

CONSEIL INTERNATIONAL POUR L'EXPLORATION DE LA MER

Zooplankton

Sheet 140-142

To replace sheet No. 8

PTEROPODA THECOSOMATA

(By S. VAN DER SPOEL)

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Pteropoda Thecosomata in the North Atlantic¹

Plankton samples frequently include animals which have lost all calcareous parts by the action of preservative²; for this reason a key is given for material with and for material without shells.

1. Shell absent (action of preservative).....	28
Shell present, of calcareous material.....	2
Pseudoconcha present, of transparent cartilagenous material.....	<i>Cymbulia peroni</i> (29)
Shell normally absent.....	<i>Desmopterus papilio</i> (30)

Specimens with shells

2. Sinistral shell.....	3
Shell not coiled.....	10
3. Shell with a rostrum along which runs a columellar membrane.....	24
Shell without rostrum, animal without proboscis, mouth and wings at the same level.....	4
4. Spire of the shell depressed, last whorl much larger than the preceding ones.....	5
Spire of shell not depressed, whorls growing regularly.....	9
5. Outer border of shell aperture with a lip-shaped protrusion supported by a rib, shell planorboid.....	<i>Limacina inflata</i> (4)
Shell not planorboid, aperture border not protruding.....	6
6. Shell of chestnut colour, umbilicus very narrow.....	<i>L. helicoides</i> (3)
Shell not chestnut coloured, but hyaline or white.....	7
7. Shell broader than high.....	8
Shell higher than broad.....	<i>L. retroversa</i> (2)
8. Shell smooth except for some spiral striae around the very narrow umbilicus.....	<i>L. lesueurii</i> (5)
Umbilicus wide, shell with transversal striae.....	<i>L. helicina</i> (1)
9. Shell higher than wide.....	<i>L. bulimoides</i> (6)
Shell as high as wide (measured from the umbilicus).....	<i>L. trochiformis</i> (7)
10. Shell bottle shaped, aperture bean shaped.....	<i>Cuvierina columnella</i> (15)
Shell not bottle shaped.....	11
11. Shell aperture rounded, cross section through shell, at all levels, rounded.....	12
Shell aperture not so, cross section through shell, at most levels, not rounded.....	15
12. Shell with prominent transversal rings.....	<i>Hyalocylis striata</i> (11)
Shell without prominent transversal rings.....	13
13. Shell with longitudinal groove over dorsal side.....	<i>Styliola subula</i> (10)
Shell without longitudinal groove.....	14
14. Shell straight over its entire length.....	<i>Creseis acicula</i> (8)
Shell curved in its caudal part.....	<i>C. virgula</i> (9)
15. Maximal shell width at the level of the aperture, dorsal shell lip not curved.....	16
Maximal width of the shell not at the level of the aperture.....	18
16. Shell with distinctly protruding dorsal and lateral ribs.....	<i>Clio cuspidata</i> (13)
Shell not with such ribs.....	17
17. Shell not curved dorsad in its caudal part.....	<i>C. pyramidata</i> (12)
Shell curved dorsad in its caudal part.....	<i>C. polita</i> (14)
18. Dorsal shell lip thickened, not elongated caudad.....	19
Dorsal shell lip not thickened, aperture slits elongated far caudad.....	20
19. Shell dorso-ventrally flattened, with long lateral spines.....	<i>Diacria trispinosa</i> (16)
Shell minute, rounded, without long lateral spines.....	<i>D. quadridentata</i> (17)
20. Greatest shell width cranial to lateral spines.....	<i>Cavolinia gibbosa</i> (21)
Greatest shell width between lateral spines.....	21
21. Embryonic shell and caudal spine absent in adults.....	<i>C. longirostris</i> (19)
Caudal spine at least partly present in adults.....	22

¹ The whole North Atlantic, north of 35° N latitude.

² It is advisable to preserve Thecosomata in alcohol 70 %.

22. Greatest shell width at about the middle of the shell	<i>C. inflexa</i> (22)
Greatest shell width distinctly below the middle of the shell	23
23. Caudal spine close to embryonic shell only slightly curved dorsad, upper shell lip slightly curved ventrad	<i>C. tridentata</i> (18)
Caudal spine curved dorsad over its entire length, dorsal shell lip strongly curved	<i>C. uncinata</i> (20)
24. Aperture of shell with one prolongation (the rostrum)	25
Aperture of shell with more than one prolongation	26
25. Shell with distinct spiral striation	<i>Peraclis valdiviae</i> (27)
Shell without spiral striation, but with reticulated sculpture	<i>P. reticulata</i> (23)
26. Two large and one small aperture spine	<i>P. bispinosa</i> (24)
Three distinct prolongations at aperture border	27
27. Apex not projecting above highest spine, shell aperture not rounded	<i>P. triacantha</i> (26)
Apex projecting slightly, aperture rounded	<i>P. moluccensis</i> (25)

