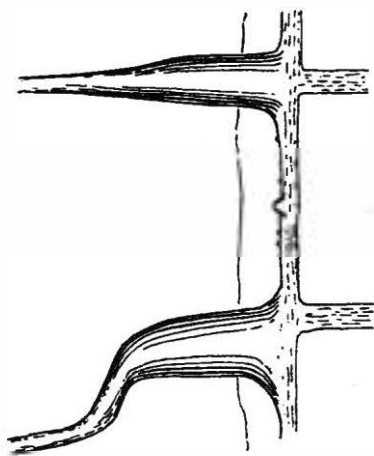
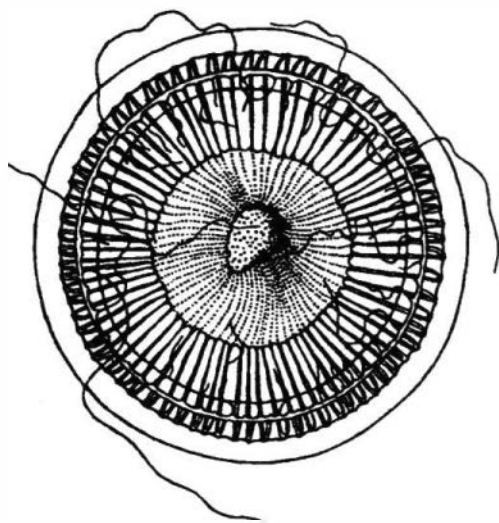


Fig. 70. *Aequorea forskalea*. After Kramp (1968); below, enlarged section of margin with tentacle bulbs and statocysts.

folds continuing as striations of perisarc downwards nearly to base of hydrotheca, the base at right angles to lateral walls; hydranths very extensile, with about 20 amphicoronate filiform oral tentacles united at their base by a prominent intertentacular membranous web. Gonothecae very large and cylindrical, blunt-ended, arising from hydrocaulus on short imperfectly annulated stems just below hydranths and containing 1, rarely 2 medusa buds.

(Rees 1938; Russell 1953; Cornelius 1995)

*Aequorea macrodactyla* (Brandt, 1834) (Fig. 71)

Umbrella up to 75 mm wide, lens-shaped, plano-convex, central disk thick, margin thin. Manubrium about half as wide as umbrella, lateral walls extensile, with transparent lines from base of radial canals to mouth lips; lips folded, crenulated, variable in number, usually same as radial canals; 60–100, up to 150 radial canals. Gonads linear, bilamellar along both sides of radial canals, extending along almost their entire length. 10–30 (rarely up to 40) smooth marginal tentacles and 6–8 times as many small rudimentary bulbs; tentacle bulbs broad, conical, clasping umbrellar margin, each with a distinct abaxial keel and prominent excretory papilla; statocysts very numerous, up to 7 or 8 between adjacent tentacles.

RECORDS FROM N.Z.: *Dana* Stns 3620, 3621, 3622, 3623, 3624, 3625, 3627, 3641, 3653, 3654, 3656; Cavalli Islands (Barnett 1985).

SEASONALITY: January, December.

DISTRIBUTION: Atlantic; Indo-Pacific.

REFERENCES: Stretch & King (1980), Bouillon (1984b), Pagès *et al.* (1992), He Zhenwu & Xu Renhe (1996).

HYDROID: Unknown.

Family CIRRHOLOVENIIDAE Bouillon, 1984

Medusae with small manubrium; no peduncle; no excretory pores. 4 simple radial canals. Gonads on radial canals separated from manubrium. Hollow marginal tentacles; marginal cirri; no lateral cirri; 4 or more closed statocysts; no ocelli.

Hydroid: Known only in *C. tetranema*.

*Cirrhovenia* Kramp, 1959

Medusa with 4–40 marginal tentacles; 7 or 8 marginal cirri between successive marginal tentacles.

Hydroid: Known only in *C. tetranema*.

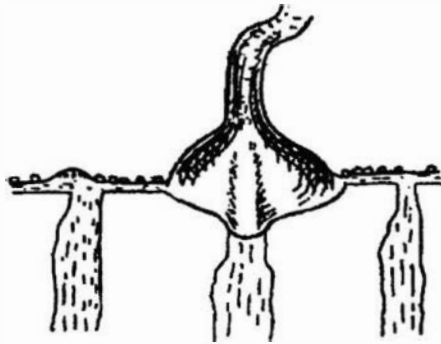
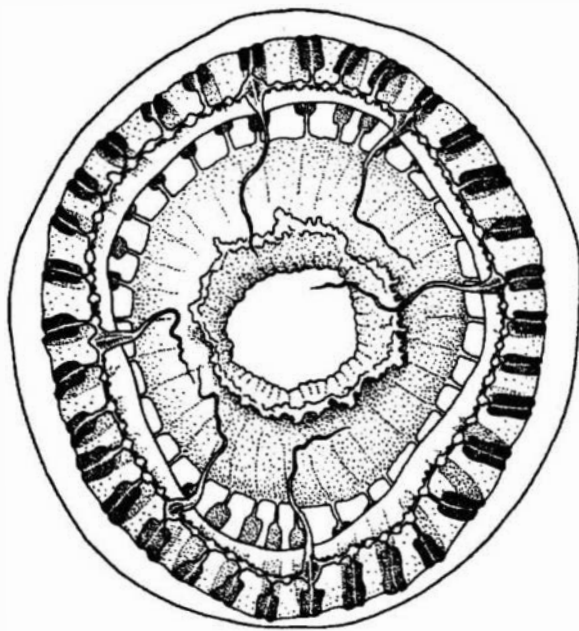


Fig. 71. *Aequorea macrodactyla*. Above, after Pagès *et al.* (1992); below, enlarged section of the margin, after Kramp (1968).

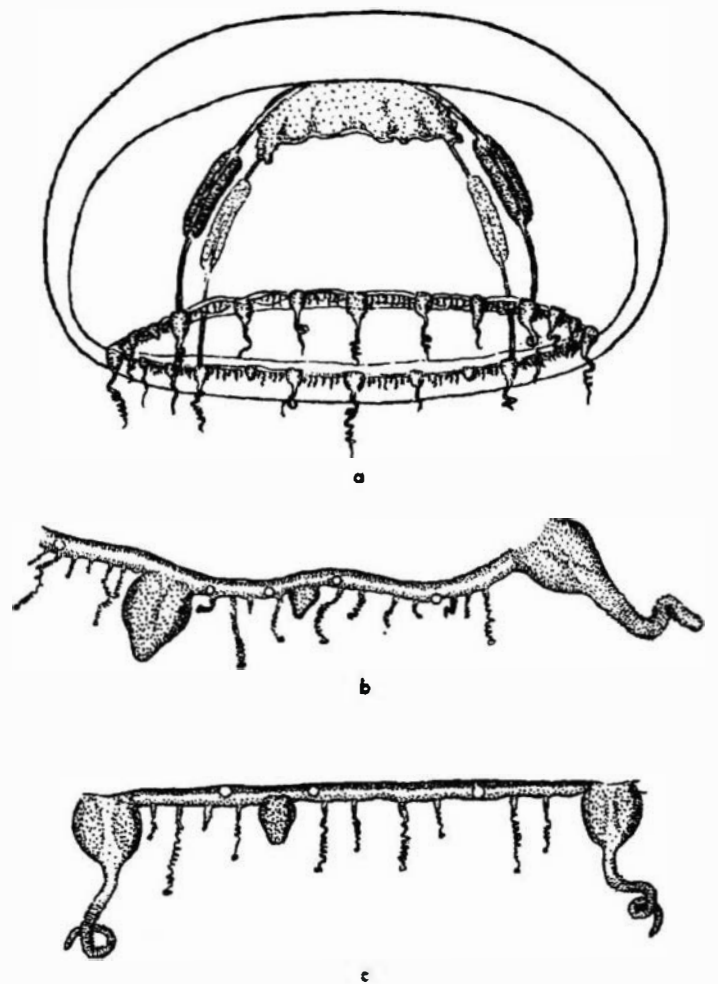


Fig. 72. *Cirrholovenia polynema*. After Kramp (1959). a, adult medusa, b, c, parts of umbrella margin.

*Cirrholovenia polynema* Kramp, 1959 (Fig 72)

Umbrella up to 12 mm wide, about hemispherical or slightly higher, mesoglea fairly thick; velum very broad. Manubrium square, broad, short; mouth with short, slightly crenulated lips. Gonads linear, along middle half of radial canals. Ca. 32–40 marginal tentacles on broadly conical or pear-shaped bulbs; up to 8 long, spirally coiled, marginal cirri between successive tentacles; twice as many statocysts as tentacles.

RECORDS FROM N.Z.: *Dana* Stns 3626, 3641; NZOI Stn N404.

SEASONALITY: January, December.

DISTRIBUTION: Indo-Pacific.

KEY REFERENCES: Bouillon (1984a, b, 1985b); Bouillon *et al.* (1988c); He Zhenwu & Xu Renhe (1996).

HYDROID: Unknown.

Family EIRENIDAE Haeckel, 1879

Medusae with small manubrium, usually on rather well differentiated gastric peduncle; 4–6 simple radial canals running from circular canal across underside of bell and along peduncle to manubrium; with or without excretory pores. Tentacles hollow; with or without cirri or marginal warts. Gonads on radial canals separated from manubrium, in each species on well-defined part(s) of radial canal; 8 to many statocysts; no ocelli.

Hydroid: Colonies stolonial, erect and ramifying; parasitic on bivalves or comprising a single polyp metamorphosing totally in a single medusa (*Eirene hexanemalis*); young colonies of erect forms have a cylindrical hydrotheca with diaphragm and folded pleated operculum formed by convergent flaps not demarcated from the hydrothecal rim (*Campanulina* type); in older colonies of this type, the operculum is

generally lost and the hydrotheca is reduced to a perisarcal collar like a haleciid hydrotheca; in stolonial colonies the hydrotheca also is usually reduced or absent, the naked hydranths being borne directly on the hydrorhiza or on short pedicels (*Campanopsis* type); commensal species totally lack perisarc, and are affixed to host by a pedal disc; in all forms the hydranths are elongated, with filiform tentacles in a single amphicoronate whorl; intertentacular web present. Nematophores absent. Gonophores on hydranths, hydrocaulus, or hydrorhiza, naked or more usually, at least initially, in a gonotheca.

- 1 more than 8 statocysts ..... 2
- 1a usually 8 statocysts (rarely 12); no marginal cirri; lateral cirri on marginal warts, usually also on base of marginal tentacles; no excretory pores ..... *Eutima*
- 2 no cirri ..... *Eirene*
- 2a marginal cirri ..... *Phialopsis*

***Eirene* Eschscholtz, 1829**

Eirenidae with distinct gastric peduncle; no marginal or lateral cirri or marginal swellings; with or without excretory pores; 4–6 simple radial canals; gonads on subumbrellar part of radial canals, not extending onto gastric peduncle; numerous statocysts.

Hydroid: *Campanopsis* or *Campanulina* type of hydroid or approaching it; see family characters and species descriptions.

- 1 peduncle short and broad ..... 2
- 1a peduncle long and slender ..... 3
- 2. manubrium short, gonads elongated ..... *Eirene tenuis*
- 2a manubrium long, gonads globular ..... *Eirene proboscidea*
- 3 distinct excretory papillae ..... *Eirene ceylonensis*
- 3a no excretory papillae ..... *Eirene menoni*

***Eirene ceylonensis* Browne 1905 (Fig. 73)**  
(= *Phortis ceylonensis*: Bouillon 1985a; 1995a)

Umbrella up to 15–25 mm wide, flat. Manubrium short; peduncle long, narrow, cylindrical; mouth with 4 prominent lips and crenulated margins. Gonads extending from base of peduncle to near bell margin. 100 or more hollow marginal tentacles, short, with excretory papillae; no or very few young marginal bulbs; about 100 statocysts.

RECORDS FROM N.Z.: *Dana* Stn 3645.  
SEASONALITY: January.  
DISTRIBUTION: Indo-Pacific.

KEY REFERENCES: Bouillon (1985a), Bouillon *et al.* (1988a), He Zhenwu & Xu Renhe (1996).

HYDROID: Stolonial colonies. Hydrotheca with very short hydrocaulus; opercula formed by convergent triangular flaps not demarcated by basal crease-line. 14–16 filiform tentacles, with an intertentacular web. Gonophores arising generally on hydrocaulus.

(Bouillon *et al.* 1988a)

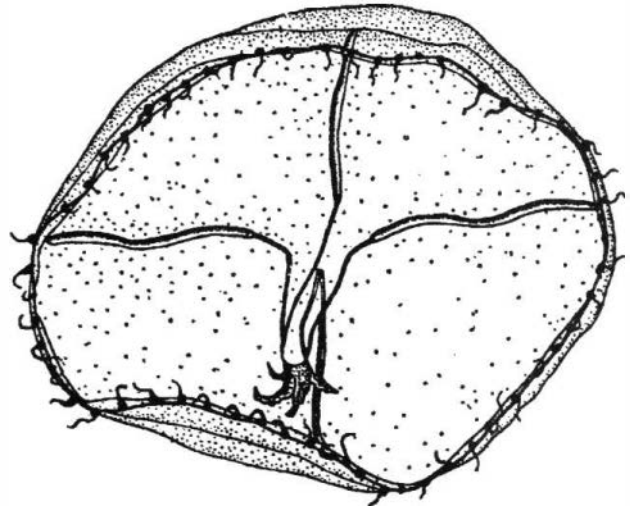


Fig. 73. *Eirene ceylonensis*. After Kramp (1968).

***Eirene menoni* Kramp, 1953 (Fig. 74)**

Umbrella 7–12 mm wide. Manubrium short; peduncle long, slender, not particularly broad at base, narrowing towards tip; mouth with 4 prominent pointed lips with folded margins. 4 interradian dark green spots on manubrium between the bases of the 4 lips. Gonads linear, from near base of peduncle to margin, but highly variable in length. Ca. 50 marginal hollow tentacles with long conical bulbs; no excretory papillae; no rudimentary bulbs; 1, sometimes 2 or 3, statocysts between tentacles;

RECORDS FROM N.Z.: NZOI Stn N361.

SEASONALITY: December.

DISTRIBUTION: Indo-Pacific.

REFERENCES: Sugiura (1979), Bouillon (1984b, 1995b), Bouillon *et al.* (1988a), He Zhenwu & Xu Renhe (1996).

HYDROID: Stolonial colonies. Hydrotheca with very short hydrocaulus; opercula formed by convergent, almost indistinct, flaps not demarcated by basal crease-line. 10 filiform tentacles, with a short intertentacular web. Gonophore unknown.

(Bouillon, 1988a)



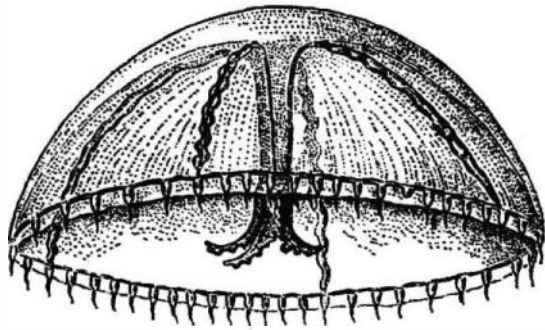


Fig. 74. *Eirene menoni*. After Kramp (1968).

*Eirene proboscidea* n. sp. (Fig. 75)

Umbrella flatter than a hemisphere, 2.5 mm wide; mesoglea thin; velum narrow; with a short, broad gastric peduncle. Manubrium very long, more than twice length of peduncle; mouth with 4 folded lips. 4 straight radial canals and narrow circular canal. Gonads on distal quarter of radial canals, only attached to radial canals over half their length; large, globular with well-developed eggs. 12 hollow tentacles with large spherical to conical bulbs; no excretory papillae; no cirri; no rudimentary bulbs; 1, usually 2, statocysts between adjacent bulbs, with 2 concretions.

DISCUSSION: This species undoubtedly belongs to the genus *Eirene* but differs from all other known species in its particularly long manubrium. Among species with oval gonads and < 32 tentacles are: *E. brevigonina*, *E. hexanemalis*, and *E. kambara*. *Eirene hexanemalis* normally has six radial canals and excretory papillae; *E. brevigonina* has a slender peduncle, 24 tentacles plus rudimentary bulbs, and only one statocyst between tentacles; *E. kambara* shows the greatest similarity to *E. proboscidea* but differs in size at maturity quite considerably. Even at 4 mm, *E. kambara* has only 4 developed tentacles and the gonads are just tiny swellings near the circular canals. *Eirene proboscidea* is fully mature at 2.5 mm.

ETYMOLOGY: The species name alludes to the particularly long size of the manubrium.

RECORDS FROM N.Z.: Whangateau Harbour, 1 specimen, March 1980 (Barnett 1985).

KEY REFERENCES: Kramp (1968), Bouillon (1984a, b), Kubota & Horita (1992), Huang & Xu (1994).

HYDROID: Unknown.

HOLOTYPE: Deposited at NIWA, Wellington, H-717.

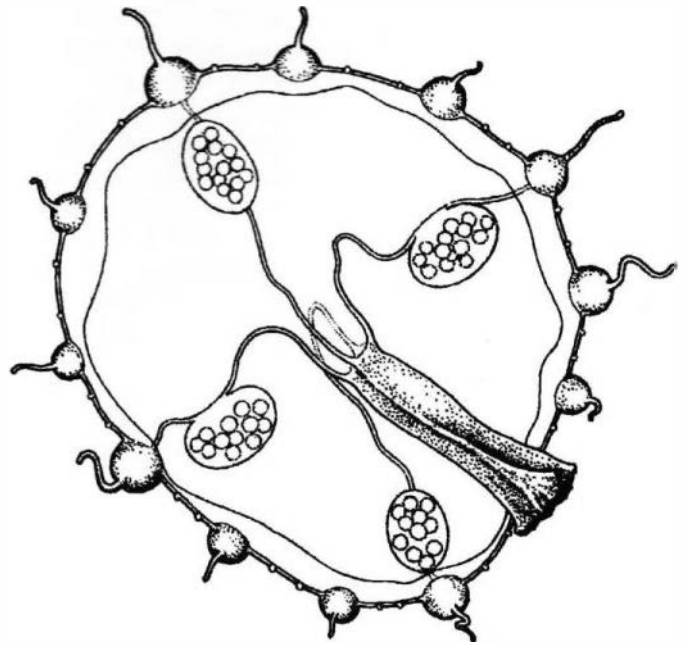


Fig. 75. *Eirene proboscidea* n.sp.

*Eirene tenuis* (Browne, 1905) (Fig. 76)

Umbrella up to 10–15 mm wide, hemispherical, mesoglea moderately thick, thicker at apex. Manubrium short with cruciform base; peduncle short and broad; mouth with long pointed lips and crenulated margins. Gonads elongated, variable in length, nearer the margin than to peduncle; 25–32 hollow marginal tentacles with long conical bulbs; small excretory papillae; between tentacles 1 and 3 small, rudimentary bulbs and 2–4 statocysts.

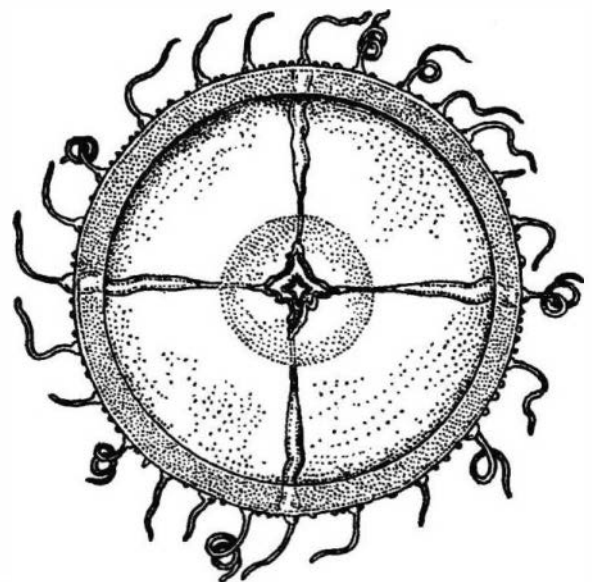


Fig. 76. *Eirene tenuis*. After Kramp (1968).

RECORDS FROM N.Z.: Whangateau Harbour; Okahu Bay; Leigh Marine Reserve (Barnett 1985).

SEASONALITY: March–June.

DISTRIBUTION: Indo-Pacific.

KEY REFERENCES: Kramp (1968), He Zhenwu & Xu Renhe (1996).

Hydroid: Unknown.

*Eutima* McCrady, 1859

Medusa with distinct gastric peduncle; lateral cirri (often difficult to observe and destroyed after fixation); with marginal swellings or warts; no excretory pores; 4 simple radial canals. Gonads on radial canals, either beneath subumbrella or on gastric peduncle or on both. 8 (exceptionally 12) statocysts.

Hydroid: Colonies of single hydranths or erect from creeping stolons, or of epizoic naked polyps; non-epizoic forms have: a hydrocaulus with smooth perisarc, their young colonies with a cylindrical hydrotheca with diaphragm and a folded pleated operculum formed by convergent flaps not demarcated from the hydrothecal rim (*Campanulina* type); in older colonies of this type the operculum is generally lost and the hydrotheca is reduced to a perisarc collar like a haleciid hydrotheca; usually the hydranth tentacles are connected basally by a membranous web. (Bouillon 1985, 1995)

- 1 4 gonads, restricted to peduncle ..... *Eutima curva*
- 1a 8 gonads, 4 on subumbrella, extending from base of peduncle outwards, 4 on greater part of peduncle . . . . .
- ..... *Eutima mira*

*Eutima curva* Browne, 1905 (Fig. 77)

Umbrella 10–25 mm wide, mesoglea quite thick; gastric peduncle as long as umbrella diameter, pyramidal above, prismatic below. 4 gonads on prismatic portion of peduncle only. 4 hollow marginal tentacles with lateral cirri; tentacle bulbs without distinct swellings at base, usually curved upwards over bellmargin, with black pigment; 120–140 marginal warts, with cirri.

RECORDS FROM N.Z.: NZOI Stn N403; Wellington (Schuchert private collection 1994.04.14a).

SEASONALITY: April, December.

DISTRIBUTION: Indo-Pacific.

KEY REFERENCES: Bouillon (1995b), Bouillon *et al.* (1988b), He Zhenwu & Xu Renhe (1996).

HYDROID: Unknown.

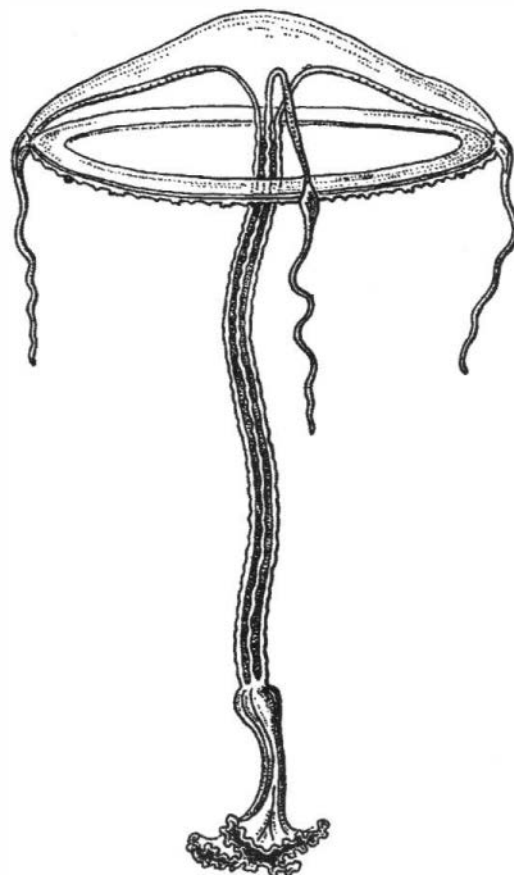


Fig. 77. *Eutima curva*. After Kramp (1968).

*Eutima mira* McCrady, 1859 (Fig. 78)  
(= *E. orientalis*)

Umbrella up to 30 mm wide, usually smaller, as broad as high, nearly hemispherical, mesoglea thick, especially in apical region; with a long slender, tapering gastric peduncle, 2–3 times as long as umbrella diameter. Manubrium small, flask-shaped, cruciform in section; mouth with 4 simple recurved lips. 4 straight radial canals and narrow circular canal. 8 elongate sinuous gonads, 4 on middle third of peduncle, 4 on subumbrella. 4 long hollow marginal tentacles with elongated basal marginal bulbs; about 100 marginal warts; marginal bulbs and warts usually with lateral cirri; 8 statocysts.

RECORDS FROM N.Z.: Dana Stn 3634; NZOI Stn 382; Leigh Marine Reserve (Barnett 1985).

SEASONALITY: January, February, May–July, December.

DISTRIBUTION: Atlantic; Indo-Pacific; Mediterranean.

KEY REFERENCES: Goy (1979), Bouillon (1978, 1984, 1995b), Bouillon *et al.* (1988b), He Zhenwu & Xu Renhe (1996).

HYDROID: Development of this species has been followed by Brooks (1884, 1886) who described a "campanu-



linid" hydroid which cannot be attributed to any specific hydroid species.

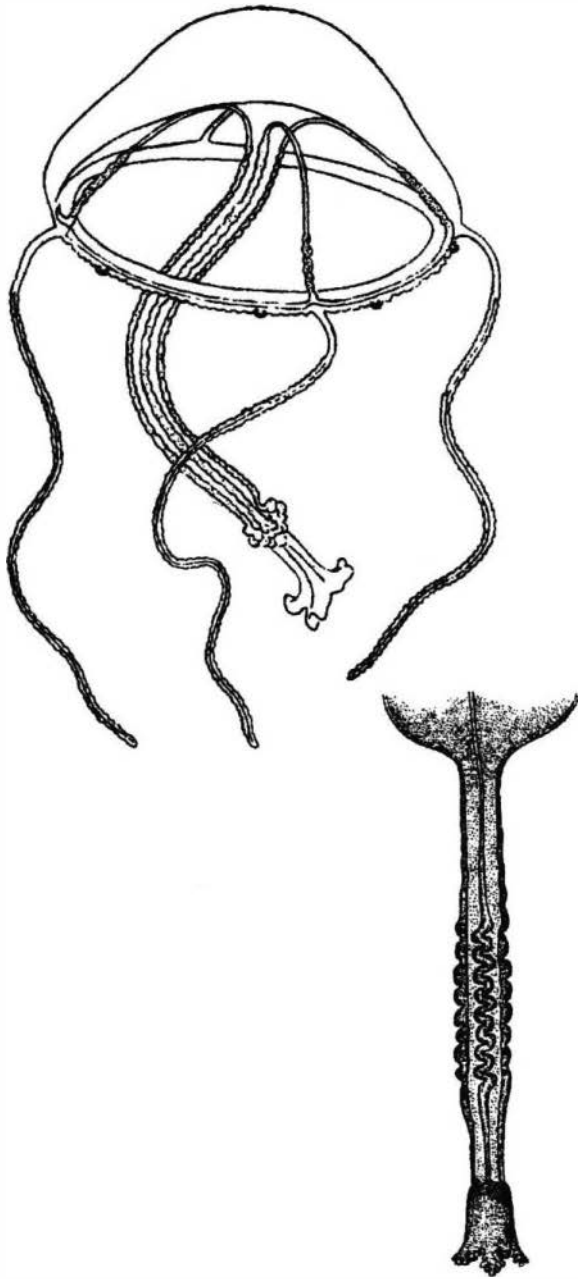


Fig. 78. *Eutima mira*.  
Above, after Kramp (1933); below, after Kramp (1968).

*Phialopsis* Torrey, 1909

Medusa with short gastric peduncle; marginal cirri; no excretory pores. Gonads restricted to subumbrellar portion of radial canals. Numerous statocysts.

Hydroid: Unknown

*Phialopsis diegensis* Torrey, 1909 (Fig. 79)

Umbrella 20–30 mm wide, rather flat, 3 or 4 times as wide as high, mesoglea thin; with very short, conical peduncle reaching about limit of bell margin. Manubrium very short; mouth with very short crenulated lips. 4 radial canals, narrow circular canal. Gonads linear on radial canals limited to subumbrellar disk, extending from basal part of peduncle almost to bell margin; 16–28 (sometimes more) tentacles with elongate conical bulbs; between successive tentacles, 3 and 9 triangular rudimentary bulbs, 3–9 scattered marginal cirri, and 2–5 statocysts; no lateral cirri.

RECORDS FROM N.Z.: Navas-Pereira & Vannucci (1990, about 48–49°S, 161–162°E).

SEASONALITY: ?

DISTRIBUTION: Atlantic; Indo-Pacific.

KEY REFERENCES: Navas-Pereira & Vannucci (1990); Cornelius (1995).

HYDROID: Unknown.

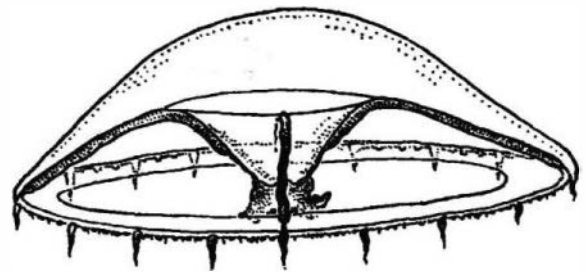


Fig. 79. *Phialopsis diegensis*. After Kramp (1968).

Family EUCHEILOtidae Bouillon, 1984

Medusae with short manubrium; no gastric peduncle; no excretory pores. 4 straight radial canals. Marginal tentacles hollow; lateral cirri, never marginal cirri. Gonads on radial canals, separated from manubrium; usually 8 (exceptionally 4 or 12) statocysts; no ocelli.

Hydroid: Where known, erect, sparsely ramifying. Hydrotheca elongate to campanulate, thin walled, on pedicel of varied length; with both diaphragm and a conical operculum, the latter comprising numerous pleats separating outer triangular cusps, not demarcated basally from the hydrotheca, best developed around young hydranths, disintegrating after emergence of hydranth and in some species leaving just a crumpled collar sheath around basal part of the hydranth. Hydranth with basal intertentacular web; no nematophores. Gonothecae long, pedicellate on erect stems, thin walled.

*Eucheilota* McCrady, 1859

With the characters of the family.

- |    |  |                              |   |
|----|--|------------------------------|---|
| 1  | 2 tentacles .....  | <i>Eucheilota</i> sp.        |   |
| 1a | more than 2 tentacles .....  |                              | 2 |
| 2  | medusa buds on gonads; 4 marginal tentacles and 4 or more rudimentary bulbs, all with 1–3 pairs of lateral cirri; 8 statocysts ..... | <i>Eucheilota paradoxica</i> |   |
| 2a | no medusa buds on gonads .....   |                              | 3 |
| 3  | gonads globular; manubrium and marginal bulbs with black pigment granules .....  | <i>Eucheilota menoni</i>     |   |
| 3a | gonads elongated; no black pigment on manubrium and marginal bulbs .....   | <i>Eucheilota tropica</i>    |   |

*Eucheilota menoni* Kramp, 1959 (Fig. 80)

Umbrella up to 2.5 mm wide, hemispherical, mesoglea fairly thick; velum very broad. Manubrium half as long as bell cavity; mouth with 4 simple lips. Lateral walls of manubrium and marginal bulbs with black pigment. Gonads globular, thick, between middle and distal parts of radial canals in females with few large ova. 4 large hollow perradial tentacles with 2 or 3 pairs of lateral cirri; 4 large and 16 smaller rudimentary bulbs without cirri; 8 statocysts. Medusa buds on radial canals.

RECORDS FROM N.Z.: Leigh Marine Reserve (Barnett 1985).

SEASONALITY: March.

DISTRIBUTION: Indo-Pacific.

KEY REFERENCES: Bouillon (1984b), Bouillon *et al.* (1988b), Navas-Pereira & Vannucci (1991), He Zhenwu & Xu Renhe (1996).

HYDROID: Unknown.

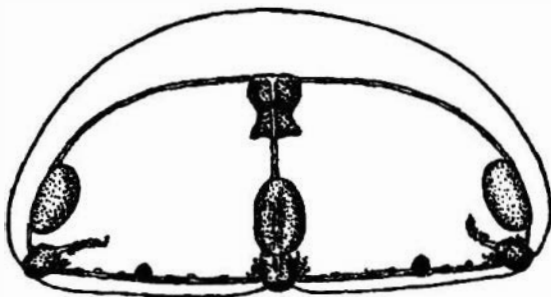


Fig. 80. *Eucheilota menoni*. After Kramp (1968).

*Eucheilota paradoxica* Mayer, 1900 (Fig. 81)

Umbrella 4 mm wide, higher than a hemisphere, sometimes with a slight apical projection, mesoglea mode-

rately thick. Manubrium small, flask-shaped; mouth with 4 simple lips. 4 narrow radial canals and narrow circular canal. Gonads along middle portion of radial canals; medusa buds on gonads or on hydranths developing on gonads; frustules on radial canals. 4 hollow marginal tentacles with large bulbs, and 4 or more rudimentary bulbs; all bulbs with 1–3 pairs of lateral cirri; 8 marginal statocysts.

RECORDS FROM N.Z.: NZOI Stns N360, N361; Whangataeu harbour; Leigh Marine Reserve (Barnett 1985).

SEASONALITY: January–July, August, October–December.

DISTRIBUTION: Atlantic; Indo-Pacific; Mediterranean. KEY REFERENCES: Bouillon (1984 a, b, 1995b); Bouillon *et al.* (1988b); Carré & Carré (1990); Xu & Huang (1990); Goy *et al.* (1991).

HYDROID: Hydroids not known from nature. Carré and Carré (1990) obtained in culture hydranths differentiating from medusae maintained for two months at 15°C. The hydroids developed on radial canals at the position usually occupied by gonads. The hydranths were able to capture prey and feed, but medusa production gradually diminished and finally the medusae were reduced to a mass constituting the base of the polyps. Following Carré and Carré, the polyps are very similar to those described for *Eucheilota maculata* by Werner (1968a); unfortunately the authors never could induce their settlement.



Fig. 81. *Eucheilota paradoxica*. After Kramp (1968).

*Eucheilota tropica* Kramp, 1959 (Fig. 82)

Umbrella up to 15 mm wide; almost hemispherical, apical mesoglea fairly thick; velum large. Manubrium short, broad; mouth with 4 simple lips; no peduncle. 4 radial canals and circular canal. Gonads elongated,

slightly sinuous, extending almost along entire length of radial canals, leaving only both ends free; 4 perradial and 4 interradial large marginal hollow tentacles with conical elongated marginal bulbs, each with 2–5 pairs of lateral cirri; in each octant 4 rudimentary bulbs, all alike (32), without cirri; 8 statocysts.

RECORDS FROM N.Z.: Leigh Marine Reserve (Barnett 1985).

SEASONALITY: January, July.

DISTRIBUTION: Indo-Pacific.

KEY REFERENCES: Bouillon (1984b), Bouillon *et al.* (1988b), Navas-Pereira & Vannucci (1991).

HYDROID: Unknown.

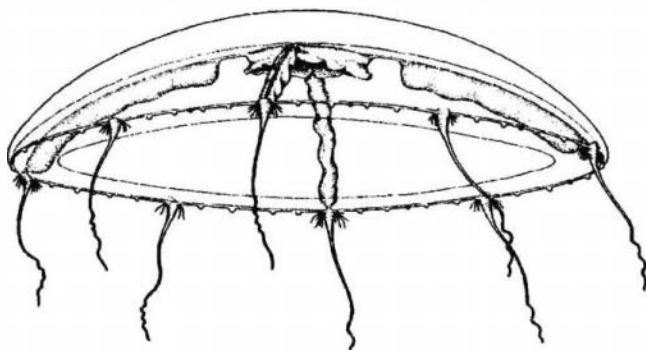


Fig. 82. *Eucheilota tropica*. After Bouillon (1984).

