

Hans De Blauwe

Marine and Brackish Bryozoans from the Southern Bight of the North Sea

Identification Guide for Belgium,
the Netherlands and the North Sea
Coast of Germany

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Hans De Blauwe
Royal Belgian Institute of Natural Sciences
Dudzele, Belgium

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Preface

A Dutch version of this book was published in 2009. It was used extensively by Western European researchers working in marine biomonitoring programs and often consulted and cited in articles on bryozoans worldwide. The sand that is predominant on the sea bottom of the studied area is usually poor substrate for moss animals. The fact that such a large number of species are described in this work is the result of an in-depth study of more than 20 years of observation (tidal mark material, specimens collected on the hard substrate of breakwaters, port structures, windmill piles, gas platforms, shells, and stones) and of the review of the historical collections in Brussels (Royal Belgian Institute of Natural Science (RBINS)).

Over time, there was a rising demand for an English-language version. We are now about 15 years further. Due to increasing interest in this animal group, many observations were made at that time, which led to new distribution data. Several new species have also been introduced via shellfish culture, on ship hulls or other vectors. The use of the scanning electron microscope made it possible to distinguish and describe new species for science. Nine species have been described as new in this English update.

These species descriptions and distribution data make the book indispensable for anyone working with bryozoans anywhere in the world. All species are included in identification keys, and illustrated with drawings or photographs made or chosen in such a way that identification can be carried out with a binocular loupe. For a number of species it is almost necessary to use a scanning electron microscope though.

For 25 years, I have been able to enjoy the understanding of my family for my long stay at the binocular and the computer and the encouragement of many members of the Strandwerkgroep Belgium and Strandwerkgemeenschap in The Netherlands. Thanks to all who shared information, material, and photos and for giving permission to use it to contribute to a better understanding of this undervalued group of animals. Thanks to A. Naber, Waterdienst van Rijkswaterstaat, for giving permission for the use of the data related to *Triticella flava*.

It is almost impossible to list all the people that contributed to the end result. Over the last two years, the identification keys have been tested during workshops in France, Belgium, the Netherlands, and Germany. Questions were asked and lots

of observations were passed on from these countries. Many sent photos that I was allowed to use in this publication. I could always contact members of the International Bryozoology Association with my questions. Thanks to all who supported and encouraged me. The Royal Belgian Institute of Natural Science (RBINS) in Brussels let me revise their collection and gave me access to the scanning electron microscope. The Flanders Marine Institute (VLIZ) supported me with the literature from their library, published my first book (De Blauwe 2009), and gave me access to their scanning electron microscope and light microscope with stacking facilities.

I am very grateful to René Vanoutryve(†) for his work at the light microscope to make color photos of my collection and to Julien Cillis of the RBINS for most of the black-and-white photos with the scanning electron microscope.

Dudzele, Belgium

Hans De Blauwe

Competing Interests The author has no competing interests to declare that are relevant to the content of this manuscript.

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Abbreviations

BCS	Belgian continental shelf
DDNZS	Duik De Noordzee Schoon (Expedition North Sea)
IfAÖ	Institut für Angewandte Ökosystemforschung GmbH
NHMUK	National History Museum, London
NIOZ	Koninklijk Nederlands Instituut voor Zeeonderzoek (Royal Netherlands Institute for Sea Research)
RBINS	Royal Belgian Institute of Natural Sciences
SEM	Scanning electron microscope
VLIZ	Vlaams Instituut voor de Zee (Flanders Marine Institute)

Chapter 1

General Introduction



Abstract This chapter cites the taxonomy followed, the sources of information, and the names of photographers who kindly allowed their photographs to be used. Furthermore, the difference between Hydrozoa and Bryozoa is briefly explained, which is not so obvious for beginners. The general morphology of bryozoans is explained, and the classification of the three extant orders is given. A brief explanation follows about reproduction, collection, research, and preservation. Finally, there is an identification key to the orders.

Sources

Taxonomy

Classification of the species is based almost completely on that provided by <https://www.marinespecies.org/> and <http://bryozoa.net/>

Resources

This book is based on De Blauwe (2009). Almost all marine and brackish-water species living in the southern bight of the North Sea, between the Pas de Calais and the German/Danish border, are included, as well as the species that wash up on the beaches, which come largely from the English or French Channel coast or even further afield, attached to drifting seaweed or plastic.

The following sources were used to determine the occurrence of the species:

- The author carried out a revision of the RBINS collection, of which the immense “Gilson Collection,” collected between 1899 and 1914, dominates.
- All published and unpublished observations of the author from the area are included here.

