Comparison of some interesting molluscs, trawled by the Belgian fishery in the Bay of Biscay, with similar representatives from adjacent waters: part V

Frank Nolf [1] & Jean-Paul Kreps [2]

[1] Pr. Stefanieplein, 43/8 – B-8400 Oostende
frank.nolf@pandora.be

[2] Rode Kruisstraat, 5 – B-8300 Knokke-Heist

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Abstract: In the fifth part of the report on the molluscs collected by the Belgian fishery in the Bay of Biscay during the previous decade, a third series of bivalves is briefly described, figured and compared with similar specimens from North Atlantic waters, the Mediterranean Sea or West Africa.

Abbreviations:
BMNH: The Natural History Museum, London – formerly: British Museum (Natural History)
FN: private collection Frank Nolf.
H.: height.
JPK: private collection Jean-Paul Kreps.
JV: private collection Johan Verstraeten.
L.: length.
LV: left valve.
PEMARCO: Pêche Maritime du Congo.
RBINS: Royal Belgian Institute for Natural Sciences, Brussels, Belgium.
RV: right valve

Description of species:

OSTREIDAE

***Crassostrea gigas* (Thunberg, 1793)**
Plate LXXXXIV, Figs 511-512

= *Ostrea gigas* Thunberg, 1793

Range: A cosmopolitan shell, living in Japan (Pl. LXXXXIV, Fig. 512), Korea, Siberia, China, New Zealand, Australia, South Africa, South America, the USA and Canada, the British Isles, the North Sea, the English Channel, the East Atlantic (Pl. LXXXXIV, Fig. 511) and the Mediterranean Sea. This oyster originates from northeast Asia and was imported to W France, the British Isles, Denmark, Sweden, Norway, Belgium and The Netherlands. It lives on mud and rocky bottoms in shallow water, especially below the low tide line. In France, the Portuguese oyster - *C. angulata* (Lamarck, 1819) - was introduced in 1860 and aimed at compensating for the depletion of *Ostrea edulis* Linnaeus, 1758). Production of *C. angulata* reached a maximum after 1950, followed by a decrease probably due to an overstocking of production units. Later on, all culture zones were infected by a virus, causing massive mortalities between 1970 and 1973, and leading to a total extinction of the Portuguese oyster in France. The oyster industry promptly reacted by importing a new species, the Pacific oyster (*C. gigas*) by several hundred tonnes from Canada. This operation resulted in a very successful harvest. At the same time, 10,000 t of *C. gigas* were imported from Japan and distributed to all production areas in France, including the Mediterranean Sea.

Until now the taxonomic question related to the real status of the Pacific oyster (*Crassostrea gigas*) and the Portuguese oyster (*C. angulata*) has not been solved. The classification of these strongly related species was influenced by the different geographical distributions, *C. gigas* being found in Asia and *C. angulata* in Europe. However, recent studies using mitochondrial markers have reported the presence of *C. angulata* in Taiwan suggesting an Asian origin of European *C. angulata* populations (Boudry *et al*., 1998). This hypothesis is supported by the observation of mixed populations of *C. angulata* and *C. gigas* (Yu *et al*., 2003; Lapègue *et al*., 2004). There are no morphological characteristics to differentiate them from each other because the larval and adult shells of both taxa have similar features. However, differences on growth performance and disease susceptibility have been reported. *C. gigas* grows faster than *C. angulata* and has a lower mortality rate (Bougrier *et al*., 1986; Soletchnik *et al*., 2002), which could be explained by differences in oxygen consumption and feeding activities (Goulletquer *et al*., 1999; Haure *et al*., 2003).

A high mortality of *C. angulata* caused by a virus was observed in France between 1967 and 1973. This infection was also present in *C. gigas*, but no associated mortality was observed. Comps & Duthoit (1976) and Comps & Bonami (1977) concluded that both species have a different resistance to virus infection. Studies on mitochondrial DNA have demonstrated genetic differences between *C. angulata* and *C. gigas* populations. According to this knowledge some authors consider them as different species (Miossec *et al*., 2009).

In spite of these conclusions, based on genetic differences, most authors (CLEMAM, WoRMS) and Huber (2010) treat *C. angulata* and *C. gigas* as a single species.
C. gigas is a cosmopolitan species whose shell characteristics are greatly influenced by habitat and geographical distribution. The many imports, shipping and various phases of cultivation during the previous 150 years make *C.angulata* and *C. gigas* morphologically indistinguishable. This paper has not the intention to judge if *C. angulata* and *C. gigas* are really different from each other and therefore we have not added a list of synonyms. As *C. angulata* disappeared in French waters in the 1970s, and *C. gigas* was imported from Canada and Japan we can most probably conclude that the shell obtained by Belgian fishermen in the Bay of Biscay belongs to *C. gigas*. Only one specimen was trawled at a depth of 100 m. As this species is in fact a habitant of the littoral and the infralittoral zone this means a rather accidental find. Therefore we have limited our illustrations to the single shell from W France and one specimen from Japan. This species is extremely variable in shape and colour, and a presentation of all possible forms should have led to an oversupply of figures. This would surely have reached beyond the aim of this paper.

Animals from bottoms outside oyster farms may develop attractive shells with lots of ridges and folds, depending of the type of substrate on which the oysters live. They differ from *Ostrea edulis* Linnaeus, 1758 by the heavily coloured adductor muscle scar and, in general, by a much more pinkish or purplish colour pattern. Commercial shells are more elongate and flattened. They can attain 300-400 mm.

PECTINIDAE

***Palliolum tigerinum* (O.F. Müller, 1776)**
Plate LXXXXV, Figs 513-518; Plate LXXXXVI, Figs 519-525; Plate LXXXXVII, Figs 526-534; Plate LXXXXVIII, Figs 535-540; Plate LXXXXIX, Figs 541-545; Plate C, Figs 546-556; Plate CI, Figs 557-568; Plate CII, Figs 569-580
= *Pecten tigerinus* O.F. Müller, 1776
= *Pecten triradiatus* O.F. Müller, 1776
= *Pecten laevis* Pennant, 1777
= *Pecten obsoletus* Pennant, 1777
= *Pecten parvus* da Costa, 1778
= *Pecten domesticus* Chemnitz, 1784
= *Pecten armoricanus* Chenu, 1843
= *Pecten tigrinus* Reeve, 1853

Range: From northern Norway and Iceland (Pl. LXXXXVII, Figs 526-534), the Shetland Islands (Pl. LXXXXVI, Figs 519-525), the British Isles (Pl. LXXXXVIII, Figs 535-540; Pl. LXXXXIX, Figs 541-545; Pl. C, Figs 546-556; Pl. CI, Figs 557-568; Pl. CII, Figs 569-580) where it is very common, southwards to the Bay of Biscay (Pl. LXXXXV, Figs 513-518) and the Atlantic coasts of the Iberian Peninsula and Morocco. Known from the Alboran Sea. It lives on all types of bottoms from the low intertidal zone down to about 120 m (Bay of Biscay) and even at -400 m. It is reported from deeper waters in the south of its range. Most shells prefer sand bottoms, but it can also be found on coarse sandy mud, gravel or stones.

This is a very variable shell in pattern and ribbing. Most specimens, especially those from the Irish Sea and the English Channel, are smooth and show a beautiful and delicate design. Other populations are less or more ribbed and this ribbing can even change in a single shell (Pl. LXXXXVII, Fig. 532; Pl. LXXXXVIII, Fig. 538; Pl. C, Fig. 553). The name *P. tigerinum* var. *triradiatum* (O.F. Müller, 1776) refers to shells with three dominating ribs (Pl. LXXXXVI, Fig. 525). Globose specimens can sometimes be found (Pl. C, Figs 549-551 & 554-556). This species differs from other species in the same genus by the more solid, not translucent shell, the larger size and the presence of ribs on the ears.