***Eucheilota* sp.**

(Fig. 83)

Umbrella flatter than hemisphere, 1.8 mm wide, 1.0 mm high with a slight apical process; jelly moderately thick; velum broad. Manubrium short, cylindrical, with 4 short simple lips; no peduncle. Radial canals moderately broad with no trace of gonads (juvenile); 2 large hollow, opposite, perradial marginal tentacles, with conical basal bulbs, 2 large conical bulbs with no tentacles in remaining perradii, 4 interradial rudimentary bulbs, all bulbs with a pair of lateral cirri; 2 or 3 very small bulbs developing between the interradii; 8 large marginal vesicles.

RECORDS FROM N.Z.: Whangateau Harbour (Barnett 1985, 1 specimen, June 1980).

HYDROID: Unknown.

Family **LAODICEIDAE** Browne, 1907

Leptomedusae with marginal cordyli with or without cnidocysts (Fig. 141B, F: Co); 4, 8, or more simple or branched radial canals; marginal tentacles hollow;

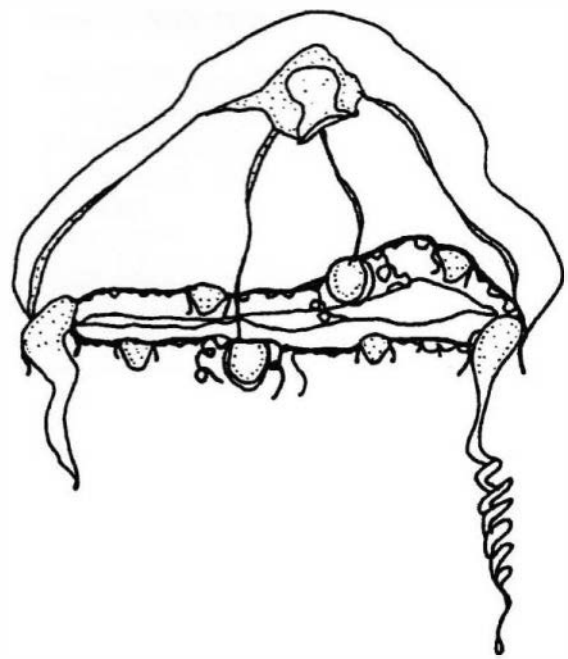


Fig. 83. *Eucheilota* sp. After Barnett (1985).

with or without marginal cirri; with or without adaxial ocelli; without statocysts.

Hydroid: Where known, of "*Cuspidella*" type; colonies stolonial. Hydrotheca tubular, sessile, sometimes with basal constriction at origin or exceptionally a poorly delimited pedicel (*Ptychogena*); hydrotheca often with transverse growth-rings; operculum conical, comprising several pleated flaps meeting centrally, with visible crease-line basally; hydranth lacking inter-tentacular web; tentacles amphicoronate. No nematophores. Gonothecae, where known, resembling hydrothecae but larger.

- 1. 4 radial canals ..... 2
- 1 6 or more radial canals, some or all dichotomously branching, all branches joining circular canal *Toxorhis*
- 2 radial canals simple or with short lateral diverticula . . . . . *Laodicea*
- 2 radial canals with one or a few pairs of lateral branches ..... *Staurodiscus*

***Laodicea* Lesson, 1843**

Medusa with small manubrium; four simple radial canals; simple wavy gonads; with or without marginal cirri; with or without adaxial ocelli.

Hydroid of "*Cuspidella*" type, see family characters; hydrothecae sessile.





*Laodicea indica* Browne, 1905

(Fig. 84)

Umbrella 20–25 mm wide, two or four times wider than high, saucer-shaped. Manubrium cruciform with short periradial lobes; mouth with short, slightly folded, recurved lips. Up to 180 hollow marginal tentacles, small abaxial spurs on young marginal tentacles, absent in adult ones; 4 simple radial canals, circular canal narrow. Gonads elongated, from corners of manubrium along half of radial canals or almost to bell margin, sinuous, gonads may be developed even in small specimens. Cirri present (often lost by preservation), usually a cordylus between tentacles or a rudimentary bulb; ocelli present, on about every second tentacle, on each tentacle when juvenile.

RECORDS FROM N.Z.: Dana Stn 3626; NZOI Stn N376; Leigh Marine Reserve (Barnett 1985, + *Laodicea* sp.)

SEASONALITY: April, October, December.

DISTRIBUTION: Atlantic and Indo-Pacific.

KEY REFERENCES: Bouillon (1984b), Bouillon, Boero & Frascchetti (1991), He Zhenwu & Xu Renhe (1996).

REMARKS: *Laodicea indica* is very similar to *L. undulata*, differing only in quantitative characters such as the number of ocelli and tentacles; several authors regard them as conspecific. Adult *L. undulata* present, an ocellus on 3rd or 5th tentacle and have 200–600 marginal tentacles with abaxial spurs.

Hydroid: Stolonal colonies of "*Cuspidella*" type. Hydrothecae sessile, tubular, with pyramidal operculum of ca. 10 converging cusps, sharply demarcated from hydrothecal rim. 8–10 amphicoronate tentacles; no basal intertentacular web. Nematophores absent. Gonothecae similar in shape to hydrothecae but longer, with a single medusa bud.

In the Bismarck Sea *Laodicea indica* has a varied seasonal cycle. In the wet season it is medusa – planula – hydroid – medusa; in the dry season the cycle is contracted and the planula gives rise to a gonotheca without formation of a hydroid colony.

(Bouillon *et al.* 1991)

### *Staurodiscus* Haeckel, 1879

Medusa with 4 radial canals, each giving rise to one or more pairs of lateral branches that may or not communicate with the circular canal; primary radial canals proceeding straight to circular canal; gonads on 4 main radial canals and branches; adaxial ocelli; no marginal cirri.

Hydroid: Perhaps a hebellid (see Paes De Andrade & Migotto 1997).



Fig. 84. *Laodicea indica*. After Kramp (1968); underside of a quadrant.

### *Staurodiscus gotoi* (Uchida, 1927)

(Fig. 85)

Umbrella 15 mm wide, 20 mm high, dome shaped. Manubrium short, 4-sided, with simple folded lips. Radial canals with 3 or 4 pairs of lateral branches, not always quite opposite each other, the proximal pairs longer than the distal; canals and branches with or without secondary diverticulae; lateral branches blind, not quite reaching the circular canal. Gonads along branches and primary radial canals. 8–16 hollow marginal tentacles; up to 88 cordyli; ocelli on base of marginal tentacles and on most of the cordyli.

Records from N.Z.: Whangateau Harbour; Leigh Marine Reserve (Barnett 1985, as *Staurodiscus* sp., usually small specimens); Wellington Harbour (Schuchert private collection 1993.11.03).

SEASONALITY: May–August, October, November.

DISTRIBUTION: Indo-Pacific.

KEY REFERENCES: Xu & Zhang (1974), Bouillon (1984b), He Zhenwu & Xu Renhe (1996), Paes De Andrade & Migotto (1997).

REMARKS: Xu and Zhang (1974) showed that this species may have up to 16 marginal tentacles and that the lateral branches may or not have secondary diverticulae.

Hydroid: Unknown.

### *Toxorthis* Haeckel, 1879

Medusa with 4, 6, or more main radial canals, some or all branching dichotomously one or more times, all

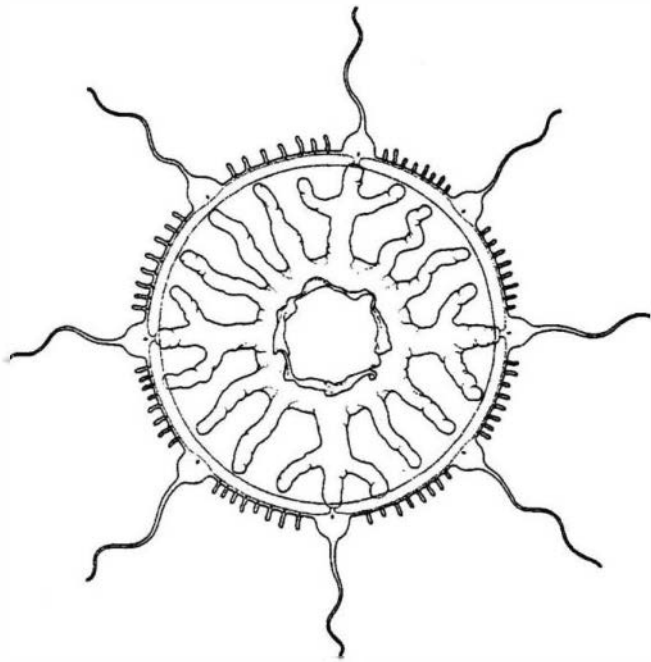


Fig. 85. *Staurodiscus gotoi*. After Bouillon, original.

branches reaching circular canal, primary radial canals not extending to circular canal. Gonads on outermost branches. Numerous tentacles and cordyli; with or without cirri; with or without ocelli.

Hydroid: Unknown.

***Toxorchis polynema* Kramp, 1959 (Fig. 86)**

Umbrella 17 mm wide, flat, disk-like. Manubrium quadrate, broad, flat; mouth with broad crenulated lips. 4 groups of radial canals, each bifurcating twice inside cruciform base of manubrium; 16 (4 x 4) radial canals leaving manubrium, all running to circular canal; gonads ribbon-like, along proximal two-thirds to three-quarters of length of radial canals, close to manubrium; about 360 hollow marginal tentacles with endodermal roots extending into bell mesoglea, and somewhat fewer cordyli; about 80 adaxial ocelli.

Records from N.Z.: *Dana* Stns 3642, 3644.

SEASONALITY: January.

DISTRIBUTION: Atlantic; Indo-Pacific.

KEY REFERENCES: Bouillon (1984b); van der Spoel & Bleeker (1988); He Zhenwu & Xu Renhe (1996).

HYDROID: Unknown.

Family **LOVENELLIDAE** Russell, 1953

Medusae with short manubrium; no gastric peduncle;

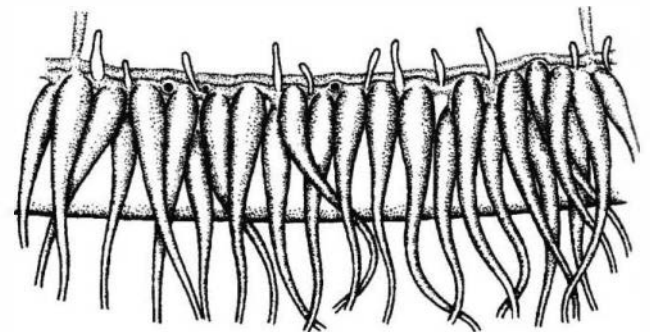
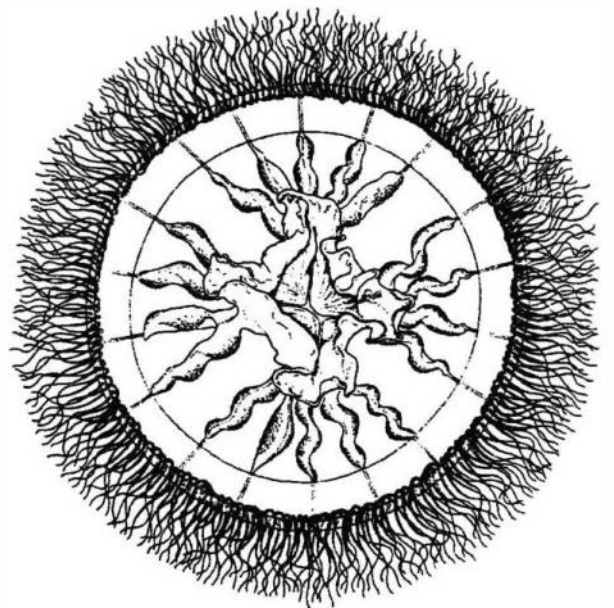


Fig. 86. *Toxorchis polynema*. After Bouillon (1980); below, enlarged section of margin.

no excretory pores; 4 simple radial canals. Marginal tentacles hollow, with lateral cirri; no marginal cirri. Gonads on radial canals, not reaching manubrium; indefinite number of statocysts, 16 or more when adult; no ocelli.

Hydroid: Colonies stolonial or forming short, branched sympodial shoots. Hydrothecae deep, elongate to campanuliform, pedicellate, operculum conical, comprising about 8–12 distinct long triangular segments each on an embayment in shallowly cusped hydrothecal margin, and in most species delimited from it by a crease-line; hydrothecae in some species frail and collapsing; hydranth having or lacking an intertentacular membrane. No nematophores. Gonothecae pedunculate; gonophore releasing numerous free medusae.

***Lovenella* Hincks, 1868**

Medusa and hydroids with the characters of the family.

*Lovenella assimilis* (Browne, 1905) (Fig. 87)

Umbrella 2.5 mm wide, higher than a hemisphere, mesoglea fairly thick. Manubrium short, cylindrical, with a quadrangular base; no gastric peduncle; mouth with 4 small, simple lips. Gonads, large, globular, longitudinally divided, between middle of radial canals and circular canal. 4 hollow marginal tentacles with large basal, conical to globular bulbs, each flanked by 3 or 4 pairs of lateral cirri; in each quadrant about 5 rudimentary bulbs without cirri, the median one the largest and about 5 statocysts. Medusa buds on gonads.

RECORDS FROM N.Z.: Whangateau Harbour (Barnett 1965).

SEASONALITY: February, April.

DISTRIBUTION: Indo-Pacific.

KEY REFERENCES: Bouillon (1984a, b), Bouillon *et al.* (1986; 1988b).

HYDROID: Unknown.

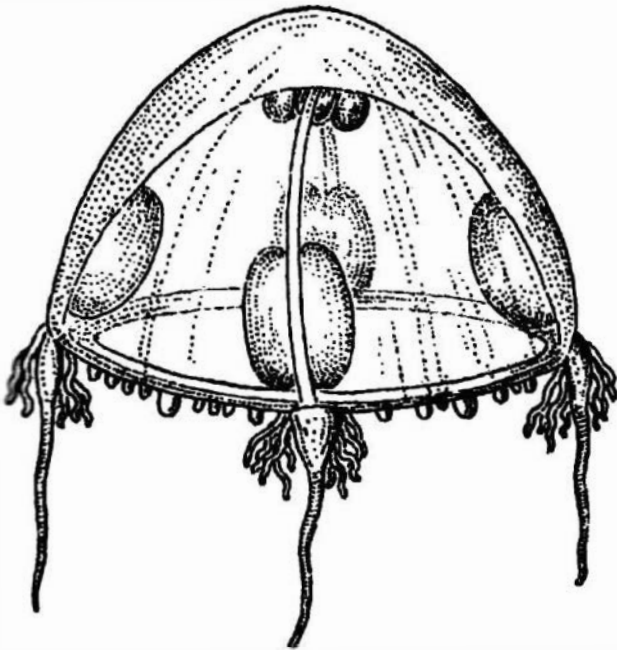


Fig. 87. *Lovenella assimilis*. After Kramp (1968).

Family MALAGAZZIIDAE Bouillon, 1984

Medusae with small manubrium; no gastric peduncle; 4-8, sometimes up to 12, radial canals. Gonads completely surrounding radial canals and separated from manubrium; with adaxial excretory papillae. No permanent rudimentary marginal bulbs (all bulbs potentially transforming into tentacles); closed statocysts; no ocelli.

Hydroid: Where known, of the "campanulinid type"; colonies stolonal. Hydrotheca shortly pedicellate,

with a conical operculum comprising numerous convergent segments not clearly demarcated from hydrothecal wall; hydranths with intertentacular web. Gonothecae claviform, arising from stolons.

(Bouillon, 1984a)

1 normally 4 radial canals (sometimes up to 10, but then asymmetrically arranged); mouth with 4 lips

..... *Malagazzia*  
 1a normally 8 or more symmetrically arranged radial canals;  
 mouth with 8 lips ..... *Octophialucium*

*Malagazzia* Bouillon, 1984

Malagazziidae typically with 4 radial canals, sometimes up to 10, but then asymmetrically arranged; manubrium with 4 lips.

*Malagazzia carolinae* (Mayer, 1900) (Fig. 88)

Umbrella 14-20 mm wide, 6-8 mm high, not quite hemispherical. Manubrium flask-shaped; 4 short, slightly folded lips. Typically 4 radial canals but sometimes up to 10 but then asymmetrically arranged. Gonads linear on distal half of radial canals; 16-36 hollow marginal tentacles, with large, conical marginal bulbs; generally 1-3 rudimentary tentacle bulbs between each pair of tentacles, the middle one largest; all marginal bulbs with excretory papillae; 4-6 statocysts between successive tentacles.

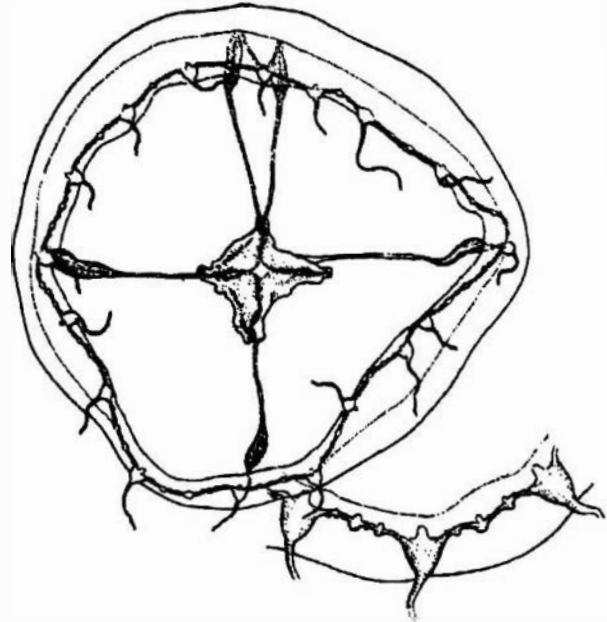


Fig. 88. *Malagazzia carolinae*. After Bouillon *et al.* (1991); below, enlarged section of margin.

RECORDS FROM N.Z.: NZOI Stns B707, N416.  
 SEASONALITY: September, December.  
 DISTRIBUTION: Atlantic; Indo-Pacific.  
 REFERENCES: Bouillon (1984a, b; 1995b), Navas-Pereira (1984), Bouillon *et al.* (1988b), Wang & Xu (1988), Bouillon *et al.* (1991), He Zhenwu & Xu Renhe (1996).  
 HYDROID: Unknown.

*Octophialucium* Kramp, 1955

Malagazziidae with normally 8 radial canals; mouth with 8 lips.

Hydroid: Where known, of the "campanulinid" type; see family characters (Bouillon 1984b).

*Octophialucium indicum* Kramp, 1958 (Fig. 89)

Umbrella up to 25 mm wide, disc-like or lenticular, mesoglea thick, with inward curving margin. Manubrium octagonal, short, one-sixth as wide as umbrella diameter; mouth with 8 acute crenulated lips. 6–12, generally 8, radial canals, continued inwards almost to centre of manubrium ceiling. Gonads along distal third to fifth of radial canals, increasing in thickness toward margin. 19–55 hollow marginal tentacles with broad conical bulbs; between successive tentacles 3–7 small triangular rudimentary bulbs; all bulbs with excretory papillae; a statocyst between each marginal structure.

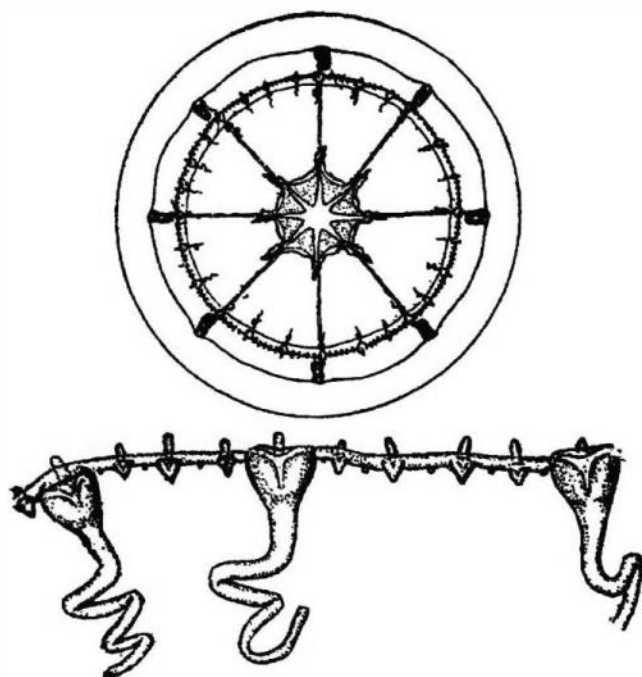


Fig. 89. *Octophialucium indicum*. After Kramp (1968); below, enlarged section of margin.

RECORDS FROM N.Z.: Dana Stn 3645; NZOI Stn N420; Wellington Harbour (Wear 1965); about 43–44°S, 172°E (Navas-Pereira & Vannucci 1990); Wellington Harbour (Schuchert collection 1994.02.02a).

SEASONALITY: January, February, December.  
 DISTRIBUTION: Indo-Pacific.

KEY REFERENCES: Wear (1965), Mills (1982), Bouillon 1984a, b; 1995b), Bouillon *et al.* (1986), Bleeker & van der Spoel (1988), He Zhenwu & Xu Renhe (1996).  
 HYDROID: Unknown.

Family MITROCOMIDAE Haeckel, 1879

Medusae with bases of manubrium attached to subumbrella along continuation of radial canals; 4 or more simple radial canals. Marginal tentacles hollow; marginal cirri present in some genera. Gonads oval or linear, only on radial canals; with open statocysts.

Hydroid: Usually poorly known; mostly of the "*Cuspidella*" type. Hydrotheca tubular, sessile, with pyramidal operculum made either of several triangular flaps, or of pleats in the continuation of hydrothecal tube, all not well demarcated from the hydrothecal wall, lacking a crease-line at base of the flaps or pleats; hydranth extensile, with a single, usually amphicononate, whorl of filiform tentacles; no intertentacular web. No nematophores. Gonophores where known scarcely pedicellate, on hydrorhiza.

- 1 no marginal cirri; 8 statocysts ..... *Cosmetirella*
- 1a marginal cirri; 8–16 statocysts ..... *Mitrocomella*

*Cosmetirella* Browne, 1910

Mitrocomidae with 4 radial canals; 8 statocysts; no marginal cirri.

Hydroid unknown.

*Cosmetirella davisii* (Browne, 1902) (Fig. 90)

Umbrella up to 60 mm wide, larger in subantarctic than in Antarctic waters, almost hemispherical. Manubrium small; mouth with somewhat folded lips. Gonads linear along half to two-thirds of radial canals. Number of marginal tentacles very variable, up to 180; normally 8 statocysts.

RECORDS FROM N.Z.: NZOI Stn N466.

SEASONALITY: February.

DISTRIBUTION: Atlantic; Indo-Pacific; Antarctic.

KEY REFERENCES: Navas-Pereira & Vannucci (1994), Bouillon (1995b).

HYDROID: Unknown.



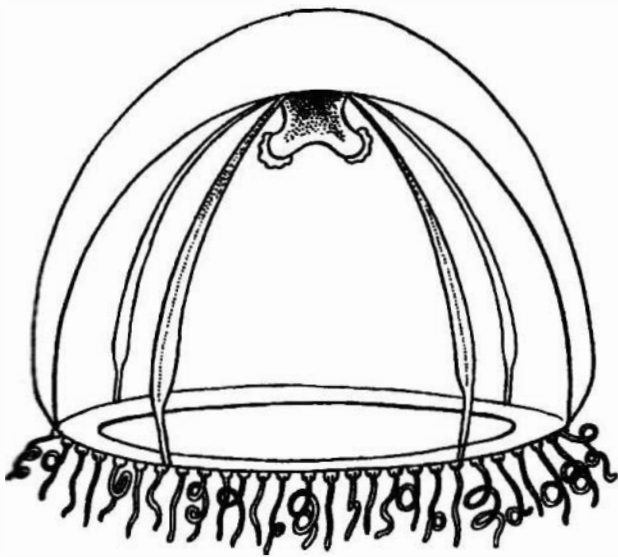


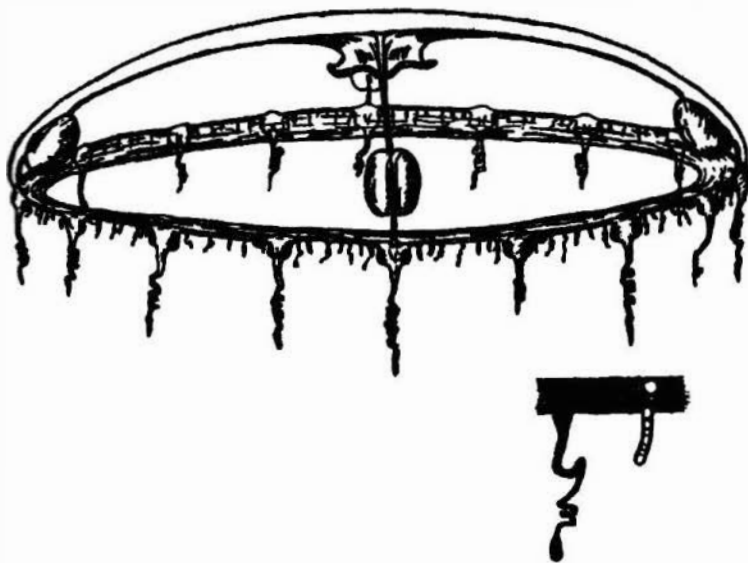
Fig. 90. *Cosmetirella davisi*. After Kramp (1968).

*Mitrocomella* Haeckel, 1879

**Mitrocomidae** with 4 radial canals; marginal cirri may or not be spirally coiled; 8, 12 or 16 (exceptionally up to 19) statocysts.

**Hydroid:** Where known, colonies of "*Cuspidella*" type. Hydranth with pleated operculum, presenting no clear limits with the hydrothecal margin; see family characters.

- 1 usually 8 marginal statocysts ..... 2
- 1a 16 marginal statocysts ..... *Mitrocomella niwai*
- 2 ca. 16 marginal tentacles ..... *Mitrocomella brownei*
- 2a with 32–72 marginal tentacles ... *Mitrocomella frigida*



*Mitrocomella brownei* (Kramp, 1930) (Fig. 91)

Umbrella 4–9 mm wide; flatter than a hemisphere, mesoglea uniformly thin. Manubrium small, short, quadrate; mouth with 4 simple, slightly recurved lips. 4 straight, narrow radial canals widen proximally as they enter manubrium, circular canal narrow. 4 gonads near distal ends of radial canals, divided longitudinally, female somewhat elongated, male oval. Typically 16, up to 24, marginal tentacles; 6–8 spiral marginal cirri between successive tentacles; typically 8 (–11) open statocysts.

RECORDS FROM N.Z.: Whangateau Harbour; Leigh Marine Reserve (Barnett 1985).

SEASONALITY: April–November.

DISTRIBUTION: Atlantic; Indo-Pacific; Mediterranean.

KEY REFERENCES: Pagès *et al.* (1992); Cornelius (1995).

**HYDROID:** Only an incomplete description of a primary polyp is known (Rees & Russell 1937). Hydrotheca tubular, arising from a creeping stolon, with pleated conical operculum of about 5–7 teeth meeting centrally and not clearly demarcated from the hydrotheca; hydranth extensile, with 8–12 filiform, amphicoronate tentacles, no basal web between tentacles; hypostome conical. Gonothecae unknown.

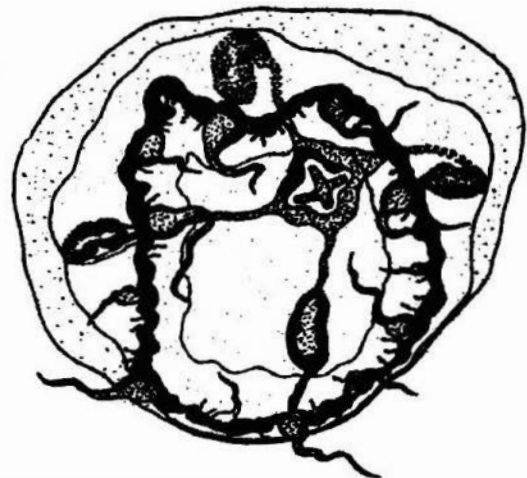
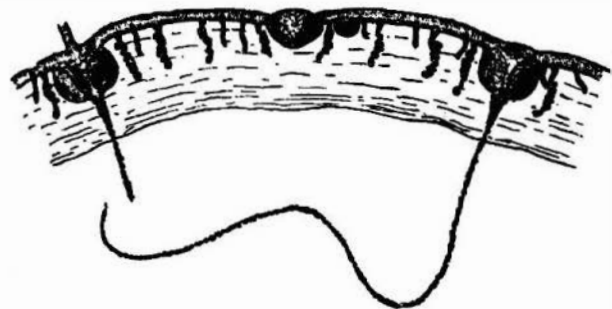


Fig. 91. *Mitrocomella brownei*. After Kramp (1930); below right, after Gili (1986).



*Mitrocomella frigida* (Browne, 1910) (Fig. 92)

Umbrella 13–17 mm wide, almost hemispherical, with thin walls. Manubrium short and broad; mouth with 4 short lips; 32–72 hollow marginal tentacles. Gonads elongated, folded, along greater part of radial canals hanging down in large vertical folds, leaving both ends free; 8 marginal cirri between successive tentacles; 8 statocysts.

RECORDS FROM N.Z.: NZOI Stn N465.

SEASONALITY: February.

DISTRIBUTION: Atlantic; Indo-Pacific; Antarctic.

KEY REFERENCES: Larson & Harbison (1990), Pagès *et al.* (1992), Bouillon (1995b).

HYDROID: Unknown.

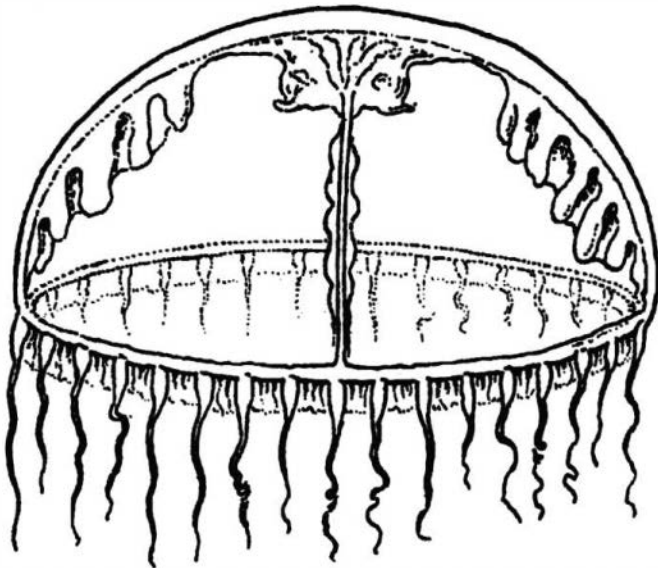


Fig. 92. *Mitrocomella frigida*. After Kramp (1968).

*Mitrocomella niwai* n. sp. (Fig. 93)

Umbrella flatter than hemisphere, 18 mm wide; mesoglea thick at apex, thinner at margin; velum very broad. Manubrium small, narrow, short, with quadrangular base; mouth with 4 pointed narrow crenulated lips; no gastric peduncle. 4 straight narrow radial canals, narrow circular canal. Gonads elongated, fairly folded, on distal half of radial canals, divided longitudinally. 40–48 marginal tentacles with rounded, conical basal bulbs; 2 or 3 straight cirri with scattered cnidocysts down length, between adjacent tentacles (80–142); 4 open marginal vesicles without ocelli in each quadrant (16).

RECORDS FROM N.Z.: Manukau Harbour (Barnett 1985, as *Cosmetira* sp.; 1 specimen, July 1983 coll. D. Pearks).

DISCUSSION: Based on its open statocysts, this species clearly belongs to the Mitrocomidae which presently contains 7 genera: *Cosmetira*, *Cosmetirella*, *Cyclocanna*, *Foersteria*, *Halopsis*, *Mitrocoma*, and *Mitrocomella*, the genera *Octogonale*, *Tiaropsidium*, and *Tiaropsis* having been included in a new family Tiaropsidae (Boero *et al.* 1987; Bouillon 1995a).

Only one genus of Mitrocomidae accords with the species from Manukau Harbour having 4 radial canals, marginal cirri, and 8–16 statocysts, i.e., *Mitrocomella*. Among the different species of *Mitrocomella*, those having 16 statocysts are *M. fulva*, *M. grandis*, and *M. polydiademata* (see diagnostic table in Pagès *et al.* 1992). *Mitrocomella fulva* is only 6 mm wide and has 16 marginal tentacles and 4 marginal cirri between adjacent tentacles; *M. grandis* is up to 51 mm wide, has 220 marginal tentacles and 5–8 marginal cirri between successive marginal tentacles; *M. polydiademata* is the closest species, having 36–64 marginal tentacles, and is 12–30 mm wide; but this species usually has 5–9 or more marginal cirri coiling spirally, 1 or 2 marginal bulbs between adjacent marginal tentacles, much longer gonads occupying most of the radial canals, not longitudinally divided, and the number of statocysts is variable (10–19, usually 16).

The New Zealand species is thus quite different and cannot be placed within any of the known species of *Mitrocomella*; a new species is consequently proposed.

ETYMOLOGY: The species is named for the National Institute of Water and Atmospheric Research (NIWA) which initiated and made possible the present work.

HOLOTYPE: Deposited in NZOI collection, NIWA, Wellington, H-718.

REMARKS: Two types of marginal cirri have been described in hydromedusae: flexile and spiral. Flexile cirri are straight, never spirally coiled, with their cnidocysts arranged in rings along their whole length. They have so far been observed only in the monotypic genus *Cosmetira* (Fig. 6B). Spiral cirri, the commonest, have their ends coiled spirally, with cnidocysts in a terminal cluster and scattered down their length (Fig. 7C). Spiral cirri are characteristic of many families and, in particular, of the genera of Mitrocomidae with marginal cirri, except for *Cosmetira*, in which they are flexible. The distinction between these two types of cirri is not so evident and clear; in *Cosmetira*, for instance, the cirri are usually straight but some may coil and terminate with an elongated cluster of cnidocysts; on the other hand, the terminal part of the spiral cirri is often lost during manipulation or preservation, and only the straight part of the cirri remains, causing some confusion.

In live New Zealand Eucheilotidae, the two types of marginal cirri may also be present (Bouillon *et al.* 1988b). This character must thus be used with precaution and the presence of straight cirri or more precisely, the absence of spirally coiled endings, in *Mitrocomella niwai*, has no great significance. Most illustrations of Mitrocomidae with supposed spiral cirri show straight ones (see for instance: Kramp 1930: figs 10, 11, p. 24; Kramp 1965: fig. 3, p. 58; Russell 1953: fig. 165, p. 276; Naumov 1960–1969: fig. 194, p. 302; Arai & Brinckmann-Voss 1980: figs 50, 53, pp 91, 95; Pagès *et al.* 1992: figs 32, 33, pp 30, 31; Cornelius 1995: fig. 32A, C, p. 143 etc.) and even Kramp (1965), describing *Mitrocomella grandis*, cautiously described "between adjacent tentacles 5–8 cirri which may coil spirally".