- Interpretation of literature data provided a wealth of information from which a fairly complete picture was distilled of the historical situation. Changes in the distributions are noticeable for a number of species. Observations from the biological journals “De Strandvlo” and “Het Zeepaard” or from members of the Strandwerkgroep (Belgium) and the Strandwerkgemeenschap (the Netherlands) were checked where possible to complete the picture. For the Netherlands, the publications of Faasse and De Blauwe (2004) and Faasse et al. (2013) were used. Ancient literature often does not state whether the colonies were collected alive and in situ or were washed ashore.
- Reports of Alcyonidiidae were treated very critically, and many have been omitted. Only those observations that seem reliable and relevant are mentioned from the nineteenth-century literature.
- Previous records are from De Blauwe (2009). Since 2009, many new observations have been made and much literature has been published on the taxonomy and occurrence of the species in the region. These are included here.
- A bryozoan workshop in Heligoland in November 2023 and April 2024 yielded many distributional records of German species.

Illustrations

Many photographs and drawings made especially for De Blauwe (2009) have been retained. The drawings were converted from bmp to svg to improve their quality. They have been supplemented with new photographs. Much of the photographed material was collected in Normandy and Brittany. These were chosen for inclusion when more beautiful material was collected there, or when indigenous material was not available.

Almost all photographs were made by the author from material in his own collection; these specimens will eventually be deposited in the RBINS. I am very grateful to René Vanoutryve† for allowing me to use his equipment for many color photographs. Since 2024, I have had the opportunity to use a Leica M205 stereomicroscope with a maximum of 160× magnification, at the LifeWatch Marine Observatory (VLIZ). Most scanning electron micrographs were made in the RBINS, under the guidance for many years of Julien Cillis and latterly Laetitia Despontin. Since 2024, I had the opportunity to use the SEM at the VLIZ. I am grateful to Jonas Mortelmans and Mattias Bossaer for their guidance in using the apparatus in VLIZ.

I am indebted to many people who lent me the following photos:

- 2.1: *Tubulipora aperta* (Marc Cochu)
- 2.13a: *Tubulipora aperta*, ooeciostome, Brittany, France (Marc Cochu)
- 3.1b: *Amathia citrina*, zooids on kenozooidal stolon (Britta Kind)
- 3.1c: *Flustrellidra hispida* with spinozooids (Britta Kind)
- 3.6a: *Alcyonidium albidum*, off the Walcheren coast (D. Tempelman in Faasse et al. 2013)

- 3.7a: *Alcyonidium condylocinereum*: beached at Nieuwpoort, 2005 (Filip Nuyten)
- 3.7b: *Alcyonidium condylocinereum*: colony on *Ensis* sp. (Francis Kerckhof)
- 3.7e: *Alcyonidium condylocinereum*: colony on *Hinia reticulata* (Arnold Wijker)
- 3.11: *Alcyonidium hydrocoalitum*, Vlissingen (Marco Faasse)
- 3.16: *Alcyonidium ambulans*: Heligoland, 2022 (Thomas Schwaha)
- 3.18b: *Arachnidium lacourti*: colony from Nieuwe Waterweg 2006 (Marco Faasse)
- 3.19a: *Arachnidium fibrosum*: (Britta Kind)
- 3.22b: *Tanganella mülleri*: showing brooded embryos in the vestibular wall (Thomas Schwaha)
- 3.24b: *Walkeria uva*: colony from Germany (Britta Kind)
- 3.25a: *Triticella flava*: on claw of *Upogebia deltaura* from Oyster grounds (David Tempelman)
- 3.26a: *Triticella pedicellata*: from Tiefe Rinne, 2022 (Britta Kind).
- 3.38a: *Amathia lendigera*: colony beached at Petten, the Netherlands, 2016 (Rien de Ruijter)
- 4.2: Schematic image (Dr. Claus Nielsen)
- 4.17b: *Aetea anguina*: fig. From Cook (1977)
- 4.28a: *Jellyella eburnea* (Arie Twigt)
- 4.30a: *Conopeum reticulum* on *Mytilus edulis* (marina Zeebrugge 2008) (Michel Decler)
- 4.32a: *Electra* cf. *asiatica* zooids with few pseudopores (Jan Leitinger)
- 4.35a: *Electra pilosa*: spherical colony at Katwijk, 3 December 2020 (Jacoline van Duijn)
- 4.35b: *Electra pilosa*: mass stranding at Texel on 7 December 2020 (Sytske Dijksen)
- 4.39d: *Flustra foliacea*: encrusting colony with avicularia and few kenozooids (Rien de Ruijter)
- 4.41a: *Securiflustra securifrons*: colony beached at Texel in 2021 (Rob Dekker)
- 4.43: *Callopora craticula*: Heligoland (Britta Kind)
- 4.51a, b: *Tegella unicornis*, Heligoland (Britta Kind)
- 4.57a: *Bugula neritina*: colony in the Grevelingen (Ad Aleman)
- 4.66a: *Beania mirabilis*: colonies on beached plastic, Texel 2017 (Sytske Dijksen)
- 4.102a: *Celleporella hyalina*: Prinses Amalia windpark (Marco Faasse)
- 4.120a: *Escharoides mamillata*: Ploubazlanec, France, Februari 2023 (Florence Gully)
- 4.123b: *Umbonula ovicellata*: colony from Verdelet, France (Florence Gully)
- 4.133a: *Metroperiella* cf. *biformis*: colony at Stavanger, Norway (Marco Faasse)
- 4.142a: *Watersipora subatra*: colonies at Brittany, France (Marco Faasse)
- 4.142b: *Watersipora subatra*: Brittany, France (Marco Faasse)