***Pseudamussium clavatum* (Poli, 1795)**
Plate CIII, Figs 581-584; Plate CIV, Figs 585-589; Plate CV, Figs 590-597; Plate CVI, Figs 598-604

= *Ostrea clavata* Poli, 1795
= *Pecten plicus* Linnaeus, 1758
= *Ostrea inflexa* Poli, 1795
= *Pecten dumasii* Payraudeau, 1826
= *Pecten aspersus* Lamarck, 1819
= *Pecten adspersus* Philippi, 1836
= *Pecten aspersus* Philippi, 1844

Range: From Norway, the Shetland Islands, the North Sea, the Bay of Biscay (Pl. CIII, Figs 581-

583), south to Portugal and Morocco, Mauritania, the Azores and the Canary Islands, into the Mediterranean Sea (Pl. CIII, Fig. 584; Pl. IV, Figs 585-589; Pl. CV, Figs 590-597; Pl. CVI, Figs 598-604) as far as the Bosphorus and Israel.
It lives between 10 to 1400 m deep on muddy, silty or coralligenous bottoms and has been found even at -2000 m. Collected by Belgian fishermen at -130 m in the Bay of Biscay, where it is seldom found. It lives in deeper waters in the northern part of its distribution area.

This is a very variable scallop. Flat as well as "inflexed" or box-shaped specimens occur together. Albino shells are very rare.
Some of the most striking forms:

- *P. clavatum* var. *depressa* (Locard, 1888): upper part of the valves depressed in such a way the outside appears concave (Pl. CV, Figs 590-593).
- *P. clavatum* var. *dumasii* (Payraudeau, 1826): the complete shell is swollen and the radiating ribs are crossed by overlapping concentric lines (Pl. CIII, Fig. 583; Pl. CV, Figs 594-597; Pl. CVI, Figs 598-599).
- *P. clavatum* var. *inflexa* (Poli, 1795): pyxoid form with only the ventral margins inflected (Pl. CIII, Figs. 584; Pl. CIV, Figs 587-589).
- *P. clavatum* var. *marmorata* (Monterosato, 1875): left valve irregularly marked with white flammules lined with a red border (Pl. CVI, Figs 600-601).
- *P. clavatum* var. *zonata* (Locard, 1888): the left valve is patterned with darker concentric zones (Pl. CVI, Figs 602-604).

Although these forms are of no taxonomic value, they are interesting to mention as they are typical of *Pseudamussium clavatum*. This species was confused with the less variable *Pseudamussium peslutrae* (Linnaeus, 1771) (= *Pecten septemradiatum* Chemnitz, 1784; = *Pecten septemradiatus* Müller, 1776) in older as well as in recent literature:

- ***P. clavatum***:
  - almost equivalve;
  - usually heavier with crenulated margins;
  - ears very unequal;
  - posterior ears half as large as the anterior ears;
  - both ears narrowing when reaching the upper side of the valves, especially the posterior ones.

- ***P. peslutrae***:
  - larger, with a thinner and more fragile shell;
  - shell more rounded and more equivalve;
  - ears larger than in *P. clavatum*;
  - anterior and posterior ears nearly equal in size with the posterior ears obliquely sloping down the valves without a trace of a posterior notch.

In a future paper we will extensively treat these two species regarding their distribution range and the differences in structure and pattern.

LASAEIDAE

***Montacuta phascolionis* Dautzenberg & H. Fischer, 1925**
Plate CVII, Figs 605-612; Plate CIX, Figs 625-626

= ? *Kellia coarctata* S. Wood, 1851 (Pliocene fossil)

At present, it is not clear whether the species-name '*phascolionis*' belongs to the genus *Montacuta* Turton, 1822 or *Tellimya* Brown, 1827. Moreover, it is uncertain wether this is the right name for this tiny bivalve. Some authors prefer to use the name *Mioerycina coarctata* (S.V. Wood, 1851) (Delongueville & Scaillet, 1999).

Range: Northern Atlantic. Mediterranean Sea.

In the Bay of Biscay (Pl. CVII, Figs 605-612) specimens of *M. phascolionis* are found in empty shells of *Aporrhais pespelecani* var. *bilobatus* Clément, 1875 (Pl. CVIII, Fig. 613; Pl. CIX, Figs 620-621 & 625-626), *Turritella communis* Risso, 1826 (Pl. CVIII, Figs 616-618) and occasionally of *Dentalium novemcostatum* Lamarck, 1818 (Pl. CVIII, Figs 614-615) occupied by the sipunculid *Phascolion strombi* (Montagu, 1804) (Pl. CIX, Figs 623-624). These empty shells are found on soft bottoms of muddy sand from 20 to 90 m deep, sometimes on coarse sand.

Most of the specimens of *A. pespelecani* trawled in the Bay of Biscay are covered with the sea anemone *Calliactis parasitica* (Couch, 1842) (Pl. CIX, Figs 620-622). This animal possesses slender tentacles, up to 700 in number, of moderate length. The base is cream or buff coloured, spotted and streaked with reddish or greyish brown. These markings usually form vertical stripes, often with black, red or purple in addition. The disc and tentacles are cream, rarely pink or orange, the tentacles usually with inconspicuous broken brown lines. When specimens are covered with this sea anemone they are housing one or two specimens of the montacud bivalve *Montacuta phascolionis* Dautzenberg & H. Fischer, 1825.

This bivalve is regarded as a guest of *Phascolion strombi* (Montagu, 1804) and its relationship is commensalism. *M. phascolionis* obtains a benefit apparently without affecting the sipunculid (Gage, 1979).

The sipunculid occupies that part of the inside of the gastropod shell which is devoid of soft parts and shuts off the aperture of the shell by making a plug of sand perforated by two channels (Pl. CVIII, Fig. 614). The widest channel ends in the outer part of the plug and allows the passage of the proboscis of the sipunculid. The narrow channel ends in the lower part of the plug and ensures the elimination of water from the host shell. The minute bivalve can generally be located behind the columella in the vicinity of the hole at the real start of the smallest of the two channels in the sandy plug (Perez, 1925; Gage, 1979).
The position of the bivalves in the inner shells does not show a well-defined pattern. In some shells inhabited by the sipunculid, juveniles were found in the last whorls but in other shells quite the reverse happened. They do not noticeably follow a size positioning.
Specimens of *Aporrhais pespelecani* were carefully broken at the level of the penultimate whorl by the use of a cutter and the exact position in the inner part of the shell were localized by using a stereomicroscope. Subsequently the fauna associated was numbered, measured and finally preserved in ethanol.
About 50% of all the collected *Aporrhais*-specimens contained one or two specimens of *M. phascolionis*.

Occasionally some specimens of parasitic pyramidellids (Pl. CVIII, Fig. 619) (Nolf & Verstraeten, 2010) were found associated with the sipunculid *Phascolion strombi* (Monagu, 1804). The relationship between specimens of the genus *Ondina* and the sipunculid may be qualified as parasitism since the pyramidellids are ectoparasites of the sipunculid (Troncoso, N., Moreira, J. & Troncoso, J.S., 2000). These authors mention the presence of *Ondina diaphana* (Jeffreys, 1848) (= *Odontostomia perezi* Dautzenberg & H. Fischer, 1925) in the northwest of the Iberian Peninsula. However, we suppose at least two different species of pyramidellids are found in shells dredged in the Bay of Biscay. Our specimens do not completely match figures and descriptions in literature. Further material and intensive study will be needed to solve this problem.
Pyramidellid specimens are rarely found in host shells and if so almost only one specimen per sipunculid. In the Bay of Biscay specimens were only collected in *Aporrhais pespelecani* var. *bilobatus* Clément, 1875. The individuals ranged from 1.5 to 2.5 mm.