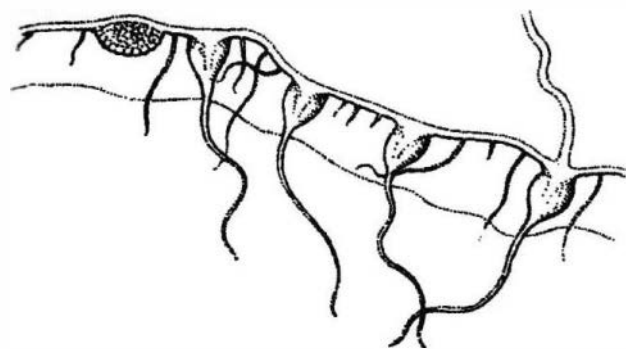
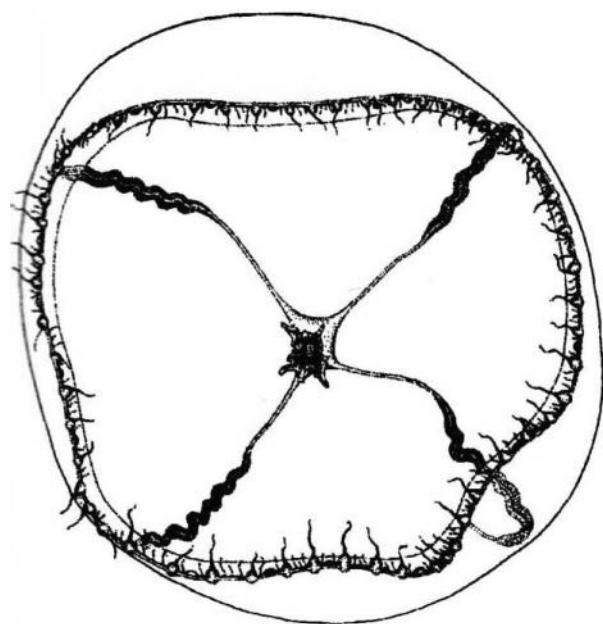


Fig. 93. *Mitrocomella niwai* sp. Below, enlarged section of margin.

KEY REFERENCES: Russell (1953), Naumov (1960–1969), Kramp (1930, 1932, 1965), Edwards (1973b), Arai & Brinckmann-Voss (1980), Bouillon *et al.* (1988b), Pagès *et al.* (1992), Cornelius (1995).

HYDROID: Unknown.

#### Family PHIALELLIDAE Russell, 1953

Medusae with small manubrium; no gastric peduncle; 4 radial canals. Gonads on radial canals, separated from manubrium and divided into two lateral parts by a median groove. Hollow tentacles; no excretory pores; no lateral or marginal cirri; 8 closed statocysts, each on bulbous-like swelling; no ocelli.

Hydroid: Colonies stolonial or erect sympodial; hydrotheca pedicellate, tubular, persistent, with operculum formed by separate triangular flaps demarcated or not from the hydrothecal margin by a basal crease-line. Gonothecae usually stolonial, sometimes on erect shoots.

#### *Phialella* Browne, 1902

Medusa and hydroids with the characters of the family.

- |    |   |                              |
|----|---|------------------------------|
| 1  | gonads along almost entire length of radial canals, hanging down in wavy folds; about 60 marginal tentacles | <i>Phialella falklandica</i> |
| 1a | gonads elongate-oval, in distal third of radial canals; 16–32 tentacles                                     | <i>Phialella quadrata</i>    |

#### *Phialella falklandica* Browne, 1902 (Fig. 94)

Umbrella up to 17 mm wide, semiglobular, a little broader than high, mesoglea thick. Manubrium short, quadrangular; 4 mouth lips with fimbriated margins. Radial canals and circular canals narrow. Gonads elongate, along greater part of radial canals, hanging down in wavy folds, with median grooves. 60–70 hollow marginal tentacles, with large, spherical marginal bulbs; no ocelli; 8 statocysts on cushion-like bulbous swellings.

RECORDS FROM N.Z.: Norman's Inlet, Auckland Islands; Perseverance Harbour, Campbell Island (Benham 1909); Portobello (Mills, per. comm.).

SEASONALITY: August.

DISTRIBUTION: Atlantic; Indo-Pacific; subantarctic.

KEY REFERENCES: Bouillon (in press).

HYDROID: Unknown.

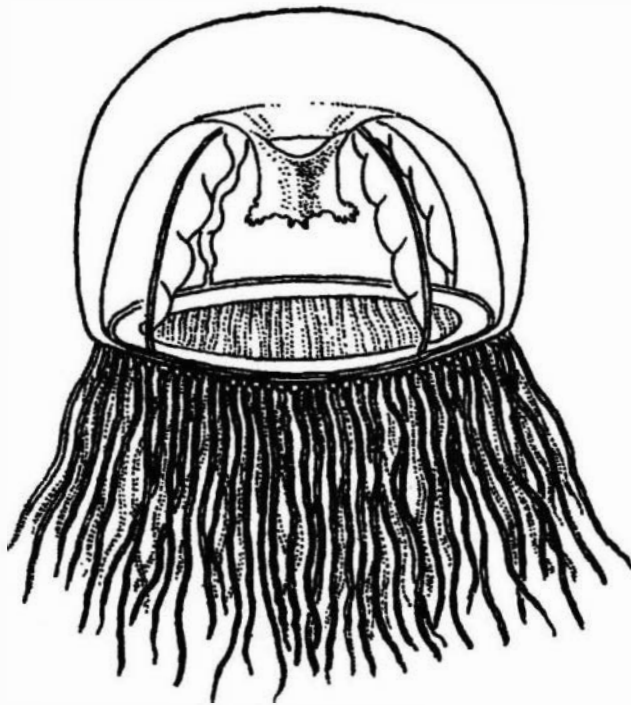


Fig. 94. *Phialella falklandica*. After Kramp (1968).

*Phialella quadrata* (Forbes, 1848) (Fig. 95)

Umbrella 13 mm wide, nearly hemispherical, mesoglea fairly thick. Manubrium quadrate, short, with small base; 4 short, slightly folded recurved lips, often with 4 black interradiial spots on base of manubrium. Radial canals and circular canal narrow. Gonads on distal third of radial canals, but not reaching bell margin, elongate-oval with median groove. 16–32 hollow marginal tentacles with small globular marginal bulbs; no ocelli; 8 statocysts on cushion-like bulbous swellings.

RECORDS FROM N.Z.: *Dana* Stns 3634, 3645; NZOI Stns B705, 706, 707, N416, N462; Otago Harbour (Russell 1953; Wellington Harbour (Wear 1965); Perversance Harbour, Campbell Island (Roberts 1972); about 52°S, 167°E (O'Sullivan 1982); Avon-Heathcote Estuary, Christchurch (Roper *et al.* 1983); Whangateau Harbour; Leigh Marine Reserve (Barnett 1985).

SEASONALITY: January–December.

DISTRIBUTION: Atlantic; Indo-Pacific; Mediterranean.

KEY REFERENCES: Fulton & Wear (1985); Cornelius (1995).

HYDROID: Colonies of simple or alternately branched hydranths from a creeping smooth hydromorpha; hydrocaulus erect, distinctly annulated throughout. Hydrotheca conical, campanulinid, on ringed pedicel closed by ca. 10-pleated membranous operculum of deep and acute convergent segments, meeting centrally and

not clearly demarcated from the hydrothecal margin, with a delicate diaphragm; hydranths very extensile with about 16 oral filiform tentacles in one whorl. Gonothecae large, obconical, usually rising from hydromorpha more occasionally from hydrocaulus, on short annulated stems.

(Huvé 1953; Gili 1986; Cornelius 1995)

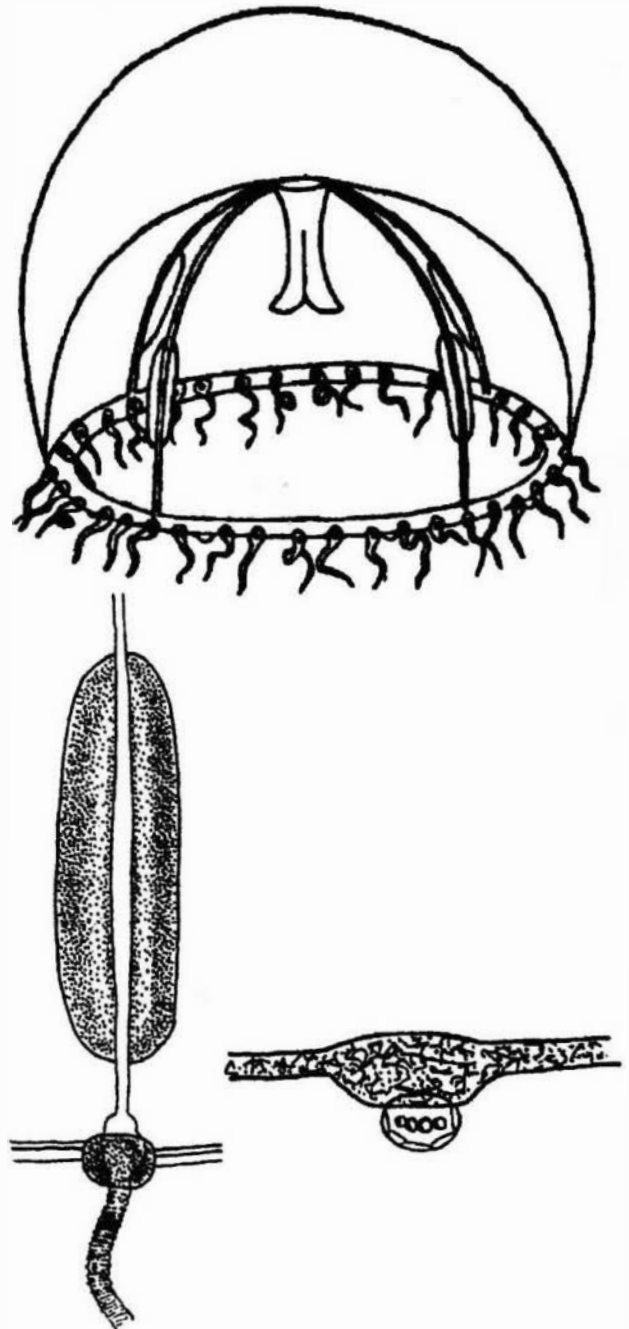


Fig. 95. *Phialella quadrata*. Above, after Kramp (1959); below, portion of the margin with gonad and statocyst, after Russell (1953).



Family **TIARANNIDAE** Russell, 1940

Medusae without apical projection; no gastric peduncle; wide, cruciform manubrium, with 4 per-radial pouches joined to subumbrella; mouth with 4 simple or crenulated lips. 4 simple radial canals. Gonads folded on interradial walls of manubrium and/or on the perradial manubrial pouches. Marginal tentacles numerous, hollow; with hollow cordyli-like structures bearing cnidocysts; no ocelli.

Hydroid: Where known, colonies stolonal, of "*Stegopoma*" type. Hydrotheca pedicellate or sessile, deep, asymmetric-tubular; operculum formed by 2 pleated membranes which meet one another like a gabled roof, with straight ridges above and sides of hydrotheca continuing up at each end, all imparting a bilateral symmetry to the distal part of the hydrotheca; hydranths where known lacking intertentacular web. Gonothecae resembling hydrothecae, but larger.

- 1 regularly transversely folded gonads on interradial walls of manubrium, extending outwards along per-radial manubrial pouches; gonads connected in interradia ..... *Modeeria*
- 1a sac-like gonads on perradial manubrial pouches only; gonads separated in interradia ..... *Chromatonema*

*Chromatonema* Fewkes, 1882

Medusa with gonads forming 8 series of sac-like invaginations (10–16) from the surface of the 4 perradial pouches; gonads separated in the interradia.

Hydroid: Unknown.

*Chromatonema rubrum* Fewkes, 1882 (Fig. 96)

Umbrella up to 27 mm wide, 22 mm high, higher than a hemisphere, with rounded apex, mesoglea very thick, thinning towards umbrellar margin. Manubrium broad, quadrangular, with 4 perradial pouches extending for half or two-thirds the distance towards bell margin; 4 radial canals; mouth with 4 short, slightly crenulated lips. Gonads in 8 adradial rows of 10–16 sac-like invaginations on each side of each manubrial pouch, hanging down into subumbrellar cavity and separated in the interradia. 20–24 hollow marginal tentacles with conical bulbs; between successive tentacles 2, rarely 1, minute cordyli-like appendages with a distal bundle of cnidocysts; cnidome: microbasic euryteles.

RECORDS FROM N.Z.: NZOI Stn N465.

SEASONALITY: February.

DISTRIBUTION: Atlantic; Indo-Pacific; Antarctic.

KEY REFERENCES: Kramp (1968); Bleeker & van der Spoel (1988); Larson *et al.* (1991); Gili *et al.* (1998)

HYDROID: Unknown.

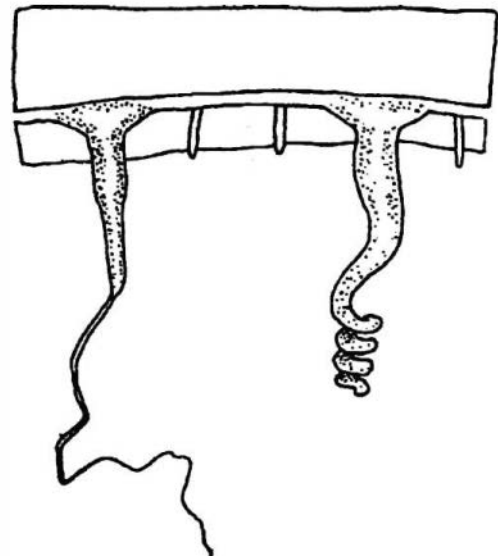
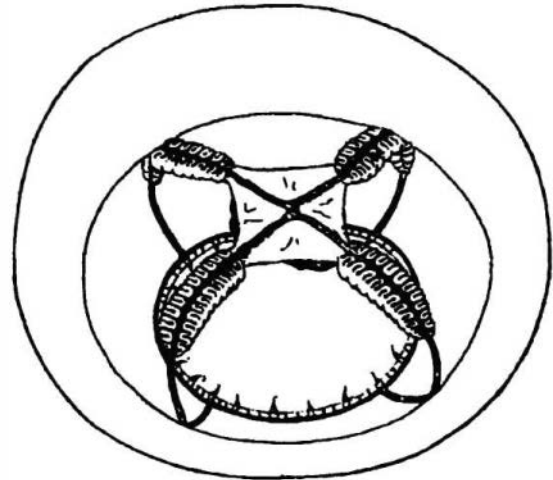


Fig. 96. *Chromatonema rubrum*. Top, after Kramp (1919); bottom, portion of umbrella margin, after Kramp (1933).

*Modeeria* Forbes, 1848

Medusa with interradial gonads on manubrium, extending outwards along perradial manubrial pouches.

Hydroid: See below.

*Modeeria rotunda* (Quoy & Gaimard, 1827) (Fig. 97)

Umbrella 20 mm wide, somewhat less high, hemispherical, mesoglea very thick, with rounded apex. Manubrium short, broad, cruciform, perradial edges of manubrium connected over entire length with sub-

umbrella, forming 4 perradial pouches; mouth with 4 large, slightly crenulated lips. 4 straight radial canals and narrow circular canal. Gonads in regular transverse folds on interradial walls of manubrium, extending outwards on perradial pouches; 16–28 hollow marginal tentacles with large conical marginal bulbs; 2–3 (4) minute cordyli-like appendages with distal bundle of cnidocysts between successive tentacles; cnidome microbasic euryteles.

RECORDS FROM N.Z.: About 44°S, 175–176°E (Navas-Pereira & Vannucci 1990).

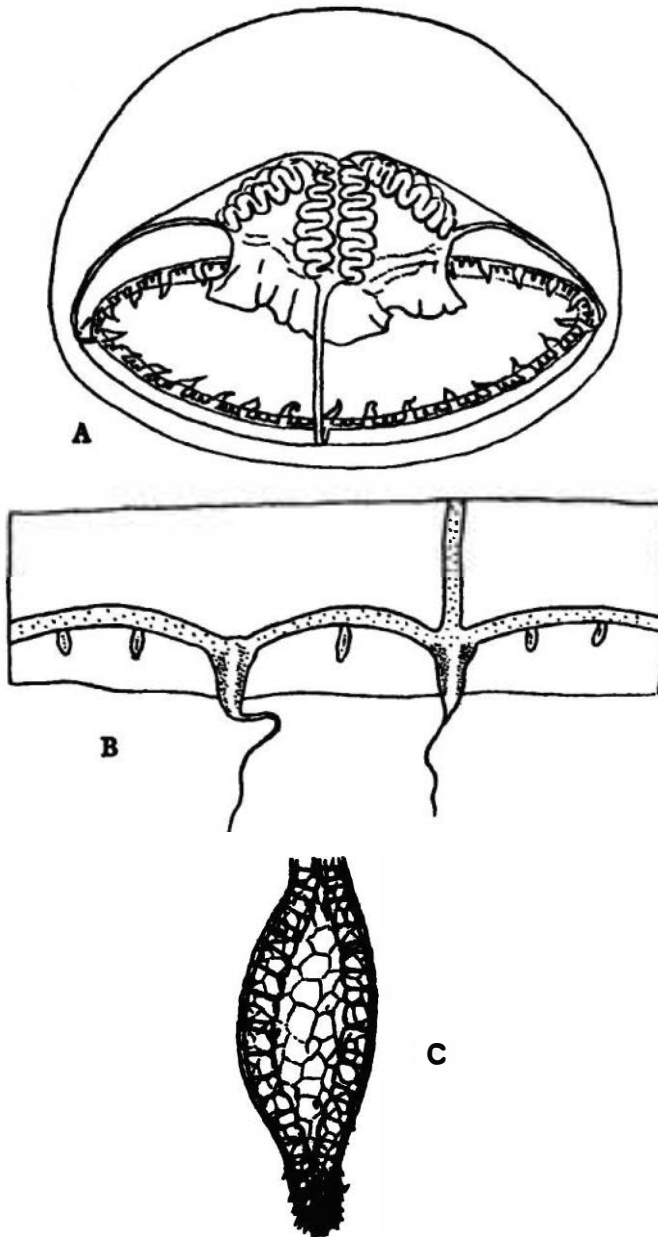


Fig. 97. *Modeeria rotunda*. A, adult medusa; B, portion of umbrellar margin, after Kramp (1920); C, cordylus-like structure, after Kramp (1919).

SEASONALITY: ?

DISTRIBUTION: Atlantic; Indo-Pacific; Antarctic; Arctic; Mediterranean.

KEY REFERENCES: Edwards (1963, 1973a); Cornelius (1995); Stepanjants *et al.* (1997); Gili *et al.* (1998).

HYDROID: Colonies stolonal. Hydrotheca arising singly from hydrorhiza at irregular intervals; large, tubular, tapering below into a smooth, straight or slightly curved, non-annulated pedicel; hydrothecal aperture closed by an operculum formed by 2 pleated membranes that meet one another like a gabled roof, with straight ridges above and sides of hydrotheca continuing up at each end, the whole imparting a bilateral symmetry to the distal part of the hydrotheca; with a very thin diaphragm often destroyed by preservation; hydranth not extending far beyond hydrothecal aperture; up to 13 filiform tentacles in a single uniconate whorl, no basal intertentacular membranous web, hypostome rounded-conical. Gonothecae resembling hydrthecae with gabled operculum, but larger, pedicel reportedly short to non-existent; gonophore with up to 4 developing medusae.

(Edwards 1973a; Millard 1975; Cornelius 1995)

Family TIAROPSIDAE Boero, Bouillon & Danovaro, 1987

Medusae with 4 or 8 radial canals (exceptionally up to 16); one or two types of marginal tentacles (long and rudimentary, both with marginal bulbs); no marginal cirri; sense organs compound, comprising an ecto-endodermal ocellus and open statocyst.

Hydroid: Where known, colonies "*Cuspidella*" like. Hydrotheca tubular, sessile or with reduced pedicel, operculum comprising numerous flaps demarcated or not from the rest of the hydrotheca by a crease-line; hydranth without intertentacular web. Gonotheca, where known, tubular or rounded, compressed laterally, with short peduncle from hydrorhiza.

- |   |   |       |                     |
|---|---|-------|---------------------|
| 1 | one kind of tentacle; 8 marginal vesicles                 | ...   | <i>Tiaropsis</i>    |
| 1 | two kinds of tentacles; 8–16, rarely 48 marginal vesicles | ..... | <i>Tiaropsidium</i> |

*Tiaropsidium* Torrey, 1909

Tiaropsidae with 4 or more (up to 16) simple radial canals; 8 or 16 (rarely 48) compound statocyst vessels; two kind of tentacles; without marginal cirri.

Hydroid: Where known, colonies of "*Cuspidella*" type. Operculum of hydrotheca formed by several flaps sharply demarcated from the hydrothecal margin by a crease-line. Gonothecae rounded, laterally compressed,

lacking operculum.

- 1 8 marginal vesicles ..... *Tiaropsidium roseum*
- 1a 16 marginal vesicles ..... *Tiaropsidium japonicum*

***Tiaropsidium japonicum* Kramp, 1932 (Fig. 98)**

Umbrella 18–34 mm wide, watch-glass-shaped, mesoglea thin. Manubrium small, square; velum narrow; mouth with very short, flat lips, slightly folded; no gastric peduncle. Gonads linear, along almost entire length of the 4 radial canals. 8 large hollow marginal tentacles with large, swollen bulbs, each tentacle with abaxial and adaxial muscular furrows; 6 or 7 small, pointed rudimentary tentacles between each 2 large tentacles; 16 compound statocysts.

RECORDS FROM N.Z.: *Galathea* Stn 629.  
SEASONALITY: January.  
DISTRIBUTION: Indo-Pacific.  
KEY REFERENCES: Kramp (1932, 1968).  
HYDROID: Unknown.

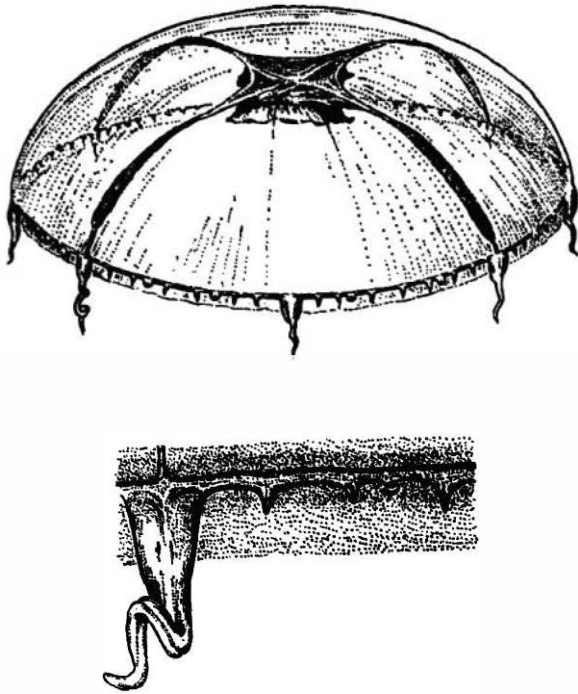


Fig. 98. *Tiaropsidium japonicum*. After Kramp (1968); below, portion of the umbrella margin.

***Tiaropsidium roseum* (Maas, 1905) (Fig. 99)**

Umbrella up to 15 mm wide, flattened, mesoglea thin. Manubrium quadrangular, short and broad; mouth

with 4 very short crenulated lips. Gonads elongate or oval, along somewhat more than one-third the length of 4 radial canals. 4 long perradial marginal tentacles; 7 rudimentary tentacles in each quadrant, each with a broad base and a pointed tip; 8 compound statocysts.

RECORDS FROM N.Z.: About 44°S, 178°E (Navas-Pereira & Vannucci (1994).  
DISTRIBUTION: Atlantic; Indo-Pacific.  
REFERENCES: Bouillon (1984b), Boero *et al.* (1987), Pagès *et al.* (1992).  
HYDROID: Colonies stolonial. Hydrotheca tubular, with a reduced, not annulated hydroclade, operculum with 7 or 8 flaps with broad base and rounded apex, meeting centrally and sharply demarcated from the hydrothecal margin; hydranth completely retractable in the hydrotheca; with one whorl of about 14 amphicoronate tentacles; no intertentacular membranous basal web; diaphragm present. Gonothecae borne on hydrorhiza, large, pyriform, base narrow, apex wide, not operculate; almost not pedunculated and strongly compressed in one plane; with a single medusa bud.  
(Boero, Bouillon & Danovaro 1987)

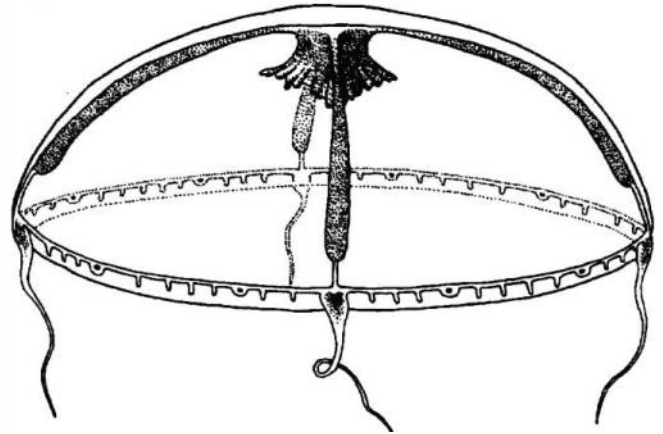


Fig. 99. *Tiaropsidium roseum*. After Pagès *et al.* (1992).

***Tiaropsis* L. Agassiz, 1849**

Medusa with 4 radial canals; 8 compound statocysts; only one kind of tentacles; no marginal cirri.

Hydroid: Where known, colonies of "*Cuspidella*" type. Hydrotheca solitary with an imperfectly ringed pedicel, tall, tubular, operculum not demarcated from hydrotheca by a basal crease-line. Gonothecae tubular, operculate.



*Tiaropsis gordonii* n.sp.

(Fig 100)

Umbrella hemispherical or slightly higher, 3–8 mm wide; mesoglea thick, particularly in apical region; velum fairly large. Manubrium short, situated on a well-developed, slender, cylindrical gelatinous gastric peduncle, extending to or slightly beyond umbrellar margin, with 4 small perradial basal projections at the entrance of each radial canal; mouth with 4 short pointed perradial lips with crenulated margins. 4 straight narrow radial canals, narrow circular canal. Gonads small, short, oval with pointed tips, pip-shaped, in middle of radial canals or slightly proximal in younger specimens. 50–100 small smooth hollow tentacles with conical basal bulbs; 8 large adradial open marginal vesicles each on cushion-like bulb with one large black ocellus; marginal vesicles each with about 12 concretions.

RECORDS FROM N.Z.: Leigh Marine Reserve (Barnett 1985).

SEASONALITY: November.

DISTRIBUTION: Endemic to New Zealand.

HYDROID: Unknown.

REMARKS: Only one species of *Tiaropsis* has been named previously, viz. *Tiaropsis multicirrata* L. Agassiz, 1849, distributed in the North Atlantic, the northeastern Pacific, and the Arctic Ocean. Its diagnosis is as follows: umbrella up to 30 mm wide, somewhat flatter than a hemisphere, becoming strongly flattened at sexual maturity; mesoglea moderately thick; velum well developed. Manubrium short, with small base, attached to subumbrella along arms of perradial cross, leaving small flat triangular pouches between dorsal wall of manubrium and subumbrella; situated on short broad and very flat peduncle (almost invisible in relaxed or living specimens); mouth with 4 elongated broad lips with much-folded crenulated margins. 4 straight radial canals and narrow circular canal. Gonads usually along middle half to two-thirds of radial canals, to nearly entire length of them in old specimens, linear, somewhat sinuous, median division present in both sexes. Marginal tentacles hollow, up to 200–330, with broad swollen bases, lacking ocelli; no marginal cirri; 8 open marginal vesicles, each with about 12–13 concretions and one black ocellus at base. Gonads dull yellow or almost black; eggs developing in the gonads, leaving them at the planula stage.

The New Zealand medusae can easily be distinguished from *T. multicirrata* by:

- 1, the presence of a long slender peduncle;
- 2, the position, shape, and size of the gonads;
- 3, the structure of the lips, which are less developed and less complexly folded and crenulated than in

*T. multicirrata*;

4, the size and shape of the marginal bulbs, conical in the New Zealand species, broad and swollen in *T. multicirrata*; and

5, the flatter umbrella shape of the adult specimens of *T. multicirrata*.

A new species, *Tiaropsis gordonii*, is consequently proposed for the New Zealand specimens.

MATERIAL EXAMINED: *Tiaropsis multicirrata*: Several medusae (12 specimens) belonging to the above described new species were found in New Zealand waters and assigned with some doubt by T. Barnett (1985) to *T. multicirrata*; I.R.S.N.B.: IG.27838, 6 specimens, Roscoff, France.

KEY REFERENCES: Kramp (1968), Naumov (1960–1969), Arai & Brinckmann-Voss (1980), Cornelius (1995).

HOLOTYPE: Deposited in the NZOI collection, NIWA, Wellington, H-719; and paratypes P-1170.

ETYMOLOGY: The species name is given in honour of Dr Dennis P. Gordon in recognition of contributions to the knowledge of the New Zealand marine fauna.

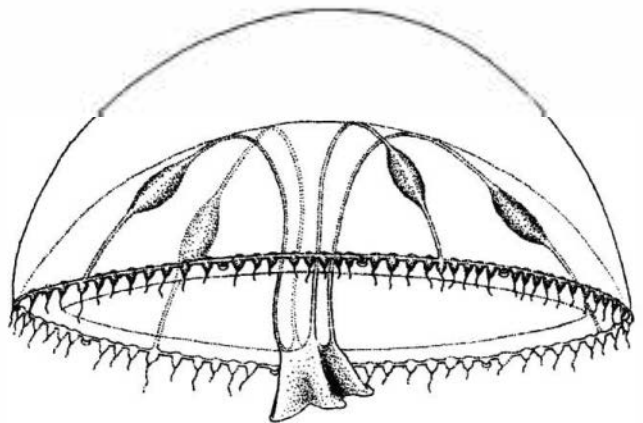


Fig. 100. *Tiaropsis gordonii* n.sp.

Order PROBOSCOIDA Broch, 1910

Hydranths with a complex flared to globose hypostome, forming a "buccal cavity" beneath the mouth (Fig. 5B). Medusa varied in expression, with closed ectodermal statocysts; never with cordyli, open statocysts, excretory pores, cirri, or ocelli.

- 1 no permanent tenon-like rudimentary marginal bulbs ..... CAMPANULARIIDAE
- 1a triangular, tenon-like permanent rudimentary marginal bulbs ..... PHIALUCIIDAE



Family **CAMPANULARIIDAE** Johnston, 1837

Leptomedusae with short manubrium; no gastric peduncle; typically with 4 radial canals (except in *Gastroblasta* and *Pseudoclytia*); with or without (*Obelia*) velum. Gonads on radial canals, completely surrounding them and separated from manubrium. Tentacles hollow (solid in *Obelia* with a short prolongation of endoderm into bell mesoglea); with or without tenon-like rudimentary bulbs; no marginal or lateral cirri; no excretory papillae or pores; numerous (16–200) closed marginal statocysts (only 8 in *Obelia*, each situated on underside of the basal bulb of some marginal tentacles); no ocelli.

Hydroid: Colonies erect or stolonal. Hydrotheca bell-shaped, radially or, secondarily bilaterally symmetrical; pedicellate, rim cusped or not, lacking operculum, with basal diaphragm or inward annular projection of perisarc. Nematophores absent. Hydranth, where known, generally tubular with flared or globose hypostome delimiting a "buccal cavity", with one whorl of filiform tentacles, gastric endoderm of uniform structure; subhydrothecal spherules present or not. Free medusae, eumedusoids or sporosacs.

- 1 medusae reduced; no manubrium or tentacles ..... *Orthopyxis*
- 1a medusae normally developed, with manubrium and tentacles ..... 2
- 2 hollow marginal tentacles and normal velum .. *Clytia*
- 2a solid marginal tentacles; no velum ..... *Obelia*

*Clytia* Lamouroux, 1812

Medusa with short manubrium; velum normal. Marginal tentacles hollow, no tenon-like permanent rudimentary bulbs; numerous statocysts.

Hydroid: Colonies unbranched, stolonal or erect and branching with reptant, branching but not anastomosing hydrorhiza. Hydrotheca rim sinuous, or deeply indented with clefts between the round to sharply pointed cusps; no true hydrothecal diaphragm; usually without subhydrothecal spherules (present in *C. hummelincki* shoots). Free medusae.

At the medusa level very few species of *Clytia* are known with certainty. Most of the morphological characters used to distinguish between them fall within the range of variation that can be expected in a single species and have little or no taxonomic value. This genus needs a careful revision.

- 1 manubrium large, globular; 4 prominent lips ..... *Clytia malayense*
- 1a manubrium fairly narrow ..... 2

- 2 statocysts about same number as tentacles and young bulbs ..... 3
- 2a statocysts about twice as numerous as tentacles and young bulbs ..... 4
- 3 gonads small, oval, near margin; females with few, very large eggs; 16–36 marginal tentacles .. *Clytia rangiroae*
- 3a gonads elongated, slightly folded, along distal half to three-quarters of radial canal; 60–85 marginal tentacles ..... *Clytia simplex*
- 4 very long, fringed lips; about 60 marginal tentacles .. *Clytia gregaria*
- 4a lips short, simple ..... *Clytia hemisphaerica*

*Clytia gregaria* (A. Agassiz, 1862) (Fig. 101)

Umbrella up to 22 mm wide, hemispherical to lens-shaped. Manubrium small, hanging on a very short peduncle, attached along arms of perradial cross; mouth with 4 very long fimbriated lips. Gonads linear, along distal two-thirds of radial canals, not touching circular canal. 60–80 marginal tentacles close together on bell margin; marginal bulbs large, nearly globular; 1 or 2, rarely 3, statocysts between successive tentacles or marginal bulbs.

RECORDS FROM N.Z.: NZOI Stns N365, N406, N422, N452, N453, Z3258.

SEASONALITY: December.

DISTRIBUTION: Indo-Pacific.

KEY REFERENCES: Arai & Brinckmann-Voss (1980), Bouillon (1995b).

HYDROID: The hydroid of this species has been raised several times from medusae but has not been clearly identified. Roosen-Runge (1970) reared a hydroid, with 8–13 hydrothecal teeth, which he was unable to identify with any of the *Clytia* species described from field collections and which he identified as *Clytia gregaria*. As stated by Arai and Brinckmann-Voss (1980) more work needs to be done to clarify the degree of variability of the species.

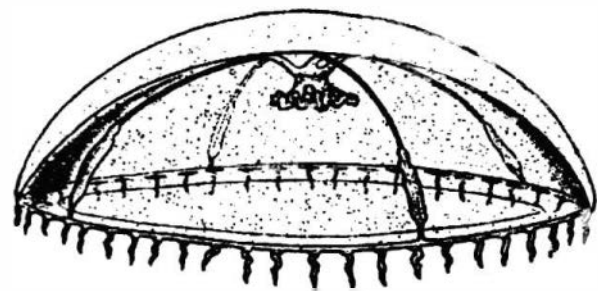


Fig. 101. *Clytia gregaria*. After Klamp (1968).

*Clytia hemisphaerica* (Linnaeus, 1767) (Fig. 102)

Umbrella up to 20 mm wide, nearly hemispherical or flatter, mesoglea fairly thin, velum narrow. Manubrium small, quadrate, with small base; mouth with 4 simple lips. Gonads oval or linear half to three-quarters the length of radial canals without median furrow, nearer to margin than to manubrium; 4 straight radial canals (sometimes more, up to 12). Typically 32 (16–58) marginal tentacles; marginal tentacular bulbs globular, prominent; few partially developed marginal bulbs; 1–3, usually 2, statocysts between successive tentacles.

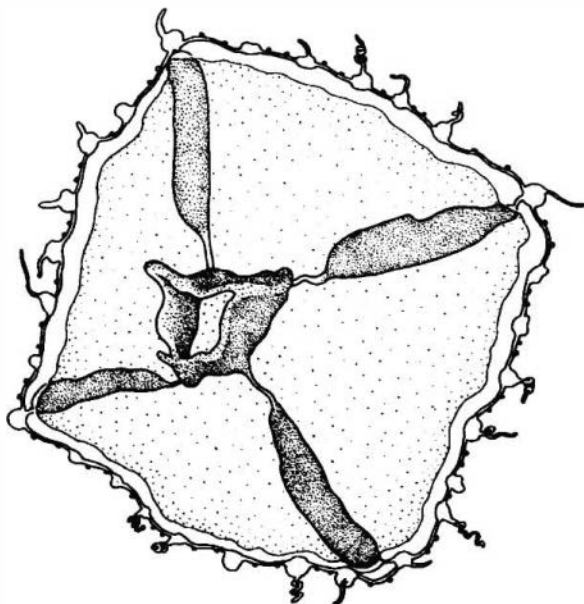
RECORDS FROM N.Z.: *Dana* Stns 3641, 3654 (as *Phialidium*); NZOI Stns N400, N433, N435; Avon-Heathcote Estuary, Christchurch (Roper *et al.* 1983); Whangateau Harbour; Leigh Marine Reserve (Barnett (1985).