Specimens without shells

28. Shell normally absent, wings fused to a swimming plate with two long tentacles directed caudad	<i>Desmopterus papilio</i> (30)
Shell absent by artificial action (of collecting or preserving), no long wing tentacles	29
29. Wings fused to one large swimming plate, body not coiled	<i>Cymbulia peroni</i> (29)
Wings fused to a swimming plate, body coiled sinistral	53
Wing not fused to a swimming disc	30
30. Body coiled ¹	31
Body straight ²	39
31. Wings thick and fleshy dark purple in colour	<i>L. helicoides</i> (3)
Wings not fleshy	32
32. Body shows a high spire	33
Body shows a depressed spire	35
33. Wing tentacles present	36
Wing tentacles absent	34
34. Whorls in loose contact, body whorl as broad as the preceding ones together	<i>L. bulimoides</i> (6)
Whorls pressed together, body whorl distinctly broader than the preceding ones together	<i>L. trochiformis</i> (7)
35. Body coiled planorboid, apical whorl free from the other whorls	<i>L. inflata</i> (4)
Body not planorboid	36
36. Large opening left between the whorls in the umbilical area	<i>L. helicina</i> (1)
No such opening	37
37. First whorls protruding as an open spiral	<i>L. r. balea</i> (2b)
First whorls in close contact	38
38. Wing tentacles on the anterior wing border absent	<i>L. lesueurii</i> (5)
Wing tentacles on the anterior wing border present	<i>L. r. retroversa</i> (2a)
39. The bands of cuboid cells in the mantle gland connects in the upper corners and sometimes a 4th band of cuboid cells is found ³	40
No clearly connecting bands of cuboid cells	42
40. Soft parts minute, ventral side strongly vaulted	<i>D. quadridentata</i> (17)
Soft parts not so small, ventral side flattened	41
41. Mantle appendages situated near band III, posterior footlobe smaller than the wings	<i>C. cuspidata</i> (13)
Mantle appendages situated near band I & II, posterior footlobe of same size as the wings	<i>D. trispinosa</i> (16)
42. In the mantle gland less than 4 distinct zones, mantle border with balancer	43
In the mantle gland more than 3 distinct cell-zones	46
43. Wings with tentacule	44
Wings without tentacule	45
44. Columellar muscle projects free over a considerable distance (more than half the length of the visceral nucleus) under the body <i>Cr. acicula</i> (8)	
Columellar muscle protrudes only slightly below the visceral nucleus	<i>Cr. virgula</i> (9)
45. Wings usually largely expanded, with translucent patch in the border, balancer small, mantle gland covers about half the visceral nucleus	<i>H. striata</i> (11)
Wings usually more contracted, not transparent, balancer well developed, mantle gland covers less than half of the visceral nucleus <i>S. subula</i> (10)	

¹ all *Limacina* species are studied from the oral side.

² all Cavoliniidae are studied from the ventral side.

³ Usually a zone of brown jigsaw-puzzle cells (A), a zone of white cuboid cells (I), another brown zone (B), another white zone (II), a brown (C) and another white zone (III) are found from anterior to posterior in the mantle gland.



Figure 1-17. Shells of Thecosomatous molluscs. 1. *Limacina h.* forma *helicina*; 2a. *L. r.* forma *retroversa*; 2b. *L. r.* forma *balea*; 3. *L. helicoides*; 4. *L. inflata*; 5. *L. lesueurii*; 6. *L. bulimoides*; 7. *L. trochiformis*; 8a. *Creseis a.* forma *acicula*; 8b. *C. a.* forma *clava*; 9a. *C. v.* forma *virgula*; 9b. *C. v.* forma *conica*; 10. *Styliola subula*; 11. *Hyalocylis striata*; 12a. *Clio p.* forma *pyramidata*; 12b. *C. p.* forma *lanceolata*; 13a. *C. cuspidata* from ventral; 13b. The same from the left; 14a. *C. polita* from ventral; 14b. The same from the left; 15. *Cuvierina columnella* forma *atlantica*; 16a. *Diacria t.* forma *trispinosa*; 16b. *D. t.* forma *major*; 17a. *D. q.* *quadridentata* from the left; 17b. The same from dorsal.