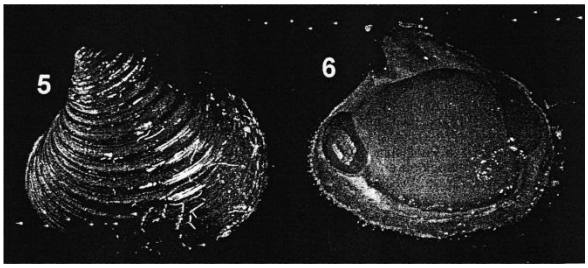
ASTARTIDAE

***Astarte sulcata* (da Costa, 1778)**
Plate CX, Figs 627-632; Plate CXI, Figs 633-638; Plate CXII, Figs 639-644

= *Pectunculus sulcatus* da Costa, 1778
= *Venus scotica* Maton & Rackett, 1807
= *Venus danmonia* Montagu, 1808
= *Crassina danmoniensis* Lamarck, 1819
= *Astarte ovalis* Woodward, 1833
= *Astarte pallida* Jeffreys in G.B. Sowerby II, 1839
= *Astarte vulgaris* Jeffreys in G.B. Sowerby II, 1839
= *Crassina brittanica* Leach, 1852
= *Astarte anholti* Høpner Petersen, 2001

Range: From Greenland, the Barents Sea, the Kara Sea, SE Newfoundland, Iceland (Pl. CXII, Fig. 639), Norway, the British Isles (Pl. CXI, Figs 637-638; Pl. CXII, Figs 640-644), the North Sea, Kattegat, south to the West African coast (West Sahara) and from Gibraltar to the Alboran Sea into the West Mediterranean Sea. Sometimes found in shallow water, but it generally lives below 20-30 m on sand, mud and gravel bottoms. Specimens have been trawled at 140-160 m in the Bay of Biscay (Pl. CX, Figs 627-632; Pl. CXI, Figs 633-636).

Rolán & Trigo (2004) reported two single valves and two live caught specimens from A Coruña (Galicia, Bay of Biscay, North Spain) of about 25 mm.
The shells were labeled *Astarte fusca* (Poli, 1791). This would mean a range extension of this species to the north into the Bay of Biscay. However, figures 5 & 6 prove that these shells were wrongly identified and undoubtedly belong to *Astarte sulcata*. Among the more than thousand specimens collected by the Belgian fishery off W France not a single specimen of *A. fusca* was found. *A. fusca* is a typically Mediterranean species, but it also occurs from southern Portugal to Mauritania, Senegal and the Canary Islands. According to Poppe & Goto (1993) *Astarte sulcata* is much more circular in outline with usually 24 to 30 ('55'?! – sic) concentric ridges compared to *A. fusca* which would only have 15 concentric ribs. We are not convinced of this differentiating characteristic because the number of ridges in both species is very variable.



'*Astarte fusca*' from Galicia, North Spain

***Astarte sulcata* from the Irish Sea, UK**

As *Astarte sulcata* is very close to *Astarte fusca* (Poli, 1791) (Pl. CXIII, Figs 645-650), we hereby summarize the main characteristics to distinguish both species from each other:

- ***A. sulcata* (da Costa, 1778)**

* rather ovate, semicircular in outline, occasionally slightly longer than high, the dorsal half almost triangular;
* ridges are sharper and more accentuated, causing deeper grooves between them;
* number of concentric ridges: from 23 to 35; specimens from Scotland (UK) seem to have a more constant number (24 to 28);
* the posterior adductor scar is located in the higher part of the inside shell; it is elongate (oval trapezoid) and larger than in *A. fusca*, where it is reduced to a small and rather circular scar.

- ***A. fusca***

* more circular in outline;
* ridges are smoothened towards the lower edge, becoming nearly invisible in large, adult shells;
* number of concentric ridges: from 30 to 35, only 20 (!) in a single specimen from Mauritania;
* there is a very slight sulcus running from the umbo to the upper posterior edge of the outer surface.
* the hinge plate containing the chondrophore is slightly smaller.

Many juvenile specimens of *Astarte fusca* tend to have a ribbed surface and can be confused with *A. sulcata*.

One of the most controversial characteristics used to separate Astartids is the presence of smooth or crenulate margins. Juvenile specimens of consistently crenulate forms may have smooth or only weakly crenate margins. Smooth margined adults have been described as separate species, as for instance *Astarte scotica* (Maton & Rackett, 1807) (Pl. CXII, Figs 641-644). However, no smooth margins were found in our samples from the Firth of Clyde, Scotland, UK. Huber (2010) reported the presence of one smooth margined specimen (16.1 mm) among many crenulate specimens from the type material in BMNH. In addition to a lot of crenate *A. sulcata*, Huber (2010) found a large (27.4 mm) smooth marginate specimen, nearly reaching the maximum known size for that species. Considering that smooth/crenulate margins are present in both juvenile and adult specimens this characteristic cannot be used to prove that *A. scotica* is a separate species or subspecies. This feature may possibly be correlated to a gender difference (Huber, 2010). Shells from Scotland are usually smaller and more circular and should only be regarded as a form of *A. sulcata*. Høpner Petersen (2001) restricted *A. sulcata* to crenate forms and redescribed smooth margined forms as *A. anholti* from Kattegat. By doing so, he probably only separated male from female forms.

CARDIIDAE

***Acanthocardia echinata* (Linnaeus, 1758)**
Plate CXIV, Figs 652-657; Plate CXV, Figs 658-663; Plate CXVI, Figs 664-669; Plate CXVII, Figs 670-673

= *Cardium echinatum* Linnaeus, 1758
= *Cardium hystrix* Lightfoot, 1786
= *Cardium flexuosum* Gmelin, 1791
= *Cardium mucronatum* Poli, 1791
= *Cardium duregnei* 'de Boury mss.' Monterosato, 1891
= *Cardium bullatum* Locard, 1892
= *Cardium novum* Coen, 1941

Range: From Greenland, Iceland and northern Norway, the Faroe Islands (Pl. CXIV, Fig. 657), south to the British Isles (Pl. CXV, Figs 658-662), the Baltic Sea, the English Channel (Pl. CXVI, Figs 664-669) the North Sea (Pl. CXV, Fig. 663), the East Atlantic coasts of France (Pl. CXIV, Figs 652-656), the Iberian Peninsula and Morocco into the Mediterranean Sea (from the Alboran Sea to the Sea of Marmara) (Pl. CXVII, Figs 670-

673). Also known from the Canaries, Madeira and the Azores.
It lives in fine sand, muddy sand, gravel or mud bottoms between 5 and 350 m deep.

The spines on the radial ribs are connected to each other by a low ridge, though the latter is often worn down and difficult to see. This is the main characteristic to differentiate this species from the very similar *Acanthocardia tuberculata* (Linnaeus, 1758). The spines in the latter are all clearly separated from each other. *A. tuberculata* has a rather glossy surface while *A. echinata* is rather dull.
Acanthocardia echinata is probably the most variable cockle between Greenland and Israel. Specimens can considerably vary in size, weight, shape, inflation and the nature of spines.
The name *Acanthocardia echinata* var. *duregnei* 'de Boury mss.' (Monterosato, 1891) refers to a form in which the radiating ribs are broader than the intermediate furrow (Pl. CXVI, Figs 669).
La Perna (2008) supposes this variety is an ecophenotype, adapted to shallow water in sheltered environments with low salinity and eutrophic conditions. This could result in sturdy shells, with bipartite radial ribs and poorly developed spines. Specimens are known from off Arcachon (Bay of Biscay) (Bucquoy *et al*., 1892; La Perna, 2008) and Croisic (Brittany, W France) (Bucquoy et al., 1892). We collected some specimens in different conditions at Locquémeau (North Brittany, France) (Pl. CXVI, Fig. 669) together with differently shaped specimens. This confirms the outstanding variability of this species once more, but some forms could be more common in extreme circumstances. Shells from the Shetland Islands tend to be very light weighted as they live in deeper waters. Others from the Irish Sea, the English Channel and the East Atlantic waters are more inequilateral and oblique in shape, with small sharp or hooked spines (Pl. CXVII, Fig. 674), whereas the southern specimens are generally more rounded and equilateral with larger spoon-like shaped or stumped spines as in the Mediterranean form *A. echinata* var. *mucronatum* (Poli, 1795) (Pl. CXVII, Figs 670-673).
This variability in characteristics provides enough arguments against the hypothesis of a clear taxonomic status for *Cardium duregnei* and other forms described in older literature.