SEASONALITY: January–December.

DISTRIBUTION: Atlantic; Indo-Pacific; Mediterranean.

KEY REFERENCES: Pagès *et al.* (1992), Cornelius (1995).

HYDROID: Colonies usually stolonial but occasionally erect, arising from a creeping hydrorhiza; hydrothecal pedicels borne at close intervals, sometimes forking; pedicels straight, with one to several rings top and bottom and in some specimens also centrally; some pedicels with secondary pedicels, these having characteristic upward curved basal region. Hydrotheca campanulate, rim with *ca.* 8–14 broad, rounded-triangular cusps; diaphragm thin. Hydranths 3 or 4 times longer than broad when fully extended, with 24–30 tentacles. Gonothecae arising from hydrorhiza on short slender pedicels, tubular, typically with deeply concertinaed walls resembling a Chinese lantern, but gonothecal walls may be smooth in some specimens; wide-mouthed. (Calder 1988; Cornelius 1995)



*Clytia malayense* Kramp, 1961 (Fig. 103)

Umbrella hemispherical, up to 7 mm wide, mesoglea fairly thin; velum narrow. Manubrium large, globular, cruciform at its base; mouth with 4 prominent recurved lips. 4 large oval or cylindrical gonads on middle third of radial canals. 32 or more equally spaced tentacles; marginal bulbs broad-based, large, conical; 0–2 statocysts between tentacles.

RECORDS FROM N.Z.: *Galathea* Stn 611 (as *Phialidium*).

SEASONALITY: January.

DISTRIBUTION: Indo-Pacific.

KEY REFERENCES: Xu & Zhang (1981); Bouillon (1984b); Bouillon *et al.* (1988c); He Zhenwu & Xu Renhe (1996).

HYDROID: Unknown.

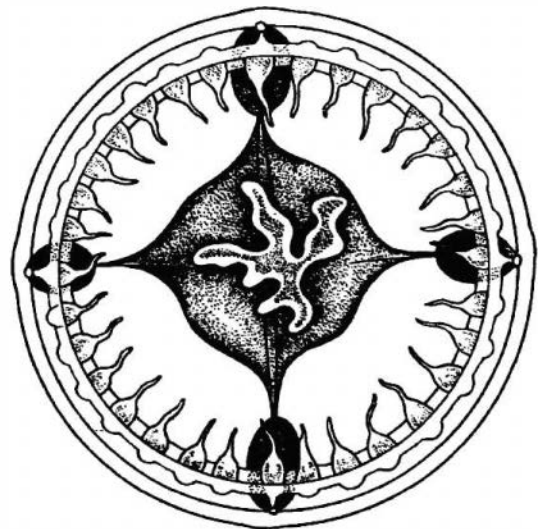


Fig. 103. *Clytia malayense*. After Kramp (1968).

*Clytia rangiroae* (Agassiz & Mayer, 1902) (Fig. 104)

Umbrella 7 mm wide, flatter than a hemisphere, mesoglea variable; velum broad. Manubrium very short, quadrate in cross section, not cruciform; mouth with 4 slightly recurved lips. Gonads small, oval, near umbrellar margin; females with a few large prominent eggs. 16–32 well-developed tentacles with large conical bulbs; statocysts usually in same number as tentacles.

RECORDS FROM N.Z.: Leigh Marine Reserve (Barnett 1985); Auckland Harbour; Whangateau Harbour; Leigh Marine Reserve (Mills, pers. comm.).

SEASONALITY: May, October, November.

DISTRIBUTION: Indo-Pacific.

REFERENCES: Bouillon (1984b).

HYDROID: Unknown.

Fig. 102. *Clytia hemisphaerica*. After Pagès *et al.* (1992).

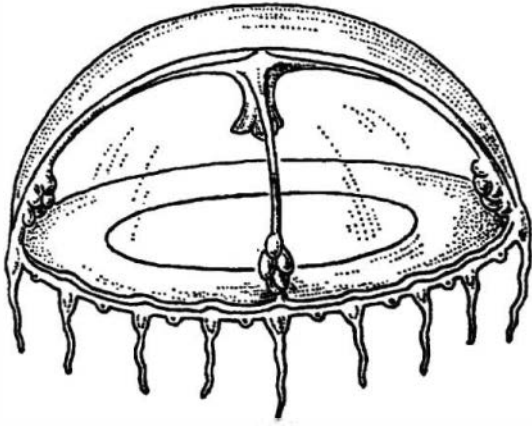


Fig. 104. *Clytia rangiroae*. After Kramp (1968).

*Clytia simplex* (Browne, 1902) (Fig. 105)

Umbrella up to 22 mm wide, 10 mm high, watch-glass-shaped, mesoglea thin. Manubrium short, with 4 lobe-like perradial thickenings; no gastric peduncle; mouth with 4 large fimbriated lips. Gonads elongated, linear, slightly folded along distal half to three-quarters of radial canal, not reaching circular canal. 60–85 marginal tentacles and a few young bulbs; marginal tentacular bulbs globular, prominent; one statocyst, sometimes 2, between successive tentacles; specimens with 3 and 6 radial canals.

RECORDS OF N.Z.: *Galathea* Stns 580, 596 (as *Phialidium*); NZOI Stn N371; Whangateau Harbour; Leigh Marine Reserve (Barnett 1985).

SEASONALITY: January–June, December.

DISTRIBUTION: Atlantic; Indo-Pacific, subantarctic.

REFERENCES: Pagès *et al.* (1992), Bouillon (1995b).

HYDROID: Unknown.

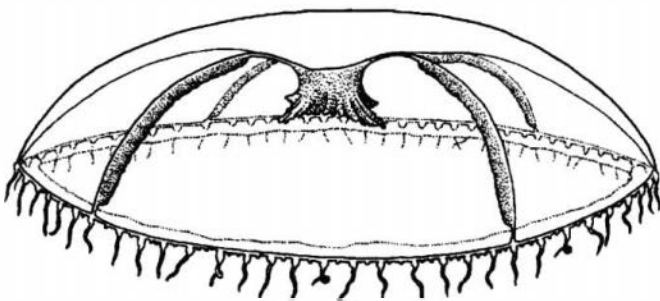


Fig. 105. *Clytia simplex*. After Pagès *et al.* (1992).

*Obelia* Péron & Lesueur, 1810

Medusa with short quadrangular manubrium; no velum. Numerous solid, stiff, non-extensile ten-

tacles with short endodermal roots extending into bell mesoglea; 8 statocysts situated on underside of basal bulbs of some marginal tentacles.

Hydroid: Erect hydrocauli forming branched or unbranched, fascicled or unfascicled, upright colonies, variably flexuose; stolons not anastomosing; internodes annulated proximally, hydroclades with distal hydrothecae. Hydrotheca bell-shaped, radially symmetrical, with toothed or untoothed margin and true hydrothecal diaphragm, no sub-hydrothecal spherule; hydranth with globose hypostome forming a "buccal cavity". Gonothecae inverted-conical, usually with raised terminal aperture but sometimes simply truncated.

*Obelia* spp. (Fig. 106)

Umbrella 2.5–6 mm wide, circular, flat, mesoglea very thin; no gastric peduncle; mouth with 4 simple lips; 4 radial canals. Gonads spherical to ovoid, sac-like, hanging from middle to end of radial canals. Numerous short, stiff, solid, non-extensile marginal tentacles with short endodermal roots extending into bell mesoglea; 8 statocysts situated on underside of basal bulbs of some marginal tentacles.

Various nominal species of *Obelia* hydroids are common throughout the world but at present no good characters exist to distinguish their medusa stages from each other.

According to Zamponi and Genzano (1990), the medusae of *Obelia dichotoma* Hincks, 1868 and *Obelia longissima* (Pallas, 1766) are distinguishable by the cnidome of atrichous isorhizas, atrichous anisorhizas, and basitrichous isorhizas in *O. dichotoma* and microbasic mastigophores and macrobasic mastigophores in *O. longissima*. The presence of macrobasic mastigophores appears improbable in the genus *Obelia*, however, as well as in any other Leptomedusae and contamination may be suspected.

RECORDS FROM N.Z.: NZOI Stns B705, N339, N343, N345, N346, N347, N349, N350, N360, N361, N382, N388, N391, N396, N397, N400, N405, N406, N408, N413, N439, N454, N462; east coast of New Zealand (Lendenfeld 1884); Wellington Harbour (Wear 1965); Jellicoe Channel, Waitemata Harbour (Jillett 1971); Perseverance Harbour, Campbell Island (Roberts 1972); Avon-Heathcote Estuary, Christchurch (Roper *et al.* 1983); Whangateau Harbour; Leigh Marine Reserve (Barnett 1985).

SEASONALITY: January–December.

DISTRIBUTION: Cosmopolitan genus.

KEY REFERENCES: Bouillon (1984b), Fulton & Wear (1985), Pagès *et al.* (1992), Cornelius (1995).



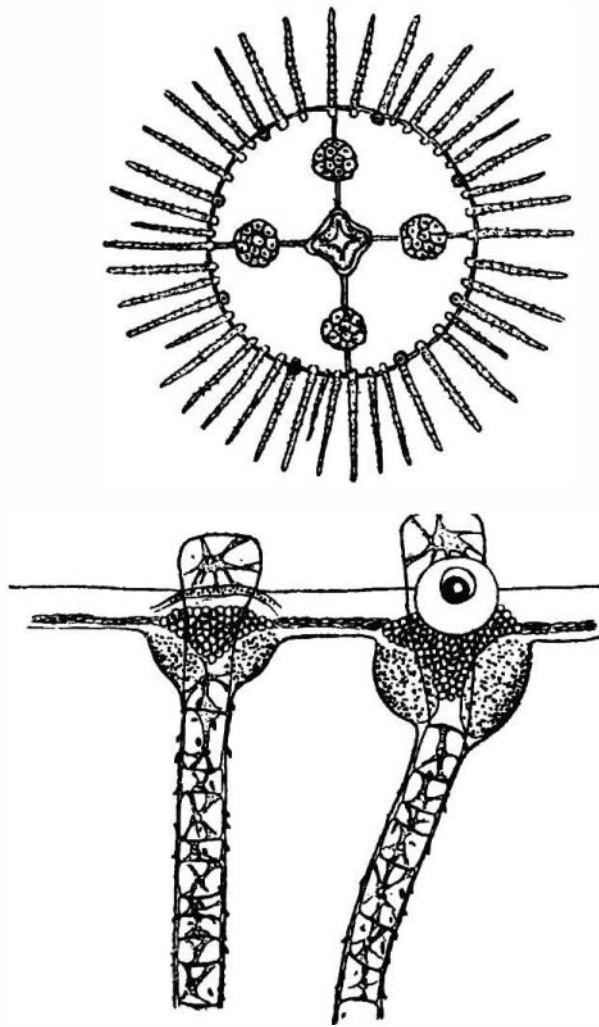


Fig. 106. *Obelia* spp. After Kramp (1933).

*Orthopyxis* L. Agassiz, 1862

Medusa reduced, no manubrium or tentacles but with 8 marginal vesicles; either free, facultatively retained, or never released.

Hydroid: Colonies stolonial or with short unbranched uprights; stolons anastomosing. Hydrotheca fundamentally radially symmetrical but often asymmetrically thickened; no true hydrothecal diaphragm. Eumedusoids.

*Orthopyxis* spp. (Fig. 107)

Umbrella pyriform, up to 1.5 mm high, thin walls; exumbrella with or without meridional ridges; circular canal narrow; 4 radial canals closed and obliterated near apex, giving rise to numerous blindly ending side branches. No manubrium. No marginal tentacles;

8 adradial statocysts. Gonads developed between branches of radial canals, bell cavity almost filled with sexual products;

RECORDS FROM N.Z.: Timaru (Coughtrey 1874); French Pass (Hartlaub 1901); east and south of North and South Islands (Ralph 1956). Only hydroids with eumedusoids.

SEASONALITY: June–December.

DISTRIBUTION: Atlantic; Indo-Pacific; Mediterranean.

REFERENCES: Cornelius (1982, 1995).

HYDROID: Stolonial or forming short unbranched upright colonies; stolons anastomosing; hydroclades deeply and spirally grooved, with sub-hydrothecal spherule. Hydrotheca deeply bell-shaped, usually compressed, perisarc often greatly thickened especially at narrow end but thinning down at margin, margin with 8–13 short rounded teeth; true diaphragm absent. Hydranth with ca. 14 tentacles. Gonothecae borne on short pedicels on hydrorhiza, strong processes projecting from upper corners containing 2 eumedusoid buds.

(Millard 1975; Cornelius 1982; Hirohito 1995)

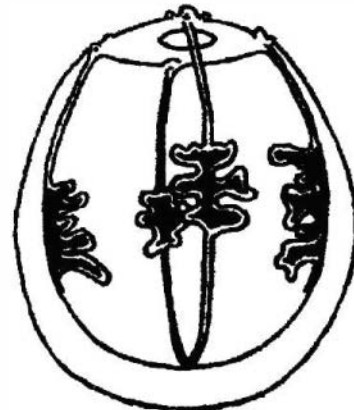


Fig. 107. *Orthopyxis*. After Mayer (1910).

Family PHIALUCIIDAE Kramp, 1955

Leptomedusae with small manubrium; no peduncle; 4 simple radial canals with gonads completely surrounding them and separated from manubrium. Hollow marginal tentacles with triangular tenon-like permanent marginal rudimentary bulbs; no marginal or lateral cirri; no excretory pores; with closed statocysts.

Hydroid: Not known from field, of "campanulariid" type; hypostome trumpet-shaped; stem long, not annulated; hydranth with 10–14 filiform tentacles.

(Bouillon 1984)



*Phialucium* Maas, 1905

With the characters of the family.

*Phialucium mbenga* (Agassiz & Mayer, 1899)  
(Fig. 108)

Umbrella 9–12 mm wide, 4–5 mm high, slightly flatter than a hemisphere; mesoglea moderately thick, rigid. Manubrium urn-shaped, as long as broad; mouth with 4 fairly long, simple, lobed and folded lips; 4 radial canals and circular canal. Gonads elongated, swollen, sinuous, on distal half of radial canals but not in contact with circular canal. Usually 16 hollow marginal tentacles but in old specimens up to 18–20, with well-developed conical marginal bulbs; 4–9 triangular, tenon-like, permanent, rudimentary marginal bulbs between successive tentacle (80–90), all alike; no excretory papillae or pores; 32 statocysts, usually 2 between each pair of tentacles.

RECORDS FROM N.Z.: *Dana* Stn 3627.

SEASONALITY: December.

DISTRIBUTION: Indo-Pacific.

KEY REFERENCES: Bouillon (1984b, 1985a, 1995a).

HYDROID: See family characters.

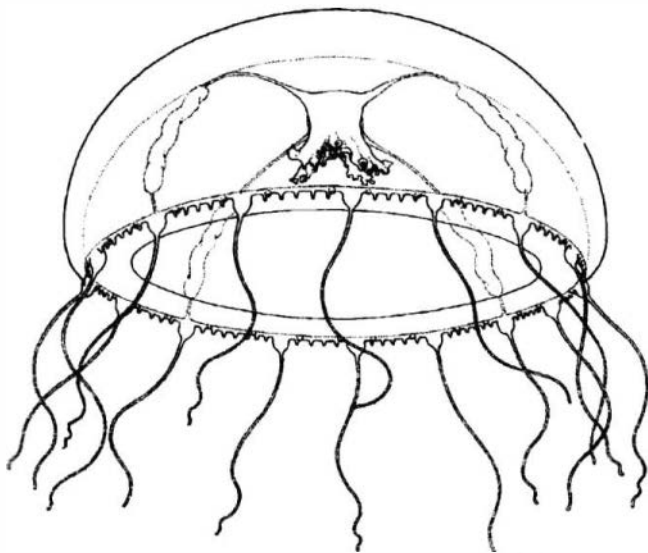


Fig. 108. *Phialucium mbenga*. After Bouillon (1984b).

Subclass LAINGIOMEDUSAE

Family LAINGIIDAE Bouillon, 1978

Medusae with umbrella divided by peronial grooves or similar structures so that umbrella margin is lobed; 4 radial canals; no typical circular canal but a solid core

of endodermal cells around umbrellar margin. Manubrium simple, quadrangular, tubular or conical; mouth-opening quadrangular to circular. Tentacles solid, inserted on the exumbrellar surface above bell margin; alternating with tentacles there may be narrow exumbrellar cnidocyst bands or triangular ciliated fields. Marginal sense organs apparently missing. Cnidome includes macrobasic mastigophores or macrobasic euryteles (Fig. 8A, B). Gonads in 4 masses on the manubrium or as epidermal lining of interradial pockets of the manubrium. Reproduction unknown.

*Fabienna* Schuchert, 1996

Medusa with slightly lobed umbrellar margins and 4 perradial tentacles that have their origin somewhat displaced towards the exumbrella; interradial triangular ciliated fields; larger cnidocysts confined to tentacle tips in one terminal cluster immediately followed proximally by an adaxial cluster; the 2 clusters may fuse in older individuals. Cnidome includes macrobasic euryteles. Gonads develop on manubrium only, in an interradial position.

Hydroid: unknown.

*Fabienna sphaerica* Schuchert, 1996 (Fig. 109)

Umbrella up to 1.8 mm high, bell rather spherical; mesoglea thick, apex about 1.5 times thicker than lateral walls; bell-margin lobed through 4 perradial furrows where tentacles originate; velum when dilated spanning half of radius; small triangular, opaque, interradial exumbrellar field with long cilia, situated along the margin; with a few scattered cnidocysts along the bell margin, occasionally more near the base of the ciliated fields. Manubrium about two-thirds as long as bell cavity, with large cruciform base, no peduncle; mouth-opening circular to quadrangular, rim provided with cnidocysts. Gonads in form of 4 large, interradial, triangular pads; with 4 narrow radial canals, very fine, blindly ending lateral branches rarely observed; no typical circular canal but a solid, thin, core of endodermal cells running closely around umbrellar margin. 4 tentacles arising somewhat towards exumbrella and may be adnate to it for a short distance; tentacles with terminal region often bent like a hook, without real terminal swelling, cnidocysts concentrated at tips of tentacles, clustered together into a terminal and an adaxial clump; tentacle endoderm proximally parenchymatous for a short distance, without lumen, then chordoid; 4 perradial marginal bulbs, egg-shaped, with adaxial cnidocyst pads; no ocelli or statocysts present. Cnidome includes macrobasic euryteles.

RECORDS FROM N.Z.: Leigh Marine Reserve; Greta Point, Evans Bay, Wellington (Schuchert 1996).  
 Seasonality: July, August, September.  
 DISTRIBUTION: Endemic to New Zealand.  
 REFERENCES: Schuchert (1996).  
 HYDROID: Unknown.

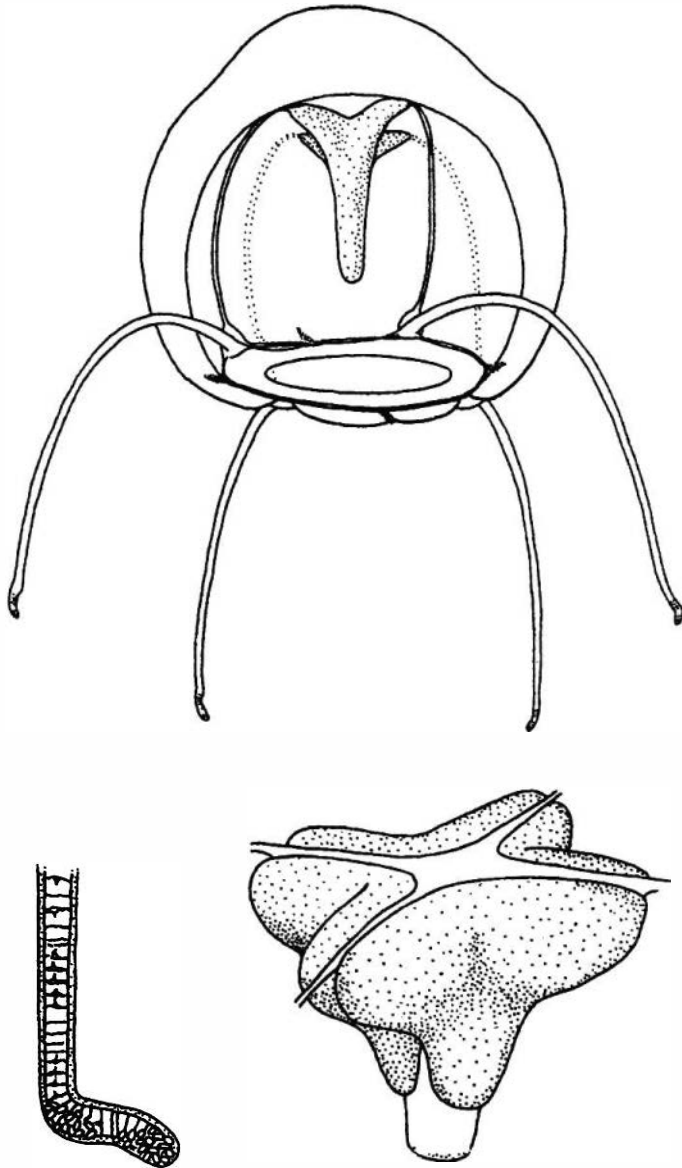


Fig. 109. *Fabienna sphaerica*. After Schuchert (1996); below, left: tentacle tip; right, manubrium.

Subclass LIMNOMEDUSAE

Family OLINDIIDAE Haeckel, 1879

Medusae with or without centripetal canals; with internal statocysts and simple, unbranched radial

canals; gonads on radial canals; no ocelli.

Hydroid: Where known, usually solitary, seldom colonial; generally reduced, minute, either without tentacles or with one tentacle or with a few tentacles in a singlering, sometimes with dactylozooids; no theca. Very active asexual reproduction by buds or frustules; usually free medusae, very exceptionally with free or fixed medusoids.

*Craspedacusta* Lankester, 1880

Medusa without peduncle; 4 simple radial canals; no centripetal canals. Gonads only on radial canal, hanging, pouch-like. Evenly distributed marginal tentacles all of one kind, not organs of adhesion; closed ecto-endodermal statocysts situated in the velum.

Hydroid: See below.

*Craspedacusta sowerbyi* Lankester, 1880 (Fig. 110)

Umbrella 10–20 mm wide, slightly flatter than a hemisphere; mesoglea fairly thick; with well-developed marginal cnidocyst ring; velum broad and well developed. Manubrium large, upper portion conical with broad square base, tapering downwards to cross-shaped distal region; mouth with 4 simple or slightly folded lips, extending beyond umbrellar margin. 4 straight radial canals and circular canal broad and massive. 4 large smooth triangular pouch-like gonads, with rounded corners, hanging down into subumbrellar cavity from points of junction of radial canals with manubrium. 200–400 or more hollow marginal tentacles, in several series situated at different levels on umbrellar margin; oldest 4 perradial marginal tentacles largest and highest; bases of marginal tentacles adherent to exumbrella; surface of marginal tentacles covered with evenly distributed papillae, each with 3–10 cnidocysts; 100–200 or more marginal vesicles, usually about half the number of marginal tentacles; situated in velum, forming centripetal tubes with basal enlargements near umbrellar margin.

RECORDS FROM N.Z.: Fish (1971, 1975).

SEASONALITY: January–March.

DISTRIBUTION: Cosmopolitan in fresh waters and sometimes in brackish waters of temperate and tropical areas.

KEY REFERENCES: Reisinger (1957), Bennett (1966), Fish (1971, 1975), Naumov & Stepanjants (1971), Acker (1976), Acker & Muscat (1976), Culberson (1976), Ludwig (1977), Dendy (1978), Dumont (1994), Stepanjants *et al.* (1997).



HYDROID: Solitary or forming small reptant colonies of 2–4, rarely 7, polyps. Hydranths without tentacles, cylindrical, with apical mouth (hypostome) surrounded by cnidocysts forming a spherical capitulum under which the polyp is slightly tapering, forming a distinct neck; basal portion of hydranths with periderm covering, attaching colonies to substratum. Medusa buds lateral, on middle or lower part of body, often becoming terminal by hydranth reduction; asexual reproduction by frustules, transverse division, and resting stages (cysts).

(Payne 1924; Dejdar 1934; Reisinger 1957)

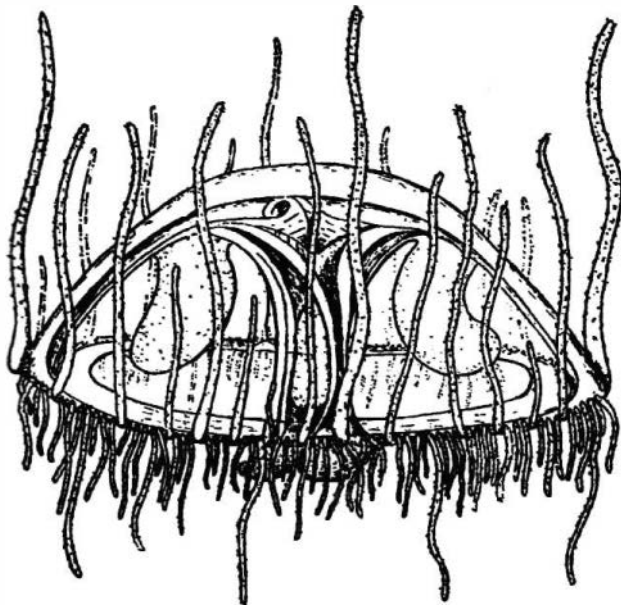


Fig. 110. *Craspedacusta sowerbyi*. After Payne (1924).

Subclass NARCOMEDUSAE

- 1 no manubrium pouches ..... SOLMARISIDAE
- 1a with manubrium pouches ..... 2
- 2 pouches perradial ..... CUNINIDAE
- 2a pouches interrarial ..... AEGINIDAE

Family AEGINIDAE Gegenbaur, 1857

Medusae with interrarial divided manubrial pouches containing the gonads; with or without peripheral canal system. Perradial primary tentacles leaving umbrella between marginal pouches, in number at least half as many as manubrial pouches; with or without secondary tentacles on umbrellar margin. Pouches extending beyond point of origin of primary tentacles. With or without otoporpaes.

- 1 only 2 tentacles ..... *Solmundella*
- 1a 4 or more tentacles ..... 2
- 2 8 or more tentacles and twice as many manubrial pouches; with secondary tentacles ..... *Aeginura*
- 2a 4–6 tentacles, 4–6 peronia, and 8–12 manubrial pouches ..... *Aegina*

*Aegina* Eschscholtz, 1829

Medusa with typically 8 primary manubrial pouches, occasionally 10–12; peripheral canal system. Typically 4, occasionally 5 or 6, marginal primary tentacles; no secondary tentacles; no otoporpaes.

*Aegina citrea* Eschscholtz, 1829 (Fig. 111)

One species. Umbrella up to 50 mm, hemispherical, mesoglea rigid, thick at the apex, thinner toward periphery; velum well developed. Manubrium large, circular and flattened, lower portion conical, usually with 8 rectangular gastric pouches, occasionally with 10–12, some or all may have slight medium clefts or notches; mouth simple, circular. Peripheral canal system present. Gonads on manubrial pouches sometimes extending to manubrium. 4 solid tentacles emerging at upper end of the 4 peronia in deep furrows; no secondary tentacles; 4 lappets with numerous statocysts, 2–720 per lappet; no otoporpaes; 5- or 6-rayed specimens occur frequently.

RECORDS FROM N.Z.: *Dana* Stns 3620, 3621, 3626, 3627, 3630, 3640, 3642, 3653, 3654; NZOI Stns B76, N377.

SEASONALITY: January, September, December.

DISTRIBUTION: Atlantic, Indo-Pacific, Mediterranean, Antarctic, Arctic.

KEY REFERENCES: Arai & Brinckmann-Voss (1980), O'Sullivan (1982), van der Spoel & Bleeker (1988), Carré *et al.* (1989), Larson *et al.* (1991), Bouillon (1995b), He Zhenwu & Xu Renhe (1996), Gili *et al.* (1998).

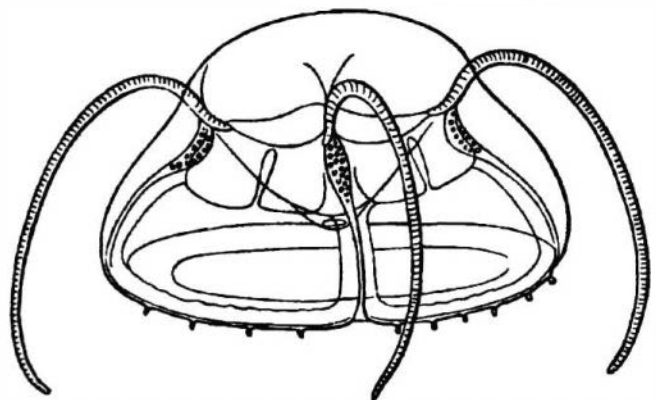


Fig. 111. *Aegina citrea*. After Kramp (1968).



*Aeginura* Haeckel, 1879

Medusa with 16 primary manubrial pouches, with indications of secondary divisions. Peripheral canal system absent or degenerated; 8 primary tentacles and peronia; secondary tentacles on umbrellar margin itself; no otoporphae.

*Aeginura grimaldii* Maas, 1904 (Fig. 112)

Umbrella hemispherical, up to 45 mm; mesoglea thick in upper half, thinner at sides and margin; 8 peronia; velum well developed. Manubrium large, lenticular, two-thirds of umbrellar diameter; 16 rectangular manubrial pouches with a slight secondary division; mouth simple, circular; colour of manubrium deep chocolate to purplish-black. Peripheral canal system absent or degenerated. 8 solid, long, primary tentacles issuing from umbrella at upper ends of peronia, with root-like continuations in apical mesoglea; 3–5 secondary tentacles on margin of umbrella in each octant; 1 or 2 statocysts between each secondary tentacle; no otoporphae.

RECORDS FROM N.Z.: Dana Stn 3640; About 42°S, 178°E (Bleeker & van der Spoel 1988).

SEASONALITY: January.

DISTRIBUTION: Atlantic, Indo-Pacific, Arctic, Antarctic.

KEY REFERENCES: van der Spoel & Bleeker (1988), Bleeker & van der Spoel (1988), Navas-Pereira & Vannucci (1990), Larson *et al.* (1991), Gili *et al.* (1998).

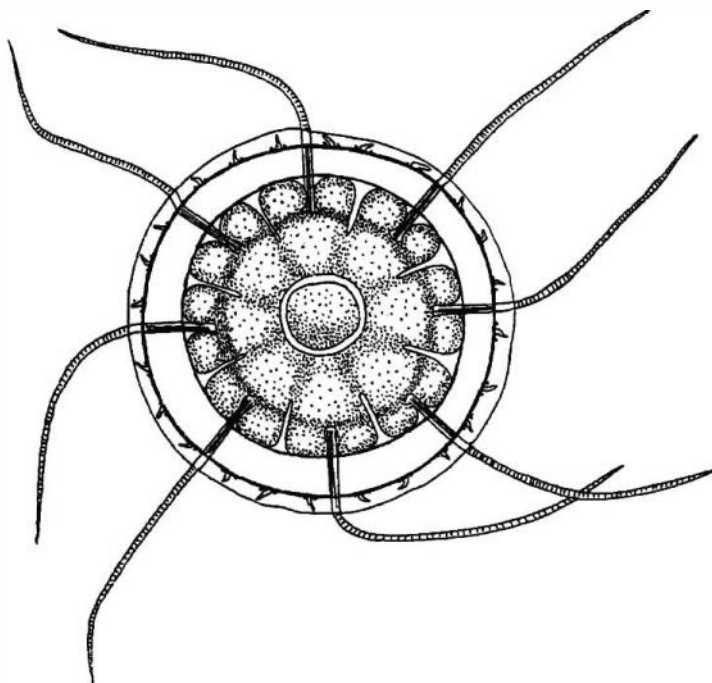


Fig. 112. *Aeginura grimaldii*. After Maas (1905).

*Solmundella* Haeckel, 1879

Medusa with 8 manubrial pouches; no peripheral canal system; 4 peronia but only 2 long tentacles; no secondary tentacles; no otoporphae.

*Solmundella bitentaculata* (Quoy & Gaimard, 1833) (Fig. 113)

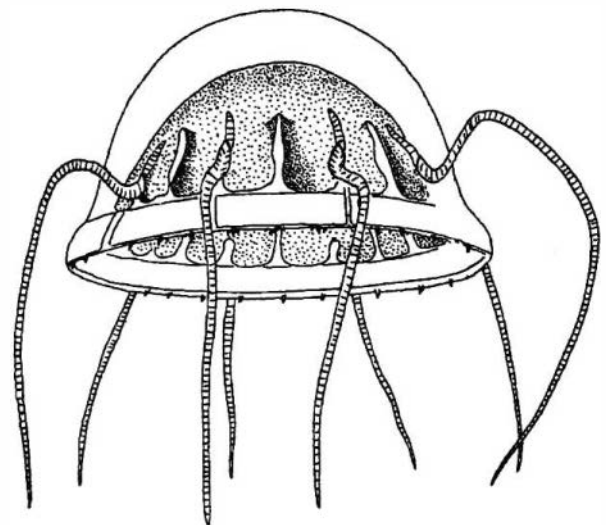
One species. Umbrella up to 12 mm wide, usually much smaller, rounded apex, keel-shaped along the axis leading to tentacles, apical mesoglea very thick, lateral walls thin; velum well developed. Manubrium short, lenticular, with 8 rectangular pouches with rounded edges; mouth circular, simple. 2 long, tapering, opposite tentacles issuing from umbrella above manubrium, near apex. Gonads in subumbrellar wall under manubrial pouches. 4 peronia in deep grooves; no peripheral system or otoporphae; 8–32 statocysts.

Records from N.Z.: Dana Stns 3641, 3642; NZOI Stn N449.

SEASONALITY: January, February.

DISTRIBUTION: Atlantic, Indo-Pacific, Mediterranean, Antarctic.

KEY REFERENCES: O'Sullivan (1982), Bouillon (1987, 1995b), Carré *et al.* (1989), Larson *et al.* (1991), Navas-Pereira & Vannucci (1990), He Zhenwu & Xu Renhe (1996), Gili *et al.* (1998).



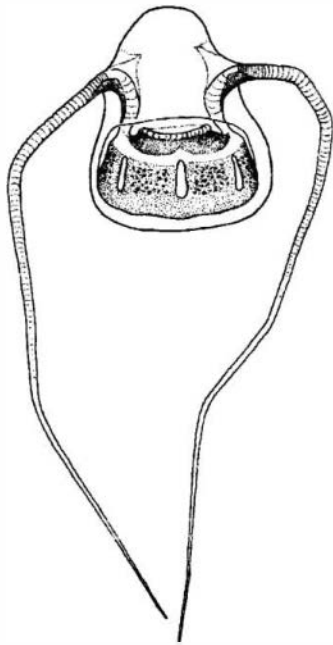


Fig. 113. *Solmundella bitentaculata*. After Pagès *et al.* (1992).

Family CUNINIDAE Bigelow, 1913

Medusae with perradial and undivided manubrial pouches; with or without peripheral canal system. Tentacles leaving umbrella opposite centre of each manubrial pouch and thus equal in number to the pouches; these not extending beyond point of origin of tentacles; with or without otoporphae.