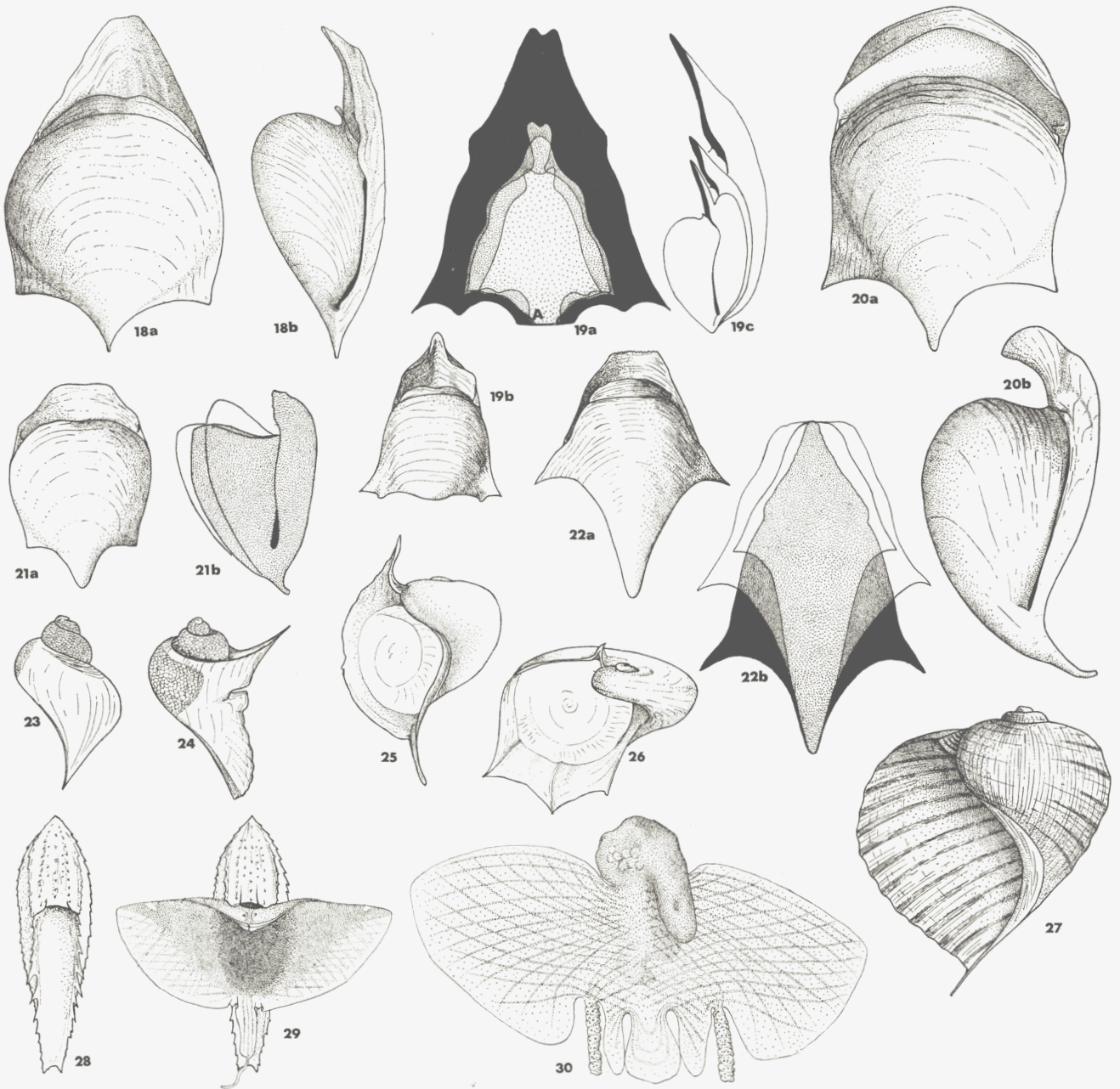
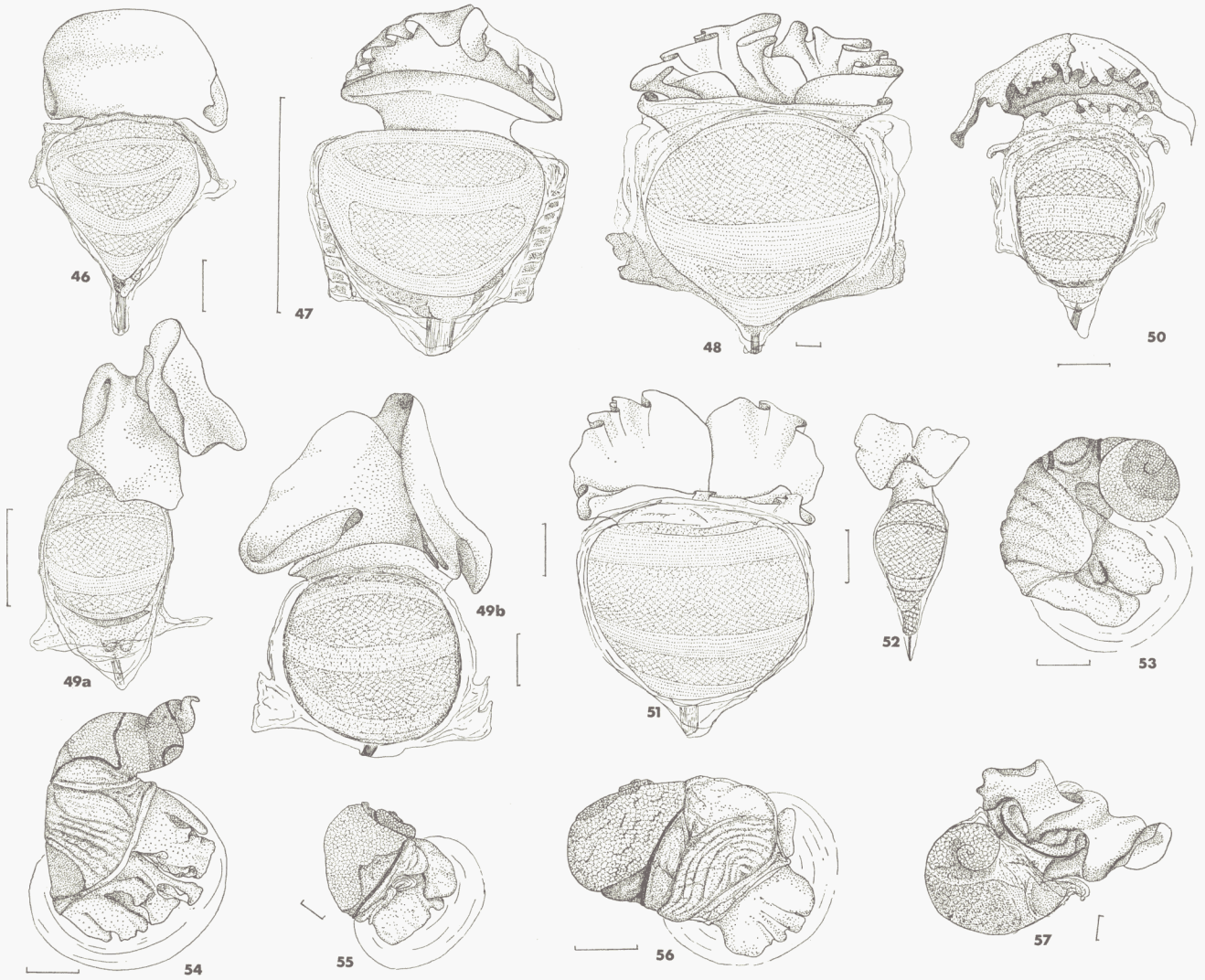