- 4.149c: *Schizobrachiella verrilli*: zooid with two avicularia, Tiefe Rinne (Britta Kind)
- 4.160a: *Pacificincola hozawai* from Oostende spuikom, Belgium (Francis Kerckhof)
- 4.161a: *Primavelans glabricollaris*: map showing the two locations where this species has been collected (Schüler et al. 2022)
- 4.172e: *Celleporaria brunnea*: from Banyuls-sur-mer, France, Mediterranean, May 2024, SEM (Gabin Droual, Nicolas Gayet)
- 4.182a: *Rhynchozoon bispinosum*: Brittany, France, 2023 (Florence Gully).

Bryozoa or Hydrozoa?

For beginners, the distinction between Hydrozoa (phylum Cnidaria) and Bryozoa is not easy. The tentacles of hydroids capture and anesthetize the prey with stinging cells and bring them to the mouth opening. Bryozoans have a ring of tentacles that carry cilia, not stinging cells. These cilia initiate a flow of water from which suspended particles can be filtered. The tentacles can move individually. When examining fresh substrates (mussels, pebbles, algae, etc.) in seawater, sometimes bryozoans are discovered unexpectedly when the characteristic tentacle crowns are protruded.

Identification Key to the Hydrozoa and Bryozoa

1. (a) Tentacles not retractable into an enclosure (Fig. 1.1a).
 Athecate hydroid
- (b) Tentacles in a whorl and retractable into an enclosure (Fig. 1.1b, d).
 2
2. (a) Tentacles with stinging cells not creating a water flow (Fig. 1.1b)
 Thecate hydroid
- (b) Tentacles with cilia creating a flow of water (Fig. 1.1c, d).
 Bryozoan

Bryozoan Colony Appearance

The appearance of bryozoan colonies is extremely varied. They can be calcified or not, the colony encrusting or erect, firm or flexible, a few millimeters to 30 cm in size. The color varies from species to species, and brightly colored embryos can give the colony a characteristic color during the reproductive period.

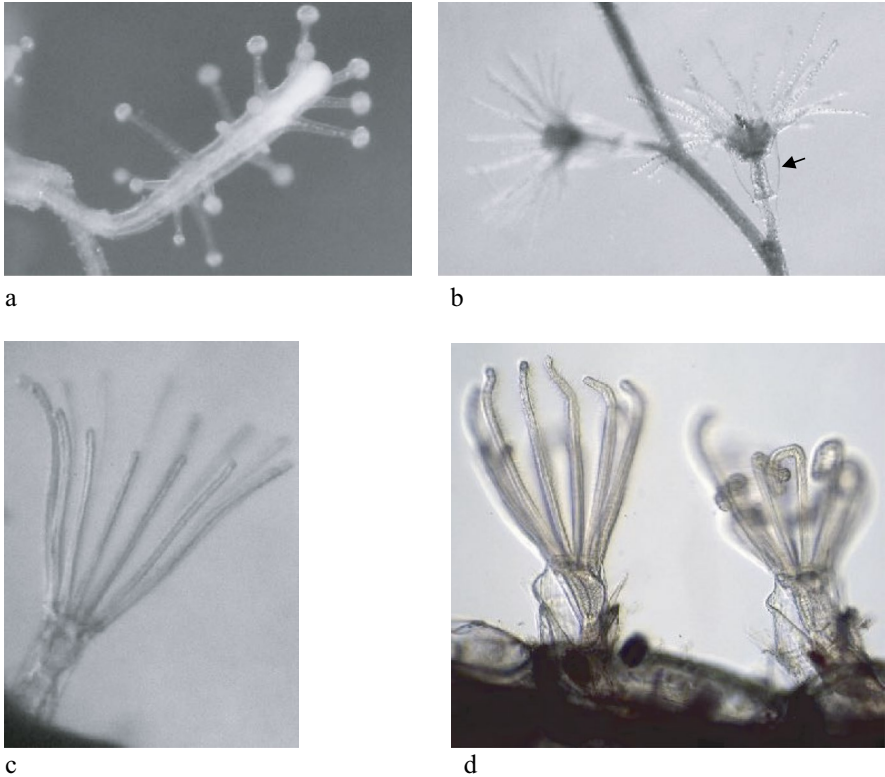


Fig. 1.1 (a) Athecate hydroid with club-shaped tentacles. (b) Thecate hydroid. (c, d) Bryozoan tentacle crowns

Anatomical Orientation of Bryozoan Zooids

Understanding the orientation of individuals (zooids) in bryozoan colonies is very important (Fig. 1.2a):

- Basal: The surface of the zooid applied to the substratum
- Lateral: The sides
- Frontal: The top surface containing the opening
- Proximal: Closest to the origin of the colony
- Distal: Toward the growing edge of the colony

Generally, with only a few exceptions elsewhere in the world, the orifice is situated near the distal end of the feeding zooid (autozooid).