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References:

Ardovini, R. & Cossignani, T., 2004. *West African Shells*. L'Informatore Piceno. Ancona. 319 pp.
Bouchet, Ph. & Rocroi, J.-P., Bieler, R., Carter, J.G. & Coan, E.V., 2010. Nomenclator of Bivalve Families with a Classification of Bivalve Families. *Malacologia*, **52**(2): 1-184.
Boudry, P., Heurtebise, S., Collet, B., Cornette, F. and Gérard, A., 1998. Differentiation between populations of the Portuguese oyster *Crassostrea angulata* (Lamarck) and the Pacific oyster *Crassostrea gigas* (Thunberg), revealed by mtDNA RFLP analysis. *Journal of Experimental Marine Biology and Ecology*, **226**(2): 279-291.
Bougrier, S., Raguenes, G., Bachere, E., Tige, G. and Grizel, H., 1986. Essai de réimplantation de *Crassostrea angulata* en France. Résistance au chambrage et comportement des hybrides *C. angulata-C. gigas*. ICES Document CM 1986/F: **38**. 10 pp.
Bucquoy, E., Dautzenberg, Ph. & Dollfus, G., 1887-1898. *Les Mollusques marins du Roussillon,* t. II*: Pélécypodes*. 884 pp., 99 plates.
CLEMAM. Check List of European Marine Molluscs. http://www.somali.asso.fr/clemam
Comps, M. & Bonami, J.R., 1977. Infection virale associée à des mortalités chez l'huître *Crassostrea gigas* Th. *Comptes rendus de l'Académie des Sciences de Paris*, D, **285**: 1139.
Comps, M. & Duthoit, J.L., 1976. Infection virale associée à la "maladie des branchies" de l'huître portugaise *Crassostrea angulata* Lmk. Comptes rendus de l'Académie des Sciences de Paris, D, **283**: 1595.
Dautzenberg, Ph., 1891. Campagne scientifique du yacht l' «Hirondelle» en 1886: Contribution à la faune malacologique du Golfe de Gascogne. *Mémoires de la Société Zoologique de France*, IV, 604-619, pl. XVI-XVII.
Dautzenberg, Ph., 1927. Mollusques provenant des campagnes scientifiques du Prince Albert Ier de Monaco dans l'Océan Atlantique et dans le Golfe de Gascogne. *Résultats des Campagnes Scientifiques accomplies sur son yacht par Albert Ier Prince Souverain de Monaco*, Fascicule LXXII: 1-400, 9 pls.

Dautzenberg, Ph. & Fischer, H., 1896. Campagnes scientifiques du Prince de Monaco. Dragages effectués par l' «Hirondelle» et la «Princesse Alice», 1888-1895. Gastéropodes. *Mémoires de la Société Zoologique de France*, IX, 395-498, pl. XV-XXII.

Dautzenberg, Ph. & Fischer, P.-H., 1925. Les Mollusques marins du Finistère et en particulier de la région de Roscoff. *Travaux de la Station Biologique de Roscoff*, fasc. 3, 180 pp. Paris.

Delongueville, C. & Scaillet, R., 1999. Relevé de l'association de *Epilepton clarkiae* (W. Clark, 1852) et de *Mioerycina coarctata* (S.V. Wood, 1851) avec *Phascolion strombi* (Montagu, 1804) en Méditerranée. *Apex*, **14**(2): 29-32.

Gage, J.D., 1979. Mode of live and behaviour of *Montacuta phascolionis*, a bivalve commensal with the sipunculan *Phascolion strombi*. Journal of the marine biological Association of the United Kingdom, **59**: 635-657.

Giannuzzi-Savelli, R., Pusateri F., Palmeri, A., Ebreo C. & Coppini M., Margelli, A., Bogi C., 2001. *Atlas of the Mediterranean Seashells,* Vol. 7 *(Bivalvia: Protobranchia – Pteriomorpha).* Roma. 246 pp.

Goulletquer, P., Wolowicz., M., Latala, A., Geairon, P., Huvet, A. and Boudry, P., 1999. Comparative analysis of oxygen consumption rates between cupped oyster spat of *Crassostrea gigas* of French, Japanese, Spanish and Taiwanese origins. *Aquatic Living Resources*, **12**: 271-277.

Harry, H.W., 1985. Synopsis of the supraspecific classification of living oysters. (Bivalvia; Gryphaeidae and Ostreidae). *Veliger*, **28**: 121-158.

Haure, J.A., Huvet, H., Palvadeau, M., Nourry, C., Pénisson, J.L., Martin, C. and Boudry, P., 2003. Feeding and respiratory time activity in the cupped oysters *Crassostrea gigas*, *Crassostrea angulata* and their hybrids. *Aquaculture*, **218**: 539-551.

Høpner Petersen, G., 2001. Studies on some Arctic and Baltic *Astarte* species (Bivalvia, Mollusca). Meddelelser om Grønland. *Bioscience 52*. Copenhagen, The Danish Polar Center. 71 pp.

Huber, M., 2010. *Compendium of Bivalves*. ConchBooks. Hackenheim. 901 pp.

Killeen, I.J. & Turner, J.A., 2009. *Yoldiella* and *Portlandia* (Bivalvia) from the Faroe-Shetland Channel and Rockall Trough, Northeast Atlantic. *Journal of Conchology*, **39**(6): 733-778.

Lapègue, S., Batista, F.M., Heurtebise, S., Yu, Z. and Boudry, P., 2004. Evidence for the presence of the Portuguese oyster, *Crassostrea angulata*, in Northern China. Journal of Shellfish Research, **23**: 759-763.

La Perna, R., 2008. Observations on *Cardium duregnei* Monterosato, 1891 ex de Boury ms and *C. gibbum* Locard, 1892 (Bivalvia, Cardiidae). *Bollettino Malacologico*, **44**(9-12): 135-140.

Millard, V., 2008. *Classification of Mollusca. A classification of Worldwide Mollusca.* Vol. 2. Fourth Edition. Clareinch. 1140 pp.

Miossec, L., Le Deuff, R-M. and Goulletquer, P., 2009. Alien species alert: *Crassostrea gigas* (Pacific oyster). *ICES Cooperative Research Report* N°. 299. 42 pp.

Nicklès, M., 1955. Scaphopodes et Lamellibranches récoltés dans l'Ouest Africain. In: *Atlantide Report, n°3, Scientific Results of the Danish Expedition to the Coasts of Tropical West Africa 1945-1946*. Copenhagen. 93-237, figs 1-41.

Nolf, F. & Kreps, J.-P., 2008. Comparison of some interesting molluscs, trawled by the Belgian fishery in the Bay of Biscay, with similar representatives from adjacent waters: part I. *Neptunea*, **7**(3): 1-33.

Nolf, F. & Kreps, J.-P., 2009. Comparison of some interesting molluscs, trawled by the Belgian fishery in the Bay of Biscay, with similar representatives from adjacent waters: part II. *Neptunea*, **8**(3): 1-28.

Nolf, F. & Kreps, J.-P., 2010. Comparison of some interesting molluscs, trawled by the Belgian fishery in the Bay of Biscay, with similar representatives from adjacent waters: part III. *Neptunea*, **9**(1): 1-34.

Nolf, F. & Kreps, J.-P., 2010. Comparison of some interesting molluscs, trawled by the Belgian fishery in the Bay of Biscay, with similar representatives from adjacent waters: part IV. *Neptunea*, **10**(1): 1-32.

Oliver, P.G., 1992. *Bivalved Seashells of the Red Sea*. National Museum of Wales. Verlag Christa Hemmen, Wiesbaden. 330 pp.