Figure 18–30. Shells of Thecosomatous molluscs (contd.). 18a. *Cavolinia t.* forma *tridentata* from ventral; 18b. The same from the left; 19a. *C. longirostris* outlines (from ventral) in order of decreasing size, of forma *limbata*, *longirostris*, *stangulata* and *angulosa*; 19b. *C. l.* forma *limbata*; 19c. *C. longirostris* outlines (from the left) of forma *limbata*, *longirostris* and *angulosa* as in 19a; 20a. *C. u.* forma *uncinata* from ventral; 20b. The same from the left; 21a. *C. g.* forma *gibbosa*; 21b. *C. gibbosa* outlines (from the left) in order of decreasing breadth of forma *gibbosa*, *flava* and *plana*; 22a. *C. i.* forma *imitans*; 22b. *C. inflexa* outlines (from ventral) of forma *inflexa*, *imitans* and forma *labiata*; 23. *Peraclis reticulata*; 24. *P. bispinosa*; 25. *P. moluccensis*; 26. *P. triacantha*; 27. *P. valdiviae* (after TESCH); 28. *Cymbulia peroni*, pseudoconcha; 29. The same with animal; 30. *Desmopterus papilio* (soft parts only).



Figure 31–45. Soft parts of Thecosomatous molluscs (the scale is 1.66 mm). 31a. *Limacina h. forma helicina* from apical; 31b. The same from oral; 32a. *L. r. forma retroversa*; 32b. *L. r. forma balea*; 33. *L. helicoides*; 34. *L. inflata*; 35. *L. lesueurii*; 36. *L. bulimoides*; 37. *L. trochiformis*; 38. *Creseis a. forma acicula*; 39a. *C. v. forma virgula*; 39b. *C. v. forma conica*; 40. *Styliola subula*; 41. *Hyalocylis striata*, with detail of expanded wing; 42a. *Clio p. forma pyramidata*; 42b. *C. p. forma lanceolata*; 43. *C. cuspidata*; 44. *C. polita*; 45a. *Cuvierina columnella forma atlantica* ♀; 45b. The same, cranial part of ♂; 45c. The same in early stage.



Figures 46–57. Soft parts of Thecosomatous molluscs, (contd.) (the scale is 1.66 mm). 46. *Diacria t.* forma *trispinosa*; 47. *D. q.* forma *quadridentata*; 48. *Cavolinia t.* forma *tridentata*; 49a. *C. l.* forma *longirostris*; 49b. *C. l.* forma *limbata*; 50. *C. u.* forma *uncinata*; 51. *C. g.* forma *gibbosa*; 52. *C. i.* forma *inflexa*; 53. *Peraclis reticulata*; 54. *P. bispinosa*; 55. *P. moluccensis*; 56. *P. triacantha*; 57. *P. valdiviae* (after TESCH). Illustrations by the author.

46. Body slender	47
Body not slender	48
47. Greatest width below the middle, mantle gland partly covers visceral nucleus	<i>C. columnella</i> (15)
Greatest width at, or above the middle, mantle covers nearly the whole visceral nucleus	<i>C. inflexa</i> (22)
48. Posterior footlobe without gland patches or tubercles	49
Posterior footlobe tuberculated and with gland patches	<i>C. polita</i> (14)
49. Zone III is much wider than zone C, mantle gland triangular in shape	<i>C. pyramidata</i> (12)
Zone III is not so broad	50
50. Ventral side vaulted, body width and thickness about equal	<i>Cav. gibbosa</i> (21)
Body not so thick	51
51. Greatest width of the mantle appendages at caudal body pole, mantle gland does not project caudad from the appendages	<i>Cav. longirostris</i> (19)
Mantle appendages developed less caudad	52
52. Three zones of cuboid cells visible and zone A also visible from the ventral side, mantle gland oval in shape	<i>Cav. uncinata</i> (20)
Only two zones of cuboid cells clearly seen in ventral view, mantle gland rounded	<i>Cav. tridentata</i> (18)
53. Operculum with radiating striae on the whorls, body spire depressed ¹	54
Operculum without radiating striae, body spire high	56
54. Striae on operculum not found on last whorl	<i>P. valdiviae</i> (27)
Striae on operculum found on last whorl	55
55. Mantle complex large, the whorl preceding the body whorl in diameter less than $\frac{1}{5}$ of the latter	<i>P. triacantha</i> (26)
Mantle complex small, the whorl preceding the body whorl has a diameter of about $\frac{1}{3}$ of the latter	<i>P. moluccensis</i> (25)
56. Intestine tract visible in the body whorl as well as in the preceding ones	<i>P. bispinosa</i> (24)
Intestine tract only visible in the body whorl	<i>P. reticulata</i> (23)

