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**Bryozoa from the Southern North Sea coast of
Belgium, the Netherlands and Germany.**

**Part II
Cyclostomatida**

Version January 2022

Hans DE BLAUWE

SUMMARY

This is the second part (Cyclostomatida) of an updated English version of De Blauwe (2009). It contains identification keys and distributional information for the Southern Bight of the North Sea. About 200 species are discussed, of which 20 Cyclostomates, found on beaches, in ports and in marine habitats between Cap Griz Nez (Northern France) and the Dutch-German border, expanded now to the German-Danish border.

For an overall summary, sources, Bryozoa in general, see part I (Ctenostomatida).

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CLASSIFICATION OF CYCLOSTOMATIDA

Class Stenolaemata: Body wall calcified and tubular.

Order Cyclostomatida: Opening circular, at the end of a small tube.

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, 1859)

Family Oncousoeciidae

Oncousoecia dilatans (Johnston, 1847)

Family Tubuliporidae

Tubulipora aperta Harmer, 1898
Tubulipora liliacea (Pallas, 1766)
Tubulipora lobifera Hastings, 1963
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

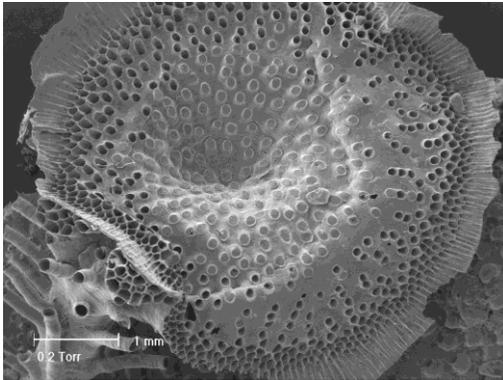
Annectocyma major (Johnston, 1847)
Entalophoroecia deflexa (Couch, 1842)

Family Lichenoporidae

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

Ctenostomatida under the microscope

The appearance of an individual (zoid) or of a colony is extremely varied. The colony can be encrusting or upright, firm or flexible, a few millimeters to 30 cm in size. Cyclostomatida have a cylindrical calcification and are mainly identified on the basis of the calcified zooecium.



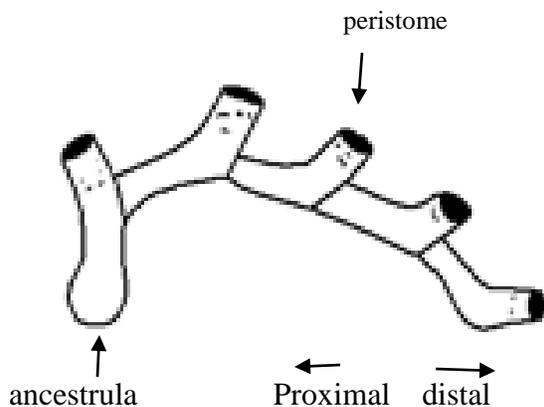
Encrusting colony (JC)



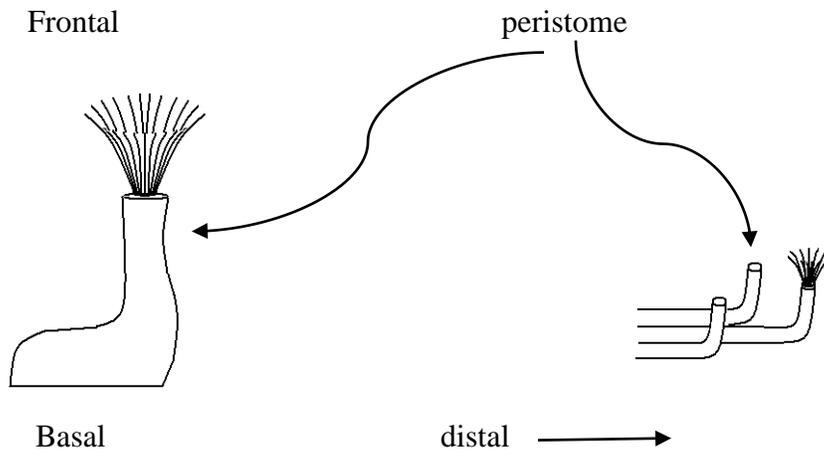
erect colony (RV)

The location on an individual is very important:

- basal: the surface of the zoid applied to the substratum;
- lateral: the sides;
- frontal: the top surface containing the opening;
- proximal: closest to the origin of the colony;
- distal: towards the growth end of the colony.

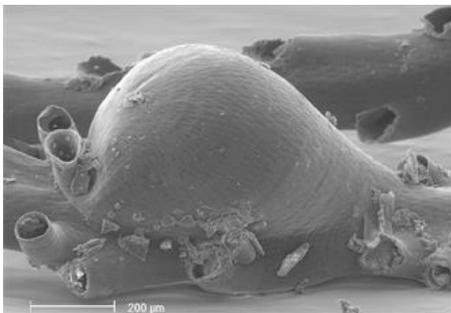


Cyclostomatida are not closed by an operculum. Peristome here refers to the erect cylindrical part of the autozoid.

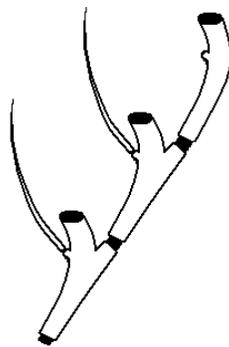


Depending on the function of the individual, a classification is made between autozooids and heterozooids. Autozooids have a nourishing function and therefore a tentacle crown. Heterozooids have no nourishing function and therefore no tentacle crown.

Heterozooids in Cyclostomatida include kenozooids and gonozooids. Embryos are incubated in the swollen gonozooids. Gonozooids are mostly distinctly perforated. Kenozooids form root-like structures (rhizoids) for the attachment of the colony or spines.



Gonozooid in *Crisia*



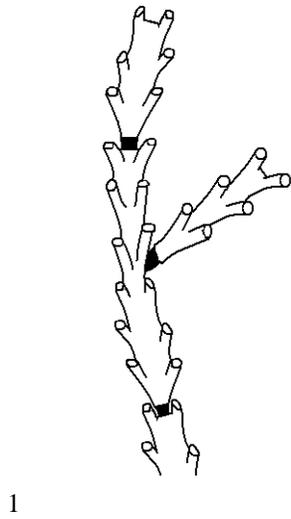
spines



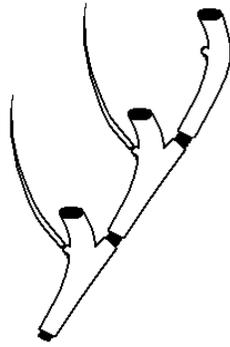
rhizoids for attachment

Key to the genera of Cyclostomatida

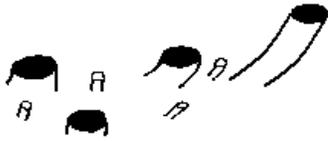
- 1 a) Colony erect and branching. Branches slender, zooids in one or two rows, with or without spines. Internodes consist of one or more zooids, internodes separated by uncalcified joints (fig. 1). 2
b) Colony encrusting or erect. If erect and branching, there are never uncalcified joints. 4
- 2 (1) a) An internode is composed of a single zooid, with an uncalcified joint before and after (fig. 2). 3
b) Internode are composed of more than one zooid (fig. 1). *Crisia* (p. 14)
- 3 (2) a) Each zooid bears or bore a long spine (fig. 2). *Crisidia cornuta* (p. 12)
b) No spines. *Filicrisia geniculata* (p. 10)
- 4 (1) a) Zooid interstices are polygonal spaces that are partially or completely closed. Peristomes often end in 2 or 3 points (photo 5). Gonozooid aperture an ordinary tube or flaring funnel. *Lichenoporidae* (p. 44)
b) There are no polygonal spaces between the zooids. Peristomes with round opening (photo 6). 5
- 5 (4) a) Zooids accompanied by a cylindrical dwarf zooid (fig. 3). *Diplosolen* (p. 36)
b) No dwarf zooids. 6
- 6 (5) a) Colony fully attached. Usually the colony consists of a curved row of zooids, the orifices all facing the outside of the curvature (fig. 4). Sometimes several rows of zooids lie against each other, in which case the orifices of a row of zooids remain directed to the same side. *Stomatoporina incurvata* (p. 22)
b) Orifices are not always oriented sideways. 7
- 7 (6) a) Colony flat or cup-shaped. Ancient zooids sealed by a terminal calcified diaphragm (photo 76), with or without a slim chimney. *Plagioecia* (p. 32)
b) Zooids never with terminal calcified diaphragm. 8



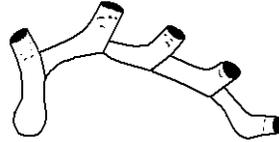
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3



4



Photo 5: *Dispirella hispida* (HD)

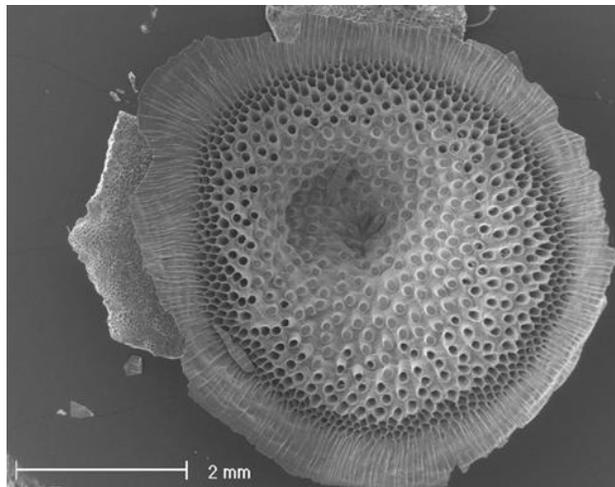
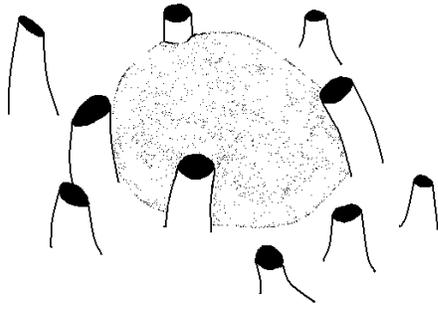
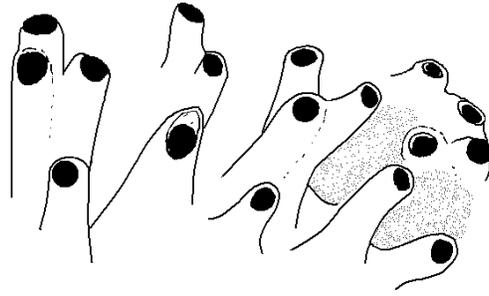


Photo 6 : *Plagioecia patina* (JC)