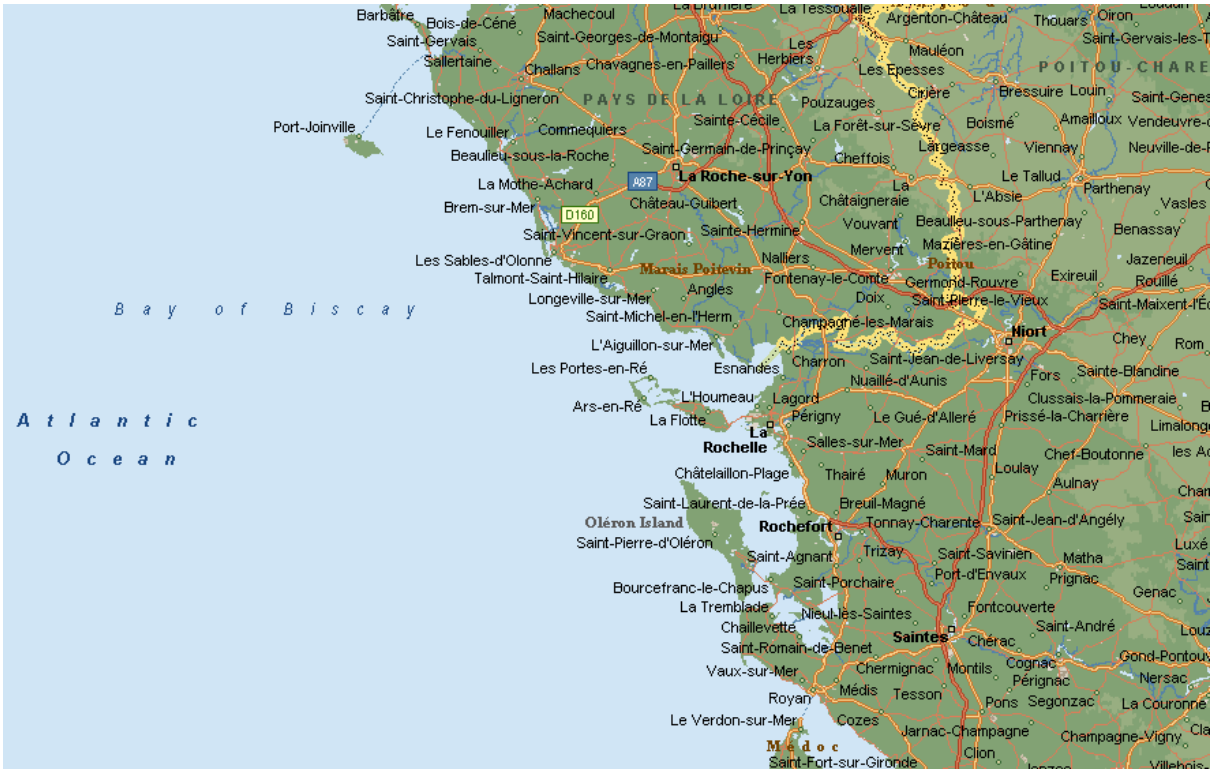
Perez, Ch., 1925. Sur le complexe éthologique du *Phascolion strombi*. Bulletin de la Société Zoologique de France, **50**: 74-76.

Poppe, G.T. & Goto, Y., 1993. *European Seashells* (vol. II). Verlag Christa Hemmen. Wiesbaden. 221 pp.

Raines, B.K. & Poppe, G.T., 2006. The Family Pectinidae. A conchological Iconography. Conchbooks, Hackenheim, Germany. 402 pp.

Repetto, G., Orlando, F. & Arduino, G., 2005. *Conchiglie del Mediterraneo*. Torino. 392 pp.

Rolán, E. & Trigo, J.E., 2003. Nuevas citas de moluscos para Galicia, con comentarios sobre otras especies. *NOTICARIO SEM*, vol.39, 58-63.
Sneli, J.-A., Schiøtte, T., Jensen, K.R., Wikander, P.B., Stokland, Ø. & Sørensen, J., 2005. The Marine Mollusca of the Faroes. *Annales Societatis Scientarium Færoensis*, Supplementum XXXXII. Tórshavn. 190 pp.
Soletchnik, P., Huvet, A., Le Moine, O., Razet, D., Geairon, P., Faury, N., Goulletquer, P. *et al*., 2002. A comparative field study of growth, survival and reproduction of *Crassostrea gigas*, *C. angulata* and their hybrids. *Aquatic Living Resources*, **15**: 243-250.
Tebble, N., 1976. *British Bivalve Seashells. A Handbook for Identification*. 2nd edition. Edinburgh. 212 pp., 12 plates.
Troncoso, N., Moreira, J. & Troncoso, J.S., 2000. *Tellimya phascolionis* (Dautzenberg & Fischer, 1925) (Bivalvia, Montacutidae) and other fauna associated with the sipunculid *Phasciolon strombi* (Montagu, 1804) in the Ría de Aldán (Galicia, NW Península Ibérica). *Argonauta*, **XIV**(1): 59-66.
Vanwalleghem, R., Verhaeghe, Y. & Swinnen, F., 2007. Seashells taken by Belgian trawlers in the eastern Bay of Biscay, Western France. *Xenophora*, **120**: 10-14.
Vaught, K.C., 1989. *A classification of the living Mollusca*. American Malacologists. Melbourne, Florida. xii + 189 pp.
WoRMS. World Register of Marine Species. http://www.marinespecies.org
Yu, Z., Kong, X., Zhang, L., Guo, X. and Xiang, J., 2003. Taxonomic status of four *Crassostrea* oysters from China as inferred from mitochondrial DNA sequences. *Journal of Shellfish Research*, **22**: 31-38.