Limacina Bosc, 1817

Editorial Note: The names *Limacina* Bosc, 1817 and *Spiratella* Blainville, 1817 are both in frequent use. Priority therefore depends on the date of publication. This has not been clearly established and both were issued in December 1817. LAMARCK's description of *Limacina* dated 1824 has no priority. The name *Limacina* is used here pending any more definite information concerning the date as this name is based on a better description and is at present probably in more general use. *J. H. F.* 13 March 1972.

Sinistral shell, without rostrum, operculum usually lost in adults, sculpture only represented by spiral or transversal striae or absent. The calcareous shell is hyaline, whitish or brown.

1. *L. helicina* (Phipps, 1774) forma *helicina* (Phipps, 1774) (Fig. 1, 31a–b). Shell with 5–6 whorls, spire rather high, aperture higher than wide, umbilicus wide with a keel, transversal striation present, suture distinct. Wing tentacles present. Shell height up to 6 mm, diam. up to 8 mm.
- 2a. *L. retroversa* (Flemming, 1823) forma *retroversa* (Flemming, 1823) (Fig. 2a, 32a). Shell with 5 whorls, last whorl very large, general shape blunt, fine spiral striation present, suture clear, aperture irregularly rounded, umbilicus narrow but deep. Wing protrusion present. Shell height up to 2.5 mm, diam. 3 mm.
- 2b. *L. retroversa* (Flemming, 1823) forma *balea* Möller, 1841 (Fig. 2b, 32b). Shell with 7 whorls, last whorl not so large, general shape more slender, coarse spiral striation present, suture clear, aperture not rounded, oblique, umbilicus narrow but deep. Wing tentacles present. Shell height 7 mm, diam. 2.4 mm.
3. *L. helicoides* Jeffreys, 1877 (Fig. 3, 33). Depressed shell with 3–4 rapidly increasing whorls, of chestnut-brown colour, spiral lines of punctation on embryonic- and first whorl, umbilicus narrow, suture not deep but distinct. Soft parts dark purple, wings and footlobes thick and fleshy fused into a swimming plate like structure, mouth not proboscis-like. Shell height up to 11 mm, diam. 15 mm.
4. *L. inflata* (d'Orbigny, 1836) (Fig. 4, 34). Shell with 3 whorls coiled in one level, border of the heart-shaped aperture with a tooth supported by a rib, umbilicus and suture deep and distinct. Shell diam. up to 1.5 mm.
5. *L. lesueurii* (d'Orbigny, 1836) (Fig. 5, 35). Shell with 4.5 whorls, transparent, flatly coiled, broader than high, inner aperture border straight, umbilicus narrow surrounded by faint striation, suture well marked, wing tentacles present. Shell height up to 0.8 mm, width up to 1.3 mm.
6. *L. bulimoides* (d'Orbigny, 1836) (Fig. 6, 36). Shell with 6 whorls, transparent, high conical, with regularly increasing whorls, umbilicus small, suture clear, wing tentacle absent. Shell height up to 2 mm, diam. up to 1.4 mm.
7. *L. trochiformis* (d'Orbigny, 1836) (Fig. 7, 37). Shell with 5 rapidly increasing whorls, white-transparent, umbilicus small but deep, suture clear, aperture relatively small, interrupted spiral lines only on last whorl, wing protrusion absent. Shell height up to 1 mm with an average apical angle of 84°.

¹ all *Peraclis* species are studied from the dorsal side.

Creseis Rang, 1828

Straight shell, with circular cross section, without sculpture, animal long drawn with small mantle gland, wing tentacles present.