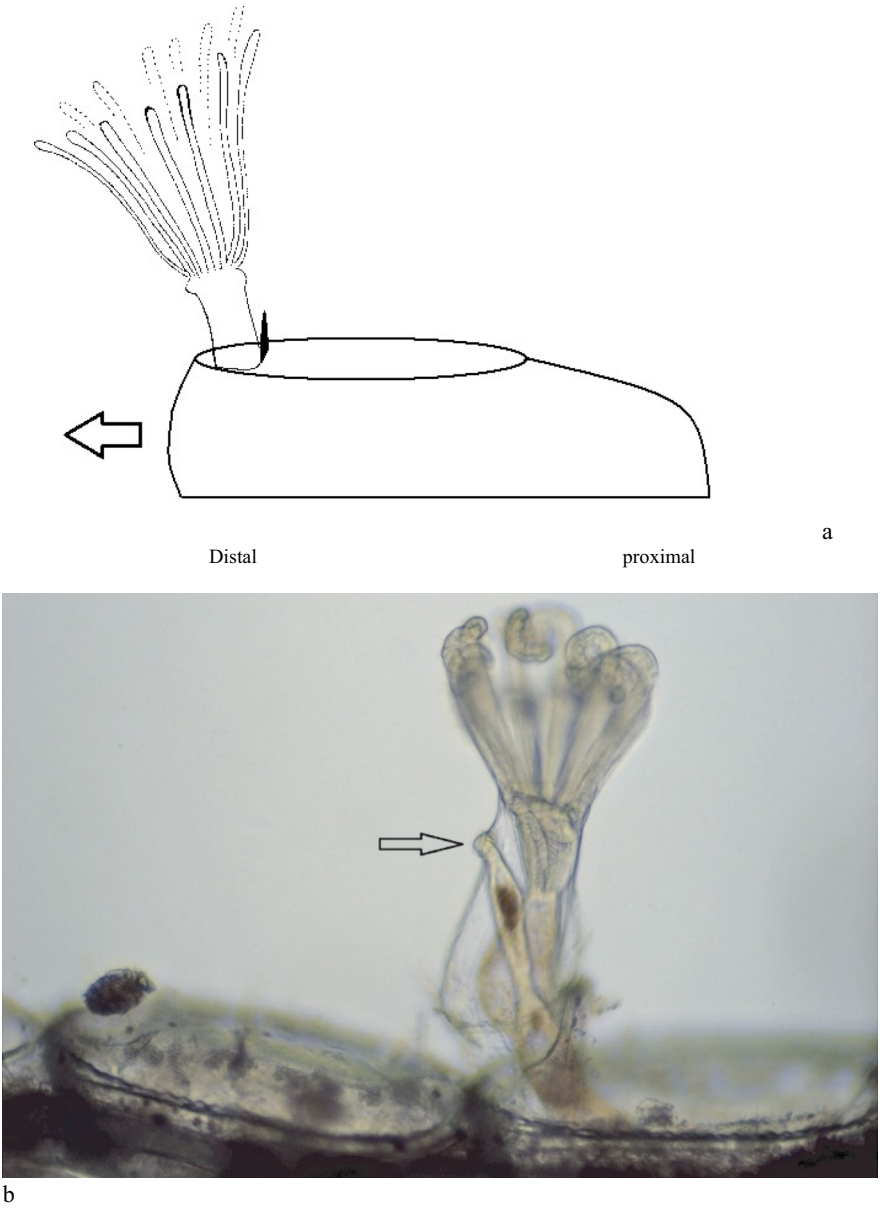


Fig. 1.2 (a) Growth direction (*arrow*). (b) Anus (*arrow*) of *Conopeum chesapeakensis*

General Morphology

A colony consists of a group of individuals (modules) that are interconnected with each other. Each feeding module (autozoid) (Fig. 1.2a) consists of a protective body wall (cystid) containing a retractile polypide. The cystid contains an opening through which the polypide can be partially protruded for feeding. A polypide consists of a tentaculate lophophore, a U-shaped gut, a muscular system, reproductive organs, and a nervous system. In the center of the tentacle crown is the mouth; the anus (Fig. 1.2b) is situated outside the tentacle crown. Polypides can degenerate into “brown bodies.” The cystid may persist after the death of the polypide, especially if it is calcified, often developing a new polypide inside.

Specific morphological characters are explained in the chapter for each order.

We distinguish three groups of bryozoans in terms of structure:

Ctenostomatida have no calcified exoskeleton and no operculum. The autozooids arise from a stolon (Fig. 1.3a) or directly from a parent zoid (Fig. 1.3b).

Cyclostomatida (Fig. 1.3c) have a cylindrical calcified cystid and are not closed by an operculum.

Cheilostomatida (Fig. 1.3d–i) have a box-like or sac-like calcified cystid. Cheilostomatida can be divided into five main morphological groups (these groups are morphological grades and are not evolutionary monophyletic divisions):

Autozooids with an opesia (large opening frontally) covered by a membranous frontal wall. The orifice and its closing operculum are set in this membrane (Fig. 1.3d, e).