- 1 no otoporphae ..... *Solmissus*
- 1a with otoporphae ..... *Cunina*

*Cunina* Eschscholtz, 1829

Medusa with otoporphae, with or without peripheral canal system.

- 1 with peripheral system ..... 2
- 1a no peripheral canal system ..... *Cunina peregrina*
- 2 manubrial pouches, tapering from broad base, separated by wide triangular spaces ..... *Cunina frugifera*
- 2a manubrial pouches with nearly parallel sides ..... 3
- 3 up to 10–14 manubrial pouches, wide and quadratic, more than twice as wide as the septa between them ...  
..... *Cunina globosa*
- 3a up to 29 manubrial pouches, elongated rectangular, hardly broader than space between them; lateral portions of peripheral canals very broad, transverse portions narrow ..... *Cunina duplicata*

*Cunina duplicata* Maas, 1893 (Fig. 114)

Umbrella up to 58 mm, rather flat; manubrium pouches increasing with age, from 9 in juvenile specimens up to 29, elongated, tongue-shaped to rectangular, hardly broader than space between them; generally of unequal length and width, sometimes large and smaller ones alternating; lateral portions of peripheral canals very broad, transverse portions narrow. Gonads forming a continuous folded band following edge of manubrium with its pouches; marginal lappets rectangular with 2 or 3 statocysts; otoporphae very small.

Records from N.Z.: *Dana* Stn 3623; Evans Bay (Schuchert collection, ?juvenile, 1993.11.25); About 47°S, 162–164°E (Navas-Pereira & Vannucci 1990).

SEASONALITY: November, December.

DISTRIBUTION: Atlantic, Indo-Pacific, Antarctic.

KEY REFERENCES: Navas-Pereira & Vannucci (1990), Gili *et al.* (1998).

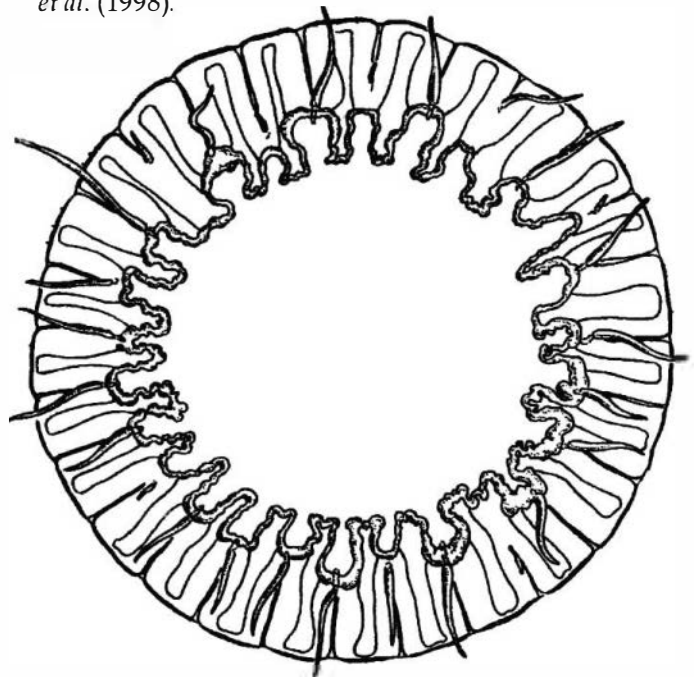


Fig. 114. *Cunina duplicata*. After Kramp (1968).

*Cunina frugifera* Kramp, 1948 (Fig. 115)

Umbrella about 8 mm wide, dome-shaped; apical mesoglea very thick; velum narrow; 6–9 manubrial pouches triangular, tapering from broad base towards tentacles and separated by wide triangular spaces; peripheral canals broad and flat; 6–9 tentacles with no ectodermal pads below their base; marginal lappets square, with 4 statocysts; otoporphae linear; often medusa bud on subumbrellar surface of manubrial pouches.



RECORDS FROM N.Z.: *Dana* Stns 3620, 3623, 3626, 3627, 3654; ca. 44°S, 172°W (Navas-Pereira & Vannucci 1990).  
 SEASONALITY: January, December.  
 DISTRIBUTION: Atlantic, Indo-Pacific, Mediterranean.  
 KEY REFERENCES: Bouillon (1987), Pagès *et al.* (1992), Navas-Pereira & Vannucci (1990), He Zhenwu & Xu Renhe (1996).

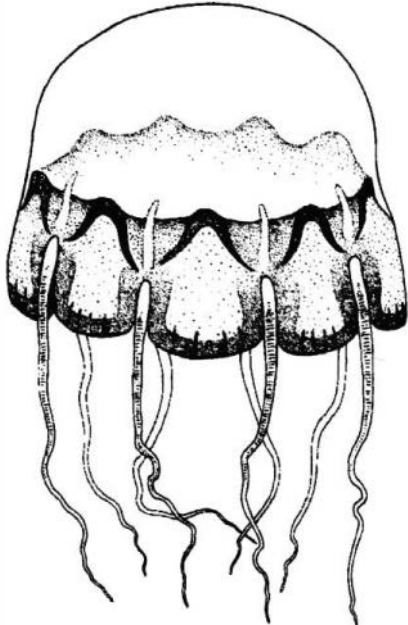


Fig. 115. *Cunina frugifera*. After Pagès *et al.* (1992).

***Cunina globosa*** Eschscholtz, 1829 (Fig 116)

Umbrella up to 18 mm wide; conical or almost globular; mesoglea thick. Manubrium circular on a broad gastric peduncle; up to 10–14 manubrial pouches, wide and quadrate, more than twice as wide as septa between them. 10–14 relatively short tentacles, issuing from the centre of bases of the manubrial pouches at a short distance only above umbrellar margin, no ectodermal pads below tentacles bases; peripheral canals well developed; marginal lappets short and broad with 3 statocysts; otoporpaes short and oval.

RECORDS FROM N.Z.: *Dana* Stn 3623.  
 SEASONALITY: December.  
 DISTRIBUTION: Atlantic, Indo-Pacific, Mediterranean.  
 KEY REFERENCES: Bouillon (1987); Pagès *et al.* (1992); Gili *et al.* (1998).

***Cunina peregrina*** Bigelow, 1909 (Fig 117)

Umbrella up to 14 mm, hemispherical, highly arched; mesoglea thick in upper half; velum broad; usually

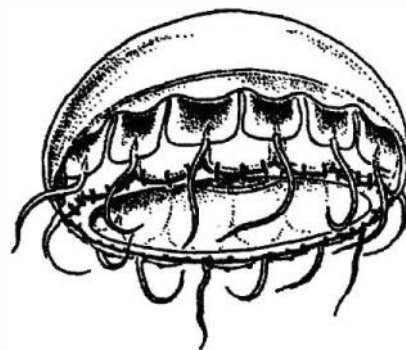
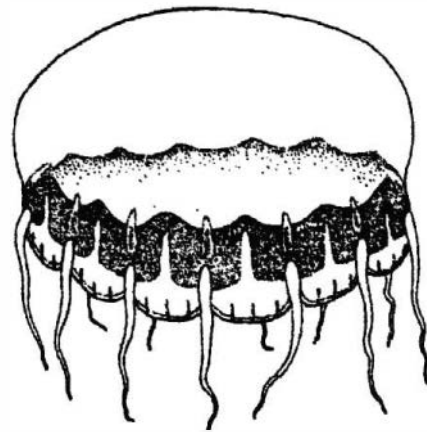


Fig. 116. *Cunina globosa*. Above after Pagès *et al.* (1992); below after Kramp (1968).

about 12 (8–14) manubrial pouches, broad, square or somewhat rounded distally, with parallel sides protruding towards exumbrella; pouches increasing in number with age; no peripheral system; a small ectodermal pad below base of tentacles; marginal lappets short and broader than high, each with 4–10 statocysts; otoporpaes narrow, linear.

RECORDS FROM N.Z.: *Dana* Stn 3623.  
 SEASONALITY: December.  
 DISTRIBUTION: Atlantic, Indo-Pacific.  
 KEY REFERENCES: Bouillon (1987); Pagès *et al.* (1992).

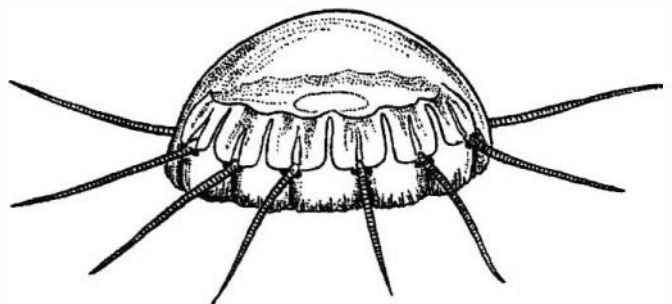


Fig. 117. *Cunina peregrina*. After Kramp (1968).

*Solmissus* Haeckel, 1879

Cuninidae without otoporphae, without peripheral canal system.

- 1 20-40 manubrial pouches, oval in outlines, mesogleal disk soft and fragile ..... *Solmissus incisa*
- 1a ca. 16 manubrial pouches, rectangular, mesogleal disk rigid ..... *Solmissus marshalli*

*Solmissus incisa* (Fewkes, 1886) (Fig. 118)

Umbrella up to 100 mm wide, flat, disk-like, with thin flexible margin, mesoglea fairly thick but soft and

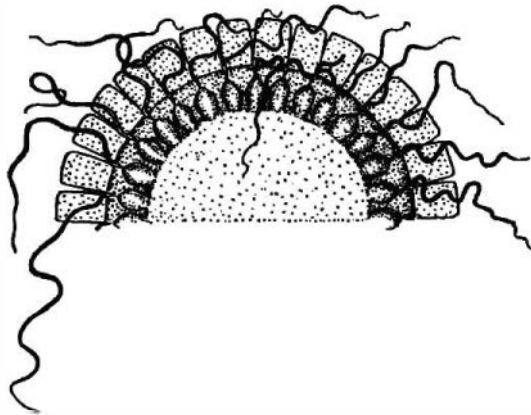
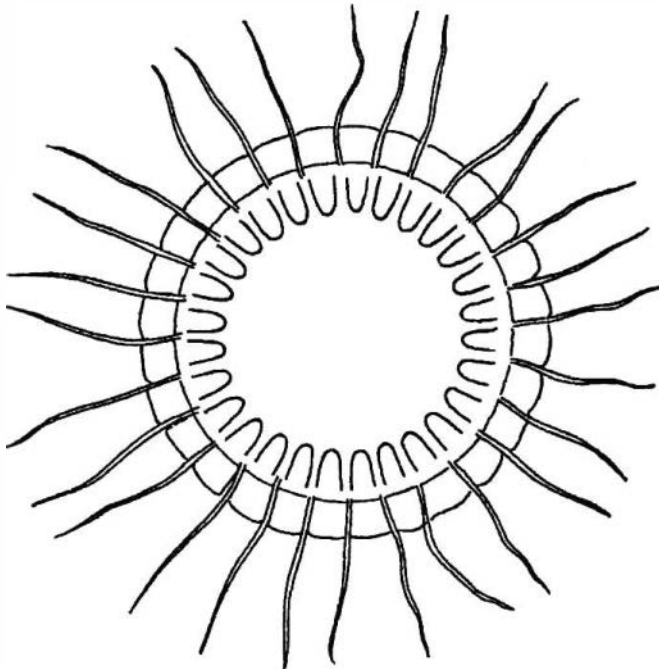


Fig. 118. *Solmissus incisa*. Above, after Vanhöffen (1908); below, after Kramp (1968).

fragile, exumbrella smooth; velum well developed. Manubrium large, circular, covering subumbrellar surface; 20-40 perradial manubrial pouches, oval in outline, usually somewhat longer than wide, septa between them alternating with tentacle roots. 20-40 marginal tentacles, stiff, tapering, up to slightly longer than diameter of umbrella; no peripheral canal system; marginal lappets rectangular, about as long as broad, each with 2-5 statocysts, no otoporphae.

RECORDS FROM N.Z.: *Dana* Stn 3642.

SEASONALITY: January.

DISTRIBUTION: Atlantic, Indo-Pacific, Mediterranean.

KEY REFERENCES: Arai & Brinckmann-Voss (1980);

Larson *et al.* (1991); Gili *et al.* (1998).

*Solmissus marshalli* Agassiz & Mayer, 1902

(Figs 8G; 119)

Umbrella up to 62 mm, watchglass-shaped; mesogleal central disc flat, thick and rigid, thinning towards the marginal lappets, exumbrella smooth; velum well developed. Manubrium wide, flat, circular; 8-20, usually 16, rectangular manubrial pouches about as long as wide or slightly longer; mouth a simple circular opening. Gonads in walls of stomach pouches; tentacles solid, issuing from midpoints of base of manubrial pouches, shorter or as long as umbrellar diameter; marginal lappets square, lappet zone very thin, up to 15 (rarely 21) statocysts permarginal lappet, peronia deep; no peripheral system.

RECORDS FROM N.Z.: *Dana* Stns 3622, 3623, 3626, 3627, 3629, 3631, 3642, 3653.

SEASONALITY: January, December.

DISTRIBUTION: Atlantic, Indo-Pacific, Antarctic.

KEY REFERENCES: Arai & Brinckmann-Voss (1980); van der Spoel & Bleeker (1988); Carré *et al.* (1989); Larson *et al.* (1991); Pagès *et al.* (1992); He Zhenwu & Xu Renhe (1996); Mills *et al.* (1996); Gili *et al.* (1998).

Family SOLMARISIDAE Haeckel, 1879

Medusae without manubrial pouches, the periphery of manubrium being circular and unbroken; with or without peripheral canal system. Gonads on manubrial wall or wall diverticula; with numerous tentacles leaving umbrella at level of periphery of manubrium. With or without otoporphae.

1 peripheral canal system; with otoporphae ... *Pegantha*

1a lacking peripheral canal system; no otoporphae .....

*Solmaris*



*Pegantha* Haeckel, 1879

Medusa with gonads forming marginal diverticula of oral manubrium wall; with peripheral canal system and otoporpae.

- 1 exumbrella with deep radiating furrows from tentacles to apex, surrounded by ribs and supplementary ridges ..... *Pegantha triloba*
- 1a exumbrella smooth ..... 2
- 2 otoporpae long, peripheral canals narrow throughout their length ..... *Pegantha clara*
- 2a all otoporpae short; peripheral canals broad, at least in their lateral portions ..... 3
- 3 umbrella highly vaulted, thick; about 16 square marginal lappets; lateral portions of peripheral canals broad at base, tapering outwards ..... *Pegantha martagon*
- 3a umbrella flat, lenticular; 16-26 marginal lappets; peripheral canals very broad throughout ..... *Pegantha laevis*

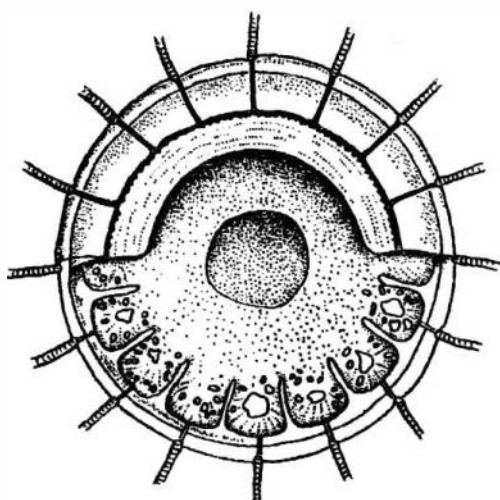
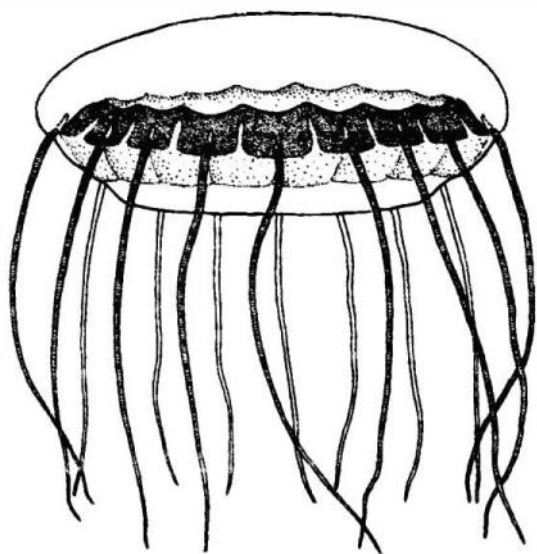


Fig. 119. *Solmissus marshalli*. Above, after Pagès et al. (1992); below, after Kramp (1968).

*Pegantha clara* R.P. Bigelow, 1909 (Fig. 120)

Umbrella up to 50 mm wide and 20 mm high, flattened, lenticular, mesoglea thick, moderately rigid, exumbrella smooth. Manubrium flat, outline circular; mouth widely open, circular. 20-40 quadrate to tongue-shaped marginal lappets, continuously increasing in number during growth, each usually with 3-5 statocysts; up to 40 tentacles. Gonads simple, smooth or somewhat crenulated, sac-shaped or halfmoon-shaped pouch in each lappet radius; peripheral canals narrow almost equal throughout their length; with linear otoporpae as long as lappets.

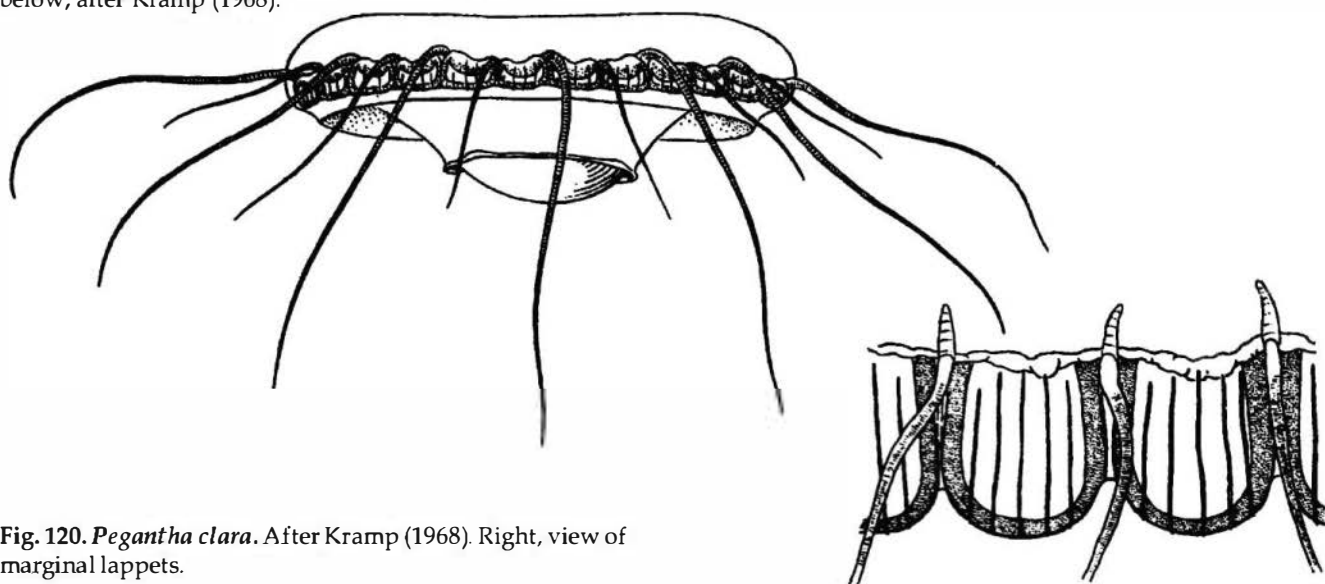


Fig. 120. *Pegantha clara*. After Kramp (1968). Right, view of marginal lappets.



RECORDS FROM N.Z.: *Dana* Stns 3620, 3622, 3623, 3624, 3626, 3627, 3631, 3638, 3639; NZOI Stn N456.  
 SEASONALITY: January, February, December.  
 DISTRIBUTION: Atlantic, Indo-Pacific, ?Antarctic.  
 KEY REFERENCES: Bouillon (1987), Larson *et al.* (1991), Navas-Pereira & Vannucci (1990), Gili *et al.* (1998).

*Pegantha laevis* H.B. Bigelow, 1909 (Fig. 121)

Umbrella up to 40 mm wide, flat, lenticular, exumbrella smooth; velum broad. Manubrium circular, flat, with thin walls; mouth simple, circular. Peripheral canals very broad throughout especially in their lateral portion. 16–26 marginal lappets square about as long as broad with rounded corners, each with 5–7 statocysts; 16–26 solid marginal tentacles; otoporphae shorter or slightly longer than width of transverse portions of peripheral canals. Gonads sac-shaped when fully developed, with oval or papilliform processes; peronia not very deep.

RECORDS FROM N.Z.: *Dana* Stns 3623, 3626, 3627.  
 SEASONALITY: December.  
 DISTRIBUTION: Atlantic, Indo-Pacific.  
 KEY REFERENCES: Bouillon (1987); Pagès *et al.* (1992).

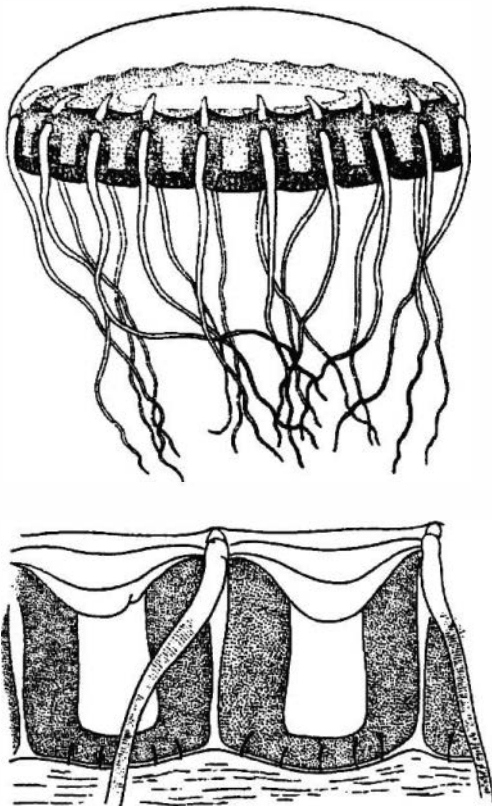


Fig. 121. *Pegantha laevis*. Above, after Pagès *et al.* (1992); below, view of marginal lappets, after Kramp (1968).

*Pegantha martagon* Haeckel, 1879 (Fig. 122)

Umbrella up to 30 mm wide and about 20 mm high, hemispherical or higher, highly vaulted, mesoglea thick, rigid, exumbrella smooth; velum broad. Manubrium circular, flat; mouth simple, circular, with distensible lips. Ca. 16–18 square or evenly rounded marginal lappets about as long as broad, often with ridges, each with 5–9 statocysts; 10–18 solid marginal tentacles. Lateral portions of peripheral canals broad at base, tapering distally, transverse portions fairly narrow; otoporphae short and narrow, about twice as long as width of transverse section of peripheral canals. Gonads simple or as lobed sacs in old specimens, running along the base of the manubrium.

RECORDS FROM N.Z.: *Dana* Stns 3620, 3623, 3625, 3626, 3627, 3631, 3643, 3654  
 SEASONALITY: January, December.  
 DISTRIBUTION: Atlantic, Indo-Pacific, Antarctic.  
 KEY REFERENCES: Pagès *et al.* (1992), Navas-Pereira & Vannucci (1990), He Zhenwu & Xu Renhe (1996).

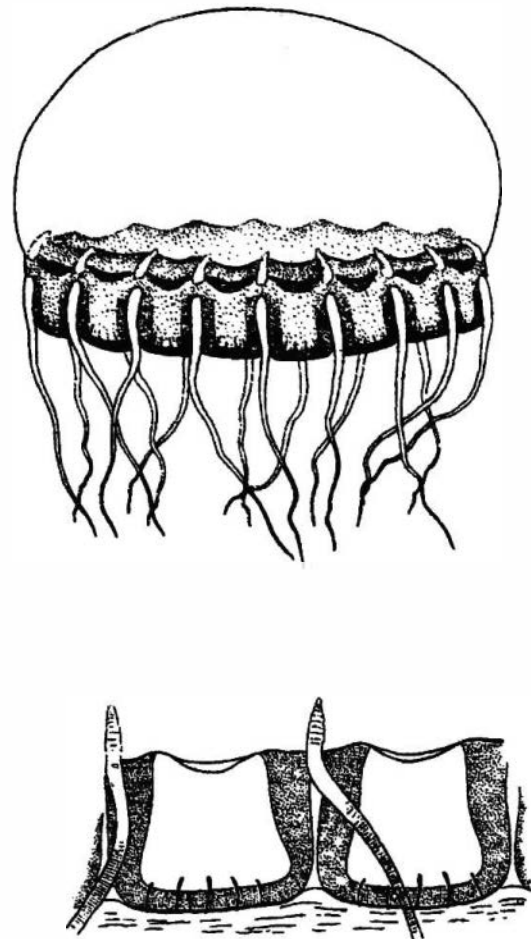


Fig. 122. *Pegantha martagon*. Above, after Pagès *et al.* (1992); below, view of marginal lappets, after Kramp (1968).

*Pegantha triloba* Haeckel, 1879 (Fig. 123)

Umbrella up to 30 mm wide, hemispherical; mesoglea very rigid, apex somewhat flattened; exumbrella with deep radiating furrows from tentacles to near apex, surrounded by ribs and supplementary ridges; velum broad. Manubrium circular, broad; mouth simple, circular. 12–16 tentacles somewhat longer than umbrellar diameter; 12–16 marginal lappets ovate, with sharp pointed end, each with up to 20 statocysts. Gonads adhering to base of manubrium, consisting of central sacs with variously subdivided lobes projecting into each lappet cavity; otoporphae long, tapering outwards.

RECORDS FROM N.Z.: *Dana* Stns 3623, 3626, 3627.  
 SEASONALITY: December.  
 DISTRIBUTION: Atlantic, Indo-Pacific, Mediterranean.  
 KEY REFERENCES: Winkler (1982), Bouillon (1987), Pagès *et al.* (1992).

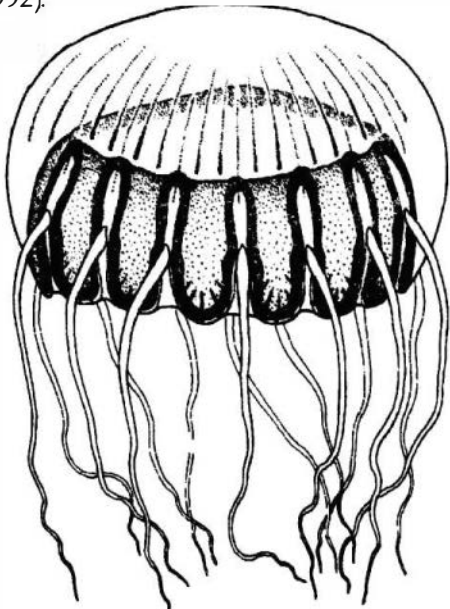


Fig. 123. *Pegantha triloba*. After Pagès *et al.* (1992).

*Solmaris* Haeckel, 1879

Medusa lacking peripheral canal system; no otoporphae, simple annular gonads.

*Solmaris rhodoloma* (Brandt, 1838) (Fig. 124)

Umbrella 2–7 mm wide, very flat, disk-like, mesoglea thin and fragile. Manubrium circular, simple; mouth simple, circular. 16–32 tentacles, longer than umbrella diameter and as many marginal lappets varying in size, each with 1 or 2 statocysts; lacking peripheral canal system; no otoporphae, with simple annular gonads in subumbrellar ectoderm.

RECORDS FROM N.Z.: NZOI Stns N349, N378; Whanga-teau; Leigh Marine Reserve (Barnett 1985); Avon-Heathcote Estuary, Christchurch (Roper *et al.* 1983); Auckland (Mills, pers. comm.); Seatoun, Wellington (Schuchert collection 1994.04.14b).

SEASONALITY: January–December.

DISTRIBUTION: Indo-Pacific.

KEY REFERENCES: Bouillon (1987); Bouillon *et al.* (1991).

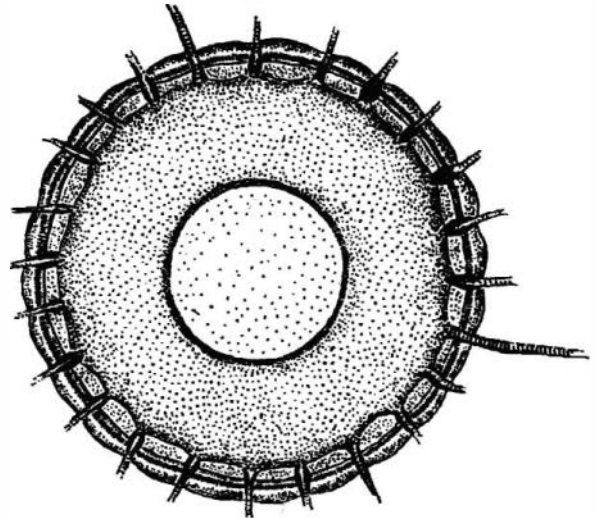


Fig. 124. *Solmaris rhodoloma*. After Kramp (1968).

Subclass TRACHYMEDUSAE

- 1 centripetal canals ..... GERYONIIDAE
- 1a lacking centripetal canals ..... 2
- 2 broad, circular manubrium and broad radial canals ....
- ..... HALICREATIDAE
- 2a manubrium and radial canals narrow .....
- ..... RHOPALONEMATIDAE

Family GERYONIIDAE Eschscholtz, 1829

Medusae with gastric peduncle; 4–6 radial canals (sometimes more); with centripetal canals. Gonads on radial canals, flattened and leaf-shaped; two kinds of marginal tentacles, solid and hollow; ecto-endodermal statocysts enclosed in mesoglea.

- 1 6 radial canals, 6 gonads, mouth with 6 lips ... *Geryonia*
- 1a usually 4 radial canals and gonads (sometimes more), mouth with 4 lips ..... *Liriope*

*Geryonia* Péron & Lesueur, 1810

Medusa with 6 lips; 6 radial canals and 6 gonads.



*Geryonia proboscidalis* (Forskäl, 1775) (Fig. 125)

Sole species. Umbrella 35–80 mm wide, almost hemispherical. Manubrium small, on long, conical, gastric peduncle; mouth with 6 simple lips. 6 radial canals; up to 7 centripetal canals between each radial canals. Gonads heart-shaped, very broad above; 6 long perradial hollow tentacles with cnidocyst rings and 6 small, solid interradial tentacles with adaxial cnidocyst clusters; 12 statocysts.

RECORDS FROM N.Z.: *Dana* Stns 3620, 3622, 3625, 3626, 3653, 3654, 3656.

SEASONALITY: January, December.

DISTRIBUTION: Atlantic, Indo-Pacific, Mediterranean.

KEY REFERENCES: He Zhenwu & Xu Renhe (1996), Bouillon (in press).

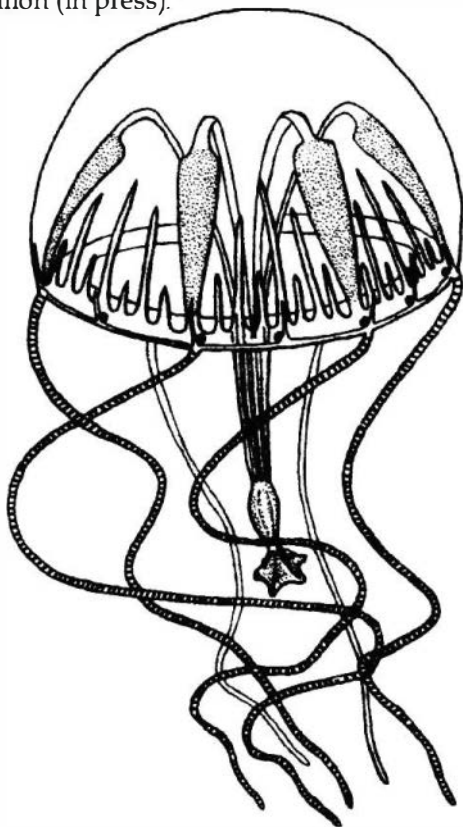


Fig. 125. *Geryonia proboscidalis*. After Trégouboff and Rose (1957).

*Liriope* Lesson, 1843

Medusa with 4 lips; usually 4 radial canals and 4 gonads, sometimes more.

*Liriope tetraphylla* (Chamisso & Eysenhardt, 1821)  
(Fig. 126)

Sole species. Umbrella 10–30 mm wide, hemispherical,

apex somewhat flattened; mesoglea thick, rigid; velum broad. Manubrium, small, on long, cylindrical gastric peduncle, longer than umbrella diameter; mouth with 4 simple lips bordered with cnidocysts. Normally 4 radial canals (sometimes more); 1–7 centripetal canals in each quadrant; with marginal cnidocyst ring. Typically 4 long hollow perradial tentacles with cnidocyst rings and 4 small solid interradial tentacles with adaxial cnidocyst clusters. Gonads variable in shape and size, generally heart-shaped, on either side of middle of radial canals; 8 statocysts.

RECORDS FROM N.Z.: *Dana* Stns 3620, 3626, 3628, 3653, 3654, 3655, 3656; Haeckel (1879, as *Glossocodon agaricus*).

SEASONALITY: January, December.

DISTRIBUTION: Atlantic, Indo-Pacific, Mediterranean.

KEY REFERENCES: Bouillon (1987), Scemes & McNamara (1991), Pagès *et al.* (1992), Desouza *et al.* (1996), He Zhenwu & Xu Renhe (1996), Bouillon (in press).

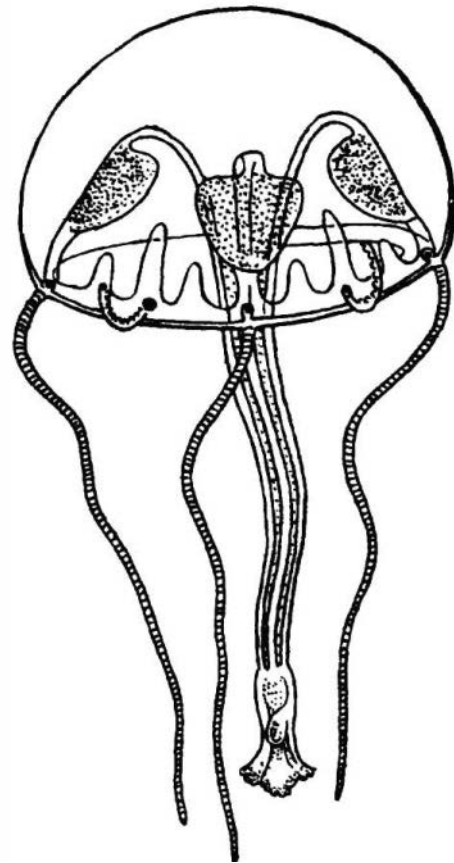


Fig. 126. *Liriope tetraphylla*. After Mayer (1910).

Family HALICREATIDAE Fewkes, 1886

Medusae with wide, circular manubrium; mouth circular, without distinct lips; no peduncle. No centri-

petal canals; 8 or more broad radial canals. Numerous marginal tentacles of different size, but all structurally alike and arranged in single series; each marginal tentacle with flexible proximal portion and stiff spine-like distal portion; with free ecto-endodermal statocysts.

- |    |   |       |                    |   |
|----|---|-------|--------------------|---|
| 1  | ca. 16 or more radial canals                | ..... | <i>Halitrephes</i> |   |
| 1a | 8 radial canals                             | ..... |                    | 2 |
| 2  | tentacles arranged in 16 groups             | ..... | <i>Botrynema</i>   |   |
| 2a | tentacles in a continuous row               | ..... |                    | 3 |
| 3  | perradial gelatinous papillae on exumbrella |       | <i>Halicreas</i>   |   |
| 3a | no exumbrellar papillae                     | ..... | <i>Haliscera</i>   |   |

***Botrynema* Browne, 1908**

Medusa with 8 radial canals; 8 solitary perradial tentacles and 16 groups of tentacles (2 separated groups with many tentacles in a single row in each octant), all tentacles solid.