- 8a. *C. acicula* (Rang, 1828) forma *acicula* (Rang, 1828) (Fig. 8a, 38). Shell needle-like with rounded aperture, surface smooth, caudal top composed of oval embryonic part with anteriorly one or two ring-shaped swellings, the columellar muscle runs free through shell-lumen over a very long distance, mantle gland divided into two zones, wing tentacles present, but not protruding beyond wing border in retracted specimens. Shell length up to 33 mm, diam. up to 1.5 mm, rear angle about 14°.
- 8b. *C. acicula* (Rang, 1828) forma *clava* (Rang, 1828) (Fig. 8b). Shell straight with rounded aperture, surface smooth, caudal top rounded, the caudal part provided with two or more swellings by transverse rings below a concave portion ending in the perfectly round embryonic top, wing tentacles like in preceding species. Shell up to 6 mm long, max. diam. 1 mm, rear angle of the shell much larger than 14°.
- 9a. *C. virgula* (Rang, 1828) forma *virgula* (Rang, 1828) (Fig. 9a, 39a). Shell gradually but distinctly curved dorsad, cross sections and aperture rounded, surface smooth, embryonic shell without rings above the rounded part, embryonic shell separated by a small incision. Specimens with very pronounced incision belong to *C. virgula constricta* (Chen & Be, 1964) described for the West Atlantic. Wing glands present and protruding usually beyond the wing border in retracted specimens. Shell length up to 6 mm, diam. up to 2 mm.
- 9b. *C. virgula* (Rang, 1828) forma *conica* Eschscholtz, 1829 (Fig. 9b, 39b). Shell with curved posterior part, aperture and cross section rounded, surface smooth, embryonic shell round without rings or constrictions above it. Shell length up to 7 mm, diam. up to 1 mm.

Styliola Gray, 1850

10. *S. subula* (Quoy & Gaimard, 1827) (Fig. 10, 40). Shell hyaline, conical, round in cross section, with a twisted latero-dorsal groove in the anterior part, caudal part with pointed embryonic shell above which there are two incisions, very faint longitudinal and transversal striation present, mantle gland very small with three zones, balancer well developed, no wing tentacles. Shell length up to 13 mm, rear angle about 11°.

Hyalocylis Fol, 1875

11. *H. striata* (Rang, 1828) (Fig. 11, 41). Shell hyaline, faintly curved dorsad, transversal striation by broad thickened bands, aperture and cross section rounded, embryonic shell nearly always lost and replaced by closing membrane, widely expanded wings without tentacle, small balancer. Shell length up to 8 mm, rear angle about 24°.

Clio Linnaeus, 1767

Shell triangular in shape with clear differentiation in ventral and dorsal side, embryonic shell usually present, growth lines give a pattern of transverse bands. Wings without tentacles, mantle gland large.

- 12a. *C. pyramidata* (L. 1767) forma *pyramidata* (L. 1767) (Fig. 12a, 42a). Shell hyaline, straight pyramidal shaped, lateral ribs thickened and slightly diverging and bent, cross section triangular, dorsal rib protruding slightly, very prominent growth lines present, embryonic shell droplet-shaped with small cusp. Shell length about 20 mm, width about 10 mm.
- 12b. *C. pyramidata* (L. 1767) forma *lanceolata* (Lesueur, 1813) (Fig. 12b, 42b). Shell transparent, nearly straight, pyramidal shaped, lateral ribs thickened strongly diverging, dorsal rib straight and protruding strongly, cross section triangular to lunar-shaped by the hollow ventral surface, rather clear growth lines present, embryonic shell long oval, pointed. Shell length up to 20 mm, diam. up to 18 mm.
13. *C. cuspidata* (Bosc, 1802) (Fig. 13a–b, 43). Shell hyaline, curved dorsad, transverse striation gives the shell an undulating surface, lateral and dorsal spine elongated as spines protruding from aperture border, greatest shell width in or below the middle of the shell, embryonic shell perfectly round with small terminal cusp. Shell length up to 20 mm and up to 30 mm in width.
14. *C. polita* (Pelseneer, 1888) (Fig. 14a–b, 44). Shell slender and thin, curved dorsad, longitudinal ribs and transverse striation are absent, only lateral ribs present, lateral ribs not gutter shaped, nearly straight and only slightly diverging so the rear angle of the shell is rather small, dorsal and ventral side of the same length, embryonic shell round, separated off by a clear ring. Shell length up to 14 mm, width up to 7 mm.

Cuvierina Boas, 1886

15. *C. columnella* (Rang, 1827) forma *atlantica* v. d. Spoel 1970 (Fig. 15, 45a–c). Shell bottle shaped, embryonic shell with conical juvenile shell usually broken off, a clear constriction below reniform aperture, caudal septum concave, shell not hyaline, surface smooth, body slender with long mantle gland and a clear separation of head and body parts. Frequently occurring minute stages show a more depressed body (Fig. 45c). Males are characterized by the accessory copulatory organ. Shell length 7–10 mm, width 1.8–2.5 mm.

Diacria Gray, 1847

Shell not transparent in adults, aperture borders thickened, no closing mechanism in the slit-like aperture in adults, juvenile shell parts are thrown off.

- 16a. *D. trispinosa* (Blainville, 1827) forma *trispinosa* (Blainville, 1827) (Fig. 16a, 46). Shell dorso-ventrally depressed with two lateral spines — the extension of the lateral ribs — perpendicular to shell axis, aperture borders thickened, ventral border bends outwards; the rim of the aperture, the longitudinal and lateral ribs are chestnut-brown, embryonic shell perfectly rounded. Shell length up to 12 mm and width up to 11 mm.
- 16b. *D. trispinosa* (Blainville, 1827) forma *major* (Boas, 1886) (Fig. 16b). Lateral spines directed caudad, ventral side flatter than in the preceding forma. Colour pattern the same but on the larger shell it occupies a relatively smaller part so that the shell looks whiter. Shell length up to 14 mm.
17. *D. quadridentata* (de Blainville, 1821) forma *quadridentata* (de Blainville, 1821) (Fig. 17a–b, 47). Globular shell with faint dorsal ribs and faint transversal striation, posterior part of ventral side concave, lateral spines curved caudad. Shell length 2.2–2.9 mm, shell length/width ratio 1.0–1.3, diam. caudal spine mark 0.92–1.12 mm. For specimens not corresponding with the present description one is referred to VAN DER SPOEL (1971).