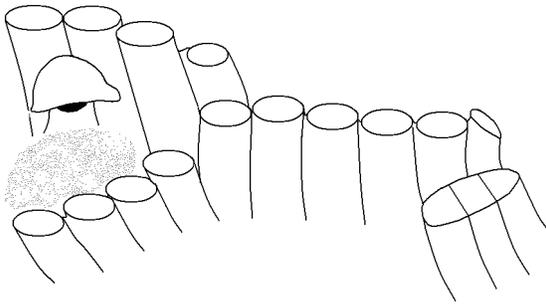
- 8 (7) a) Colony flat and thin. Gonozooid teardrop-shaped (fig. 1).
.....*Oncousoecia dilatans* (p. 30)
b) Gonozooid not teardrop-shaped. 9
- 9 (8) a) Colony encrusting, fan-shaped. Sometimes several fans form a more rounded colony. At the colony edge, the zooids form groups of 2 to 4. Gonozooid aperture round, the same size as the autozooid aperture, directed upwards on a short peristome (fig. 2). *Desmeplagioecia amphorae* (p. 38)
b) Zooids not in groups of 3 or 4 and gonozooid opening not directed upwards. 10
- 10 (9) a) Colony often purple, fully attached and lobed, or with erect lobes. Peristomes usually congregated in alternating rows. Gonozooid swollen and conspicuous. The gonozooid opening is implanted close to or against a zooidal peristome and is broad funnel-shaped or a short tube with an inverted cap (fig. 3), but often absent. *Tubulipora* (p. 24)
b) Colony adnate. Zooids in narrow branching rows. 11
- 11 (10)a) A distal branch and a lateral branch arise from the ancestrula. Zooids in transverse rows per 2 to 4, partially fused at their bases. Gonozooidal opening on a curved tube, the opening itself slit-shaped and oriented horizontal (fig. 4).
..... *Annectocyma major* (p. 40)
b) From the ancestrula arises a first zooid, from it arise two zooids that grow in opposite directions and thus form the first branch. Possibly single-row at first, later typically two- or three-row, developing into multi-row lobes at the ends of the branches. The colony sometimes forms erect, cylindrical parts (often broken off). Peristomes are not fused at their base. Gonozooid opening a long slender tube (fig. 5). *Entalophoroecia deflexa* (p. 42)



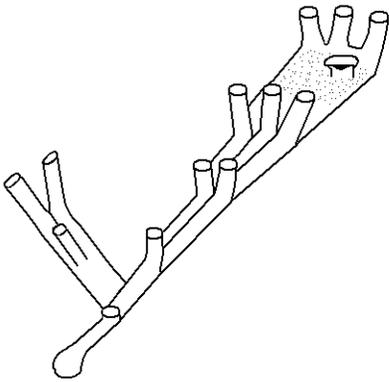
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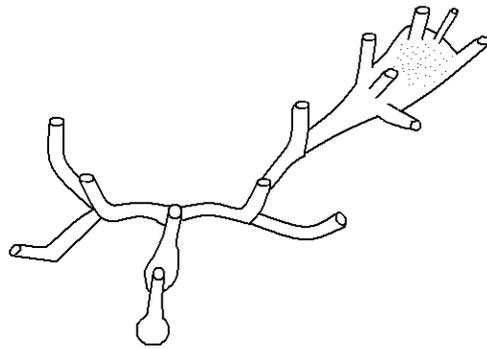
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3



4



5

Systematic part

Family Crisiidae

Colony erect and branching. Branches consist of internodes, made up of 1 or 2 rows of zooids. The internodes are connected to each other by uncalcified connections (joints).

The number of zooids per internode varies from 1 to many. The gonozooids are club-shaped, drop-shaped or almost spherical and are located between the zooids.

Gonozooids can be recognized by their high density of pores and their inflated shape. Three types of kenozooids can occur, namely in rhizoids, in the colony base and in spines.

The rhizoids consist of kenozooids which, like the internodes, are separated by joints. They serve to adhere to the substrate and look like rootlets. Some species have long spines, which consist of one or more kenozooids.

Genus *Filicrisia*

***Filicrisia geniculata* Milne Edwards, 1838**

Description:

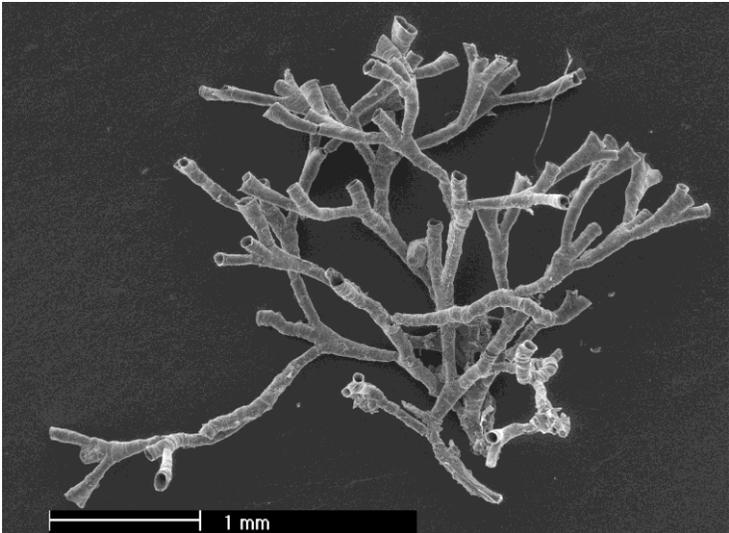
Colony erect, branching. Internodes consist of 1 zooid, rarely more. Internodes with gonozooid consist of 3 to 5 zooids. Zooids very long and slender, straight, curved or angled. Opening round and distally directed. Connection between the internodes (here before and after each zooid) pale. Polypide with 8 tentacles. Gonozooid in 2nd, 3rd, or 4th place in an internode. No spines. Gonozooid club-shaped, fully attached to the next zooid. Opening almost terminal on a short tube, transversely oval, directed forward and upward.

Occurrence: There are no reports of native material from Belgium or the Netherlands. Rarely on beached *Himantalia* buttons in Belgium (De Blauwe, 2000 en 2005; Vanhaelen *et al.* 2006). Washed up in the Netherlands on *Himantalia* buttons (Bloklander & Leenhouts, 1948; Verkuil, 1998; de Ruijter 2012a, 2018b).

Filicrisia geniculata:



From beached *Himanthalia* button, Oostduinkerke, 2005 (RV)



Some branches, Oostduinkerke, 2005 (JC)



few zooids, Oostduinkerke, 2005 (RV)

Genus *Crisidia*

Crisidia cornuta (Linnaeus, 1758)

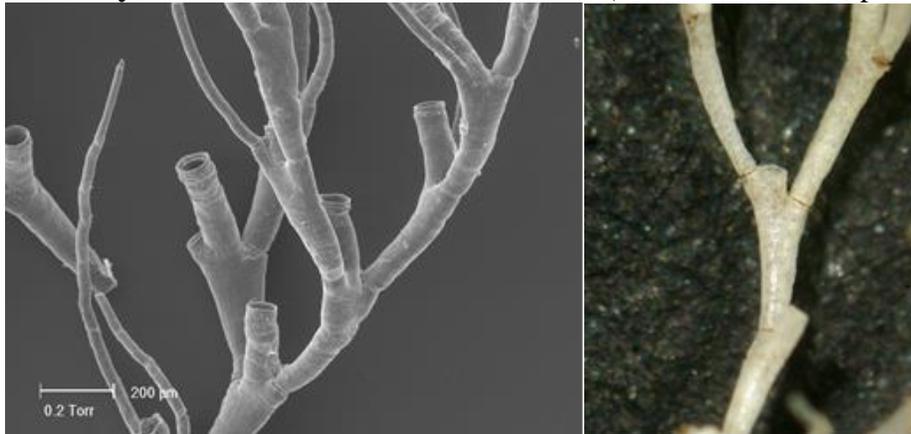
Description: Colony up to 15 mm high, often a dense tuft. Internodes consist of one zooid. On that zooid there is either the rest of the branch with a slightly higher, on the other side a long curved spine, separated by joints, or two branches springing from that zooid and then spine is missing. Internodes with gonozooid consist of one gonozooid, pear-shaped and free-growing with two branches at its base. Zooids horn-shaped with round distally directed opening. Polypide with 9 tentacles. Gonozooidal opening terminal on a tube, facing forward and upward.

Occurrence:

Belgium: In the collection of the RBINS there is a colony on *Flustra foliacea* dredged at the Westhinder Bank (51°24'N 2°28'O) on July 21, 1904. Loppens (1906) calls this species rare on algae and shells. Rarely washes ashore on *Himanthalia* buttons in Belgium (De Blauwe, 2005). Several colonies collected during the DDNZS campaign in June 2021 on the wreck of the 'Katwijk', 6 miles west of lightschip 'Noordhinder'.

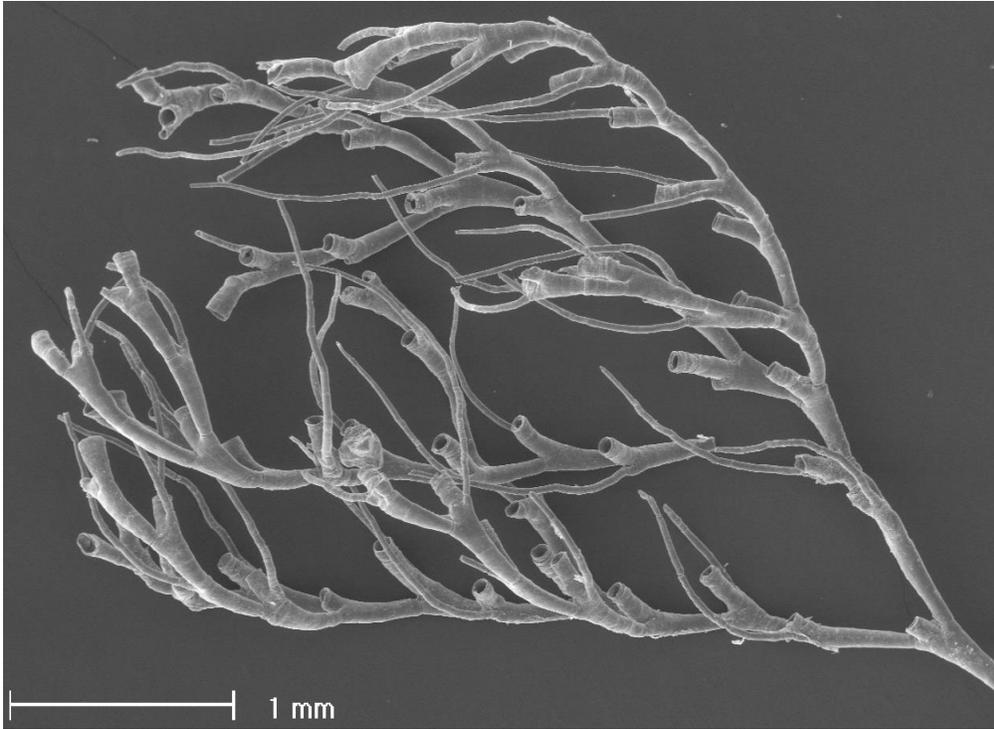
The Netherlands: Maitland (1851) reports this species from Walcheren on washed-up algae and bryozoans, Lacourt (1949) found colonies on cork washed ashore in the National Museum of Natural History in Leiden, collected in Noordwijk, Scheveningen and Terschelling. Washed up at Ouddorp on plastic (de Ruijter 2014c, 2015b), at Egmond aan Zee on a lobster trap (de Ruijter 2018a), at Camperduin on washed up plastic lobster trap entrance (de Ruijter, 2020) and at Oostkapelle on January 27, 2021 (de Ruijter 2021).