***Botrynema brucei* Browne, 1908 (Fig 127)**

Umbrella 30 mm wide, hemispherical or slightly higher than wide and terminating in a distinct and sharp knob, mesoglea very thick especially at apex; velum very broad. Manubrium short, circular; mouth circular. 8 broad radial canals and a very broad circular canal. Gonads oval to shield-shaped on proximal or central halves of radial canals; 8 solitary perradial marginal tentacles and 16 adradial groups of 11 to 12 tentacles; no basal swellings or bulbs on tentacles; usually 3 statocysts in each interradial space and 1 or 2 on either side of the 8 solitary perradial tentacles.

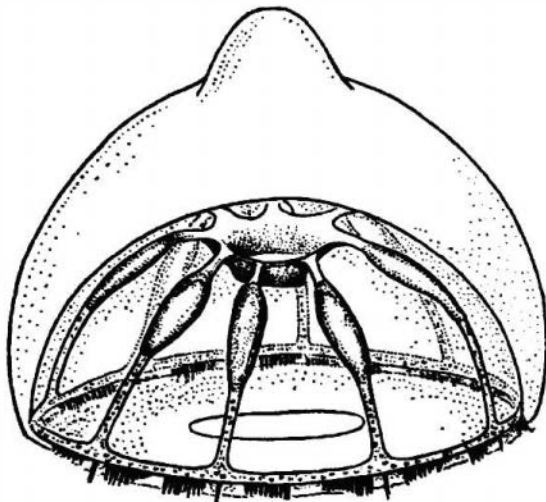


Fig. 127. *Botrynema brucei*. After Kramp (1968).

RECORDS FROM N.Z.: *Dana* Stns 3624, 3642; NZOI Stn N370.

SEASONALITY: January, December.

DISTRIBUTION: Atlantic, Indo-Pacific, Antarctic, Arctic.

KEY REFERENCES: Larson *et al.* (1991), Navas-Pereira & Vannucci (1990), Stepanjants *et al.* (1997), Gili *et al.* (1998).

***Halicreas* Fewkes, 1882**

Medusa with 8 radial canals; a continuous row of tentacles; perradial gelatinous papillae on exumbrella.

***Halicreas minimum* Fewkes, 1882 (Fig 128)**

Sole species. Umbrella 30–44 mm wide, thick, disk-like, with a small apical projection of varying size, mesoglea thick in apical region, thin at sides and margin; exumbrella with 8 groups of 5–10 gelatinous papillae

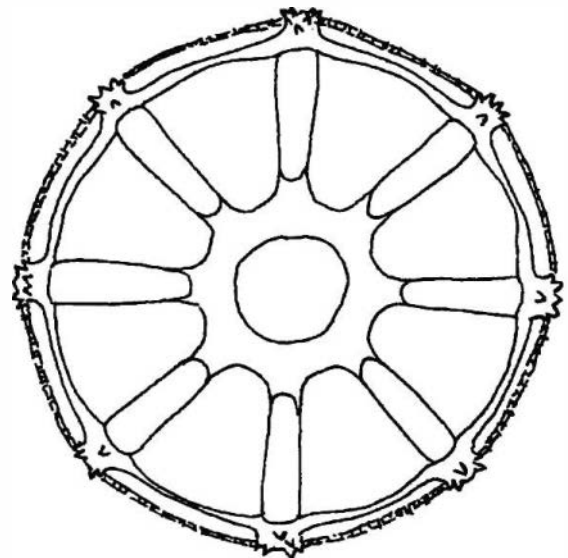
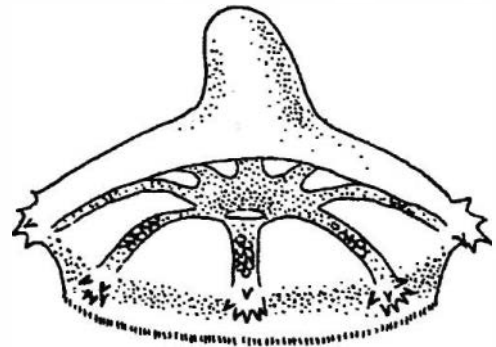


Fig. 128. *Halicreas minimum*. Above, after Vanhöffen (1902); below, after Kramp (1947).



above margin; umbrellar cavity shallow; velum very broad. Manubrium short, circular, broad, flat; mouth a wide circular opening. 8 broad band-like, radial canals; broad circular canal. Gonads flattened, extending along almost entire length of radial canals. Tentacles up to 640, in continuous row, the 8 perradial the largest, the other of decreasing size in each radius; tentacles flexile proximally, stiffer distally; 3 or 4 statocysts in each octant.

RECORDS FROM N.Z.: *Dana* Stns 3621, 3624, 3626, 3640, 3642, 3651, 3653, 3656; *Galathea* Stns 574, 656; NZOI Stn B707.

SEASONALITY: January, February, September, December.

DISTRIBUTION: Atlantic, Indo-Pacific, Antarctic, Arctic.

KEY REFERENCES: Bouillon *et al.* (1986), van der Spoel & Bleeker (1988), Larson *et al.* (1991), Navas-Pereira & Vannucci (1994), Gili *et al.* (1998).

*Haliscera* Vanhöffen, 1902

Medusa with 8 radial canals; a continuous row of tentacles; no papillae on the exumbrella.

- 1 umbrella with fairly thin walls, apex evenly rounded; 6 tentacles in each octant ..... *Haliscera racovitzae*
- 1a umbrella with very thick dome-shaped apex; 12 tentacles in each octant ..... *Haliscera bigelowi*

*Haliscera bigelowi* Kramp, 1947 (Fig. 129)

Umbrella 15–17 mm wide, 9–10 mm high, almost hemispherical, umbrella with a very thick dome-shaped mesogleal apex comprising about two-thirds of the height, mesoglea thin at margin; velum very broad. Manubrium broad, flat, slightly conical; mouth simple, tubular; 8 broad radial canals and broad circular canal. In adults, about 12 solid marginal tentacles in each octant, flexile proximally, stiff distally; the base of each tentacle surrounded by a small thickening of marginal cnidocyst tissue. 8 gonads broadly oval, flat, about two-fifths as long as radial canals, situated slightly nearer manubrium than to bell margin; 3 statocysts in each octant.

RECORDS FROM N.Z.: *Dana* Stns 3627, 3642; NZOI Stn N466.

SEASONALITY: January, February, December.

DISTRIBUTION: Atlantic; Indo-Pacific, Mediterranean; Arctic.

KEY REFERENCES: van der Spoel & Bleeker (1988), Larson *et al.* (1991), Gili *et al.* (1998).

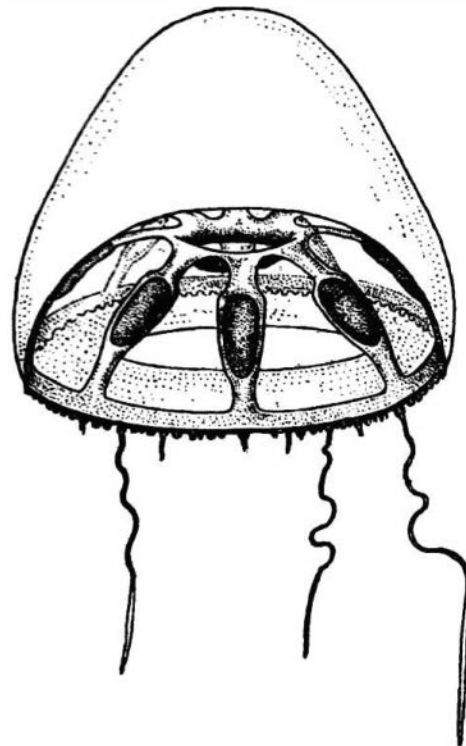


Fig. 129. *Haliscera bigelowi*. After Kramp (1968).

*Haliscera racovitzae* (Maas, 1906) (Fig. 130)

Umbrella 8 mm wide, 4 mm high, almost hemispherical; with fairly thin walls, mesoglea thin, flaccid, apex evenly rounded; velum very wide. Manubrium a truncated cone, broad, flat; mouth simple, circular. 8 radial canals, narrow distally, circular canal fairly narrow. Gonads flat, shield-shaped, along half to two-fifths of proximal part of radial canals, very close to manubrium. 6 solid tentacles, flexile proximally and stiff distally in each octant; with 2 statocysts in each octant.

RECORDS FROM N.Z.: *Dana* Stns 3627, 3642.

SEASONALITY: January, December.

DISTRIBUTION: Atlantic, Indo-Pacific, Antarctic, Mediterranean.

REFERENCES: Gili *et al.* (1998).

*Halitrephes* Bigelow, 1909

Medusa with 16 or more radial canals; a continuous row of tentacles; no papillae on exumbrella.

*Halitrephes maasi* Bigelow, 1909 (Fig. 131)

Sole species. Umbrella up to 100 mm wide, low,



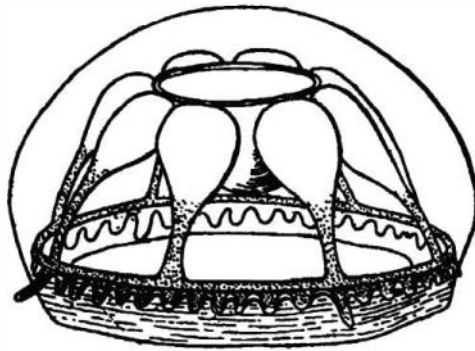


Fig. 130. *Haliscera racovitzae*. After Mayer (1910).

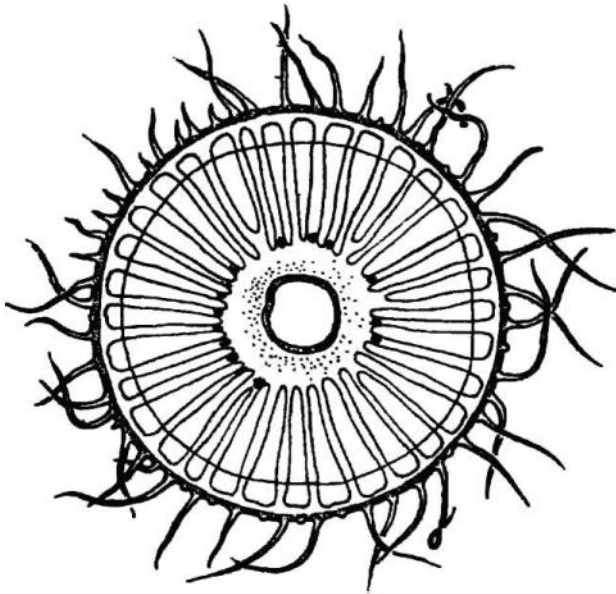


Fig. 131. *Halitrephes maasi*. After Kramp (1968).

rounded, smooth, lacking exumbrellar papillae; mesoglea thin, soft and flaccid; velum well developed. Manubrium small with simple circular mouth. 16–30 broad, ribbon-like radial canals, some may be bifurcated; circular canal broad. 100–300 marginal tentacles, flexile proximally and stiff distally in continuous row. Shape of adult gonads unknown. Number of statocysts unknown.

RECORDS FROM N.Z.: *Dana* Stns 3629, 3630, 3640, 3642, 3644; *Galathea* Stns 575, 634, 656; 42°S, 172°E (O'Sullivan 1982); About 42°S, 160°E; 44°S, 165°E; 45°S, 176°W (Navas-Pereira & Vannucci 1990).

SEASONALITY: January, February, December.

DISTRIBUTION: Atlantic, Indo-Pacific, Antarctic, Mediterranean.

KEY REFERENCES: O'Sullivan (1982), Larson *et al.* (1991), Navas-Pereira & Vannucci (1990), Gili *et al.* (1998).

#### Family RHOPALONEMATIDAE Russell, 1953

Medusae with a narrow manubrium; with or without peduncle; no centripetal canal; usually 8, rarely more, narrow radial canals; mouth with distinct lips. Marginal tentacles evenly distributed, sometimes of two kinds, each tentacle of uniform structure throughout or with proximal portion differing from distal one. Gonads globular, linear, or hanging in pouches into subumbrellar cavity, on radial canals, or forming a continuous ring around base of manubrium and extending outwards along radial canals. Free, rarely enclosed ecto-endodermal statocysts.

- |    |   |                    |
|----|---|--------------------|
| 1  | lacking gastric peduncle  | 2                  |
| 1a | with gastric peduncle   | 7                  |
| 2  | 4 gonads only, pendant; 4 large and 24 small marginal tentacles   | <i>Tetrorchis</i>  |
| 2a | 8 (rarely more) gonads  | 3                  |
| 3  | 8 long, club-shaped and up to 24 small, cirrus-like, tentacles; gonads elongated along radial canals; enclosed statocysts | <i>Rhopalonema</i> |
| 3a | tentacles all of one kind; free statocysts  | 4                  |
| 4  | exumbrella with numerous conspicuous meridional furrows; gonads sausage-shaped, pendant                                   | <i>Crossota</i>    |
| 4a | exumbrella smooth or exceptionally with very fine meridional furrows (only <i>Pantachogon</i> ); gonads not pendant       | 5                  |
| 5  | gonads globular, distal; 8 tentacles  | <i>Sminthea</i>    |
| 5a | gonads linear   | 6                  |
| 6  | up to 32 tentacles successively developed   | <i>Colobonema</i>  |
| 6a | 48 or more tentacles of equal size  | <i>Pantachogon</i> |

- 7 peduncle short conical (in young specimens almost invisible) ..... 8
- 7a peduncle long, slender; gonads attached to peduncle ..  
..... *Aglaura*
- 8 2 gonads ..... *Persa*
- 8a 8 gonads ..... *Amphogona*

*Aglaura* Péron & Lesueur, 1810

Medusa with slender gastric peduncle. 8 sausage-shaped gonads on peduncle, not on subumbrella. Numerous tentacles all alike, free club-shaped statocysts.

*Aglaura hemistoma* Péron & Lesueur, 1810

(Fig. 132)

Umbrella 4–6 mm high, 3–4 mm wide; umbrella high, with vertical, parallel walls, with very narrow longitudinal ridges, apex flattened, mesoglea exceedingly thin; margin almost octagonal in cross section; velum extremely broad, usually hanging downwards; gastric peduncle conical, somewhat shorter than subumbrellar radius. Manubrium small, flask-shaped; mouth with 4 small, simple, projecting lips. 8 narrow radial canals and narrow circular canal. gonads sausage-shaped, attached on the peduncle at the place of juncture of the radial canals with the manubrium. 48–85 marginal tentacles all alike; 8 statocysts.

RECORDS FROM N.Z.: *Dana* Stns 3624, 3627, 3642, 3651; *Galathea* Stns 574, 575; NZOI Stns N340, N370, N371, N374, N375, N401, N445, N446, N447, N456, Z3259.

SEASONALITY: February April, July, November, December.

DISTRIBUTION: Atlantic, Indo-Pacific, Mediterranean.

KEY REFERENCES: Navas-Pereira & Vannucci (1990), Bouillon (1995b), He Zhenwu & Xu Renhe (1996).

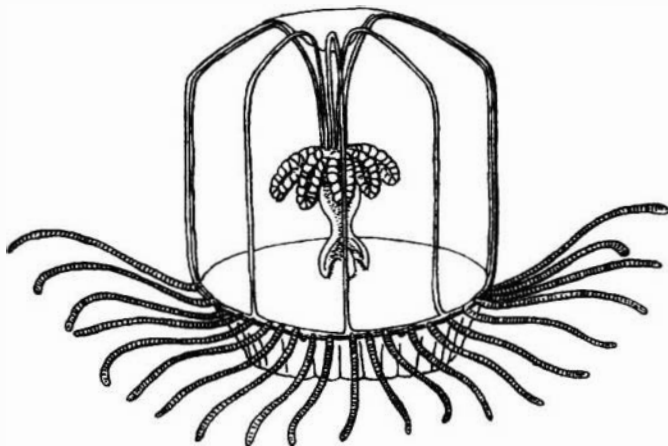


Fig. 132. *Aglaura hemistoma*. After Mayer (1910).

*Amphogona* Browne, 1905

Medusa with short, conical gastric peduncle, exumbrella smooth. Ellipsoidal or sac-shaped pendant gonads on the 8 radial canals, gonads usually of unequal size. Tentacles all alike, not densely crowded; with free club-shaped statocysts.

*Amphogona apicata* Kramp, 1957

(Fig. 133)

Umbrella up to 7 mm wide and 8 mm high, dome-shaped with thin walls and a bluntly conical apical projection; a small, broad peduncle. Manubrium small, tubular, about half length of subumbrellar cavity; 4 short simple lips. Gonads sac-shaped, pendant, near middle points of radial canals. Ca. 64 marginal tentacles; statocysts unknown.

RECORDS FROM N.Z.: *Dana* Stn 3642; 38°S, 173°E (O'Sullivan 1982); about 44°S, 173°E (Navas-Pereira & Vannucci 1990).

SEASONALITY: January.

DISTRIBUTION: Atlantic; Indo-Pacific; subantarctic.

REFERENCES: O'Sullivan (1982), Mills *et al.* (1985), Navas-Pereira & Vannucci (1990), He Zhenwu & Xu Renhe (1996).

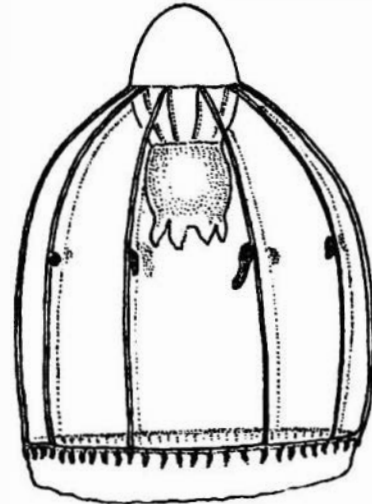


Fig. 133. *Amphogona apicata*. After Kramp (1968).

*Colobonema* Vanhöffen 1902

Medusa lacking gastric peduncle; with the apical outlines of the subumbrellar muscular fields forming a star-shaped figure. Elongated gonads extending along the 8 radial canals. Up to 32 marginal tentacles, all of one kind, developing in succession; with free club-shaped statocysts.

*Colobonema sericeum* Vanhöffen, 1902 (Fig. 134)

Umbrella up to 45 mm wide and 40 mm high, bell-shaped, slightly conical, as broad as high; with fairly thin but rigid mesoglea, no apical projection; velum very broad. Manubrium quadrangular to tubular, variable in length; mouth with 4 small, pointed, simple lips. 8 straight narrow radial canals, widening towards apex of umbrella, narrow circular canal. Gonads linear, straight, narrow, along greater part of radial canals. 32 short, stump-like marginal tentacles, adradial tentacles formed before interradial; club-shaped statocysts alternating probably with tentacles.

RECORDS FROM N.Z.: *Dana* Stns 3621, 3623, 3626, 3627, 3629, 3651, 3653, 3656; *Galathea* Stns 629, 634, 656, 668. SEASONALITY: January, February. DISTRIBUTION: Atlantic; Indo-Pacific; Antarctic. KEY REFERENCES: van der Spoel & Bleeker (1988), Larson *et al.* (1991), He Zhenwu & Xu Renhe (1996), Gili *et al.* (1998).

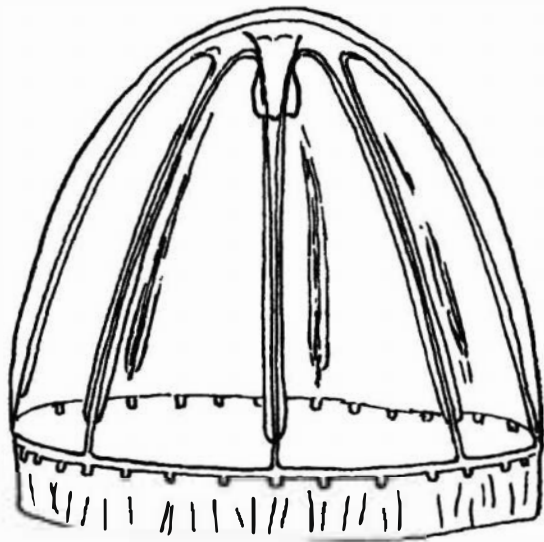


Fig. 134. *Colobonema sericeum*. After Kramp (1968).

*Crossota* Vanhöffen, 1902

Medusa lacking peduncle; exumbrella with numerous conspicuous meridional furrows; 8 or more radial canals. Pendant sausage-shaped gonads on radial canals. Numerous densely crowded, evenly spaced, marginal tentacles, all alike; with club-shaped free statocysts.

- 1 gonads nearer circular canal than manubrium; up to 190 marginal tentacles; umbrella colourless *Crossota alba*
- 1a gonads near base of manubrium; 600 or more marginal tentacles; umbrella pale brown ... *Crossota brunnea*

*Crossota alba* Bigelow, 1913 (Fig. 135)

Umbrella colourless, up to 42 mm wide and 28 mm high; no gastric peduncle. Manubrium tubular, narrow, with 8 sharp longitudinal ridges separated by 8 broad, flat furrows; 4 small lips; manubrium dark chocolate-brown, almost black, oral lips white. Gonads on the 8 radial canals somewhat nearer to circular canal than manubrium. Up to 190 marginal tentacles; number of statocysts unknown.

RECORDS FROM N.Z.: *Dana* Stn 3627.

SEASONALITY: December.

DISTRIBUTION: Atlantic; Indo-Pacific.

KEY REFERENCES: Gili *et al.* (1998).

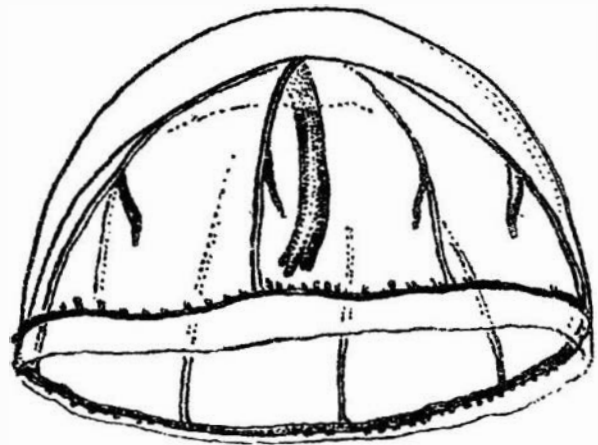


Fig. 135. *Crossota alba*. After Kramp (1968).

*Crossota brunnea* Vanhöffen, 1902 (Fig. 136)

Umbrella pale brown, up to 30 mm wide and 22 mm high; dome-shaped, mesoglea thin, a little thicker at apex; velum well developed. Manubrium bottle-shaped, small, octagonal with 8 large, deep longitudinal fissures and above them 8 similar small similar invaginations; mouth with 4 small lips. No gastric peduncle; 8 narrow straight radial canals. Gonads sausage-shaped, on radial canals near base of manubrium. 600 or more marginal tentacles, very densely crowded, in several rows; number of statocysts unknown.

RECORDS FROM N.Z.: *Dana* Stns 3640, 3653, 3656; *Galathea* Stns 607, 668.

SEASONALITY: January, February.

DISTRIBUTION: Atlantic; Indo-Pacific; Antarctic.

KEY REFERENCES: Arai & Brinckmann-Voss (1980), He Zhenwu & Xu Renhe (1996), Gili *et al.* (1998)



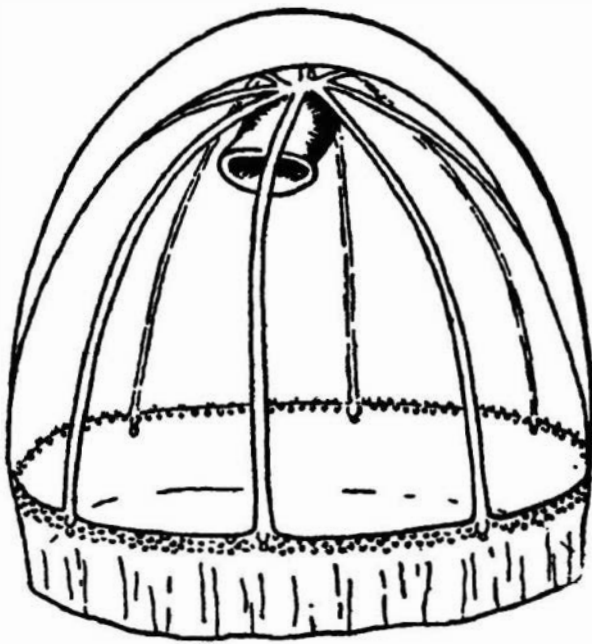


Fig. 136. *Crossota brunnea*. After Kramp (1968).

*Pantachogon* Maas, 1893

Medusa without gastric peduncle; the apical outlines of the subumbrellar muscular fields forming an entire circle. Gonads on the 8 radial canals separated from manubrium. 48 or more tentacles all alike; free club-shaped marginal statocysts.

*Pantachogon haeckeli* Maas, 1893 (Fig. 137)

Umbrella about 20 mm wide and high, bell-shaped, sometimes wider than high, no apical projection, mesoglea fairly thin; umbrella with very strong and conspicuous musculature, forming an entire circle; large specimens with 32 fine exumbrellar meridional furrows; velum very broad. Manubrium small, varying in length, octagonal at base; mouth with 4 simple, small, pointed lips; no gastric peduncle; 8 narrow, straight radial canals, circular canal narrow. Gonads initially forming discontinuous linear swellings along distal two-thirds or almost whole length of radial canals, which eventually coalesce and become folded transversally. 64 marginal tentacles all alike in one row; 64 free club-shaped statocysts.

RECORDS FROM N.Z.: *Dana* Stns 3621, 3624, 3627, 3640, 3642, 3653, 3656; NZOI Stn 482; about 28-48°S, 178°E; 32°S, 172°W; 28°S, 170°E; 32°S, 168°E (Bleeker & van der Spoel 1988).

SEASONALITY: January, February, December.

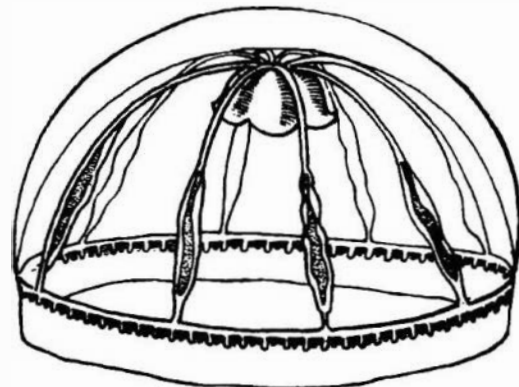
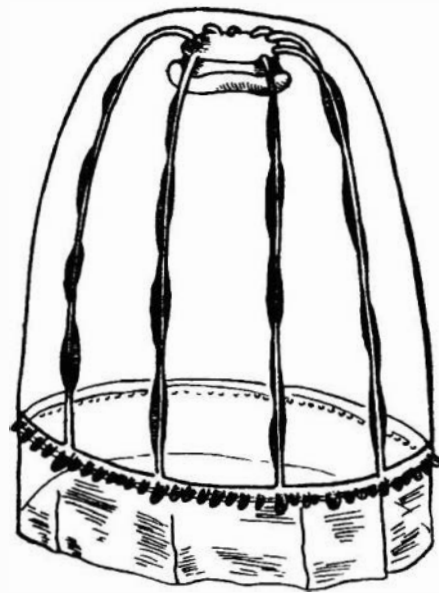


Fig. 137. *Pantachogon haeckeli*. Above, after Maas (1893); below after Kramp (1968).

DISTRIBUTION: Atlantic; Indo-Pacific; Antarctic; Arctic; Mediterranean.

KEY REFERENCES: Arai & Brinckmann-Voss (1980); Bleeker & van der Spoel (1988); Gili *et al.* (1998).

*Persa* McCrady, 1859

Medusa with a short gastric peduncle. Only 2 oval or sausage-shaped gonads, pendant, near middle point of the subumbrellar portions of two opposite radial canals; 8 radial canals. Numerous long tentacles, all alike, each with a terminal knob; free club-shaped statocysts.

*Persa incolorata* McCrady, 1859 (Fig. 138)

Umbrella 3 mm wide, 4 mm high, with or without a

small apical projection, mesoglea very thin; velum broad; with a very retractile gastric peduncle. Manubrium tubular, elongated; mouth with 4 small, broadly rounded, prominent lips. 8 narrow radial canals; with only 2 oval or sausage-shaped gonads, pendant, near middle point of the subumbrellar portions of two opposite radial canals. Up to 48 marginal tentacles all alike, each with a terminal knob; 8 club-shaped statocysts.

Records from N.Z.: About 40°S, 161°E; 44°S, 165°E; 43°S, 171°E (Navas-Pereira & Vannucci 1990).

DISTRIBUTION: Atlantic; Indo-Pacific; Mediterranean.

KEY REFERENCES: Goy *et al.* (1991), Pagès *et al.* (1992), Navas-Pereira & Vannucci (1990), Gili *et al.* (1998).

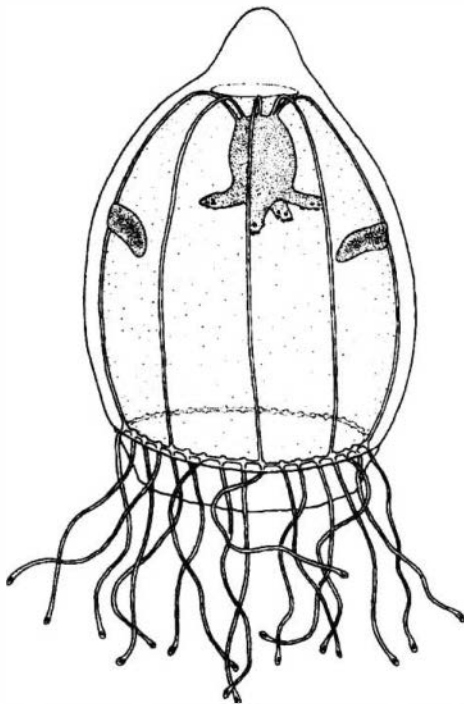


Fig. 138. *Persa incolorata*. After Pagès *et al.* (1992).

*Rhopalonema* Gegenbaur, 1857

Medusa lacking gastric peduncle; with gonads separated from manubrium along the radial canals. Marginal tentacles of two kinds: large, club-shaped, per-radial tentacles with swollen ends and inter- and adradial short, stiff, cirri-like tentacles also with swollen ends; with enclosed statocysts.

- 1 umbrella with distinct apical knob; gonads oval, in middle third of radial canals; statocysts beside tentacles ..... *Rhopalonema velatum*
- 1a no apical knob; gonads along distal two-thirds of radial canals; statocysts in middle of spaces between tentacles ..... *Rhopalonema funerarium*

*Rhopalonema funerarium* Vanhöffen, 1902 (Fig. 139)

Umbrella up to 17 mm wide and 14 mm high, hemispherical to somewhat conical but lacking apical projection, mesoglea stiff, but fairly thin; no gastric peduncle; velum very broad. Manubrium narrow, elongated, quadrilateral with octagonal base, contractile, hardly reaching velar opening; mouth with 4 simple lips. 8 narrow straight radial canals, narrow circular canal. Gonads elongated linear pouches extending along distal two-thirds of radial canals. 8 large radial marginal tentacles with swollen ends, 3 very short, club-shaped cirrus-like tentacles in each octant. 32 enclosed statocysts in the middle of spaces between tentacles.

RECORDS FROM N.Z.: Dana Stn 3642.

SEASONALITY: January.

DISTRIBUTION: Atlantic, Indo-Pacific, Mediterranean.

REFERENCES: He Zhenwu & Xu Renhe (1996), Gili *et al.* (1998).

REMARKS: *Rhopalonema funerarium* is considered by several authors as a deep-water race of *R. velatum*, although Kramp (1961, 1965, 1968) regarded them both as distinct species. In fact, most of the characters used to distinguish the two presumed species (form of the umbrella, development of the gonads) appear to be only intraspecific variations. Possibly the position of the statocysts is the only valid species-level character allowing separation of the two forms.

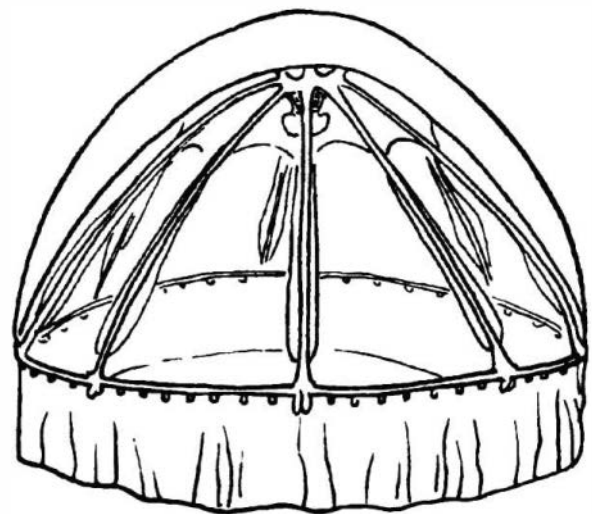


Fig. 139. *Rhopalonema funerarium*. After Mayer (1910).

*Rhopalonema velatum* Gegenbaur, 1857 (Fig. 140)

Umbrella 8–10 mm wide, 6.6 mm high, somewhat flat-



ter than a hemisphere, with a solid conical or dome-like apical thickening; mesoglea stiff, but fairly thin, except at apex; velum very broad almost closing umbrella cavity. Manubrium narrow, elongated, cylindrical, with octagonal base, contractile, when extended almost reaching velar opening; no gastric peduncle; mouth with 4 simple or somewhat elongated lips, often strongly recurved. 8 straight radial canals and narrow circular canal. Gonads linear or oval on middle third of the 8 radial canals. 8 large radial marginal tentacles, 1–3 short cirrus-like tentacles in each octant, all tentacles with swollen ends; an enclosed statocyst close to each right side of the perradial tentacles and interradial cirrus-like tentacles.

RECORDS FROM N.Z.: *Dana* Stns 3620–3627, 3729, 3630, 3637–3645, 3651, 3654–3656; NZOI Stns N341, Z3259, Z3260; Leigh Marine Reserve (Barnett 1985); ca. 43°S, 158°E; 43°S, 168°E; 44°S, 161°E; 44°S, 175°E; 43°S, 178°E; 43°S, 175°E, 43°S, 162°E (Navas-Pereira & Vannucci (1990).

SEASONALITY: January, April–June, December.

DISTRIBUTION: Atlantic; Indo-Pacific; Antarctic; Mediterranean.

KEY REFERENCES: Bleeker & van der Spoel (1988); Pagès *et al.* (1992); Navas-Pereira & Vannucci (1990), He Zhenwu & Xu Renhe (1996), Gili *et al.* (1998).

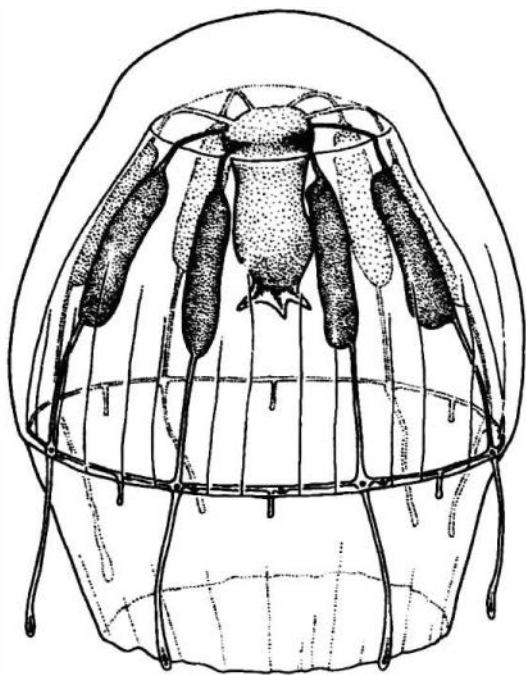


Fig. 140. *Rhopalonema velatum*. After Pagès *et al.* (1992).