Autozooids with a membranous frontal wall underlain by the internal calcified wall (cryptocyst of Setosellidae, Microporidae, and Cellariidae). The orifice and its closing operculum are set in the frontal membrane (Fig. 1.3f).

Autozooids with an opesia overlain by a basket-shaped shield of fused flattened spines (Fig. 1.3g).

Autozooids with a frontal surface completely calcified, except for the opening closed by the operculum. The calcified wall is not covered by a membrane (gymnocystal shield of Hippothooidea, Fig. 1.3h).

Autozooids with frontal shields completely calcified, except for the opening closed by the operculum. The calcified wall is covered by a frontal membrane, with a slit-like space (hypostegal coelom) between it and the frontal shield (Fig. 1.3i, umbonuloid shield; Fig. 1.3j, lepralioid shield).

Reproduction, Establishment, and Dissemination

Bryozoan colonies are hermaphrodites. They make male and female sex cells, simultaneously or at different times. Embryos are incubated in specialized brood chambers (Fig. 1.4a), within the zooids themselves (Fig. 1.4b), or in Cyclostomatida in swollen gonozooids (Fig. 1.4c).

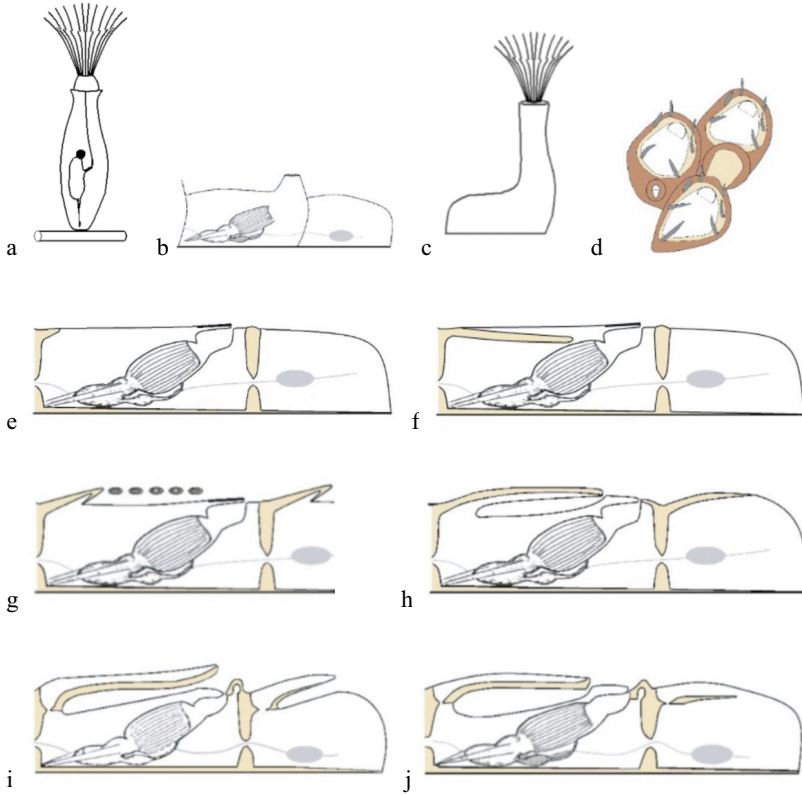


Fig. 1.3 (a) Ctenostomatida, autozooids arise from a stolon. (b) Ctenostomatida, autozooids arise directly from the parent zooid. (c) Cyclostomatida have a cylindrical calcified exoskeleton. (Modified and redrawn from Hayward and Ryland 1998). Cheilostomatida. (d) Autozooids with an opesia covered by a membrane, frontal view. (e) Idem, longitudinal section of autozooid and bud. (f) A membranous frontal wall underlain by the internal calcified wall (cryptocyst). (g) Autozooid with an opesia overlain by a basket-shaped shield of fused flattened spines. (h) Autozooid with frontal surface completely calcified. (i, j) The calcified wall itself covered by a membrane, with a space between the two layers (i) umbonuloid and (j) lepralioid shield

Most cheilostome species have ciliated (coronate) larvae that are brooded until their release, do not feed, and live only a short time (hours or days) in the plankton before settling. Consequently, the distance of dispersal possible by individual larvae is limited.

Exceptions to this include the Membraniporoidea and some species from the genus *Alcyonidium*. These species release cyphonautes larvae that can survive for a few weeks or months and feed while in the plankton. As a result, larvae can disperse over great distances and therefore species such as *Electra pilosa* and *Conopeum reticulum* with cyphonautes larvae are the first to colonize new substrates such as recent shipwrecks.