Germany: record from the German North Sea (Zettler *et al.* 2018, pers. comm. B. Kind)



Internodes

spines lost



Washed ashore at De Haan, 2001 (JC)



From wreck of 'Katwijk' 2021, with gonozooid (HD)

Genus *Crisia*

- 1 a) Internodes usually consist of a maximum of 9 zooids, internodes with a gonozooid can consist of more than 9 zooids. 2
b) Internodes generally consist of 11 or more zooids. 3
- 2 a) Internodes usually consist of 5 to 7 zooids, internodes strongly bent, zooids never bear spines. *Crisia eburnea* (p. 18)
b) Internodes often consist of more than 7 zooids in the distal parts of the colony. Internodes very weakly bent. Many zooids bear a long spine, but often broken off. *Crisia aculeata* (p. 14)
- 3 a) Joints black, except on young branches. The rhizoids (root-like attachments) also have black connections between the kenozooids. *Crisia denticulata* (p. 16)
b) Joints yellow to brown, never black. *Crisia* sp. (p. 20)

***Crisia aculeata* Hassall, 1841**

Description: Forms delicate tufts up to 2 cm high. Internodes very weakly bent, they often consist of 5 or 7 zooids, more distally. Branching at the 1st or 2nd position on the internode, sometimes at a higher position on the extremities of the colony.

At some internodes, one or more zooids may bear long slender spines composed of kenozooids separated by joints. The spines are bent forward. Such a spine is usually present on the 1st zooid in the internode.

Joints yellow or colorless in young colony parts. Peristomes curved towards the frontal surface. Orifice round, without pointed outgrowth next to it. Gonozooids in the 3rd to 5th position at their internode, teardrop shaped, the opening difficult to see.

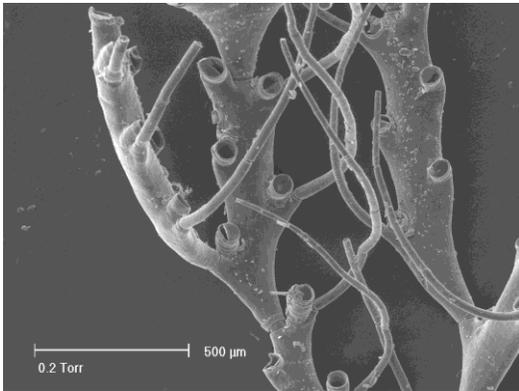
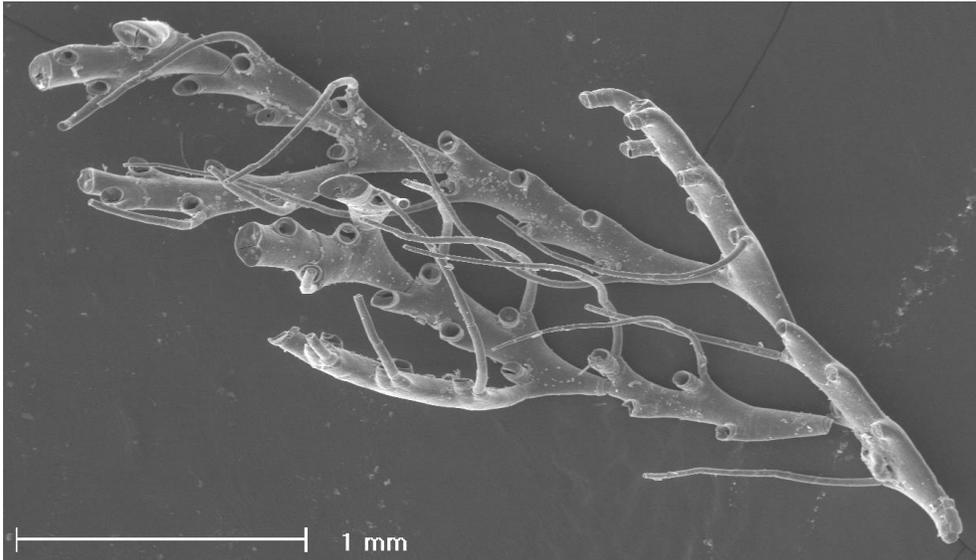
Occurrence: Washes ashore on *Abietinaria abietina* and on plastic.

Belgium: a colony was found on the wreck of the Kilmore in 2003 and 2004 (Zintzen, 2007) and on the wreck of the Katwijk in 2021 (DDNZZS-campaign 2021).

The Netherlands: Lives in the most seaward parts of the Oosterschelde and the Westerschelde. Sampled in 2015 on shipwreck 2801 (N55°12'46'' E03°32'46'') on the Doggersbank (Faasse et al., 2016). On DDNZZS nets in 2016, at the Niponia wreck no. 2305 (52°44.520'N – 3°58.702'E) (van Leeuwen et al. 2017).

Germany: record from the German North Sea (Zettler *et al.* 2018, pers. comm. B. Kind)

Crisia aculeata :



Few internodes



stolon and erect colony part

***Crisia denticulata* (Lamarck, 1816)**

Description: Upright tufts up to 2.5 cm high. Internodes consist of 15 or more zooids except at the beginning of the colony. Joints inky black, except when newly formed. Internodes with an odd number of zooids usually carry a side branch, those with an even number of zooids usually do not.

The side branches are usually in the 5th to 9th position on the internode. Many rhizoids with black joints. Zooids almost entirely adnate, except for a forward-facing peristome. Orifice round with sometimes a pointed protrusion next to it. Gonozooid high on the internode, teardrop-shaped on the frontal side. Gonozooidal opening inconspicuous with very short tube.

Occurrence:

Belgium: in 1904 a colony was collected at the West-Hinder lightship and in 1905 at the Strait of Dover (RBINS collection). Loppens (1906) rarely found this species on *Flustra foliacea* and seaweed washed ashore. Rarely washes up on the Belgian coast on *Cystoseira baccata* and plastic (Zeebrugge, December 2000).

The Netherlands: Maitland (1851) reports a colony on *Flustra foliacea* washed ashore in Westkapelle. Found on washed up plastic at Westkapelle on in 2004 and again at Ouddorp (de Ruijter 2014c).

Germany: record from the German North Sea (Zettler *et al.*, 2018)

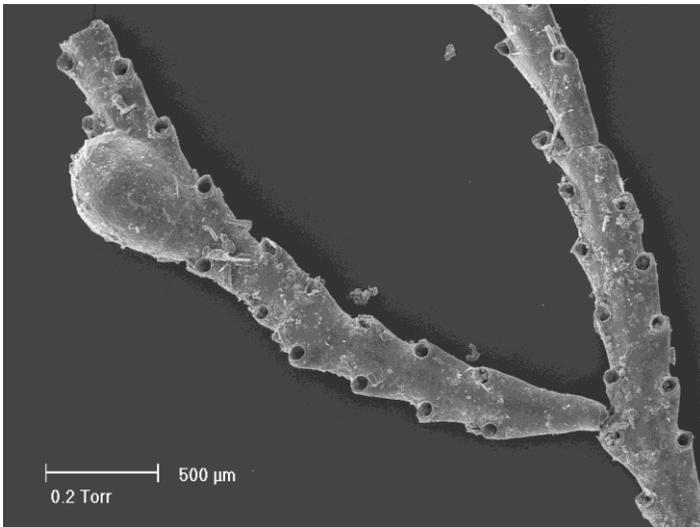
Crisia denticulata:



Colony, St-Jacut (France), April 2005 (JC)



internodes and rhizoids with black joints (HD)



internode with gonozooid (JC)

***Crisia eburnea* (Linnaeus, 1758)**

Description:

Forms dense tufts up to 2 cm high. The branches are characteristically curved inward. Internodes usually consist of 5 to 7 zooids. Side branches usually arise on the 1st zooid in an internode, alternating left and right of the main branch.

Joints yellow or colorless in young internodes, brown in older colony parts. Peristome short and inverted frontally, orifice facing forward. Sometimes a small pointed outgrowth next to the opening.

Gonozooid teardrop-shaped, replaces the 2nd or sometimes the 3rd zooid in the internode. The gonozooid opening is round or transversely oval, obliquely up and directed forward on a gradually narrowing tube.

Occurrence:

Belgium: Loppens (1906) considers this species common on *Flustra foliacea* washed ashore. Often washes up on *Abietinaria abietina*, *Flustra foliacea*, plastic and *Himantalia* buttons (De Blauwe, 2005; Vanhaelen, et al., 2006).

The Netherlands: Lacourt (1949) reports washing up on *Flustra foliacea*, hydroids and cork along the entire coast. Maitland (1851) mentions sites such as Zandvoort, Katwijk and Scheveningen, probably on washed-up algae and *Flustra foliacea*. Collected during the DDNZS campaign in June 2018 on the wreck of Somali. Often washes up on plastic and *Himantalia* buttons (de Ruijter 2012, 2013a and b, 2014a, 2014b, 2015a).

Germany: record from the German North Sea (Zettler *et al.* 2018, pers. comm. B. Kind)

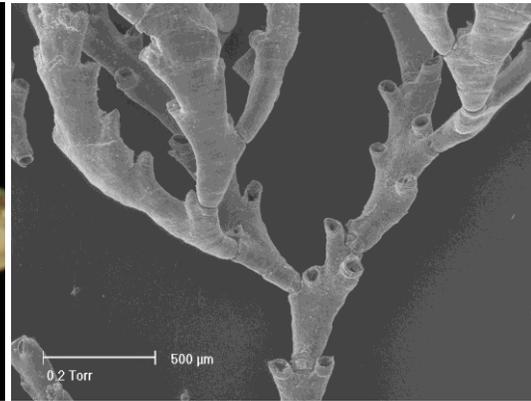
Crisia eburnea:



Beached colony (Zeebrugge, 2001) (RV)



internodes en yellow/brown joints (RV)



internoden (JC)

Crisia sp.

Description:

Internodes usually consist of more than 11 zooids, the joints are never black. Hayward & Ryland (1985) lists three species from around the British Isles. The shape of the gonozooidal opening, the peristome diameter, the shape of the peristome and the density of the pseudopores should lead to a reliable determination.

Crisia ramosa Harmer, 1891 is a species of shallow coastal waters common south west of England. *Crisia calyptostoma* Hayward & Ryland, 1978 is a deepwater species known from the western entrance of the Channel. *Crisia klugei* Ryland, 1967 is a northern species reaching the Skagerrak.

The Le Conquet material (photos on next page) has a gonozooidal opening and a peristome diameter that corresponds to *Crisia ramosa*, but the density of the pseudopores is much too high.