### *Sminthea* Gegenbaur, 1857

Medusa without gastric peduncle; with globular gonads on very distal parts of the 8 radial canals; only 8 perradial tentacles; enclosed statocysts.

### *Sminthea eurygaster* Gegenbaur, 1857 (Fig. 141)

Umbrella up to 6 mm wide and about half as high, umbrella-shaped, with a small apical projection, mesoglea stiff, fairly thin; velum well developed. Manubrium short, cylindrical; mouth with 4 short simple lips; no gastric peduncle. 8 straight radial canals, narrow circular canal. 8 perradial marginal tentacles. Gonads globular to egg-shaped on radial canals, very close to circular canal; 8 interradial enclosed statocysts.

RECORDS FROM N.Z.: *Dana* Stns 3627, 3642, 3651, 3654–3656; NZOI Stn N408; Leigh Marine Reserve (Barnett 1985); ca. 44°S, 158°E; 40–43°S, 160°E; 44°S, 163–165°E; 44°S, 172°W (Navas-Pereira & Vannucci 1990).

SEASONALITY: January, December.

DISTRIBUTION: Atlantic; Indo-Pacific; Antarctic; Mediterranean.

KEY REFERENCES: Goy *et al.* (1991), Navas-Pereira & Vannucci (1990), Gili *et al.* (1998).

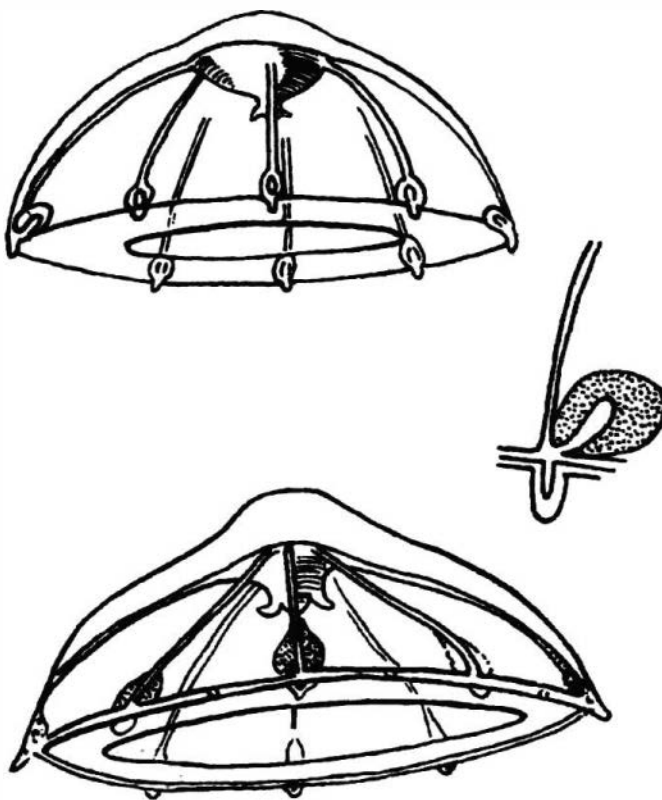


Fig. 141. *Sminthea eurygaster*. After Mayer (1910).

*Tetrochis* Bigelow, 1909

Medusa lacking gastric peduncle; only 4 sausage-shaped, pendant, gonads attached to 4 of the 8 radial canals near the middle points; with 4 large perradial and several small marginal tentacles.

*Tetrochis erythrogaster* Bigelow, 1909 (Fig. 142)

Umbrella 10–12 mm wide and 8 mm high, pyriform, apical mesoglea very thick, lateral mesoglea thin; velum well developed. Manubrium tubular, brilliant carmine, reaching slightly beyond velar opening; mouth with 4 small, simple lips; no gastric peduncle. 8 straight radial canals, narrow circular canal. 4 sausage-shaped gonads attached to every second radial canal, middle to distal in position. 4 large perradial tentacles opposite fertile radial canals and 16–24 small tentacles not placed in reference to the radial canals; statocysts unknown.

RECORDS OF N.Z.: East of New Zealand (Kramp 1968, no details).

DISTRIBUTION: Atlantic; Indo-Pacific; Mediterranean.  
KEY REFERENCES: Bleeker & van der Spoel (1988), Goy *et al.* (1991), Gili *et al.* (1998)

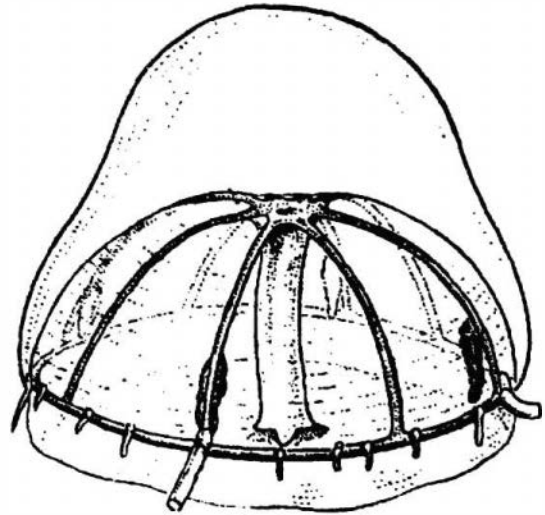


Fig. 142. *Tetrochis erythrogaster*. After Kramp (1968).

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## REFERENCES

- ACKER, T.S. 1976: *Craspedacusta sowerbyi*: an analysis of an introduced species. Pp 219–266 in Mackie, G.O. (ed.) *Coelenterate Biology and Behaviour*. Plenum Publishing Corporation, New York.
- ACKER, T.S.; MUSCAT, A.M. 1976: The ecology of *Craspedacusta sowerbyi* Lankester, a freshwater hydrozoan. *American Midland Naturalist* 95 : 323–336.
- AGASSIZ, A.; MAYER, A. G. 1899: Acalephs from the Fiji Islands. *Bulletin of the Museum of Comparative Zoology at Harvard College* 32 : 157–189.
- AGASSIZ, A.; MAYER, A.G. 1902: Medusae. Reports on the Scientific results of the Expedition to the tropical Pacific in charge of Alexander Agassiz, by the U.S. Fish Commission Steamer "Albatross" from August 1899 to March 1900. *Memoirs of the Museum of Comparative Zoology at Harvard College* 26 : 139–176.
- AGASSIZ, L. 1849: Contribution to the natural history of the Acalephae of North America. Part 1. *Memoirs of the American Academy of Arts and Sciences* 4 : 221–316.
- AGASSIZ, L. 1862: *Contributions to the Natural History of the United States of America* 4 : 1–380, pls 20–34.
- ALLMAN, G.J. 1859: Notes on the hydroid zoophytes. *Annals and Magazine of Natural History, ser. 3*, 4 : 48–55, 137–144.
- ALLMAN, G.J. 1863: Notes on the Hydroida. *Annals and Magazine of Natural History, ser. 3*, 11 : 1–12.
- ALLMAN, G.J. 1864: On the construction and limitation of genera among the Hydroida. *Annals and Magazine of Natural History, ser. 3*, 13 : 345–380.
- ALLMAN, G.J. 1872: *A Monograph of the Gymnoblatic or*

- Tubularian Hydroids*. Vol. 1. The Ray Society, London. Pp 1–450, 23 pls.
- ALVARIÑO, A. 1988: *Pandea cybeles*, a new medusa from Sargasso Sea (Coelenterata: Anthomedusae: Pandeidae). *Proceedings of the Biological Society, Washington* 101 : 102–108.
- ARAI, M.N.; BRINCKMANN-VOSS, A. 1980: Hydromedusae of British Columbia and Puget Sound. *Canadian Bulletin of Fisheries and Aquatic Sciences* 204 : 1–192.
- BALLARD, L.; MYERS, A. 1996: Seasonal changes in vertical distribution of five species of the family Bougainvilliidae (Anthomedusae) at Lough Hyne, south-west Ireland. *Scientia Marina* 60 : 69–74.
- BARNETT, T.J. 1985: Seasonality of northern New Zealand Hydromedusae and a review of the New Zealand hydromedusae fauna. Unpublished M.Sc. thesis, Department of Zoology, University of Auckland, New Zealand. 257 p.
- BAVESTRELLO, G.; SOMMER, C.; SARA, M. 1992: Bidirectional conversion in *Turritopsis nutricula* (Hydrozoa). In Bouillon, J.; Boero, F. et al. (eds), *Aspects of Hydrozoan Biology*. *Scientia Marina* 56 : 137–140.
- BENEDEN, P.J. Van 1841: Sur la structure de l'oeuf dans un nouveau genre de Polype (genre Hydractinie). *Bulletin de l'Académie des Sciences (Bruxelles)* 8 : 89–93.
- BENEDEN, P.J. Van 1844: Recherches sur l'embryogénie des Tubulaires, et l'histoire naturelle des différents genres de cette famille qui habitent la côte d'Ostende. *Nouveaux Mémoires de l'Académie Royale de Sciences et Belles-Lettres de Bruxelles* 17 : 1–72.
- BENHAM, W. B. 1909: Hydromedusae and Scyphomedusae from the Auckland and Campbell Islands, Pp 306–311 in Chilton, C. (ed.) *The Subantarctic Islands of New Zealand*. Vol. 1. Philosophical Institute of Canterbury, Christchurch.
- BENNET, I. 1966: *The Fringe of the Sea*. Rigby, Adelaide, Australia.
- BENOVIC, A.; LUCIC, D. 1996: Comparison of hydromedusae findings in the northern and southern Adriatic Sea. *Scientia Marina* 60 : 129–135.
- BIGELOW, H.B. 1909: Reports on the scientific results of the expedition to the eastern tropical Pacific, in charge of Alexander Agassiz, by the U.S. Fish Commission Steamer "Albatross", from October, 1904, to March, 1905, Lieut. Commander L. M. Garrett, U.S.N., commanding. XVI. The Medusae. *Memoirs of the Museum of Comparative Zoology at Harvard College* 37 : 1–243.
- BIGELOW, H.B. 1913: Medusae and Siphonophora collected by the U.S. steamer "Albatross" in the Northwestern Pacific. *Proceedings of the U.S. National Museum* 44 : 1–1189, pls 1–6.
- BIGELOW, H.B. 1940: Eastern Pacific Expedition of the New York Zoological Society. XX. Medusae of the Templeton Crocker and Eastern Pacific "Zaca" Expeditions, 1936–1938. *Zoologica (N.Y.)* 25 : 281–321.
- BIGELOW, R.P. 1909: A new narcomedusa from the North Atlantic. *Biological Bulletin. Marine Biological Laboratory, Woods Hole* 16 : 80–82.
- BLEEKER, J.; VAN DER SPOEL, S. 1988: Medusae of the Amsterdam Mid North Atlantic Plankton Expeditions (1980–1983) with description of two new species. *Bijdragen tot de Dierkunde* 58 : 227–258.
- BODO, F. 1970: Etude du développement embryonnaire de l'Anthoméduse *Cladonema radiatum* Dujardin (Athécate, Capité, Cladonematidae). *Annales d'Embryologie et de Morphogénèse* 3 : 309–313.
- BOERO, F.; BOUILLON, J. 1993: Zoogeography and life cycle patterns of Mediterranean hydromedusae (Cnidaria). *Biological Journal of the Linnean Society* 48 : 239–266.
- BOERO, F.; BOUILLON, J. (in press): A survey of the Zancleidae, with description of new species. *Italian Journal of Zoology*.
- BOERO, F.; BOUILLON, J.; DANOVARO, R. 1987: The life cycle of *Tiaropsidium roseum* (Tiaropsidae, fam. nov., Leptomedusae, Cnidaria). *Indo-Malayan Zoology* 4 : 293–302.
- BOERO, F.; BOUILLON, J.; PIRAINO, S. 1992: On the origins and evolution of hydromedusan life cycles (Cnidaria, Hydrozoa). Pp 59–68 in Dalli, R. (ed.) *Sex, Origin and Evolution*. Mocchi Editore, Modena, Italy.
- BOERO, F.; BOUILLON, J.; PIRAINO, S. 1998: Heterochrony, generic distinction and phylogeny in the family Hydractiniidae (Hydrozoa, Cnidaria). *Zoologische Verhandlungen* 32 : 25–36.
- BOERO, F.; GRAVILI, C.; PAGLIARA, P.; PIRAINO, S.; BOUILLON, J.; SCHMID, V. 1998: The cnidarian premises of metazoan evolution: from triploblasty, to coelom formation, to metamerism. *Italian Journal of Zoology* 65 : 5–9.
- BONNEVIE, K. 1898: Zur Systematik der Hydroiden. *Zeitschrift für Wissenschaftliche Zoologie* 63 : 465–495.
- BOUILLON, J. 1957: Étude monographique du genre *Limnocnida* (Limnoméduse). *Annales de la Société Royale Zoologique de Belgique* 87 : 254–500.
- BOUILLON, J. 1961: Sur le bourgeonnement médusaire manubrial de *Rathkea octopunctata*. *Annales de la Société Royale Zoologique de Belgique* 92 : 7–25.
- BOUILLON, J. 1966: Les cellules glandulaires des hydroïdes et des hydroméduses. Leur structure et la nature de leurs sécrétions. *Cahiers de Biologie marine* 7 : 157–205.

- BOUILLON, J. 1968a: Introduction to coelenterates. Pp 81–143 in Florkin, M.; Scheer, B.T. (eds) *Chemical Zoology. Vol. 2. Porifera, Coelenterata and Platyhelminthes*. Academic Press, New York.
- BOUILLON, J. 1968b : Sur la structure des tentacules adhésifs des Cladonematidae et Eleutheriidae (Anthomedusae). *Pubblicazioni della Stazione Zoologica di Napoli* 36 : 471–504.
- BOUILLON, J. 1971: Sur quelques hydroïdes de Roscoff. *Cahiers de Biologie marine* 12: 323–364.
- BOUILLON, J. 1974a: Description de *Teissiera milleporoides*, nouveau genre et nouvelle espèce de Zancleidae des Seychelles (Hydrozoaires; Athécates; Anthoméduses), avec une révision des hydroïdes Pteronematoidea. *Cahiers de Biologie marine* 15 : 113–154.
- BOUILLON, J. 1974b: Ultrastructure des cnidophores de *Teissiera milleporoides* Bouillon (Atheccates, Anthomeduses, Zancleidae). *Cahiers de Biologie marine* 15 : 285–293.
- BOUILLON, J. 1978a: Hydroméduses de l'archipel des Séchelles et du Mozambique. *Revue de Zoologie Africaine* 92 : 118–172.
- BOUILLON, J. 1978b: Hydroméduses de la mer de Bismarck (Papouasie, Nouvelle-Guinée). I. Anthomedusae Capitata (Hydrozoa). *Cahiers de Biologie marine* 19 : 249–297.
- BOUILLON, J. 1978c. Hydroméduses de la mer de Bismarck (Papouasie, Nouvelle-Guinée). II. Limnomedusa, Narcomedusa, Trachymedusa et Laingiomedusa (sous-classe nov.). *Cahiers de Biologie marine* 19 : 473–483.
- BOUILLON, J. 1980: Hydroméduses de la mer de Bismarck (Papouasie, Nouvelle-Guinée). III. Anthomedusae-Filifera (Hydrozoa-Cnidaria). *Cahiers de Biologie marine* 21 : 307–344.
- BOUILLON, J. 1984a: Révision de la famille des Phialuciidae (Kramp 1955) (Leptomedusae, Hydrozoa, Cnidaria), avec un essai de classification des Thecatae-Leptomedusae. *Indo-Malayan Zoology* 1 : 1–24.
- BOUILLON, J. 1984b: Hydroméduses de la mer de Bismarck (Papouasie Nouvelle-Guinée). IV. Leptomedusae (Hydrozoa, Cnidaria). *Indo-Malayan Zoology* 1 : 25–112.
- BOUILLON, J. 1984c : Sur la méduse de *Porpita porpita* (Linné, 1758) (Veilellidae, Hydrozoa, Cnidaria). *Indo-Malayan Zoology* 1 : 249–254.
- BOUILLON, J. 1985a: Essai de classification des Hydro-polypes-Hydroméduses (Hydrozoa-Cnidaria). *Indo-Malayan Zoology* 2 : 29–243.
- BOUILLON, J. 1985b: Notes additionnelles sur les Hydroméduses de la mer de Bismarck (Hydrozoa-Cnidaria). *Indo-Malayan Zoology* 2 : 245–266.
- BOUILLON, J. 1987: Considérations sur le développement des Narcoméduses et sur leur position phylogénétique. *Indo-Malayan Zoology* 4 : 189–278.
- BOUILLON, J. 1995a: Classe des Hydrozoaires. Pp 29–416 in Grassé, P.P.; Doumenc, D. (eds) *Traité de Zoologie*, 3 (2). Masson, Paris.
- BOUILLON, J. 1995b: Hydromedusae of the New Zealand Oceanographic Institute (Hydrozoa, Cnidaria). *N.Z. Journal of Zoology* 22 : 223–238.
- BOUILLON, J. 1999: Hydromedusae. Pp 385–465 in Boltovskoy, D. (ed.) *South Atlantic Zooplankton*. Backhuys Publishers, Leiden.
- BOUILLON, J.; BOERO, F.; CICOGNA, F.; GILI, J.M.; HUGHES, R.G. 1992: Non-siphonophoran Hydrozoa: what are we talking about? *Scientia Marina* 56 : 279–284.
- BOUILLON, J.; BOERO, F.; FRASCHETTI, S. 1991: The life cycle of *Laodicea indica* (Laodiceidae, Leptomedusae, Cnidaria). *Hydrobiologia* 216/217 : 151–157.
- BOUILLON, J.; BOERO, F.; SEGHERS, G. 1988a: Notes additionnelles sur les Hydroméduses de la Mer de Bismarck (Hydrozoa-Cnidaria). II. *Indo-Malayan Zoology* 5 : 87–99.
- BOUILLON, J.; BOERO, F.; SEGHERS, G. 1988b: Note sur les cnidocystes des Hydroméduses de la mer de Bismarck (Papouasie Nouvelle-Guinée). *Indo-Malayan Zoology* 5 : 203–224.
- BOUILLON, J.; BOERO, F.; SEGHERS, G. 1988c: Notes additionnelles sur les méduses de Papouasie Nouvelle-Guinée. III. *Indo-Malayan Zoology* 5 : 225–253.
- BOUILLON, J.; BOERO, F.; SEGHERS, G. 1991: Notes additionnelles sur les méduses de Papouasie Nouvelle-Guinée (Hydrozoa, Cnidaria) IV. *Cahiers de Biologie marine* 32 : 387–411.
- BOUILLON J.; CLAEREBOUDT, M.; SEGHERS, G. 1986: Hydroméduses de la baie de Hansa (Mer de Bismarck; Papouasie Nouvelle-Guinée). Répartition, conditions climatiques et hydrologiques. *Indo-Malayan Zoology* 3 : 105–152.
- BOUILLON, J.; GROHMANN, P.A. 1990: *Pinushydra chiquitita* gen. et sp. nov. (Cnidaria, Hydrozoa, Athecata), a solitary marine mesopsammic polyp. *Cahiers de Biologie marine* 31 : 291–305.
- BOUILLON J.; HOUVENHAGEL, G. 1970: Histophysiologie de la digestion chez *Cladonema radiatum*, Dujardin, 1843 (Anthomedusae). *Pubblicazioni della Stazione Zoologica di Napoli* 38 : 71–108.
- BOUILLON, J.; MEDEL, D.; PEÑA CANTERO, A.L. 1997: The taxonomic status of the genus *Stylactaria* Stechow, 1921 (Hydrozoa, Anthomedusae, Hydractiniidae), with

- the description of a new species. *Scientia Marina* 61 : 471–486.
- BOUILLON, J.; NIELSEN, M., 1974: Étude de quelques organes sensoriels de cnidaires. *Archives de Biologie* 85 : 307–328.
- BOUILLON, J.; WERNER, B. 1965: Production of medusae buds by the polyps of *Rathkea octopunctata* (M. Sars) (Hydroida Athecata). *Helgoländer Wissenschaftliche Meeresuntersuchungen* 12 : 137–148.
- BRANDT, J.F. 1835: Prodomus descriptiones animalium ab Mertensio in orbis terrarum circumnavigatione observatorum. Fasc. 1. Polypos, Acalephas Discophoras et Siphonophoras, nec on Echinodermata continens. *Recueil des Actes de la Séance publique de l'Académie de impériale des Sciences de St Petersbourg (1834)* : 2012–2075.
- BRANDT, J.F. 1838: Remarques sur quelques modifications dans l'arrangement de l'ordre des Acalephes Discophores ou Ombrellifères. *Bulletin de l'Académie des Sciences de St Petersbourg* 1 : 185–191.
- BRINCKMANN-VOSS, A. 1964: Observations on the structure and development of the medusa of *Velella velella* (Linné, 1758). *Videnskabelige Meddelelser fra Dansk naturhistorisk Forening i Kjøbenhavn* 126 : 327–336.
- BRINCKMANN-VOSS, A. 1967: The hydroid of *Vannuccia forbesii* (Anthomedusae, Tubulariidae). *Breviora* 263 : 1–10.
- BRINCKMANN-VOSS A. 1970: Anthomedusae/ Athecatae (Hydrozoa, Cnidaria) of the Mediterranean. Part. I: Capitata. *Fauna e Flora del Golfo di Napoli*. 39 : 1–96.
- BRINCKMANN-VOSS, A. 1979: The life cycle of *Bythothara huntsmani* (Fraser, 1911) (Calycopsidae, Hydrozoa, Cnidaria). *Canadian Journal of Zoology* 57 : 1226–1231.
- BRINCKMANN-VOSS, A., 1989: *Sarsia cliffordi* n.sp. (Cnidaria, Hydrozoa, Anthomedusae) from British Columbia, with distribution records and evaluation of related species. *Canadian Journal of Zoology* 67 : 685–691.
- BROCH, H. 1910: Die Hydroiden der arktischen Meere. *Fauna artica* 5 : 127–248.
- BROOKS, W.K. 1884: On the life history of *Eutima*, and on radial and bilateral symmetry in hydroids. *Zoologischer Anzeiger* 7 : 709–711
- BROOKS, W.K. 1886: The life history of the medusae. *Memoirs of the Boston Society of Natural History* 3 : 359–430.
- BROOKS, W.K. 1895: The sensory clubs or cordyli of *Laodicea*. *Journal of Morphology* 10 : 287–304.
- BROWNE, E.T. 1902: A preliminary report on Hydro-medusae from the Falkland Islands. *Annals and Magazine of Natural History, ser. 7, 9* : 272–284.
- BROWNE, E.T. 1905: Report on the medusae collected by Professor Herdman at Ceylon, in 1902. *Report of the Pearl Fisheries, Manaar, Pt 4, Supplementary Report* 27 : 131–136.
- BROWNE, E.T. 1907: A revision of the medusae belonging to the family Laodiceidae. *Annals and Magazine of Natural History, ser. 7, 20* : 457–489.
- BROWNE, E.T. 1908: The medusae of the Scottish National Antarctic Expedition. *Transactions of the Royal Society of Edinburgh* 46 : 223–251.
- BROWNE, E.T. 1910: Coelenterata. V. Medusae. *National Antarctic Expedition, Natural History* 5 : 1–62, pls 1–7.
- BROWNE, E.T.; KRAMP, P.L. 1939: Hydromedusae from the Falkland Islands. *Discovery Reports* 18 : 265–322.
- CALDER, D.R. 1988: Shallow water hydroids of Bermuda. The Athecatae. *Life Science Contributions of the Royal Ontario Museum* 148 : 1–107.
- CALDER, D.R. 1991: Shallow-water hydroids of Bermuda. The Thecatae, exclusive of Plumularioidea. *Life Science Contributions of the Royal Ontario Museum* 154 : 1–140.
- CALDER, D.R. 1992: *Zanclaea costata* Gegenbaur, 1856 (Cnidaria, Hydrozoa) : Proposed conservation of both generic and specific names. *Bulletin of Zoological Nomenclature* 49 : 184–186.
- CANZ, 1997: New Zealand region bathymetry, 3rd edn, 1:4000,000. *NIWA Miscellaneous Chart* 74.
- CARRE, D.; CARRE, C. 1990: Complex reproductive cycle in *Eucheilota paradoxa* (Hydrozoa: Leptomedusae): Medusae, polyps and frustules produced from medusa stage. *Marine Biology* 104 : 303–310.
- CARRE, D.; CARRE, C.; MILLS, C. 1989: Novel cnidocysts of Narcomedusae and a medusivorous ctenophore, and confirmation of kleptocnidism. *Tissue and Cell* 21 : 723–734.
- CERRANO, C.; AMORETTI, D.; BAVESTRELLO, G. 1997: The polyp and the medusae of *Zanclaea costata* Gegenbaur (Cnidaria, Hydrozoa). *Italian Journal of Zoology* 64 : 177–180.
- CHAMISSO, A. de; EYSENHARDT, C.G. 1821: De Animalibus quibusdam e Classe vermium Linneana, in circumnavigatione terrae, auspicante Comite N. Romanzoff, duce Ottone de Kotzebue, annis 1815–1818. *Nova Acta Physico-Medica. Academiae Caesareae Leopoldino Carolinae Naturae Curiosorum* 10 : 345–374.
- CORNELIUS, P.F.S. 1982: Hydroids and medusae of the family Campanulariidae recorded from the eastern North Atlantic, with a world synopsis of genera. *Bulletin of the British Museum of Natural History, Zoology* 42 : 37–148.

- CORNELIUS P.F.S. 1995: North-west European thecate hydroids and their medusae (Cnidaria, Leptolida, Leptothecatae). *Synopses of the British Fauna*, n.s. 1 : 1–347; 2 : 1–386.
- COUGHTREY, M. 1874: Notes on the New Zealand Hydroidae. *Transactions and Proceedings of the N.Z. Institute* 7 : 281–293.
- CULBERSON, D.E. 1976: Encystment and excystment of the polyp of the fresh water jellyfish, *Craspedacusta sowerbyi* (Cnidaria: Hydrozoa). *Journal of the Alabama Academy of Science* 47 : 125.
- DANIEL, R. 1976: Chondrophora of the Indian Ocean. *Journal of the Marine Biological Association of India* 18 : 110–121.
- DEJDAR, E. 1934: Die Süßwassermeduse *Craspedacusta sowerbyi* Lankester in monographischer Darstellung. *Zeitschrift für Morphologie und Ökologie der Tiere* 28 : 595–691.
- DE LAFONTAINE, Y.; LEGGETT, W.C. 1989: Changes in size and weight of hydromedusae during formalin preservation. *Bulletin of Marine Science* 44 : 1129–1137.
- DENDY, A. 1902: On a freeswimming hydroid, *Pelagohydra mirabilis*, n. gen. et sp. *Quarterly Journal of Microscopical Science* 46 : 1–24.
- DENDY, J.S. 1978: Polyps of *Craspedacusta sowerbyi* as predators on young striped bass. *Progressive Fish Culturist* 40 : 5–6.
- DESOUZA, M.M.; SCEMES, E.; MENDES, E.G. 1996: Behavioral modifications of *Liriope tetraphylla* (Chamisso and Eysenhardt) (Cnidaria, Hydrozoa, Trachymedusae) induced by hypotonic conditions. *Journal of Experimental Marine Biology and Ecology* 206 : 223–236.
- DUJARDIN, F. 1843: Observations sur un nouveau genre de médusaires provenant de la métamorphose des *Syncorynes*. *Compte rendu de l'Académie des Sciences, Paris* 16 : 1121–1136.
- DUMONT, H. 1994: The distribution and ecology of fresh- and brackish-water medusae of the world. *Hydrobiologia* 272 : 1–12.
- EDWARDS, C. 1963: On the Anthomedusae *Tiaranna rotunda* and *Modeeria formosa*. *Journal of the Marine Biological Association of the United Kingdom* 43 : 457–467.
- EDWARDS, C. 1964: On the hydroids and medusae *Bougainvillia pyramidata* and *B. muscoides*. *Journal of the Marine Biological Association of the United Kingdom* 44 : 725–752.
- EDWARDS, C. 1966a: *Velella velella* (L.): the distribution of its dimorphic forms in the Atlantic Ocean and the Mediterranean, with comments on its nature and affinities. Pp 283–296 in Barnes, H. (ed.) *Some Contemporary Studies in Marine Science*. Allen & Unwin Ltd., London.
- EDWARDS, C. 1966b: The hydroid and the medusa *Bougainvillia principis*, and a review of the British species of *Bougainvillia*. *Journal of the Marine Biological Association of the United Kingdom* 46 : 129–152.
- EDWARDS, C. 1973a: The medusa *Modeeria rotunda* and its hydroid *Stegopoma fastigiatum*, with a review of *Stegopoma* and *Stegolaria*. *Journal of the Marine Biological Association of the United Kingdom* 53 : 573–600.
- EDWARDS, C. 1973b: The medusa *Mitrocomella polydiademata* and its hydroid. *Journal of the Marine Biological Association of the United Kingdom* 53 : 601–607.
- ESCHSCHOLTZ, J.F. 1829: *System der Acalephen. Eine ausführliche Beschreibung aller medusenartigen Strahltruere. Dritte Ordnung Röhrenquallen, Siphonophorae*. Ferdinand Dümmler, Berlin. iv + 1–190, pls 1–16.
- FEWKES, J.W. 1882: Notes on Acalephae from the Tortugas, with a description of new genera and species. *Bulletin of the Museum of Comparative Zoology at Harvard College* 9 : 251–289.
- FEWKES, J.W. 1886: Report on the medusae collected by the U.S. Fish Commission steamer "Albatross" in the region of the Gulf Stream in 1883–84. *Report of the U.S. Commission of Fish and Fisheries for 1884* : 927–977.
- FISH, G.R. 1971: *Craspedacusta sowerbyi* Lankester (Coelenterates : Limnomedusae) in New Zealand lakes. *N.Z. Journal of Marine and Freshwater Research* 5 : 66–69.
- FISH, G.R. 1975: Further records of *Craspedacusta sowerbyi* Lankester in North Island Lakes (Note). *N.Z. Journal of Marine and Freshwater Research* 9 : 573–574.
- FLEMING, J. 1823: Gleanings of natural history, gathered on the coast of Scotland during a voyage in 1821. *Edinburgh Philosophical Journal* 8 : 294–303.
- FLEMING, J. 1828: *A History of British Animals, exhibiting the descriptive characters and systematical arrangement of the genera and species of quadrupeds, birds, reptiles, fishes, Mollusca, and Radiata from the United Kingdom*. Bell & Bradfute, Edinburgh. 565 p.
- FORBES, E. 1848: *A Monograph of the British naked-eye Medusae*. The Ray Society, London. Pp 1–104, 113 pls.
- FORSKÅL, P. 1775: *Descriptiones animalium avium, amphibiorum, piscium, insectorum, vermium; quae in itinere orientali observavit Petrus Forskål, post mortem auctoris edidit Carsten Niebuhr*. Molleri, Hauniae. 164 p.
- FULTON, R.S.; WEAR, R.C. 1985: Predatory feeding of the hydromedusae *Obelia geniculata* and *Phialella quadrata*. *Marine Biology* 87 : 47–54.
- FYFE, M. 1929: A new freshwater hydroid from Otago. *Transactions and Proceedings of the N.Z. Institute* 59 : 813–823.