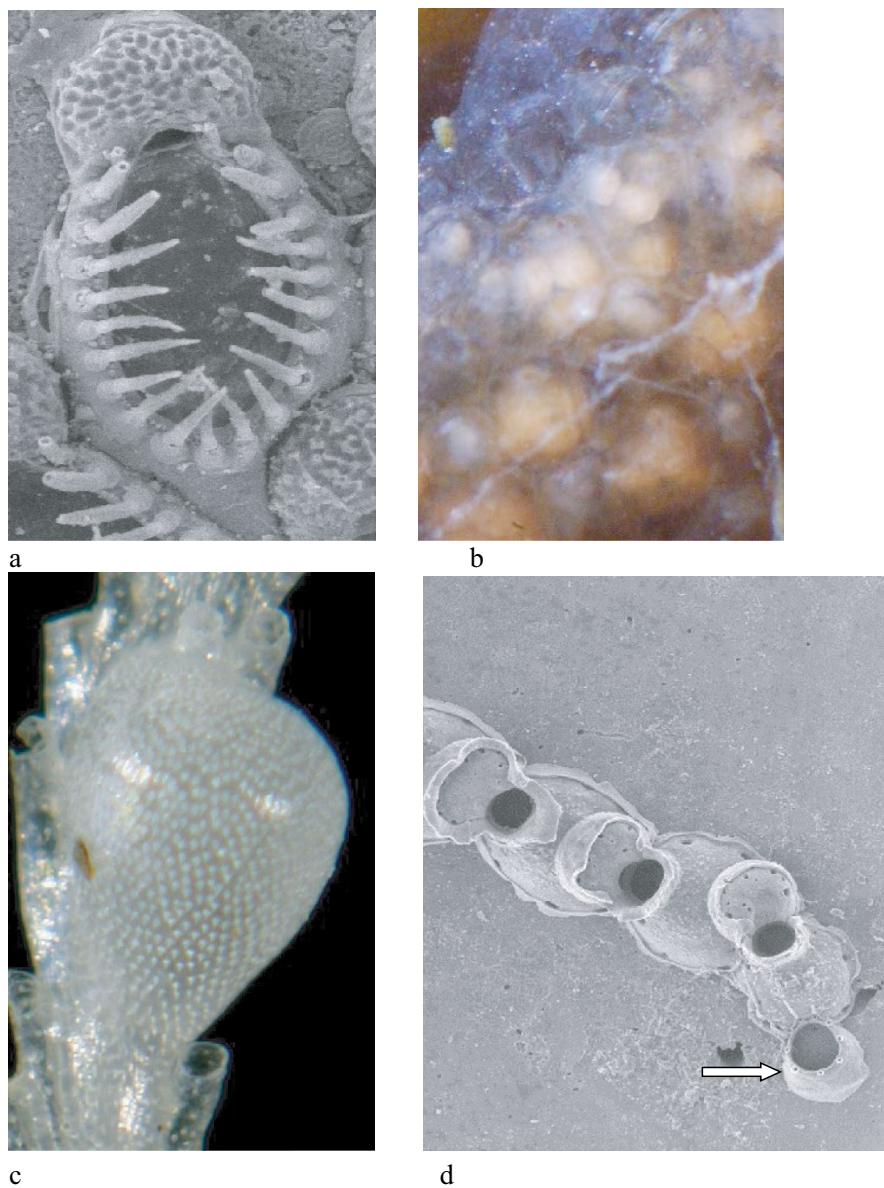


Fig. 1.4 (a) *Callopora discreta* (Cheilostomatida): ovicellate zooid. (b) *Alcyonidium* sp. (Ctenostomatida) with embryos in the zooecia. (c) *Crisia* sp. (Cyclostomatida): gonozooid. (d) *Neolagenipora* (Cheilostomatida): ancestrula (arrow)

An attached colony that moves with its substrate can of course cover great distances. Fertile colonies, for example, can be carried about on floating algae, plastic objects, or ship hulls. The large amount of plastic in the sea is undoubtedly contributing to the spread of bryozoans today. Recreational boating transfers species from one marina to another.

The larva settles on a suitable substrate and forms a first zooid or ancestrula (Fig. 1.4d). This ancestrula is usually different in shape from the later zooids and can be a useful aid for identification. The ancestrula typically buds 1, 2, or 3 first daughter zooids, which in turn expand the colony by further budding. Colonies are built of tens to hundreds of genetically identical zooids.

Collection

Scientific samples are often transported in 70% alcohol, seawater-formalin, or special liquids for DNA research. A beachcomber with an interest in bryozoans can transport beached substrates dry. Uncalcified species should be transported in seawater or alcohol. Pruning shears are useful for cutting the most interesting pieces out of plastic, so you do not have to carry large amounts. Bush-shaped colonies can be removed from the substrate with a knife. Handle them gently to preserve important features, e.g., spines. The use of brushes to clean the colony is therefore not recommended for species with spines. Rinsing under running water is sometimes sufficient. In dry, calcified species, annoying grains of sand can be removed under magnification with a moist needle to which they adhere. Dirt can be removed from calcified colonies by soaking them in a bleach solution for a while (about half an hour, depending on the firmness of the colony). Rinse well afterward. Bleach removes membranes and tissues but unfortunately also uncalcified joints, spines, or even autozooids in some weakly calcified species.

Examination and Identification

A magnification of 30× is very helpful. In some species, photography with a scanning electron microscope is necessary.