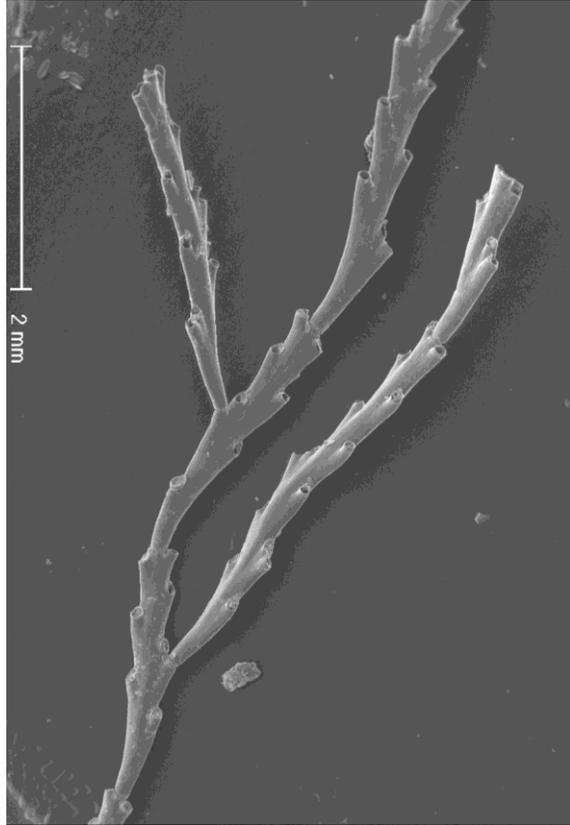
Occurrence:

Belgium: Colonies with more than 11 zooids per internode and yellowish joints have washed up in Zeebrugge (December 23, 2000) on a net and in Wenduine (September 15, 2001) on plastic. This washed-up material had no gonozooids, which greatly complicates identification. The finding of *C. ramosa*, reported in De Blauwe (2003), serves to be considered as *Crisia* spec.

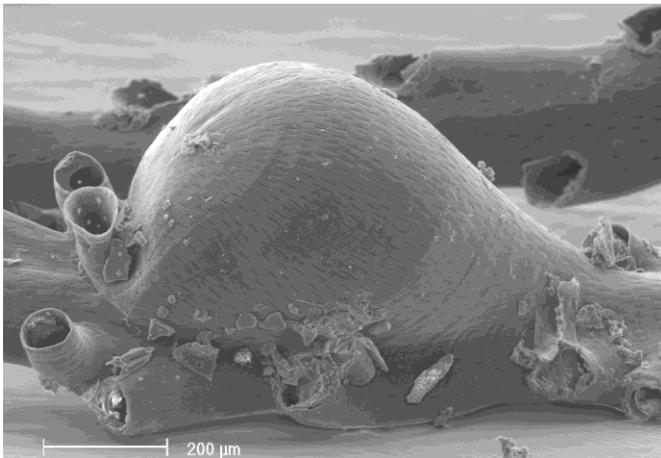
Crisia sp. :



Le Conquet (Bretagne) (JC)



beached at Wenduine (JC)



Le Conquet (Bretagne) (RV)

Family Stomatoporidae

Genus Stomatoporina

Stomatoporina incurvata (Hincks, 1859)

Description:

The colony is small and completely attached to the substrate. The zooids are in one row. A young colony makes a 90° turn and then grows further to a circle with a diameter of 2 mm or continues in a straight line and reaches a length of up to 8 mm.

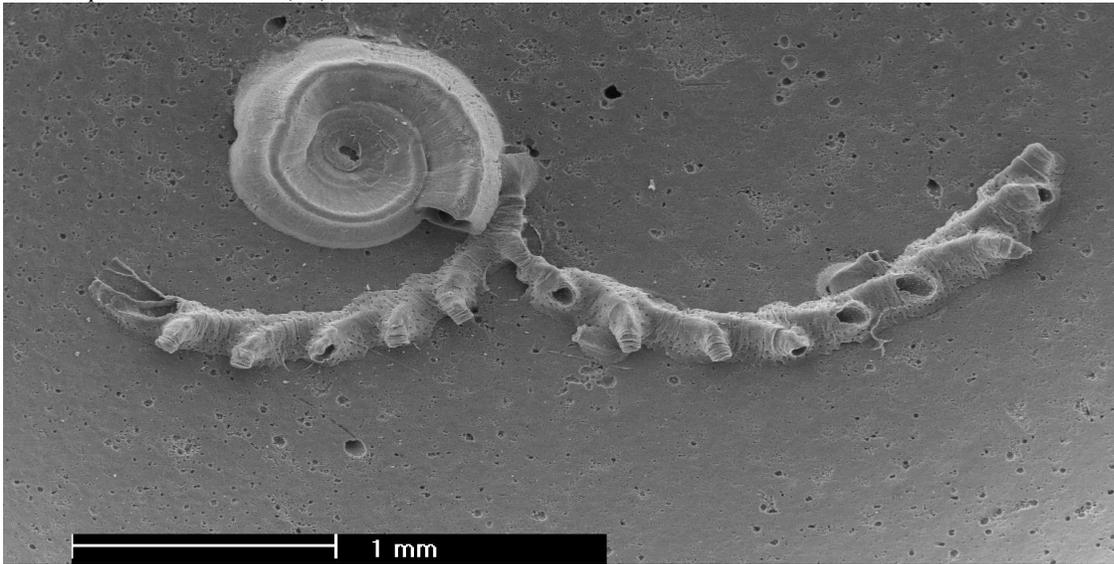
Sometimes a colony branches, with the two rows twisting away from each other in opposite directions. Further on, growth can continue in two rows of zooids with the openings in one row to the left and in the other to the right. Typically, the zooids have their opening in curved rows towards the outside of the circle. Colonies with several rows of zooids next to each other were found on the Westhinder Bank, the typical growth form is then not clear. In this case, the shape of the zooids is a striking feature.

The distal third of the zooids is suddenly turned sideways, the openings facing sideways. On top of the zooid there is a knobby ridge, which means that the peristome is not round in cross-section as in the other Cyclostomatida in the area.

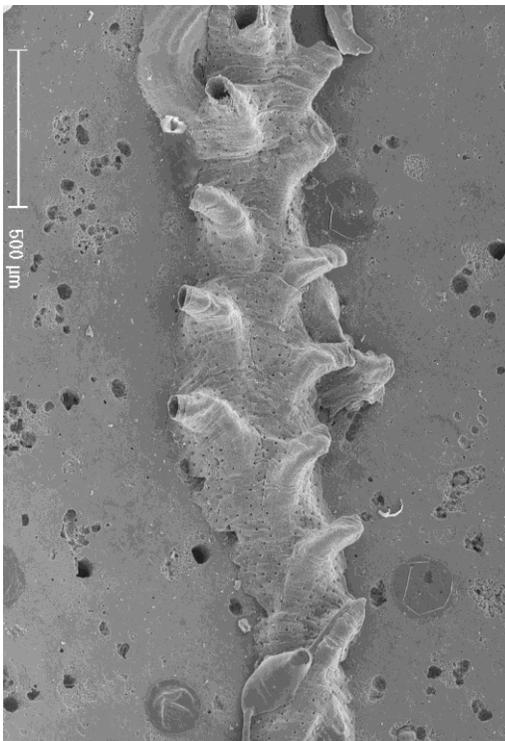
Occurrence:

Belgium: On the inner side of bivalve shells. There are colonies in the RBINS, fished on the Hinderbanken in the period 1904-1906. In May 2004 a colony was found on a shell valve of the Kwinte Bank and in June 2005 several colonies were found on shell valves of the Hinder Banks.

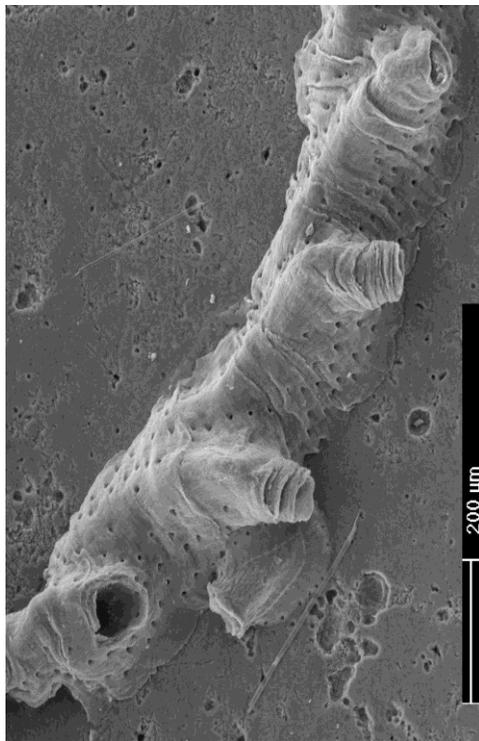
Stomatoporina incurvata: (JC)



In *Cerastoderma edule*, Kwintebank, 2004



biserial colony, Westhinderbank, 2005



detail, Kwintebank

Family Tubuliporidae

Genus Tubulipora

The shape of the gonozooid aperture is very useful for identification. Unfortunately, a gonozooid aperture is often absent, which does not allow identification to species level. Hayward & Ryland (1985) gives 7 species, of which 4 are reported in our area. Other species can be found in the English Channel and in the North Sea that can wash up on algae or plastic. Lacourt (1949) mentions a colony of *Tubulipora phalangea* Couch on a *Saccorhiza bulbosa* in Scheveningen and possibly 3 colonies on cork in Noordwijk (National Museum of Natural History in Leiden).

Tubulipora were collected from shells from the Kwintebank, which cannot be identified due to damage.

- 1 a) Autozooids in uniserial connate rows. 2
b) Autozooids not in connate series. Gonozooid aperture a tube opening upward.
..... 3
- 2 a) Gonozooid aperture usually on the distal side of an autozooid, with wide distal cap facing down or sideways. *Tubulipora liliacea* (p. 26)
b) Gonozooid aperture opening directly upward. *Tubulipora plumosa* (p. 25)
- 3 a) The colony forms short, thick and robust lobes, arranged symmetrically to give a flower-like appearance. Peristomes partially connate and short. Gonozooids inconspicuous, their opening is a short tube that opens immediately upwards, as wide as the zooid opening. *Tubulipora lobifera* (p. 28)
b) Colony delicate with long peristomes in alternating longitudinal rows, not in connate series. Gonozooid aperture broadly funnel shaped, folded opening upwards. *Tubulipora aperta* (p. 25)

***Tubulipora aperta* Harmer 1898**

Description: Colony adnate, autozooids not connate, in alternating radiating series. Gonozooid aperture forms a pleated funnel, twisted between two peristomes, which opens upwards.

Occurrence:

The Netherlands: One record on beached plastic (De Blauwe & de Ruijter, 2015)

Germany: record from the German North Sea (Zettler *et al.* 2018, pers. comm. B. Kind)



Tubulipora aperta, beached in the Netherlands (HD)

***Tubulipora plumosa* Thompson in Harmer, 1898**

Description: Colony adnate, occasionally with semi-erect lobes. Often 2 to 4 autozooids in radiating, connate series. Gonozooid aperture opening directly upward, the lip broadly flared.

Occurrence: On algae and shells. Recorded from the German North Sea (Zettler *et al.* 2018, pers. comm. B. Kind)

***Tubulipora liliacea* (Pallas, 1766)**

Description: Colony fragile calcified, translucent, light purple. Zooids like a pan flute in a row, grown together over their entire length. A free top is usually broken off. Peristome length varies. The longest, up to 2 mm high, are at the axis of the lobes and decrease in length towards the edge of the colony.

Gonozooid distal in the colony, densely perforated. Gonozooidal opening close to a zooid peristome, short, oval in section, as wide as a peristome with a wide distal cap, pointing downwards or laterally.

Tubulipora phalangea, which has not yet been reported from the area, has a similar gonozooidal opening, but it is half as wide as a peristome.

Occurrence: Often washes up on plastic, nylon nets and *Himantalia* buttons in Belgium and the Netherlands.

Belgium: Loppens (1906) found that this species was common on Belgian beaches on *Hydrallmania falcata*, *Bugulina* and old shells.