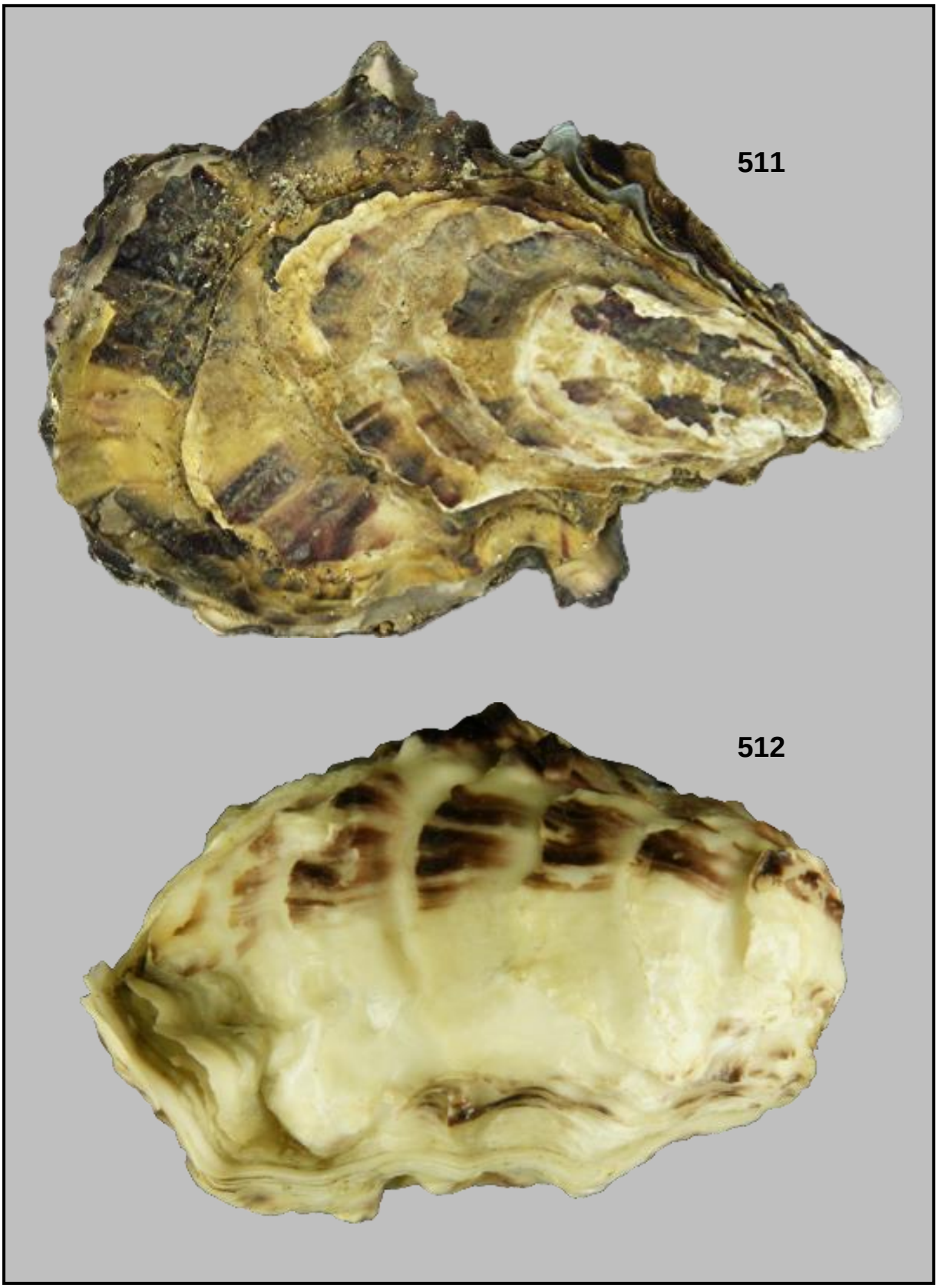


Plate LXXXXIV. Figs 511-512: *Crassostrea gigas* (Thunberg, 1793); 511: South of La Rochelle, Bay of Biscay, W France. Trawled by Belgian fishermen at a depth of 100 m. H. 93 mm L. 51 mm. JPK; 512: Minabe, Wakayama Prefecture, Japan. At low tide. H. 75.30 mm L. 51.39 mm. FN.

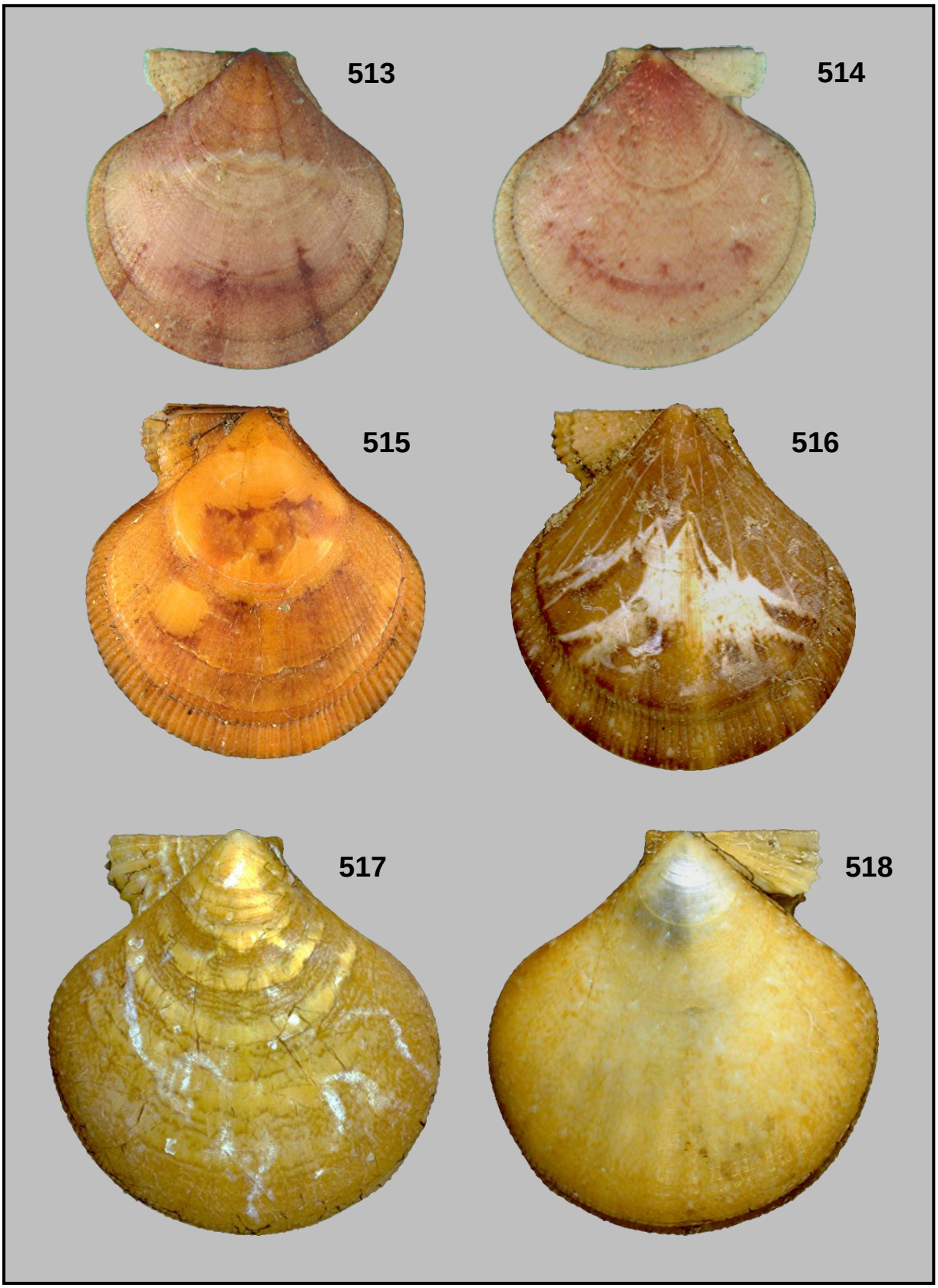


Plate LXXXXV. Figs 513-518: *Palliolum tigerinum* (O.F. Müller, 1776). South of La Rochelle, Bay of Biscay, W France. Trawled by Belgian fishermen. JPK; 513-515: Depth: -100m. July 2002; 513-514: H. 22.17 mm L. 20.62 mm; 513: LV; 514: RV; 515: H. 26.0 mm L. 24.9 mm. LV; 516-518: Depth: -122 mm. August 2010; 516: H. 26.92 mm L. 24.58 mm. LV; 517-518: H. 28.82 mm L. 27.83 mm; 517: LV; 518: RV.