Uncalcified colonies are examined in seawater, as are all living colonies. In fresh, living colonies, one can easily observe the number of tentacles and the color of the tentacles, eggs, embryos, tissues, etc.

Calcified colonies are viewed as dry, or completely submerged. Damp colonies that have just been removed from the water are difficult to identify due to the reflective glittering of the remaining water.

Keep in mind that many features may have disappeared from washed-up or long-deceased colonies. Spines are usually found in young zooids at the colony edge; in older colony parts, they are often broken and lost. The frontal surface may be worn

off from sandblasting. Species that have a membrane over the frontal surface covering the opesia or frontal calcification may have lost that membrane.

Lighting is very important during the investigation. Lighting from above does not always provide good results. Side lighting casts shadows to enhance features, useful when counting the spines. When photographing specimens, the distal end should be at the top and the predominant direction of lighting from the top left.

Casts can be made of the few species that drill into shells. Brush the shell with liquid polyester on the inside with a brush. Leave to dry, preferably on a vibrating surface such as the air pump of an aquarium. Then, place the shell in hydrochloric acid (30% solution) in a Petri dish. When the shell has dissolved, you can carefully rinse off the remaining polyester fleece. The cast of the zooids and kenozooids can then be studied under binocular magnification. Store with care as these casts are very delicate.

Conservation

Calcified species can be kept dry after rinsing with fresh water. With colonies on algae, it must be taken into account that the algae shrink when drying, while the attached bryozoans do not, so that they will fracture. It is better to keep such colonies in 70% alcohol. Colonies without calcification are best stored in 4% neutralized formalin made with seawater. Important finds belong in a natural history museum. The amateur can keep the colonies, properly labeled, temporarily in rubbing alcohol from the supermarket or pharmacist and donate them later to a museum.

Classification and Key to the Orders

Class Stenolaemata: Zooidal wall calcified and tubular

Order Cyclostomatida: Orifice circular or polygonal, at the end of a small tube

Class Gymnolaemata: Zooidal wall calcified or not. Zooids tubular, bottle-shaped, or box-shaped

Order Ctenostomatida: Zooidal walls not calcified, membranous. Zooids cylindrical, bottle-shaped, or flattened. Orifice terminal or frontal in encrusting species, not closed by an operculum but closed by pleated collar in most. Heterozooids absent, or only kenozooids

Order Cheilostomatida: Zooidal walls calcified, box-shaped. Orifice frontal and closed by a proximally hinged operculum. Heterozooids usually present, commonly diverse; suborders based upon frontal calcification and mechanism of lophophore protrusion