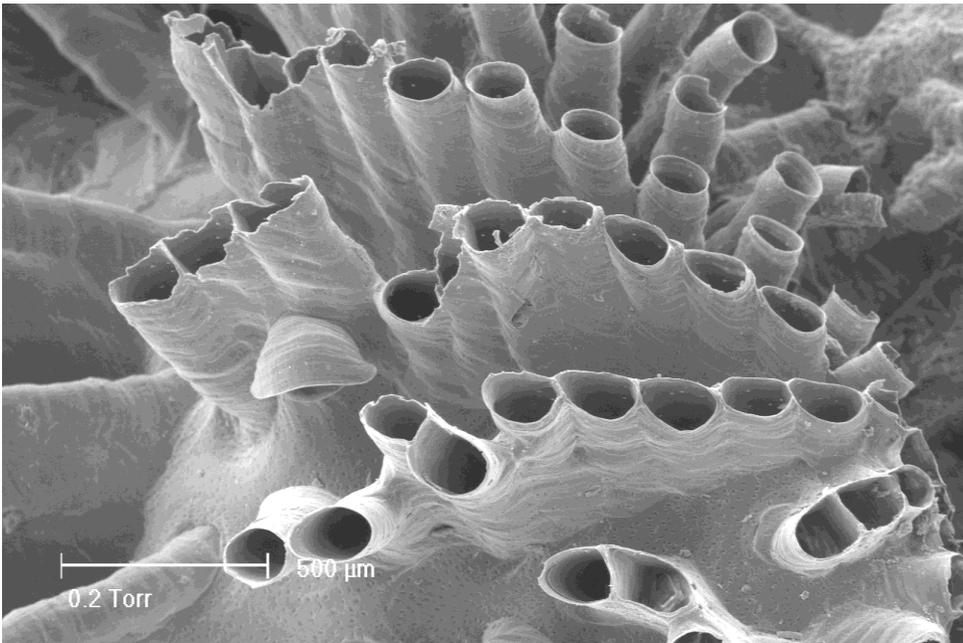
The Netherlands: Lacourt (1949) lists finds from Westkapelle to Den Helder. Heerebout (1970) lists two sites (washed up?): Katse Hoek and Breskens. Reports from the Netherlands are considered uncertain in Faasse & De Blauwe (2004) due to a lack of gonozooids.

Germany: record from the German North Sea (Zettler *et al.* 2018, pers. comm. B. Kind)

Tubulipora liliacea



from fishing net, Le Conquet (Bretagne), 2002 (RV)



Peristomes and gonozooid aperture (JC)

***Tubulipora lobifera* Hastings, 1963**

Description:

Colony completely adnate, firm, light purple, regular flower-shaped in outline by forming symmetrical lobes.

Lobes generally 2 to 2.5 cm wide, sometimes 4 cm wide. The lobes are up to 4 mm apart. Colony firm with a high profile, although the peristomes are rather short and often broken. At the colony edge, the colony quickly descends to the substrate. The edge consists of about four zooid generations in development.

Adnate parts of the zooids short, broad and convex, separated by grooves. Surface roughly stippled with transverse ribs and grooves. Peristomes grow together for half their length, narrowing distal part with rough rings, growing freely.

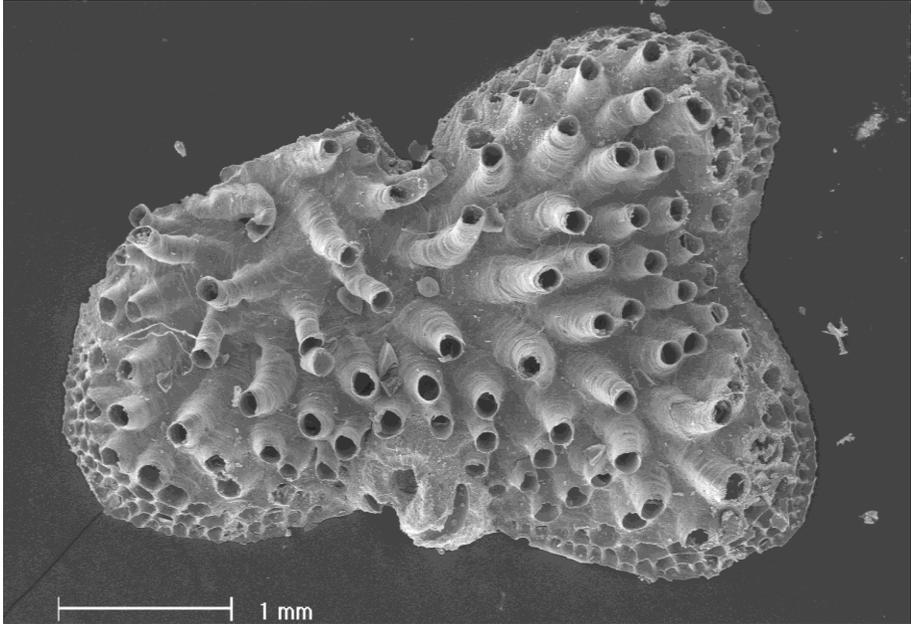
Peristomes usually shorter than 1 mm. Zooids per 3 or 5 in a row (distal to 8 zooids per row) facing the edge of the lobe. As the colony widens, the rows split into bundles of 3-4 zooids and two-row rows can form.

Gonozooid not conspicuously swollen, occupying most of the lobe width. Opening rather in the center of the gonozooid, short, partially against a peristome or between two zooids. Opening directed upwards, funnel-shaped with folded edge, wider than a peristome.

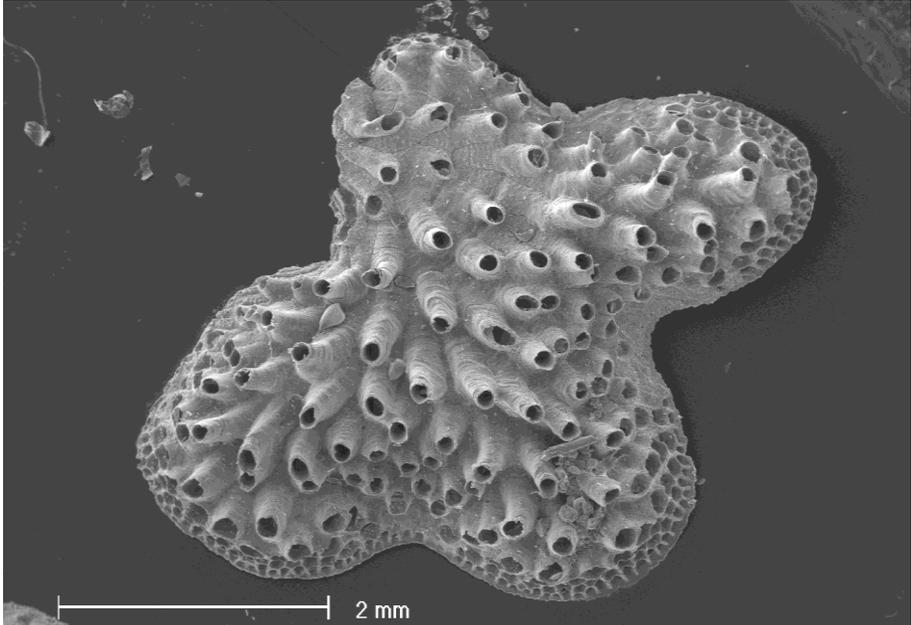
Occurrence:

Colonies that washed ashore on plastic in Belgium (Zeebrugge, 2000) and the Netherlands (Neeltje Jans, 1999) had no gonozooidal opening. Based on the colony shape, it is assumed that this is *T. lobifera*. De Ruijter (2015a and 2018a) reports washing up on plastic in the Netherlands.

Tubulipora lobifera:



On beached plastic, Zeebrugge, 2000 (JC)



On beached plastic, Zeebrugge, 2000 (JC)

Family Oncousoeciidae

Genus Oncousoecia

Colony encrusting, the densely pseudoporous and bulbous brood chamber roof not penetrated by autozooidal peristomes; oeciopore terminal subterminal, circular or transversely elliptical, a little smaller than an autozooidal aperture; oeciostome short, straight, not adnate to an autozooidal peristome.

***Oncousoecia dilatans* (Johnston, 1847)**

Formerly reported as *Eurystrotos compacta* (Norman, 1866) in Hayward & Ryland (1985) and De Blauwe (2009).

Description (after Taylor & Zaton, 2008): The colony forms a thin, flat, translucent white crust, shimmering to chalky. The growth margin of the colony is minimal. Autozooids elongate, frontal walls flat proximally, gently convex distally; pseudopores regularly spaced, small, teardrop-shaped, pointed distally. Apertures subcircular, 0.06–0.11 mm in diameter, distributed more or less quincuncially, not clustered or connate; preserved peristomes short to moderate in length; terminal diaphragms with scattered pseudopores occluding some apertures and buds at inactive growing edges.

Ancestrula with large protoecium, about 0.17 mm in diameter, a single row of tiny pseudopores around the perimeter; distal tube short, 0.09–0.15 mm long, straight or curved; one distal autozooid budded from ancestrula.

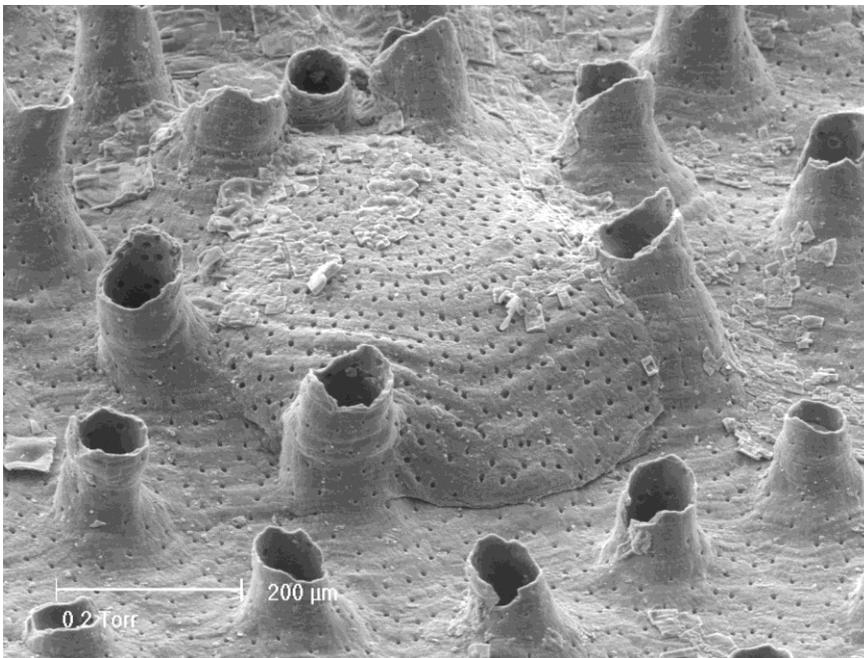
Gonozooids small with short, longitudinally ovoidal to rounded subtriangular brood chambers, 0.38–0.45 mm long by 0.30–0.46 mm wide, bulbous, margins indented by neighbouring autozooids but roof not pierced by peristomes; frontal wall densely pseudoporous, the pseudopores identical in shape to those of autozooids; oeciopore terminal or subterminal, slightly transversely elliptical, smaller than an autozooidal aperture, about 0.04–0.07 mm in diameter; oeciostome simple, short.