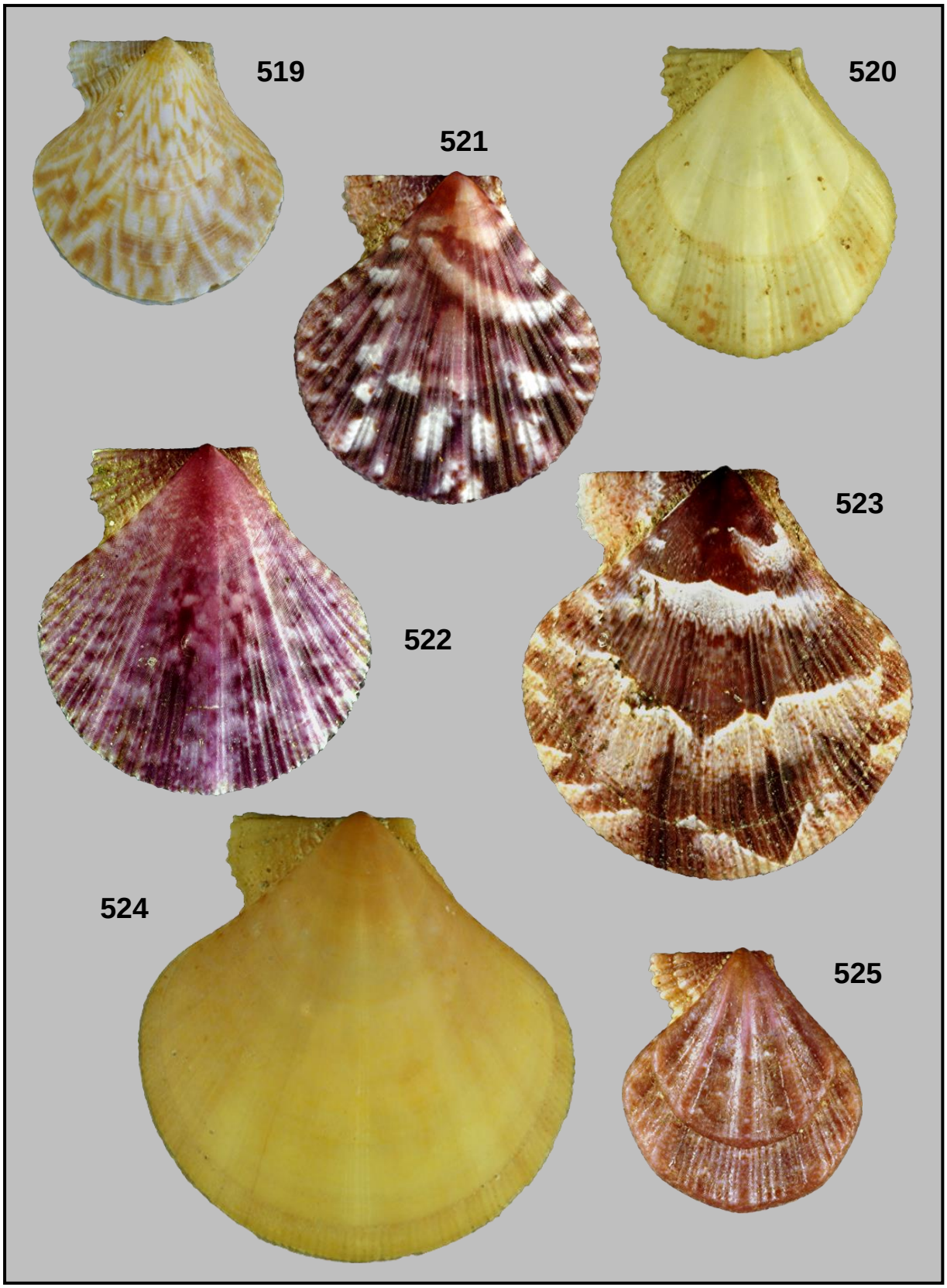


Plate LXXXXVI. Figs 519-525: *Palliolum tigerinum* (O.F. Müller, 1776). Off Lerwick, Shetland Islands, Scotland, UK. Trawled by scallop boats. 1996. LV; 519-524: JV; 519: H. 13.20 mm L. 12.37 mm; 520: H. 16.44 mm L. 14.98 mm; 521: H. 17.34 mm L. 15.93 mm; 522: H. 18.45 mm L. 17.66 mm; 523: H. 22.17 mm L. 20.66 mm; 524: H. 26.40 mm L. 25.46 mm; Fig. 525: *Palliolum tigerinum* var. *triradiata* (Müller, 1776). H. 18.37 mm L. 17.39 mm. FN.

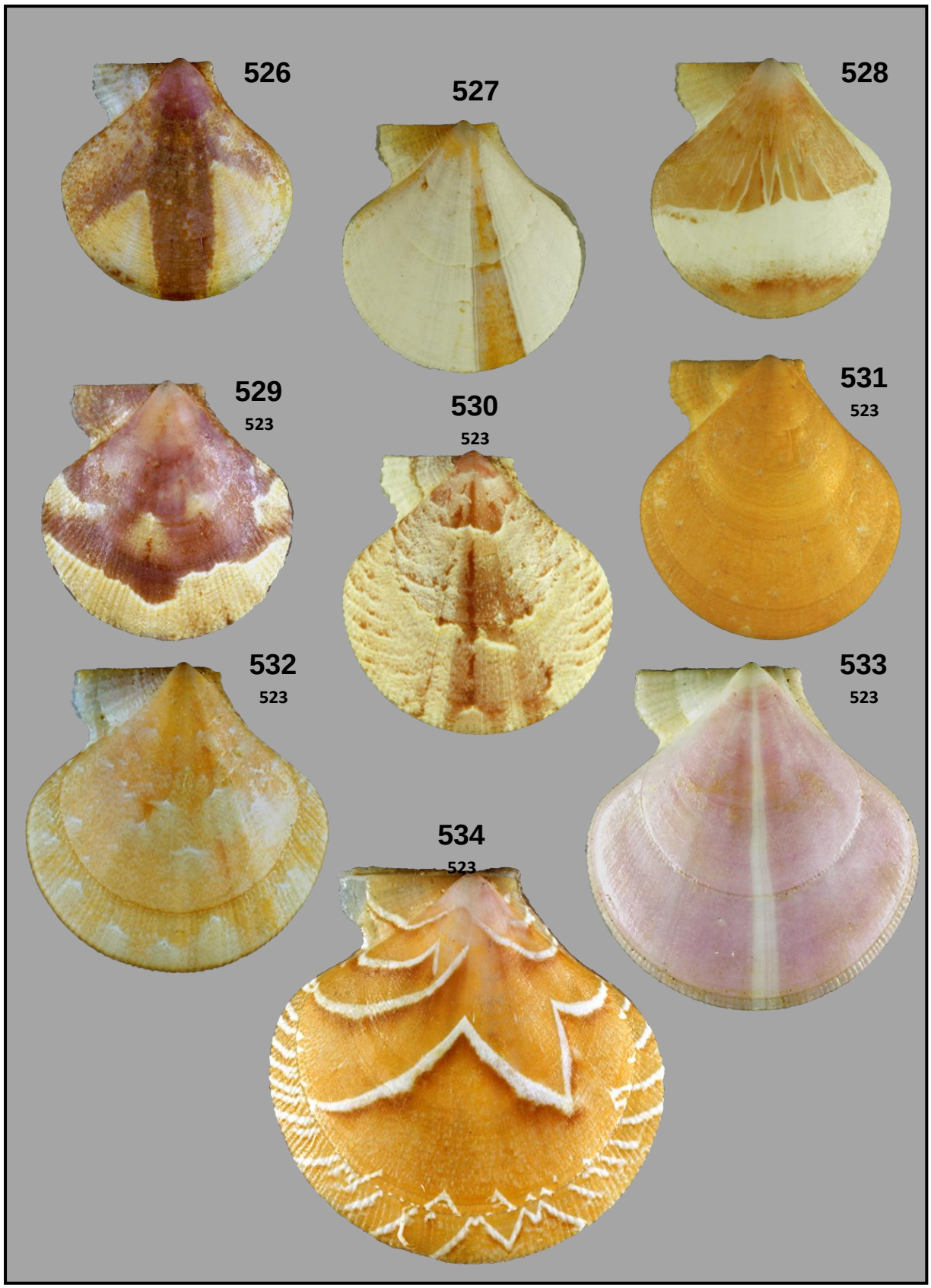


Plate LXXXXVII. Figs 526-534: *Palliolum tigerinum* (O.F. Müller, 1776). South Iceland. Trawled by Belgian fishermen at a depth of 90 m. January 1972. LV. FN; 526: H. 19.30 mm L. 18.39 mm; 527: H. 19.33 mm L. 18.52 mm; 528: H. 19.68 mm L. 18.28 mm; 529: H. 20.73 mm L. 20.01 mm; 530: H. 23.82 mm L. 22.73 mm; 531: H. 24.42 mm L. 22.43 mm; 532: H. 24.12 mm L. 23.50 mm; 533: H. 27.87 mm L. 26.64 mm; 534: H. 28.45 mm L. 27.98 mm.