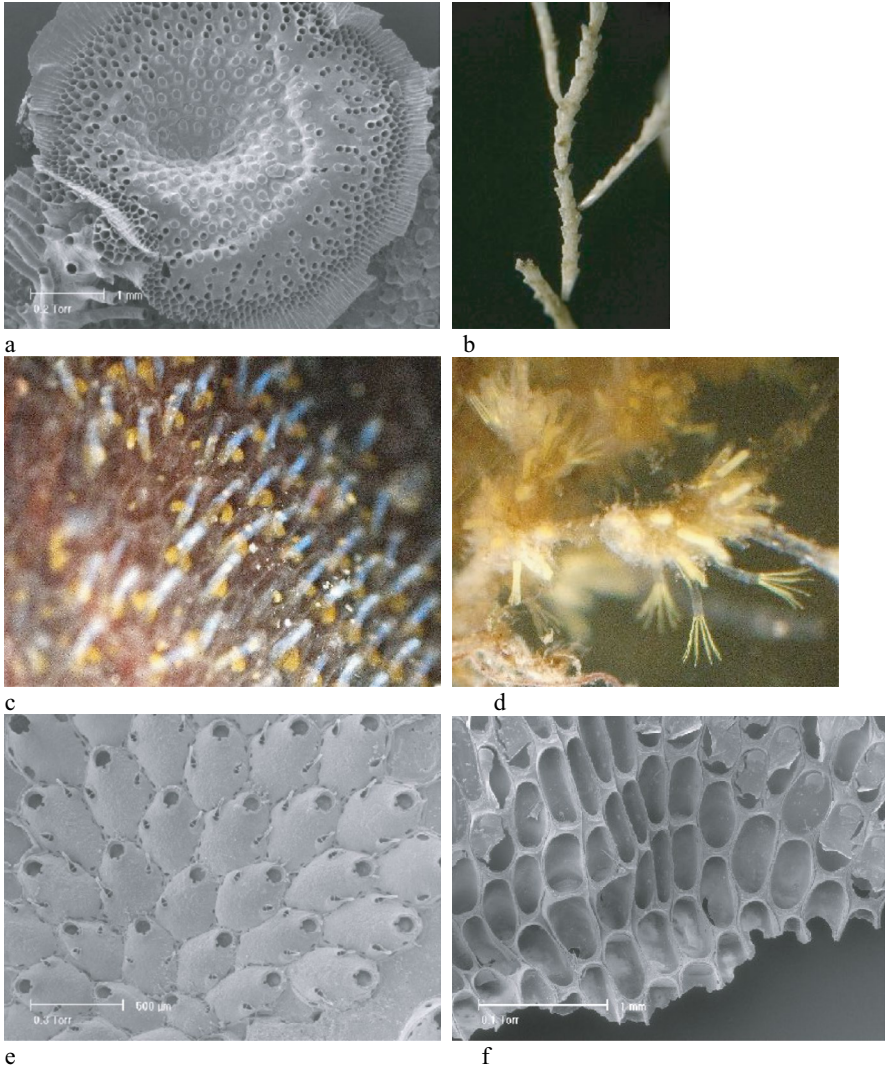


Fig. 1.5 (a) Encrusting colony of Cyclostomatida. (b) Part of erect colony of Cyclostomatida. (c) Encrusting colony of Ctenostomatida. (d) Erect colony of Ctenostomatida. (e) Encrusting colony of Cheilostomatida, with calcified frontal shield. (f) Encrusting colony of Cheilostomatida, showing opesiaie; frontal membranes are visible in some zooids

1. (a) Zooidal wall is not calcified (Fig. 1.5c, d). Chapter 3 Ctenostomatida (p. 55)
- (b) Calcification is always present, at least in the side walls. 2
2. (a) Orifice at the distal end and round or polygonal, wall completely calcified, tubular (Fig. 1.5a, b).Chapter 2 Cyclostomatida (p. 15)

- (b) Frontal or subterminal orifice, usually closed by an operculum; the autozoid is box-shaped, frontally calcified (Fig. 1.5e), or membranous (Fig. 1.5f).
 Chapter 4 Cheilostomatida (p. 119)

More about bryozoan morphology, reproduction, classification, and ecology relevant to neontologists can be found in Cook et al. (2018a, b), Hayward (1985), Hayward and Ryland (1985, 1998, 1999), Ostrovsky (2013), Schwaha (2020), and (Taylor 2020).

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Chapter 2

Cyclostomatida



Abstract This chapter discusses the order Cyclostomatida found in the southern bend of the North Sea, between Cap Gris-Nez in France and the German-Danish border. Twenty species have been identified. In addition to an identification key, the species are briefly described and illustrated, and the known distribution data is listed in detail.

Classification

Family Crisiidae

- Filicrisia geniculata* (Milne Edwards, 1838)
- Crisidia cornuta* (Linnaeus, 1758)
- Crisia aculeata* Hassall, 1841
- Crisia denticulata* (Lamarck, 1816)
- Crisia eburnea* (Linnaeus, 1758)
- Crisia* sp.

Family Stomatoporidae

- Stomatoporina incurvata* (Hincks, 1860)

Family Oncousoeciidae

- Oncousoecia dilatans* (Johnston, 1847)

Family Tubuliporidae

- Tubulipora aperta* Harmer, 1898
- Tubulipora liliacea* (Pallas, 1766)
- Tubulipora lobifera* Hastings, 1963
- Tubulipora phalangea* Couch, 1844
- Tubulipora plumosa* Thompson in Harmer, 1898

Family Plagioeciidae

- Plagioecia patina* (Lamarck, 1816)
- Plagioecia sarniensis* (Norman, 1864)
- Diplosolen obelium* (Johnston, 1838)
- Desmeplagioecia amphorae* Harmelin, 1974

Family Annectocymidae

- Annectocyma major* (Johnston, 1847)
- Entalophoroecia deflexa* (Couch, 1842)

Family Lichenoporidae

- Disporella hispida* (Fleming, 1828)
- Patinella verrucaria* (Linnaeus, 1758)

Specific Morphology

There is a big difference in the appearance of cyclostome colonies depending on the species. The colony can be encrusting (Fig. 2.1a) or erect (Fig. 2.1b), rigid or flexible, ranging from a few millimeters to 30 cm in size. Cyclostomatida have a cylindrical calcified skeleton. The zooidal orifice is not closed by an operculum.

Colony members are divided into two categories or polymorphs: autozooids and heterozooids. Autozooids include the ancestrula and subsequently budded zooids, having a tentacle crown and being able to feed. Heterozooids have no feeding capability and include gonozooids, kenozooids, and nanozooids.

Embryos are incubated in the swollen gonozooids, and larvae are released via the oeciopore, the opening of the oeciostome (Fig. 2.2). Both oeciostome and oeciopore have species-specific shapes: oval, flattened, or flared. The oeciopore is often slit-like (Ostrovsky 1998). Gonozooids have mostly distinct non-calcified areas (pseudopores) in their zooidal wall and seem perforated, but they are not true perforations. Autozooidal walls have much fewer pseudopores.

Kenozooids form root-like structures (rhizoids, Fig. 2.1c) for the attachment of the colony or spines (Fig. 2.3b). Nanozooids are small polymorphs with a single tentacle, probably used to sweep detritus and small organisms off the colony surface.

Jointed branches in the colonies in the family Crisiidae consist of calcified parts (internodes) and cuticular joints making colonies very flexible.