Occurrence:

In Belgium and The Netherlands on washed up plastic. A colony was collected off the Belgian west coast in 1899 and 2 specimens on *Chlamys* in 1905 (RBINS collection). On boulders near Cap Gris-Nez in June 1992 (Davoult *et al.* 1999).



Colony on beached plastic (HD)



Gonozooid with aperture, on beached plastic (JC)

Family Plagioeciidae

Genus Plagioecia

- 1 a) Older zooids closed by a diaphragm without a short tube on it.
..... *Plagioecia patina* (p. 32)
b) Older zooids closed by a diaphragm with a short tube on it.
..... *Plagioecia sarniensis* (p. 34)

***Plagioecia patina* (Lamarck 1816)**

Description: Forms a flat disc and is fully adhered or forms a cup that is adhered only centrally. The plate-shaped growth margin is always well developed. Often a number of daughter colonies form a composite colony. The cups are usually 4 to 7 mm in diameter, sometimes larger. Calcification white, shimmering in living colonies. Zooids radiating from the colony center to the periphery in alternating rows. Zooids largely hidden, sometimes with erect peristome, especially in deep cup-shaped colonies. Orifice oval or round.

Gonozooids often at the colony margin, always wider than long. Very swollen, densely covered with very small pores, completely enclosing peristomes up to their orifice. Gonozooid opening slender, directed upward or slightly curved proximally.

Occurrence:

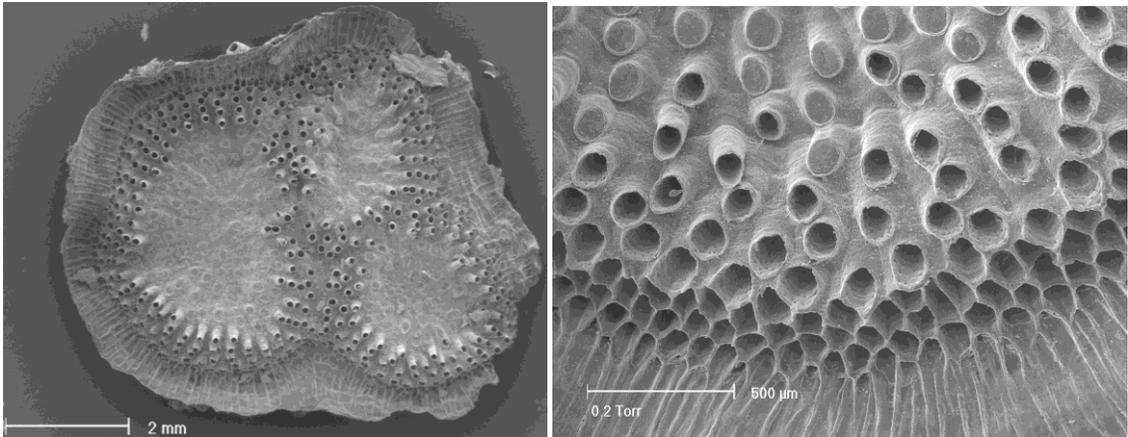
Belgium: About 10 specimens were collected between 1898 and 1910 on the Hinderbanken and 1 specimen in 1902 at “Spleet” (51°25 N 3°15 O). Often occurs on washed up objects. Four colonies were found on boulders and shells of the Hinderbanks. Living colonies occur on shipwrecks off the Belgian coast (Zintzen, 2007).

The Netherlands: Lacourt (1949) found colonies on cork in the Dutch natural history museums in Leiden and Amsterdam, collected in Scheveningen, Wassenaar, Katwijk, Noordwijk and Den Helder. Five colonies were found on Texel on rope washed ashore in February 2006 (de Ruijter, 2006), on nylon rope (de Ruijter, 2011) and on plastic (de Ruijter, 2012b, 2014b, 2015a, 2020). Collected in situ on the Cleaver Bank in 2002 (van Moorsel, 2003), near Westkapelle (Faasse et al., 2013) and on the shipwreck of the ‘Tubantia SS’ (UTM 487399 5742147) (Lengkeek et al. 2013). Sampled in 2015 on shipwreck 2801 (N55°12’46’’ E03°32’46’’) on the Doggersbank (Faasse *et al.*, 2016).

Plagioecia patina:



white colonies on the underside of a rock, Brittany, 2005 (HD)



composite colony, Pointe du Rozel (Brittany), 2002 (JC)

***Plagioecia sarniensis* (Norman, 1864)**

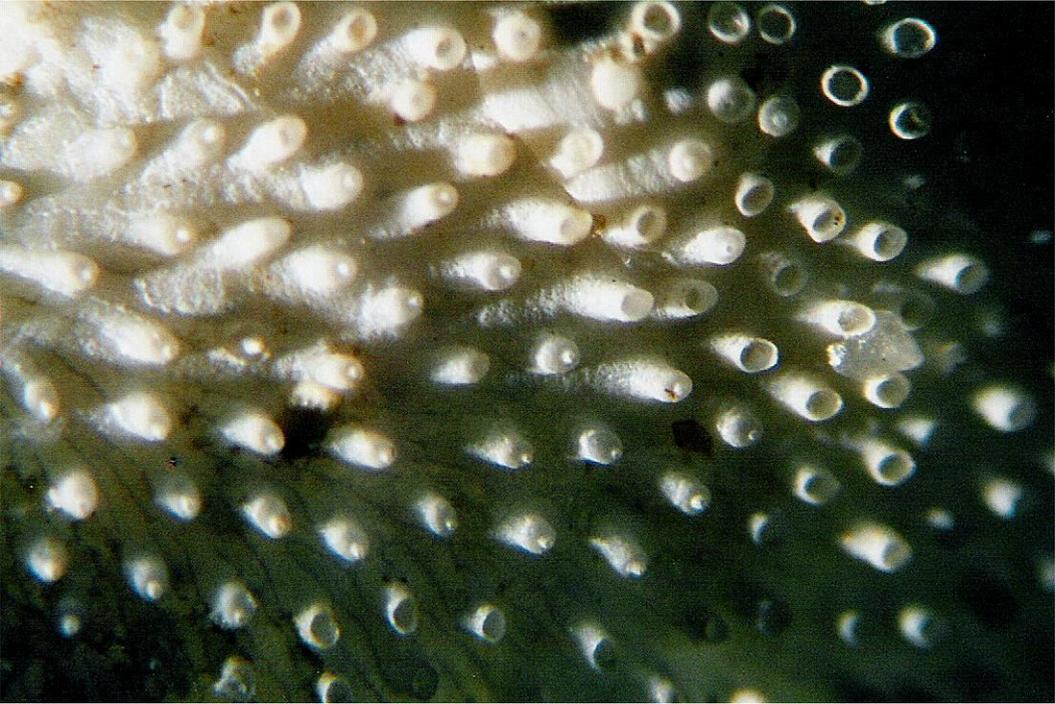
Description:

Colony fully attached, thin, flat, round or irregularly lobed with flat growth margin. Translucent white, often wider than 2 cm. Daughter colonies often present at the growth margin. Zooids in alternating rows radiating from the colony origin. Lying zooid parts flat, with inconspicuous border. Peristome length variable, often longer than 1 mm. The rim of their orifice is typically with two spikes. Peristomes weakly constricting and curved. Older zooids are sealed with a diaphragm with on top a short tube or miniature chimney.

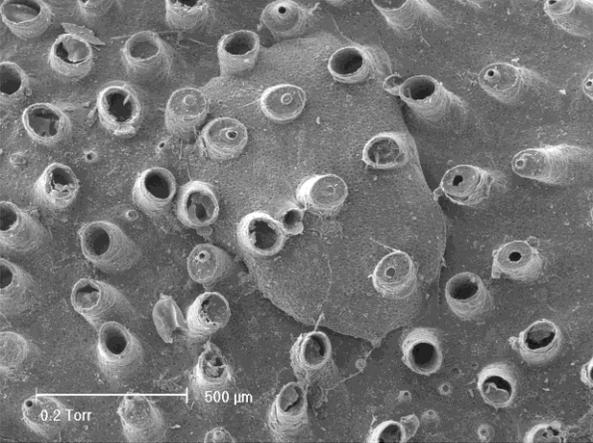
Gonozooids near the colony boundary, always wider than long and completely enclosing a number of peristomes. Opening distal, short, cylindrical, slightly curved proximally.

Occurrence: In 2000, a colony washed ashore in Zeebrugge, attached to plastic. De Ruijter (2014b) reports the washing up of a colony on plastic near Egmond aan Zee in 2013 and again in 2017 (de Ruijter 2018a).

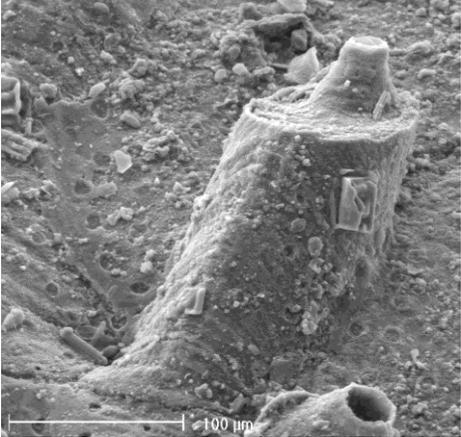
Plagioecia sarniensis:



On beached plastic (HD)



Gonozooid and aperture (JC)



peristomes closed by diaphragma en chimney (JC)

Genus Diplosolen

***Diplosolen obelium* (Johnston, 1838)**

Description: Forms a thin flat crust, translucent to chalky white, often lobed and wider than 1 cm. The plate-shaped growth margin is wide.

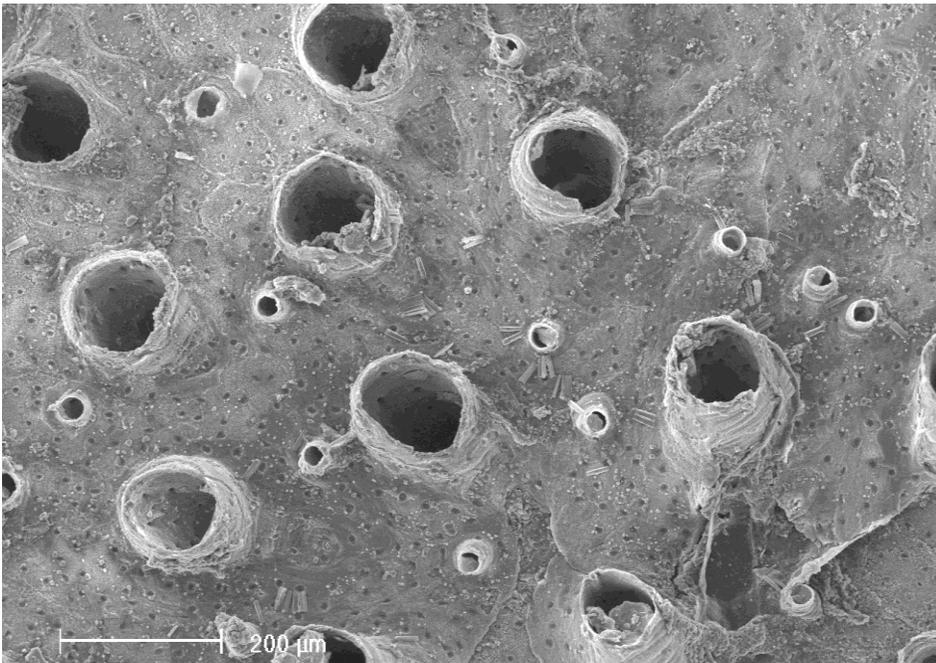
Zooids in regular alternating rows. Lying zooid parts rather flat. Peristome slender, often longer than 1 mm. Each zooid carries a dwarf zooid. Zoïden in regelmatige alternerende rijen. The dwarf zooid sits on the proximal part of the zooid and has a very narrow peristome. The dwarf zooid has one tentacle that wipes the surface. Gonozooids often large, their opening short cylindrical and inconspicuous, distal end partially recurved.