Cavolinia Abildgaard, 1791

Shell with strongly differentiated ventral and dorsal sides. Aperture slit-like very long with a closing mechanism at both sides. No thickened aperture borders, dorsal lip much larger than ventral lip.

18. *C. tridentata* (Niebuhr, 1775) forma *tridentata* (Niebuhr, 1775) (Fig. 18a–b, 48). Shell solid, slightly hyaline and brown, ventral side rounded, dorsal side less rounded, caudal spine short and straight, embryonic shell usually absent, lateral spines small. Shell length up to 20 mm.
- 19a. *C. longirostris* (de Blainville, 1821) forma *longirostris* (de Blainville, 1821) (Fig. 19a–c, 49a). Shell brown or white-hyaline, no caudal spine present, in dorsal view triangular, ventral side clearly rounded, dorsal lip with cutter shaped rib bending regularly ventrad and not separated from the ventral side, lateral spines more or less directed caudad. Shell length 2.0–6.0 mm, width 1.5–4.0 mm. For specimens not corresponding with the present description see VAN DER SPOEL (1971).
- 19b. *C. longirostris* (de Blainville, 1821) forma *limbata* (d'Orbigny, 1836) (Fig. 19b, 49b). Larger than the preceding forma, the spines laterally, not caudally, no incision or constriction separates the gutter shaped dorsal lip from the dorsal side. Shell length 5.0–10.0 mm, width 3.0–8.0 mm.
- 19c. *C. longirostris* (de Blainville, 1821) forma *strangulata* (Deshayes, 1813) (Fig. 19a–c). Lateral spines as in *C. l.* forma *longirostris*, an abrupt lateral constriction in the rostrum gives rise to a tubercle distally separated from the dorsal side. Shell length 4.5–8.0 mm, width 3.0–7.0 mm.
20. *C. uncinata* (Rang, 1829) forma *uncinata* (Rang, 1829) (Fig. 20a–b, 50). Shell hyaline with brown zone along aperture, surface with growth lines and hammered structure, on ventral side transverse ribs, caudal spine curved dorsad, lateral spines directed caudad, dorsal rib bends ventrad over the aperture. Shell length 5.5–7.5 mm, width 4.0–6.6 mm.
- 21a. *C. gibbosa* (d'Orbigny, 1836) forma *gibbosa* (d'Orbigny, 1836) (Fig. 21a–b, 51). Shell globular, ventral side rounded with typical regularly bent edge in upper part, lateral spines very small, curved caudad, caudal spine and embryonic shell usually present. Shell length up to 8.0 mm, width and thickness more than 70 % of shell length. The following two forma are distinguished by the relation of shell length and width.
- 21b. *C. gibbosa* (d'Orbigny, 1836) forma *flava* (d'Orbigny, 1836) (Fig. 21b). Ventral side with sharp edge. Shell length up to 11.0 mm, width and thickness less than 70 % of shell length.
- 21c. *C. gibbosa* (d'Orbigny, 1836) forma *plana* Meisenheimer, 1905 (Fig. 21b). More flattened shell with less developed dorsal ribs, the edge in the ventral side is shifted anteriorly.
- 22a. *C. inflexa* (Lesueur, 1813) forma *inflexa* (Lesueur, 1813) (Fig. 22b, 52). Relatively long shell with flat ventral side, part behind spines moderately developed, ribs on ventral side are absent and on the dorsal very faint, posteriorly the shell is bent dorsad, dorsal lip truncated with dentated border. Aperture relatively small not reaching far caudad, caudal spine bending dorsad with embryonic shell. Shell length up to 7 mm, width up to 5 mm. 50 % of shell length below lateral spines.
- 22b. *C. inflexa* (Lesueur, 1813) forma *labiata* (d'Orbigny, 1836) (Fig. 22b). Shell broader than in the other forms, width 80 % of length, lateral spines well developed bent caudad, shell length up to 8 mm, width up to 5.5 mm, 36 % of shell length below the lateral spines.
- 22c. *C. inflexa* (Lesueur, 1813) forma *imitans* (Pfeffer, 1880) (Fig. 22a–b). Stronger curved dorsad than forma *inflexa*, upper lip separated from dorsal side by incision. Shell length up to 8 mm. 40 % of length below lateral spines.

Peraclis Forbes, 1844

Sinistral shell of rapidly increasing whorls, rostrum with columellar membrane, usually one or more protrusions at the aperture border, sculpture along the suture or over the whole surface. Wings fused to a swimming plate, foot parts fused into a proboscis, tentacles symmetrical, mantle aperture at dextral side, operculum also present in adults.