- GEGENBAUER, C. 1857: Versuch eines Systemes der Medusen, mit Beschreibung neuer oder wenig bekannter Formen; zugleich ein Beitrag zur Kenntnis der Fauna des Mittelmeeres. *Zeitschrift für Wissenschaftliche Zoologie* 3 : 202–273.
- GIBBONS, M.J.; RYLAND, J.S. 1989: Intertidal and shallow water hydroids from Fiji. I. Athecata to Sertulariidae. *Memoirs of the Queensland Museum* 27 : 377–432.
- GILL, J.-M., 1986: Estudio sistemático y faunístico de los Cnidarios de la costa catalana. Thesis, University of Barcelona. 565 p.
- GILL, J.-M.; BOUILLON, J.; PAGÈS, F.; PALANQUES, A.; PUIG, P.; HEUSSNER, S. 1998: Origin and biogeography of deep water Mediterranean Hydromedusae including the description of two new species collected in submarine canyons of Northwestern Mediterranean. *Scientia Marina* 64 : 113–134.
- GOLDFUSS, G.A. 1818: Ueber die Classification der Zoophyten. *Isis* 1818 : 1008–1013.
- GOLDFUSS, G.A. 1820: *Handbuch der Zoologie* 1. Abtheilung. Johann Leonhard Schrag, Nürnberg. 696 p.
- GORDON, D.P.; MAWATARI, S.F. 1992: Atlas of marine fouling Bryozoa of New Zealand ports and harbours. *Miscellaneous Publications N.Z. Oceanographic Institute* 107 : 1–52.
- GOY, J. 1972: Les hydroméduses de la mer Ligure. *Bulletin du Muséum national d'Histoire naturelle, série 3*, 83, *Zoologie* 62 : 965–1008.
- GOY, J. 1979: Méduses. In: Campagne de la *Calypso* au large des côtes atlantiques de l'Amérique du Sud (1961–1962). Résultats scientifiques des campagnes de la *Calypso*, Part XI. *Annales de l'Institut Océanographique de Monaco, n. sér.* 35 (suppl.) : 263–296.
- GOY, J.; LAKKIS, S.; ZEIDANE, R. 1991: Les Méduses (Cnidaria) des eaux libanaises. *Annales de l'Institut Océanographique, Paris* 67 : 99–128.
- GRAVILI, C.; BOERO, F.; BOUILLON, J. 1996: *Zanclaea* species (Hydroidomedusae, Anthomedusae) from the Mediterranean. *Scientia Marina* 60 : 99–108.
- GUENTHER, R.T. 1903: Report on the Coelenterata from the intermediate waters of the North Atlantic, obtained by Mr George Murray during the cruise of the "Oceana" in 1898. *Annals and Magazine of Natural History, ser. 6*, 11 : 269–275.
- HAECKEL, E. 1866: *Generellen Morphologie* 2 : 57.
- HAECKEL, E. 1879: *Das System der Medusen*. Gustav Fisher Verlag, Jena. 2 vols.
- HAMILTON, A. 1883: A fresh-water Hydrozoon. *N.Z. Journal of Science* 1 : 419.
- HAND, C. 1961: A new species of Athecate hydroid, *Podocoryne bella* (Hydractinidae), living on the pigfish, *Cangiopeidus leucopaecilus*. *Transactions of the Royal Society of N.Z., Zoology* 1 : 91–94.
- HAND, C.; HENDRICKSON, J.R. 1950: A two-tentacled, commensal hydroid from California (Limnomedusae, Proboscidae). *Biological Bulletin. Marine Biological Laboratory, Woods Hole* 99 : 74–87.
- HARGITT, C.W. 1904: Notes on some Hydromedusae from the Bay of Naples. *Mitteilungen aus der Zoologischen Station zu Neapel* 16 : 553–585.
- HARTLAUB, C. 1901: Hydroiden aus dem Stillen Ocean. Ergebnisse einer Reise nach dem Pacific. *Zoologische Jahrbücher, Abteilung Systematik, Geographie und Biologie der Thiere* 14 : 349–379.
- HARTLAUB, C. 1907: Craspedote Medusen. Teil I, Lief. 1. Codoniden und Cladonemiden. In Brandt, K.; Apstein, C. (eds) *Nordisches Plankton, Zoologischer* 12 : 1–135, 126 figs. Reprint by A. Asher & Co., Amsterdam, 1964.
- HARTLAUB, C. 1907–1917: Craspedote Medusen. Teil I. Lief. Familie III, Margelidae. In Brandt, K.; Apstein, C. (eds) *Nordisches Plankton, Zoologischer* 12 : 137–479.
- HERTWIG, O.; HERTWIG, R. 1878: *Das Nervensystem und die Sinnesorgane der Medusen*. Leipzig. 189 p.
- HE ZHENWU & XU RENHE, 1996: The Hydromedusae of China Sea. *Journal of Henan Normal University (Natural History)* 24 : 69–76.
- HINCKS, T. 1868: *A History of the British Hydroid Zoophytes*. John van Voorst, London. 338 p.
- HIROHITO 1988: *The Hydroids of Sagami Bay*. (Part I. Athecata). Biological Laboratory Imperial Household, Tokyo, Japan. 179 p.
- HIROHITO 1995: *The Hydroids of Sagami Bay*. (Part II. Thecata). Biological Laboratory Imperial Household, Tokyo, Japan. 243 p.
- HUANG, J.Q.; XU, Z.Z. 1994: Description of four new species of hydromedusae from Fujian Province (Athecatae-Anthomedusae and Thecatae-Leptomedusae). *Acta Zootaxonomica Sinica* 19 : 132–138.
- HYMAN, L.H. 1940: *The Invertebrates*. Vol. I, Protozoa through Ctenophora. McGraw-Hill, London. 726 p.
- HUVÉ, P. 1953: Biologie de l'hydraire *Hypsorophus quadratus* (Forbes) 1848 en Méditerranée occidentale. *Bulletin de l'Institut Océanographique Monaco* 1019 : 1–11

- JILLETT, J.B. 1971: Zooplankton and hydrology of Hauraki Gulf, New Zealand. *Memoir. N.Z. Oceanographic Institute* 53 : 103 p.
- JILLETT, J.B. 1976: Zooplankton associations of Otago Peninsula, south-eastern New Zealand, related to different water masses. *N.Z. Journal of Marine and Freshwater Research* 10 : 543–557.
- JOHNSTON, G. 1836/37: A catalogue of the zoophytes of Berwickshire. *Proceedings of the Berwickshire Naturalist's Club* 1 : 107–108.
- KABERRY, A.C. 1937: Pelagic coelenterates from Cook Strait. Unpublished M.Sc. thesis, Victoria University College, Wellington, New Zealand. 168 p.
- KIRK, H.B. 1915: On *Asciodioclava*, a new genus of gymno-blastic hydroids. *Transactions and Proceedings of the N.Z. Institute* 47 : 146–148, pl. 1.
- KÖLLIKER, A. 1853: In Gegenbaur, C.; Kölliker, A.; Müller, H. Bericht über einige im Herbst 1852 in Messina angestellte vergleichend-anatomische Untersuchungen. *Zeitschrift für Wissenschaftliche Zoologie* 4 : 299–370.
- KRAMP, P.L. 1919: Medusae. Pt 1. Leptomedusae. *Danish Ingolf Expedition* 5(8) : 1–111.
- KRAMP, P.L. 1920a: List of Medusae collected by the M.S. *Armauer Hansen* in the North Atlantic in 1913. *Bergens Museum Årbog* 1917, 1918, ser. 2, 8 : 1–7.
- KRAMP, P.L. 1920b: Anthomedusae and Leptomedusae. *Report of the Scientific Results of the "Michael Sars" North Atlantic Deep Sea Expedition 1910*, 3 : 1–14.
- KRAMP, P.L. 1926: Medusae. Part II. Anthomedusae. *Danish Ingolf-Expedition* 5(10) : 1–102, pls 1–2.
- KRAMP, P.L. 1928: Hydromedusae 1. Anthomedusae. In *Papers from Dr. Mortensen's Pacific Expeditions 1914–1916. Videnskabelige Meddelelser fra Dansk naturhistorisk Forening i Kjøbenhavn* 85 : 27–64.
- KRAMP, P.L. 1930: Hydromedusae. *Mémoires du Musée Royal d'Histoire Naturelle de Belgique* 45: 1–55.
- KRAMP, P. L. 1932: A revision of the medusae belonging to the family Mitrocomidae. *Videnskabelige Meddelelser fra Dansk naturhistorisk Forening i Kjøbenhavn* 92 : 305–384.
- KRAMP, P.L. 1933a: Coelenterata, Ctenophora and Chaetognatha. In *The Scoresby Sound Committee's 2nd East Greenland Expedition in 1932 to King Christian IX's Land. Meddelelser om Grønland* 104 : 1–20.
- KRAMP, P.L. 1933b: Craspedote Medusen. III. Leptomedusen. In *Brandt, K.; Apstein, C. (eds) Nordisches Plankton* 22, 6(12), 3 : 541–602.
- KRAMP, P.L. 1933c: Occasional notes on Coelenterata, II. *Videnskabelige Meddelelser fra Dansk naturhistorisk Forening i Kjøbenhavn* 94 : 237–247.
- KRAMP, P.L. 1938: Die Meduse von *Ostroumovia inkermanica* (Pal. Ostr.) und die systematische Stellung der Olindiiden. *Zoologischer Anzeiger* 122 : 103–108.
- KRAMP, P.L. 1939: Occasional notes on Coelenterata, II. *Videnskabelige Meddelelser fra Dansk naturhistorisk Forening i Kjøbenhavn* 103 : 503–516.
- KRAMP, P.L. 1942: Medusae. In *The Godthaab Expedition, 1928. Meddelelser om Grønland* 81 : 1–168.
- KRAMP, P.L. 1947: Medusae. Part III. Trachylina and Scyphozoa, with zoogeographical remarks on all the medusae of the northern Atlantic. *Danish Ingolf-Expedition* 5(14) : 1–66.
- KRAMP, P.L. 1948: Trachymedusae and Narcomedusae from the "Michael Sars" North Atlantic Deep-Sea Expedition 1910, with additions on Anthomedusae, Leptomedusae, and Scyphomedusae. *Report of the Scientific Results of the 'Michael Sars' North Atlantic Deep Sea Expedition, 1910*, 5 : 1–23, figs 1–7, pl. I.
- KRAMP, P.L. 1953: Hydromedusae. *Scientific Reports of the Great Barrier Reef Expedition, 1928–1929*, 6 : 259–322.
- KRAMP, P.L. 1955: The medusae of the tropical West Coast of Africa. *Atlantide Report* 3 : 239–324.
- KRAMP, P.L. 1957: Hydromedusae from the Discovery collections. *Discovery Reports* 29 : 1–128.
- KRAMP, P.L. 1958: Hydromedusae in the Indian Museum. *Records of the Indian Museum* 53 : 339–376.
- KRAMP, P.L. 1959: The hydromedusae of the Atlantic Ocean and adjacent waters. *Dana-Reports* 46: 1–283.
- KRAMP, P. L. 1961: Synopsis of the medusae of the world. *Journal of the Marine Biological Association of the United Kingdom* 40 : 1–469.
- KRAMP, P.L. 1962: Medusae of Vietnam. *Videnskabelige Meddelelser fra Dansk naturhistorisk Forening i Kjøbenhavn* 124 : 305–366.
- KRAMP, P.L. 1965: The hydromedusae of the Pacific and Indian Oceans. *Dana Reports* 63 : 1–162.
- KRAMP, P.L. 1966: A collection of medusae from the coast of Chile. *Videnskabelige Meddelelser fra Dansk naturhistorisk Forening i Kjøbenhavn* 129 : 1–38.
- KRAMP, P.L. 1968: The hydromedusae of the Pacific and Indian Oceans. Sect. II and III. *Dana Reports* 72 : 1–200.
- KRAMP, P.L.; DAMAS, D. 1925: Les Méduses de la Norvège. Introduction et partie spéciale. *Videnskabelige Meddelelser fra Dansk naturhistorisk Forening i Kjøbenhavn* 80: 217–323.

- KUBOTA, S.; HORITA, T. 1992: A new Hydromedusa of the genus *Eirene* (Leptomedusae; Eirenidae) from Toba, Japan. *Zoological Science* 9 : 413–421.
- KUBOTA, S.; TAKASHIMA, Y. 1992: Redescription of *Sarsia japonica* (Nagao) (Hydrozoa: Corynidae) from Hokkaido, Japan. *Publications of the Seto Marine Biological Laboratory* 35 : 371–381.
- KÜHN, A. 1913: Entwicklungsgeschichte und Verwandtschaftsbeziehungen der Hydrozoen. I. Die Hydroiden. *Ergebnisse und Fortschritte der Zoologie* 4 : 1–284.
- LAMARCK, J.B.P.A. de M. 1801: *Système des animaux sans vertèbres, ou tableau général des classes, des ordres et des genres de ces animaux*. Paris. 432 p.
- LAMOUREUX, J.V.F. 1812: Extrait d'un mémoire des polypiers coralligènes non entièrement pierreux. *Nouveau Bulletin des Sciences par la Société Philomatique de Paris* 3 : 181–188.
- LANKESTER, E.R. 1880: On a new jellyfish of the order Trachomedusae, living in fresh water. *Nature, London* 22 : 147–148.
- LARSON, R.J. 1980: The medusa of *Veleva veleva* (Linnaeus, 1758) (Hydrozoa, Chondrophora). *Journal of Plankton Research* 2 : 183–186.
- LARSON, R.J.; HARBISON, G.R. 1990: Medusae from McMurdo Sound, Ross Sea including the descriptions of two new species, *Leuckartiara brownei* and *Benthocodon hyalinus*. *Polar Biology* 11 : 19–25.
- LARSON, R.J.; MILLS, C.E.; HARBISON, G.R. 1991: Western Atlantic midwater hydrozoan and scyphozoan medusae: *in situ* studies using manned submersibles. *Hydrobiologia* 216/217 : 311–317.
- LELOUP, E. 1929: Recherches sur l'anatomie et de développement de *Veleva spirans* Forsk. *Archives de Biologie* 39 : 395–478.
- LENDENFELD, R. von 1884: The Australian hydromedusae. *Proceedings of the Linnean Society of New South Wales* 9 : 206–241; 345–353; 401–420; 46–492; 58–634; 908–924; 984–985.
- LESSON, R.P. 1830: *Voyage autour du monde, pendant les années 1822, 1823, 1824 et 1825*. Zoologie. Description des Zoophytes échinodermes. *Voyage de la Coquille II*, 20. 155 p.
- LESSON, R.P. 1843: *Histoire naturelle des Zoophytes. Acalèphes, nouvelles suites à Buffon, formant avec les oeuvres de cet auteur, un cours complet d'histoire naturelle*. Librairie Encyclopédique de Roret, Paris. vii + 1–596, pls 1–12.
- LINKO, A. 1900: Über den Bau der Augen bei den Hydromedusen. *Mémoires de l'Académie Impériale de Saint-Petersbourg* 10 : 1–23.
- LINNAEUS, C. 1758: *Systema Naturae sive regna tria naturae, systematice proposita per classes, ordines, genera et species, cum characteribus, differentiis, synonymis, locis &c.* 10th edn. Vol. 1. Regnum Animale. Holmiae. ii + 1–824.
- LINNAEUS, C. 1767: *Systema Naturae per regna tria naturae, secundum classes, ordines, genera, species, cum characteribus differentiis, synonymis locis*. 12th edn. Holmiae, Stockholm 1(2) : 533–1328.
- LUDWIG, H.W. 1977: 99.26 per cent water content in the fresh-water medusa *Craspedacusta sowerbyi*. *Zeitschrift für Naturwissenschaften (C)* 32 : 1011–1012.
- LÜTKEN, C. 1850: Nogle bemaerkninger om Medusernes systematiske Inddeling, navnlig, med Hensyn til Forbes's "History of British naked-eyed Medusae". *Videnskabelige Meddelelser fra Dansk naturhistorisk Forening i Kjøbenhavn* 1850 : 15–35.
- MCCRADY, J. 1859: Gymnophthalmata of Charleston Harbour. *Proceedings of the Elliot Society of Natural History* 1 : 103–121, pls 8–12.
- MAAS, O. 1893: Craspedoten Medusen der Plankton-Expedition. *Ergebnisse der Atlantische Plankton-Expedition der Humboldt-Stiftung, 1889*, 2 : 1–107.
- MAAS, O. 1904: Révision des méduses appartenant aux familles des Cunanthidae et des Aegenidae et groupement nouveau des genres. *Bulletin du Museum Océanographique de Monaco* 5 : 1–8.
- MAAS, O. 1905: Die craspedoten Medusen der Siboga-Expedition. *Siboga-Expedition* 10 : 1–84, pls 1–14.
- MAAS, O. 1906: Medusen. *Résultats du Voyage du S.Y. Belgica en 1897–1899. Expedition Antarctique Belge, Zoologie* : 1–30.
- MACKIE, G.O. 1959: The evolution of the Chondrophora (Siphonophora – Disconanthae). *Transactions of the Royal Society of Canada, ser. 3*, 53 : 7–20.
- MACKIE, G.O. 1960: The structure of the nervous system in *Veleva*. *Quarterly Journal of Microscopical Science* 101 : 119–131.
- MACKIE, G.O.; MACKIE, G.V. 1963: Systematic and biological notes on living hydromedusae from Puget Sound. *Bulletin of the National Museum of Canada* 199 : 63–84.
- MARK, E.L. 1898: Preliminary report on *Branchiocerianthus urceolus* a new type of actinian. In: Reports on dredging operations on the west coast of Central America. U.S. Fish Commission Steamer "Albatross". *Bulletin of the Museum of Comparative Zoology of Harvard College* 32 : 147–154.
- MARGULIS, R.Ya. 1989: New hydroid jelly-fishes of the family Tubulariidae (Coelenterata, Hydrozoa). *Zoologicheskii Zhurnal* 68(6) : 126–130. [In Russian with English summary]

- MAYER, A.G. 1900: Some medusae from the Tortugas, Florida. *Bulletin of the Museum of Comparative Zoology at Harvard College* 37 : 13–82, pls 1–44.
- MAYER A.G. 1910: *Medusae of the World. Hydromedusae*. Carnegie Institution, Washington. Vols I, II. 735 p.
- MEDEL, M.D.; LÓPEZ-GONZÁLES, P.J. 1996: Updated catalogue of hydrozoans of the Iberian Peninsula and Balearic Islands with remarks on zoogeography and affinities. *Scientia Marina* 60 : 183–209.
- METSCHNIKOFF, E. 1886: *Embryologische Studien an Medusen*. A. Hölder, Wien. 159 p.
- MILLARD, N. 1975: Monograph on the Hydroida of Southern Africa. *Annals of the South African Museum* 68 : 1–513.
- MILLARD, N.A.H.; BOUILLON, J. 1973: Hydroids from the Seychelles (Coelenterata). *Annales du Musée Royal d'Afrique Centrale. Science Zoologique* 206 : 1–106.
- MILLS, C. 1982: Survey of the Hydromedusae, Siphonophores and Scyphomedusae of New Zealand. Unpublished report. (Lodged at University of Auckland, Biological Science Library, Leigh Marine Laboratory).
- MILLS, C.; MACKIE, G.O.; SINGLA, C.L. 1985: Giant nerve axons and escape swimming in *Amphogona apicata* with notes on other hydromedusae. *Canadian Journal of Zoology* 63 : 2221–2224.
- MILLS, C.; PUGH, P.R.; HARBISON, G.R.; HADDOCK, S.H.D. 1996: Medusae, siphonophores and ctenophores of the Alborán Sea, south western Mediterranean. *Scientia Marina* 60 : 143–163.
- MURBACH, L. 1899: Hydroids from Woods Hole, Mass. *Hypolytus peregrinus*, a new unattached marine hydroid, *Corynitis agassizii* and its medusa. *Quarterly Journal of Microscopical Science* 42 : 341–360.
- NAGAO, Z. 1962: The polyp and medusa of the hydrozoan, *Stauridiosarsia japonica* n.sp., from Akkeshi, Hokkaido. *Annotationes zoologicae japonensis* 35 : 176–181.
- NAVAS, D. 1984: On the morphological variability of *Phialucium carolinae* (Mayer, 1900) (Leptomedusae, Phialuciidae). *Dusernia* 14 : 51–53.
- NAVAS-PEREIRA, D. 1980: Hydromedusae of the Bay of Sepetiba (Rio de Janeiro, Brazil). *Revista Brasileira de Biologia* 40 : 817–824.
- NAVAS-PEREIRA, D. 1984: On the morphological variability of *Phialucium coralinae* (Mayer, 1900) (Leptomedusae, Phialuciidae). *Dusernia* 14 : 51–53.
- NAVAS-PEREIRA, D.; VANNUCCI, M. 1990 [1994]: Antarctic hydromedusae and water masses. *Pesquisa antártica brasileira* 2 : 101–141.
- NAVAS-PEREIRA, D.; VANNUCCI, M. 1991: The hydromedusae and water masses of the Indian Ocean. *Boletim do Instituto Oceanográfico São Paulo* 39 : 25–60.
- NAUMOV, D.V. 1960–1969: *Hydroids and hydromedusae of the USSR*. Keys to the fauna of the USSR. Zoological Institute of the Academy of Science of the USSR 70. 660 p.
- NAUMOV, D.V.; STEPANJANTS, S.D. 1971: Novii vid meduz *Craspedacusta* (Hydrozoa) is morskoi laguni. [A new species of the genus *Craspedacusta* (Hydrozoa) from a sea lagoon.] *Zoologicheskij Zhurnal* 50 : 1094–1097
- O'SULLIVAN, D. 1982: A guide to the hydromedusae of the Southern Ocean and adjacent waters. *ANARE Research Notes* 5 : 1–135.
- O'SULLIVAN, D. 1984: Description of *Rathkea lizzoides* sp. nov. (Hydromedusae: Rathkeidae) from Antarctica and a key to the genus. *Journal of Natural History* 18 : 861–868.
- PAES DE ANDRADE, L.; MIGOTTO, A. 1997: Is there a link between *Hebella* hydroids (Hydrozoa, Lafoeidae) and *Staurodiscus* medusae (Hydrozoa, Laodiceidae)? *VI Colacmar, Congresso LatinoAmericano sobre Ciências do Mar* 1 : 35–36.
- PAGÈS, F.; BOUILLON, J.; GILI, J.-M. 1991: Four new species of hydromedusae (Cnidaria, Hydrozoa) from the coast of south-western Africa. *Zoologica Scripta* 20 : 89–98.
- PAGÈS, F.; GILI, J.M.; BOUILLON, J. 1992: Medusae (Hydrozoa, Scyphozoa, Cubozoa) of the Benguela Current (southeastern Atlantic). *Scientia Marina* 56 (suppl.) : 1–64.
- PALLAS, P.S. 1766: *Elenchus zoophytorum sistens generum adumbrationes generaliores et specierum cognitarum succinctas descriptiones cum selectis auctorum synonymis*. F. Varrentrapp, The Hague. 451 p.
- PAYNE, F. 1924: A study of the fresh-water medusa, *Craspedacusta ryderi*. *Journal of Morphology* 38 : 387–430.
- PERCIVAL, E. 1938: *Pelagohydra mirabilis* Dendy in New Zealand. *Nature, London* 142 (3592) : 439.
- PÉRON, F.; LESUEUR, A. 1810: Histoire générale et particulière de tous les animaux qui composent la familles des Méduses. *Annales du Muséum d'Histoire Naturelle, Paris* 14 : 312–366.
- PETERSEN, K. W. 1990: Evolution and taxonomy in capitate hydroids and medusae. *Zoological Journal of the Linnean Society* 100 : 101–231.
- PICARD, J. 1955: Sur la position systématique d' *Eucodonium brownei* Hartlaub (1907). *Recueil des Travaux de la Station Marine d'Endoume* 15 : 95–98.

- PICARD, J. 1956: Le premier stade de l'hydroméduse *Pandea conica*, issu du l'hydropolype *Campaniclava cleodora*. *Bulletin de l'Institut Océanographique, Monaco* 1086 : 1–11.
- PILGRIM, R.L.C. 1967a: A third specimen of the hydrozoan cnidarian *Pelagohydra mirabilis* Dendy 1902, with observations on its morphology and behaviour in the laboratory. *Proceedings of the Royal Society (B)* 168 : 439–448.
- PILGRIM, R.L.C. 1967b: Some responses to light in a specimen of *Pelagohydra mirabilis* Dendy, 1902. (Coelenterata: Hydrozoa). *Journal of Experimental Biology* 46 : 491–197.
- PIRAINO, S. 1992: The "stinging" egg of *Clavopsella michaeli* (Berrill) (Hydrozoa, Cnidaria). *Bolletino Zoologica* 59 : 251–256.
- PIRAINO, S.; BOERO, F.; AESCHBACH, B.; SCHMID, V. 1996: Reversing the life cycle: Medusae transforming into polyps and cell transdifferentiation in *Turritopsis nutricula* (Cnidaria, Hydrozoa). *Biological Bulletin* 190 : 302–312.
- POCHE, F. 1914: Das System der Coelenterata. *Archiv für Naturgeschichte* 5 : 47–128.
- POWELL, A.W.B. 1947 (1987): *Native Animals of New Zealand*. Auckland Museum Handbook of Zoology. University Press, Auckland. 88 p.
- PREVOT, E. 1959: Morphologie et évolution des structures tentaculaires chez les Hydriaires Gymnoblastes Capitata. *Recueil des Travaux de la Station marine d'Endoume* 17 : 91–126.
- PURCELL, J.E. 1991: A review of cnidarians and ctenophores feeding on competitors in the plankton. In Williams, R.B.; Cornelius, P.F.S. *et al.* (eds) *Coelenterate Biology. Recent research on Cnidaria and Ctenophora*. *Hydrobiologia* 216–217 : 335–342.
- PURCELL, J.E. ; MILLS, C.E. 1988. The correlation between nematocyst types and diets in pelagic Hydrozoa. Pp 463–485 in Hessinger, D.A.; Lenhoff, H. (eds) *The Biology of Nematocysts*. Academic Press Inc., New York.
- QUOY, J.R.; GAIMARD, J.P. 1827: Observations zoologiques faites à bord de l'*Astrolabe* en mai 1826, dans le détroit de Gibraltar. *Annales des Sciences naturelles, Paris* 10 : 1–21.
- QUOY, J.R.; GAIMARD, J.P. 1833: Zoologie. In : *Voyage de découverte de la corvette l'Astrolabe ... pendant les années 1826–1829 sous le commandement de M.J. Dumont d'Urville*. Tastu, Paris. Vols 1–4. 1–390.
- RALPH, P.M. 1947: The hydroid and medusa of *Cnidonema vallentini* (Anthomedusa) from Wellington, New Zealand. *Transactions and Proceedings of the Royal Society of New Zealand* 76 : 414–420.
- RALPH, P.M. 1953: Guide to the athecate (Gymnoblasic) hydroids and medusae of New Zealand. *Tuatara* 5 : 59–75.
- RALPH, P.M. 1956: Variation in *Obelia geniculata* (Linnaeus, 1758) and *Silicularia bilabiata* (Coughtrey, 1875) (Hydrozoa, f. Campanulariidae). *Transactions and Proceedings of the Royal Society of New Zealand* 84 : 279–296.
- RALPH, P.M. 1957: New Zealand thecate hydroids. Part I. Campanulariidae and Campanulinidae. *Transactions of the Royal Society of New Zealand* 84 : 811–854.
- RALPH, P. M. 1958: New Zealand thecate hydroids. Part II. Families Lafoeidae, Lineolariidae, Haleciidae and Syntheciidae. *Transactions of the Royal Society of New Zealand* 85 : 301–356.
- RALPH, P.M. 1961a: New Zealand thecate hydroids. Part III. Family Sertulariidae. *Transactions of the Royal Society of New Zealand*. 88 : 749–838.
- RALPH, P.M. 1961b: New Zealand thecate hydroids. Part IV. Family Plumulariidae. *Transactions of the Royal Society of New Zealand, Zoology* 1 : 19–74.
- RANSON, G. 1929: Observations morphologiques et systématiques sur une Anthoméduse, *Neoturris papua* (Lesson 1843). *Bulletin du Muséum national d'Histoire naturelle, Paris* 2(1) 3 : 209–215.
- REES, J.T. 1979a: The polyp and immature stages of *Cladonema californicum* Hyman, 1947 (Anthomedusae: Cladonemidae) with biological notes and a discussion of the taxonomy of the genus *Cladonema*. *Journal of Natural History* 13 : 295–302.
- REES, W.J. 1938: Observations on British and Norwegian hydroids and their medusae. *Journal of the Marine Biological Association of the United Kingdom* 23 : 1–42.
- REES, W.J. 1962. Hydroids of the family Cytaeidae L. Agassiz 1862. *Bulletin of the British Museum of Natural History, Zoology* 8 : 381–400.
- REES, W.J.; RALPH, P.M. 1970: An interpretation of the structure of the cnidarian *Pelagohydra mirabilis* (Coelenterata: Hydrozoa). *Journal of Zoology* 162 : 11–18.
- REES, W.J.; RUSSELL, F.S. 1937: On rearing the hydroids of certain medusae, with an account of the methods used. *Journal of the Marine Biological Association of the United Kingdom* 22 : 61–82.
- REISINGER, E. 1957: Zur Entwicklungsgeschichte und Entwicklungsmechanik von *Craspedacusta* (Hydrozoa, Limnotrachelina). *Zeitschrift für Morphologie und Ökologie der Tiere* 45 : 656–698.
- ROBERTS, P.E. 1972: The plankton of Perseverance Harbour, Campbell Island, New Zealand. *Pacific Science* 26 : 296–309.
- ROOSEN-RUNGE, E. C. 1970: Life cycle of the hydromedusa *Phialidium gregarium* (A. Agassiz, 1862) in the laboratory.

- Biological Bulletin. Marine Biological Laboratory, Woods Hole* 139 : 203–221.
- ROPER, D.S.; SIMONS, M.S.; JONES, M.B. 1983: Distribution of zooplankton in the Avon-Heathcote Estuary, Christchurch. *N.Z. Journal of Marine and Freshwater Research* 17 : 267–278.
- RUSSELL, F.S. 1936: On the hydroid of *Laodicea undulata*. *Journal of the Marine Biological Association of the United Kingdom* 20 : 581–588.
- RUSSELL, F.S. 1940: On the nematocysts of hydromedusae III. *Journal of the Marine Biological Association of the United Kingdom* 24 : 515–523.
- RUSSELL, F.S. 1953: *The medusae of the British Isles — Anthomedusae, Leptomedusae, Limnomedusae, Trachymedusae and Narcomedusae*. Cambridge University Press, London. 530 p.
- RUSSELL, F.S. 1970: *The medusae of the British Isles. II. Pelagic Scyphozoa with a supplement to the first volume on hydromedusae*. Cambridge University Press, London. 284 p.
- RUSSELL, F.S.; REES, W.J. 1936: On rearing the hydroid *Zanclaea implexa* and its medusa *Zanclaea gemmosa* with a review of the genus *Zanclaea*. *Journal of the Marine Biological Association of the United Kingdom* 21 : 107–129.
- SALVINI-PLAWEN, L. von 1966: Zur Kenntnis der Cnidaria des nordadriatischen Mesosammon. In VI. Meeresbiologische Symposium. *Veröffentlichungen des Instituts für Meeresforschung in Bremerhaven* 2 : 165–186.
- SALVINI-PLAWEN, L. von 1987: Mesosammic Cnidaria from Plymouth (with systematic notes). *Journal of the Marine Biological Association of the United Kingdom* 67 : 623–637.
- SARS, M. 1835: Beskrivelser og lagttagelser over nogle mærkelige eller nye i Havet ved den Bergenske Kyst levende Dyr. Bergen. 81 p., 115 pls.
- SARS, M. 1846: *Fauna littoralis Norvegiae, 1. Christiania*. 1–94, pls 1–9.
- SCEMES, E.; McNAMARA, J.C. 1991: The ultrastructure of the radial neuromuscular system of the jellyfish *Liriope tetraphylla* (Hydrozoa, Trachymedusae): Implications in crumpling behavior. *Biological Bulletin. Marine Biological Laboratory, Woods Hole* 181 : 474–483.
- SCHUCHERT, P. 1996: Athecate hydroids and their medusae (Cnidaria: Hydrozoa). *Memoirs. New Zealand Oceanographic Institute* 106 : 1–159.
- SINGLA, C.L. 1975: Statocysts of Hydromedusae. *Cell and Tissue Research* 158 : 391–407.
- STEPANJANTS, S.D.; SVOBODA, A.; VERVOORT, W. 1997: The problem of bipolarity, with emphasis on the Medusozoa (Cnidaria: Anthozoa excepted). Pp 455–464 in den Hartog, J.C. (ed.) *Proceedings of the 6th International Conference on Coelenterate Biology*. The Leeuwenhorst, The Netherlands.
- STRETCH, J.J.; KING, J.M. 1980: Direct fission: an undescribed reproductive method in hydromedusae. *Bulletin of Marine Science* 30 : 522–526.
- SUGIURA, Y. 1979: On a hydromedusa *Eirene menoni* Kramp from Amakusa, Japan. *Proceedings of the Japanese Society of Systematic Zoology* 16 : 5–8.
- SWAINSON, W. 1832: *Zoological illustrations, or original figures and descriptions of new, rare, or interesting animals, selected chiefly from the classes of ornithology, entomology, and conchyology, and arranged according to their apparent affinities*. Volume 2, 2nd series. Baldwin & Cradock, London. 96 p.
- TORREY, H.B. 1909: The Leptomedusae of the San Diego region. *University of California Publications in Zoology* 5 : 11–31.
- TREBILCOCK, R.E. 1928: Notes on New Zealand Hydroida. *Proceedings of the Royal Society of Victoria* 41 : 1–33, pls 1–6.
- TRÉGOUBOFF, G.; ROSE, M. 1957: *Manuel de planctologie méditerranéenne*. Centre National de la Recherche Scientifique, Paris. Vol. I, 1–587, Vol. II, pls 62–93.
- TRINCI, G. 1903: Di una nuova specie di *Cytaeis* gemmante del Golfo di Napoli. *Mitteilungen aus der Zoologischen Station zu Neapel* 16 : 1–34, pl. 1.
- UCHIDA, T. 1927: Studies on Japanese Hydromedusae. 1. Anthomedusae. *Journal of the Faculty of Science, Imperial University, Tokyo ser. 4, 1* : 143–241.
- UCHIDA, T. 1947: Some medusae from the Central Pacific. *Journal of the Faculty of Science of the Hokkaido Imperial University, Zoology* 7 : 297–319.
- UCHIDA, T.; SUGIURA, Y. 1977: On medusa-budding in the Anthomedusa, *Podocoryne minima* (Trinci). *Publications of the Seto Marine Biological Laboratory* 24 : 52–57.
- VAN DER SPOEL, S.; BLEEKER, J. 1988: Medusae from the Banda Sea and Aru Sea plankton, collected during the Snellius II Expeditions, 1984–1985. *Indo-Malayan Zoology* 5 : 161–262.
- VANHÖFFEN, E. 1902: Die Acraspeden Medusen der Deutschen Tiefsee-Expedition 1898–1899. Die Craspedoten Medusen der Deutschen Tiefsee-Expedition 1898–1899 I. Trachymedusen. *Wissenschaftliche Ergebnisse der Deutschen-Expedition auf dem Dampfer "Valdivia" 1898–1899, 3* : 1–53, 55–86.
- VANHÖFFEN, E. 1908: Die Narcomedusen. *Wissenschaftliche Ergebnisse der Deutschen-Expedition auf dem Dampfer "Valdivia" 1898–1899, 19* : 41–74.

- VANHOEFFEN, E. 1911: Die Anthomedusen und Leptomedusen der Deutschen Tiefsee-Expedition 1898–1899. *Deutsche Tiefsee-Expedition 19* : 193–235.
- VANHOEFFEN, E. 1912: Die craspedoten Medusen der Deutschen Südpolar-Expedition. *Deutsche Südpolar Expedition, Zoologie 1* : 351–395.
- VAN IMPE, E. 1992: A method for the transportation, long term preservation and storage of gelatinous planktonic organisms. *Scientia Marina* 56: 237–238.
- VANNUCCI, M.; NAVAS, D. 1973: Distribution of hydromedusae in the Indian Ocean. In Zeitzschel, B. (ed.) *Ecological Studies 3. The Biology of the Indian Ocean*. Springer-Verlag, Berlin. 273 p.
- VANNUCCI, M.; REES, W.J. 1961: A revision of the genus *Bougainvillia* (Anthomedusae). *Boletim do Instituto Oceanográfico São Paulo* 11 : 57–100.
- WANG, W.; XU, Z.-Z. 1988: A preliminary study on the life history of *Phialucium condensum* (Coelenterata: Hydromedusae). *Journal of Xiamen University, Natural Science* 27: 454–458.
- WANG, W.; XU, Z.-Z. 1990: Nematocysts of some medusae from Xiamen Harbour. *Journal of Oceanography, Taiwan Strait*, 9 : 161–165.
- WEAR, R.G. 1965: Zooplankton of Wellington Harbour, New Zealand. *Zoological Publications of Victoria University, Wellington* 38 : 1–31.
- WEILL, R. 1937: Contribution à l'étude des Cnidaires et de leurs nématocystes. II. Valeur taxonomique du cnidôme. *Travaux de la Station Zoologique de Wimereux* 11 : 349–701.
- WERNER, B. 1956: Ueber die entwicklungsphysiologische Bedeutung des Fortpflanzungswechsels der Anthomeduse *Rathkea octopunctata* M. Sars. *Zoologischer Anzeiger* 156 : 159–177.
- WERNER, B. 1958: Die Verbreitung und das jahreszeitliche Auftreten der Anthomeduse *Rathkea octopunctata* M. Sars, sowie die Temperaturabhängigkeit ihrer Entwicklung und Fortpflanzung. *Helgoländer wissenschaftliche Meeresuntersuchungen* 6 : 138–170.
- WERNER, B. 1961: Morphologie und Lebensgeschichte, sowie Temperaturabhängigkeit der Verbreitung und des jahreszeitlichen Auftretens von *Bougainvillia superciliaris* (L. Agassiz) (Atheicatae – Anthomedusae). *Helgoländer wissenschaftliche Meeresuntersuchungen* 7 : 206–237.
- WERNER, B. 1968: Polypengeneration und Entwicklungsgeschichte von *Eucheilota maculata* (Thecata – Leptomedusae). Mit einem Beitrag zur Methodik der Kultur mariner Hydroiden. *Helgoländer Wissenschaftliche Meeresuntersuchungen* 18 : 136–168.
- WERNER, B. 1984: Stamm Cnidaria, Nesseltiere. In Kaestner, V.A. (ed.) *Lehrbuch der speziellen Zoologie, 1(2), Cnidaria, Ctenophora, Mesozoa, Plathelminthes, Nemertini, Entoprocta, Nemathelminthes, Priapulida*. G. Fischer, Stuttgart. 305 p.
- WINKLER, T. 1982: The hydromedusae of the Amsterdam Mid North Atlantic Plankton Expeditions 1980 (Coelenterata, Hydrozoa). *Beaufortia* 32 : 27–5.
- XU, Z.-Z.; HUANG, J.-Q. 1990: A new genus and new species of Hydropolypae – Hydromedusae from the Luoyuan Bay, Fujian Province, China. *Acta Zootaxonomica Sinica* 15 : 262–266.
- XU, Z.-Z.; HUANG, J.-Q.; CHEN, X. 1991: On new species and record of hydromedusae in the upwelling region off the Minnan-Taiwan Bank fishing ground. Pp 469–486 in *Minnan-Taiwan Bank fishing ground upwelling ecosystems study*. China Science Press, Beijing.
- XU, Z.-Z.; WANG, W. 1991: The description of a new kind and three new types of medusae nematocysts in the Xiamen Harbour, China. *Acta Zootaxonomica Sinica* 10 : 441–445.
- XU Z.-Z.; ZHANG, J. 1974: Studies on the medusae from the Fukien coast. III. On the taxonomy of the Hydromedusae, siphonophores and ctenophores off North Fukien. *Oceanologia et Technologia Sinica* 19 : 17–32.
- XU Z.-Z.; ZHANG, J. 1981: On the Hydromedusae from the continental shelf waters of northern part of the South China Sea. *Acta Scientiarum Naturalium Universitatis Amoiensis* 20 : 373–382
- YAMADA, M.; KONNO, K.; KUBOTA, S. 1977: On a new athecate hydroid, *Fukaurahydra anthoformis* n.gen. n.sp., from northern Japan. *Proceedings of the Japanese Academy of Science* 53 : 151–154.

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