Occurrence: Does not often wash up on plastic in Belgium and the Netherlands (de Ruijter 2015a).

Diplosolen obelium:



Colony from fishing nets in Le Conquet (Bretagne), 2002 (HD)



Zooids and dwarf zooids (JC)

Genus Desmeplagioecia

***Desmeplagioecia amphorae* Harmelin, 1974**

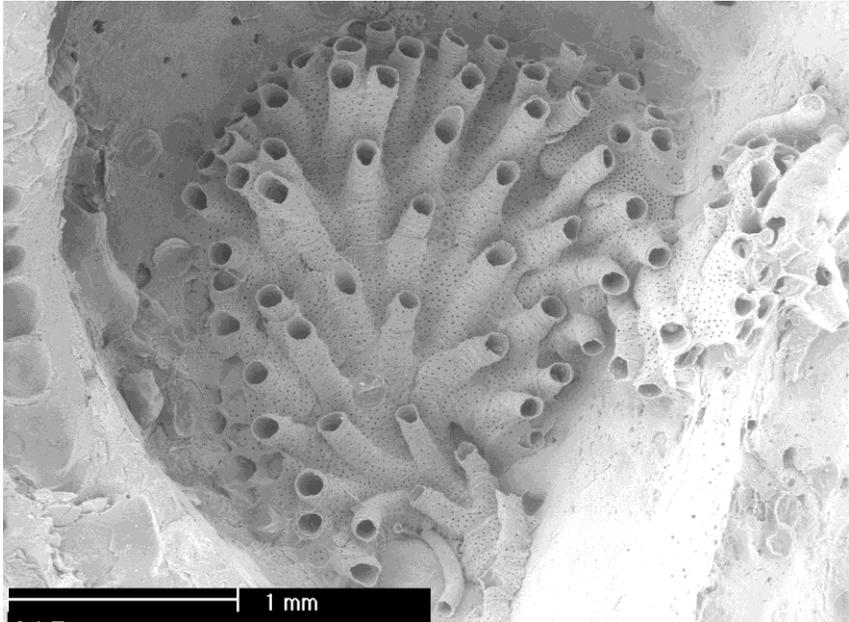
Description: Forms a lobed crust, multiple lobes can give the colony a more rounded shape. The flat colony is quite thick. There is no noteworthy plate-shaped growth margin, but a border of zooid buds. At the edge, groups of 2 or 4 zooids grow together at their base. The flat zooid parts are not well distinguishable. As a result, the erected peristomes appear to originate on a flat plate. The peristomes grow together a little but separate at the end.

Gonozooids distally in the colony between three zooid groups, but no zooids grow through them. Gonozooidal opening distal to the gonozooid, with a circular opening on a short tube that faces upward. The gonozooid opening has approximately the same diameter as a zooid orifice.

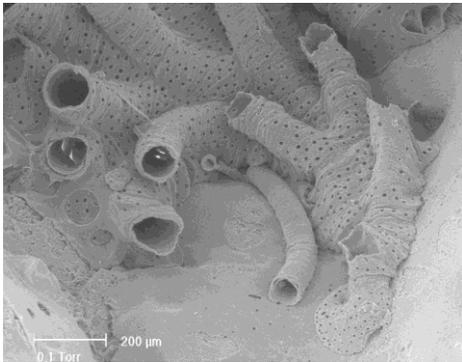
Ancestrula with a basal disc and a peristome that is curved to the left or right.

Occurrence: A few colonies were found in shell valves on the Hinderbanks in 2005.

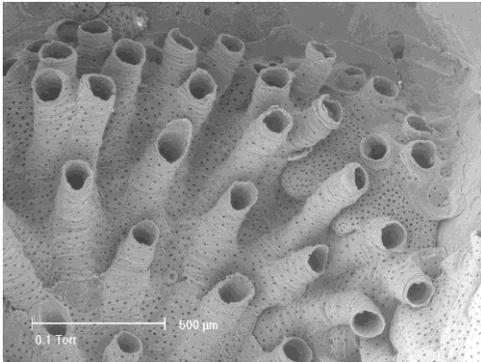
Desmeplagioecia amphorae:



Colony, Westhinderbank 2005 (JC)



ancestrular region (JC)



groups of zooids and gonozooid aperture (JC)

Family Annectocymidae

Genus Annectocyma

***Annectocyma major* (Johnston, 1847)**

Description: Forms a fully attached branching network of slender lobes. Rarely, erect cylindrical colony parts are formed with zooids all around. Zooids in two to five rows and widening to 8 or more rows near a branch. Peristomes almost perpendicular to the frontal plane. Orifice round and quite large (0.15-0.2 mm in diameter).

Gonozooid variable in shape and not very conspicuous because of the same perforation as autozooids. The gonozooidal opening is a slender tube that bends horizontally and is compressed at the end into a slit.

Two colony parts usually arise from the ancestrula: a distal part and a lateral part that grows in the other direction. Both colony parts start with one zooid and then widen to three rows of zooids.

Occurrence: A colony was found on a clam shell fished from the Hinderbanks in 2005.

Annectocyma major:



on beached plastic and on the left a young colony *Disporella hispida*, Brittany (RV)



ancestrular region of the same colony (RV)



part of colony with gonozooid aperture, Brittany (RV)

Genus Entalophoroecia

***Entalophoroecia deflexa* (Couch, 1842)**

Description:

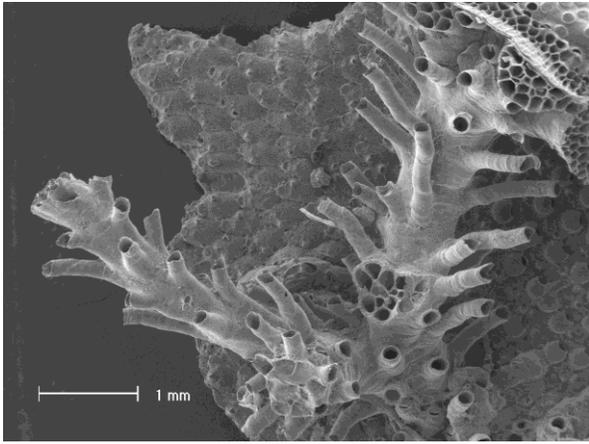
Very similar to *Annectocyma major* but often forms erect colony parts. Forms an attached network of very slender lobes that branch dichotomously at regular intervals. Zooids start in a single row, later two rows at each branch, widening to 6-8 zooids, usually with gonozooids at each branch end. Upright branches club-shaped, up to 2 mm in diameter and 1 cm in height, peristomes alternating in spiral whorls, under 60° with the branch axis, opening all around.

The ancestrula consists of a disk surrounded by a ring of pseudopores and a straight tube at an angle of 60 to 90 degrees to the substrate. From the first zooid formed after the ancestrula two zooids arise which form the first branch. These two branches grow apart at an angle of 180°. The following branches diverge at 90°. The branches end broadly with often a prominent gonozooid after 4 or 5 branches after the ancestrula.

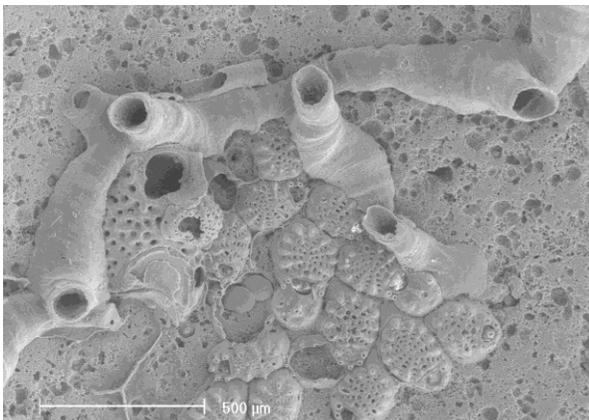
Peristomes perpendicular to the frontal surface, alternating, non-converging at their base. Gonozooids can occur anywhere in the colony, very convex and teardrop-shaped, densely covered with pseudopores. Few autozooidal peristomes grow through the gonozooid. In erect colony parts, gonozooids occupy the entire distal widening and many peristomes grow through it.

Gonozooidal opening in the center or more distal, close to a peristome base but not attached to it, slender cylindrical and straight.

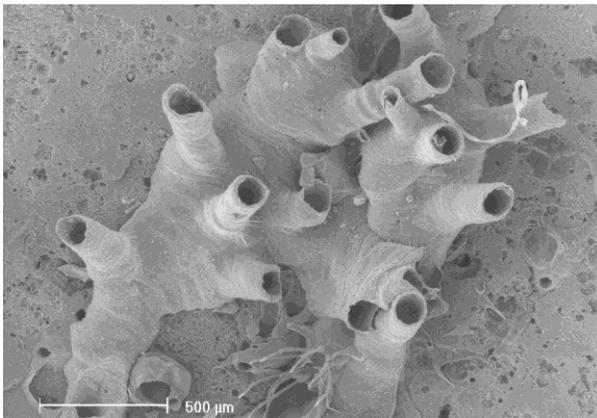
Occurrence: Does not often wash up on plastic in Belgium (De Blauwe, 2003). Two colonies were found in June 2005 on shells from the Hinderbanks. On a fossil bivalve from the Netherlands (de Ruijter 2013c). De Ruijter 2014b, 2015b, 2019 reports the washing up of a colony on plastic.



Two erect colony parts, on beached plastic, Wenduine, 2001 (JC)



ancestrular region, Westhinderbank, 2005 (JC)



branches with gonozooids an their aperture, Westhinderbank, 2005 (JC)

Family Lichenoporidae

- 1 a) Basal plate smooth, no open tubes extending to the margin. Gonozooid aperture a simple tube. *Disporella hispida* (p. 44)
- b) Basal plate surrounding the colony has open tubes up to the rim. Gonozooid aperture is funnel-shaped. *Patinella verrucaria* (p. 46)

Genus *Disporella*

***Disporella hispida* (Fleming, 1828)**

Description:

Colony flat, cup-shaped with broad basal plate beyond the growth margin, sometimes dome-shaped, with less distinct basal plate at the growth margin. Colony usually 2 to 15 mm in diameter. Composite colonies have multiple centers from which zooid rows radiate. Zooids initially in radiating rows, with each zooid sometimes connected to its predecessor and to the next zooid by struts. The peristomes themselves have not grown together. Most of the peristomes grow completely free. Later the row pattern is lost and the zooids are arranged alternately or irregularly. The free part of the peristomes varies in length and decreases towards the edge of the colony. Proximal lip like a slender spine, often with one or more additional spines on each side.

The holes, created by the struts in the spaces between the zooids, initially have the same diameter as the peristomes, they become smaller due to progressive calcification.