23. *P. reticulata* (d'Orbigny, 1836) (Fig. 23, 53). Shell brown or yellowish, spire high, about 4 whorls with distinct suture, no other protrusion from aperture than the rostrum, columellar membrane small, shell covered with hexagonal reticulum. Operculum with $5\frac{1}{2}$ whorls without radial striation. Shell height about 5 mm, shell width about 3 mm.

24. *P. bispinosa* Pelseneer, 1888 (Fig. 24, 54). Shell white, transparent with 4 rapidly increasing whorls, suture deep, spire rather high, columellar membrane well developed, aperture border with two protrusions besides the rostrum, shell covered by sculpture of hexagonal structure, between the rib of the upper aperture protrusion and the suture a prominent radiating structure, operculum with 5 whorls without radial striation. Shell height up to 10 mm, shell width up to 7 mm.
25. *P. moluccensis* Tesch 1903 (Fig. 25, 55). Shell white, transparent, spire very low, 3 whorls, aperture with one keeled protrusion besides the rostrum, small radiating striae between suture and keel, columellar membrane present but small, no sculpture on shell surface. Operculum with 5 whorls with radiating striae. Shell height up to 3 mm, width up to 2.5 mm.
26. *P. triacantha* (Fischer, 1882) (Fig. 26, 56). Shell white, with 3 whorls, last one covering other whorls, aperture with two spines beside the rostrum, columellar membrane large, umbilicus well developed, surface with faint reticulate pattern of punctation. Operculum with 6 whorls and radiating striae. Shell height up to 3 mm, width up to 5 mm.
27. *P. valdiviae* (Meisenheimer, 1905) (Fig. 27, 57 after Tesch). Thin calcareous shell, depressed last whorl very large, strong rib along the suture, between both there is a fine radiating structure, columellar membrane well developed, spiral ribs on the body whorl especially strong near the aperture, hexagonal sculpture over the whole shell except near the ribs, operculum with 5 whorls and fine radiating structure along the suture. Shell height about 6 mm, width about 5 mm.
28. *P. michaelsarsi* (Bonnevie, 1913). This species is given as found in the North Atlantic but it is a dubious species related to the preceding one. The shell is unknown and the soft parts differ only by lateral and median lips which are fused at the lateral point where they meet.

Cymbulia Peron & Lesueur, 1810

29. *C. peroni* de Blainville, 1818 (Fig. 28, 29). Pseudoconch of cartilaginous material, boat-shaped with blunt top, covered by numerous spines, lateral sides parallel. Animal with large swimming disc with median filamentous appendage and small proboscis. Pseudoconch up to 62 mm in length.

Desmopterus Chun, 1889

30. *D. papilio* Chun, 1889 (Fig. 30). No shell or pseudoconch present. Animal with cylindrical body, very large swimming disc. The posterior border divided into 5 lobes. Two tentacles protrude from the posterior border. Diameter of the swimming disc up to 5 mm.

Distribution

Area ²	Species (species in brackets occur only occasionally)
Norwegian Sea	1, 2a, 2b, 12a, (13), (14), 16. ¹
Kattegat	(2a).
Skagerak	2a.
Northern North Sea	2a, 2b, (5), 12a, (13), (16), (18).
Southern North Sea	2a.
English Channel	2a, (5).
Ireland Area	2a, 2b, 4, (6), 12a, (12b), 13, 14, 16, 22, 23, 24, (25), 29.
Gulf of Biscay	(2a), (2b), 3, 4, 5, 8, ¹ 10, (12A), 12b, (13), 14, 15, 16, 18, 22, 23, 24, 25, 26, 29.
Coast of Portugal	(2a), 3, 4, 5, 8, 9, ¹ 10, 11, 12b, 13, 14, 15, 16, 17, 18, 19, ² 20, 21, 22, 23, 24, 25, 26, 29, 30.
Open Atlantic between 35°–40° N	3, 4, 5, 6, 7, 8, 9, 10, 11, (12A), 12B, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 29, 30.
Open Atlantic between 40°–50° N	(2a), 3, 4, 5, 6, 7, 8, 9, 10, (11), 12a, 13, 14, 15, 16, (17), 18, 19, (21), 22, 23, 24, 25, (26), 27, 29, 30.
Open Atlantic between 50°–60° N	(1), 2a, 2b, 3, (10), 12a, 13, 14, 16, (18), (22), (23), (25).
Faroe-Shetland Area	2a, 2b, (10), 12a, 13, 14, 16, 18, (23), (25).
Faroe-Iceland Area	(1), 2b, 3, (4), (10), 12a, (13), 14, (15), 16, 18.
North of Iceland	1, 2b, (17).
Spitsbergen Area	1, 2b.
Denmark Strait	1, (2a), 2b, 3, 12a, (18).
Davis Strait	1, (2a), 2b.
Newfoundland Area	1, 2b, 4, (8), 12a, (17), 18, 19, 20.
Cape Hatteras–Newfoundland Area	(1), (2b), 4, 6, 7, 8, 9, (10), 11, (12a), 12b, 13, 15, 16, 17, 18, 19, 20, 21, 22, (23), 24, 25, 29, 30.

¹ Data on the different formae in this species are too few to give the distributions of the formae separately.

² No Pteropods are known from the Baltic.

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