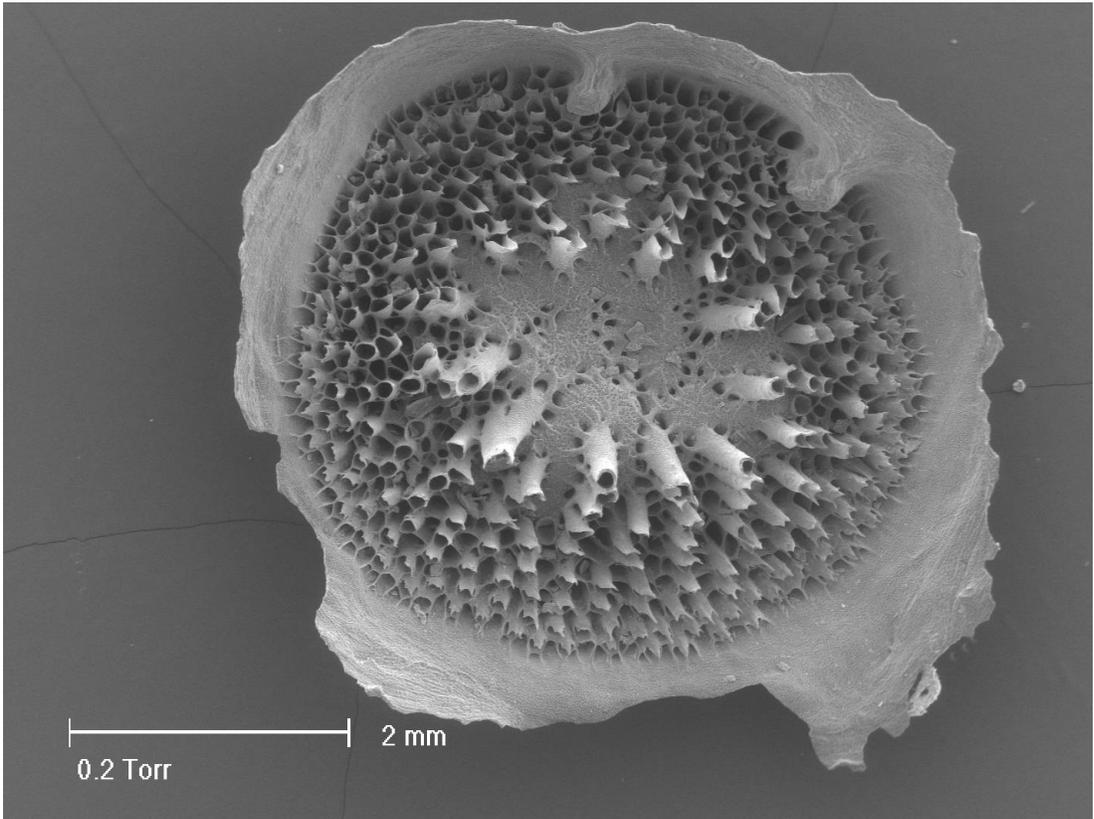
Gonozooids as lobes in central parts of the colony or between the rows of zooids, recognizable as a smooth calcified plate with tiny holes. Opening a very short tube.

Occurrence:

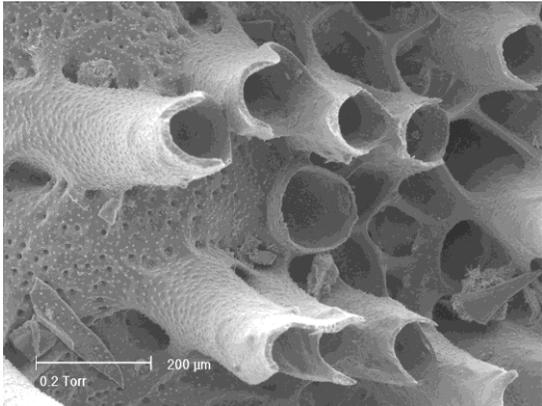
Belgium: On stones and shells in the RBINS collection. Dead colonies were found on boulders between the Hinderbanks in June 2005. A colony was found on the wreck of the Birkenfels in 2002 (Zintzen, 2007). Often present on washed up plastic.

The Netherlands: washed up on cork in Scheveningen and Noordwijk (Lacourt, 1949), more recently on cork (de Ruijter, 2010), nylon rope (de Ruijter, 2011) and on plastic (de Ruijter, 2012b, 2013a, 2015a, 2015b, 2020). *Disporella hispida* has been collected on the Cleaver Bank (van Moorsel, 2003).

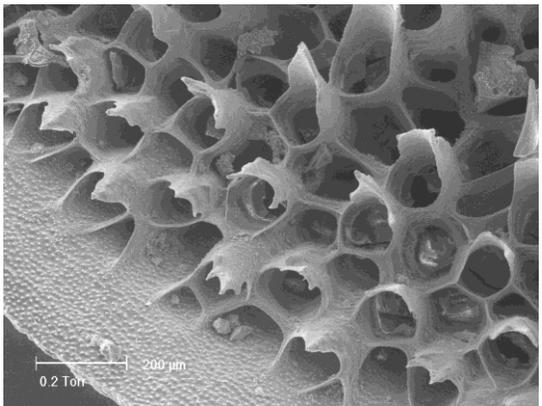
Germany: record from the German North Sea (Zettler *et al.* 2018, pers. comm. B. Kind)



On beached plastic, Wenduine, 2001 (JC)



Gonozooid aperture in the centre



colony edge fishing net Le Conquet (France), 2002 (JC)

Genus Patinella

***Patinella verrucaria* (Linnaeus, 1758)**

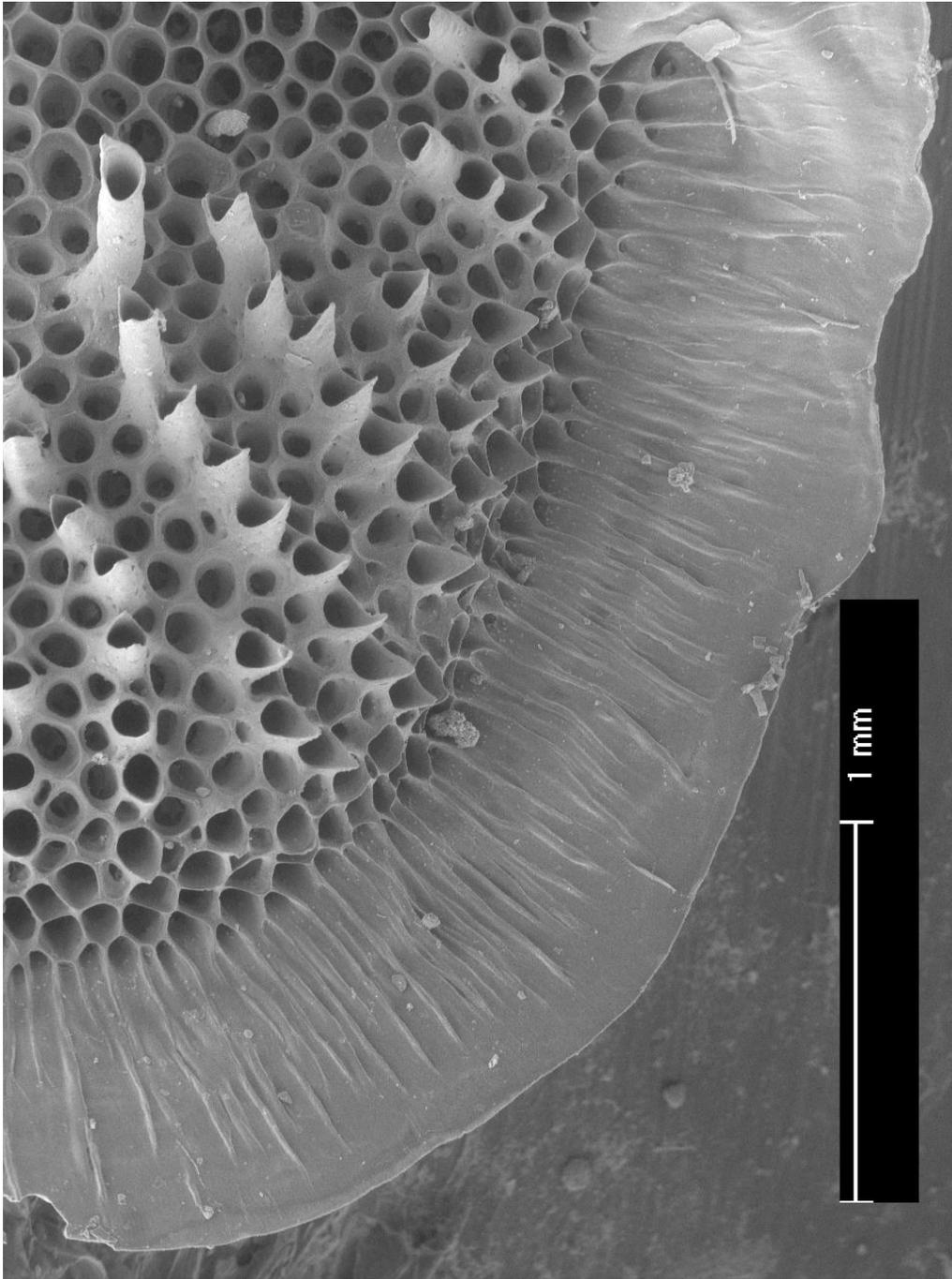
Description:

Quite similar to *Disporella hispida*, but the gonozoid aperture is funnel-shaped and the basal plate surrounding the colony has open tubes up to the rim.

Occurrence:

From the Netherlands there is a report of *Patinella verrucaria* on washed-up hydroids between Zandvoort and IJmuiden and on the leg of an Augustine crab *Lithodes maja* at Den Helder (Lacourt, 1949). This material was probably brought in by fishermen from the northern North Sea (Adema, 1991).

Patinella verrucaria was collected on washed up plastic in 2011 and 2013 near Egmond aan Zee (de Ruijter, 2012a and 2013). Both colonies were identified by present author.



Patinella spec., on plastic, harbor of St-Malo (France), april 2005 (JC)

GLOSSARY OF SPECIAL TERMS

Ancestrula: first zooid of a colony formed by metamorphosis of a free-swimming larva.

Autozoïde: nourishing zooid with tentacles.

Basal: the side opposite to the frontal side (of the autozooid)

Distal: toward the growth end of the colony, away from the ancestrula

Frontal: the top surface, which contains the opening.

Gonozooid: zooid modified as a brood chamber.

Heterozooid: individual that is not a feeding zooid.

Internode: segment of a jointed colony.

Joint: not calcified, flexible connection between two internodes or two kenozooids.

Kenozooid: individual that is not a feeding zooid (stolonial kenozooid, spinous kenozooid, without either orifice or muscles).

Lateral: the side walls.

Peristome: in Cyclostomatida: the erect portion of an autozooid.

Polypide: tissue and organs in the autozooid (tentacles, tentacle sheath, alimentary canal, muscles and nerve ganglion).

Proximal: toward the origin of the colony.

Rhizoids: root-like structures that attach established colonies to the substrate.

Stolon: root-like connection between zooids, attached to the substrate or not.

Zooid: single bryozoan individual.

Zoecium: protective wall of a zooid, membranous or calcified.

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REGISTER

<i>Annectocyma major</i>	40-41
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