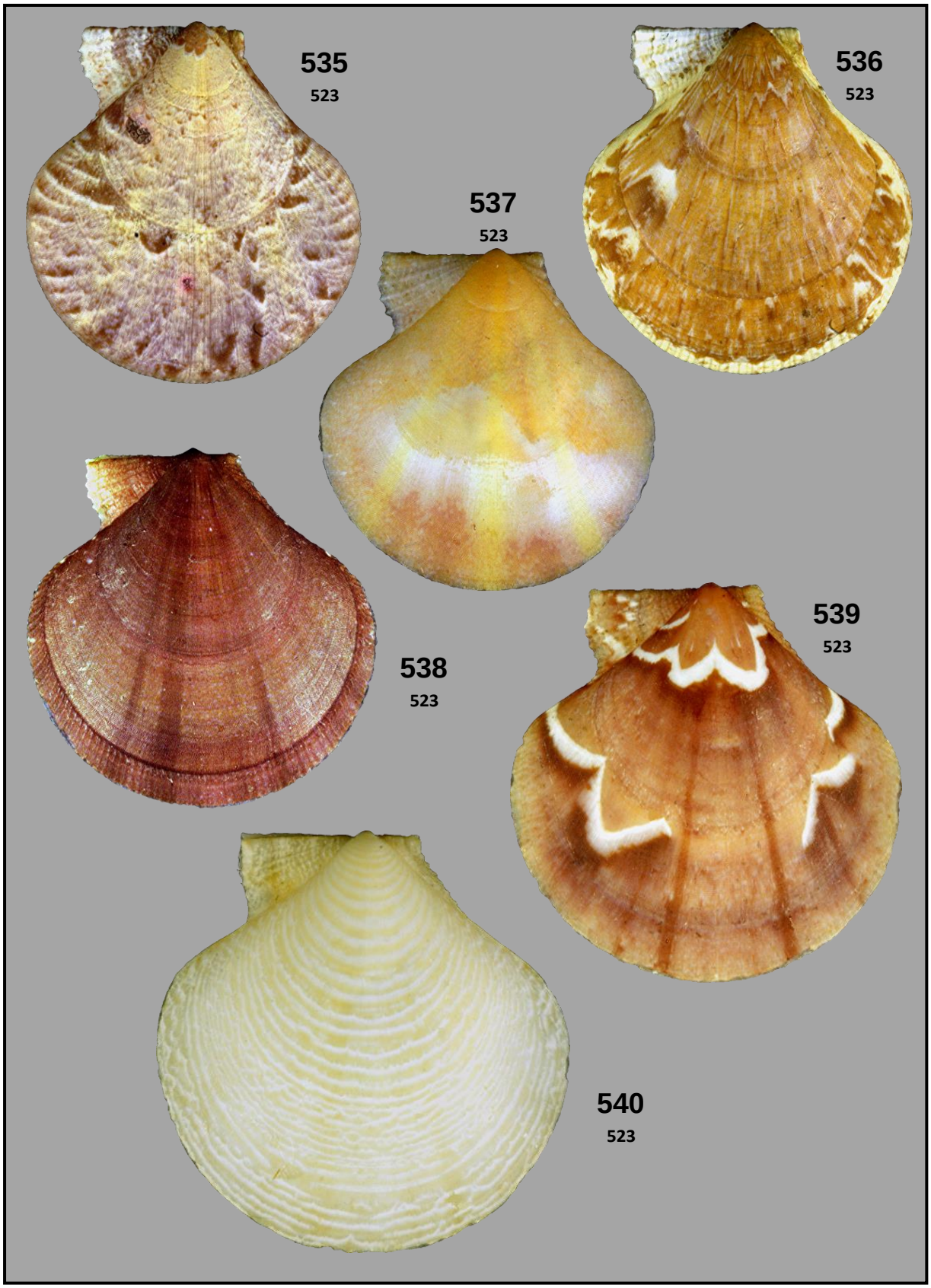


Plate LXXXXVIII. Figs 535-540: *Palliolum tigerinum* (O.F. Müller, 1776). Irish Sea, UK. Trawled by Belgian fishermen between Cork and Waterford at a depth of 40 m. LV. FN; 535: H. 26.25 mm L. 24.35 mm; 536: H. 25.14 mm L. 23.66 mm; 537: H. 23.42 mm L. 22.98 mm; 538: H. 25.62 mm L. 24.80 mm; 539: H. 25.36 mm L. 24.87 mm; 540: 26.09 mm L. 25.00 mm.

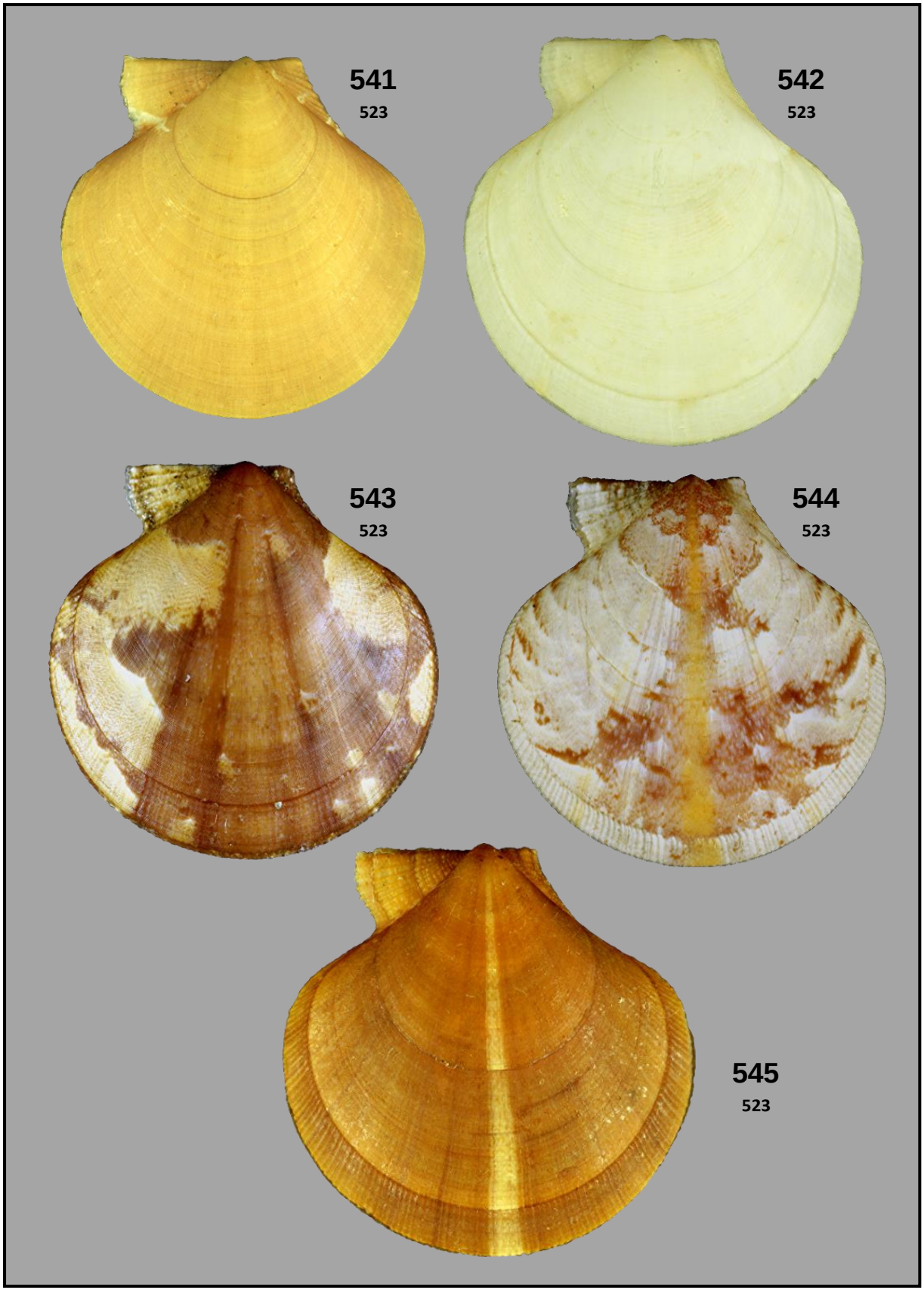


Plate LXXXXIX. Figs 541-545: *Palliolum tigerinum* (O.F. Müller, 1776). Irish Sea, UK. Trawled by Belgian fishermen between Cork and Waterford at a depth of 40 m. LV. FN; 541: H. 27.25 mm L. 27.51 mm; 542: H. 27.80 mm L. 28.34 mm; 543: H. 29.57 mm L. 28.56 mm; 544: H. 30.01 mm L. 29.69 mm; 545: H. 30.84 mm L. 30.80 mm.

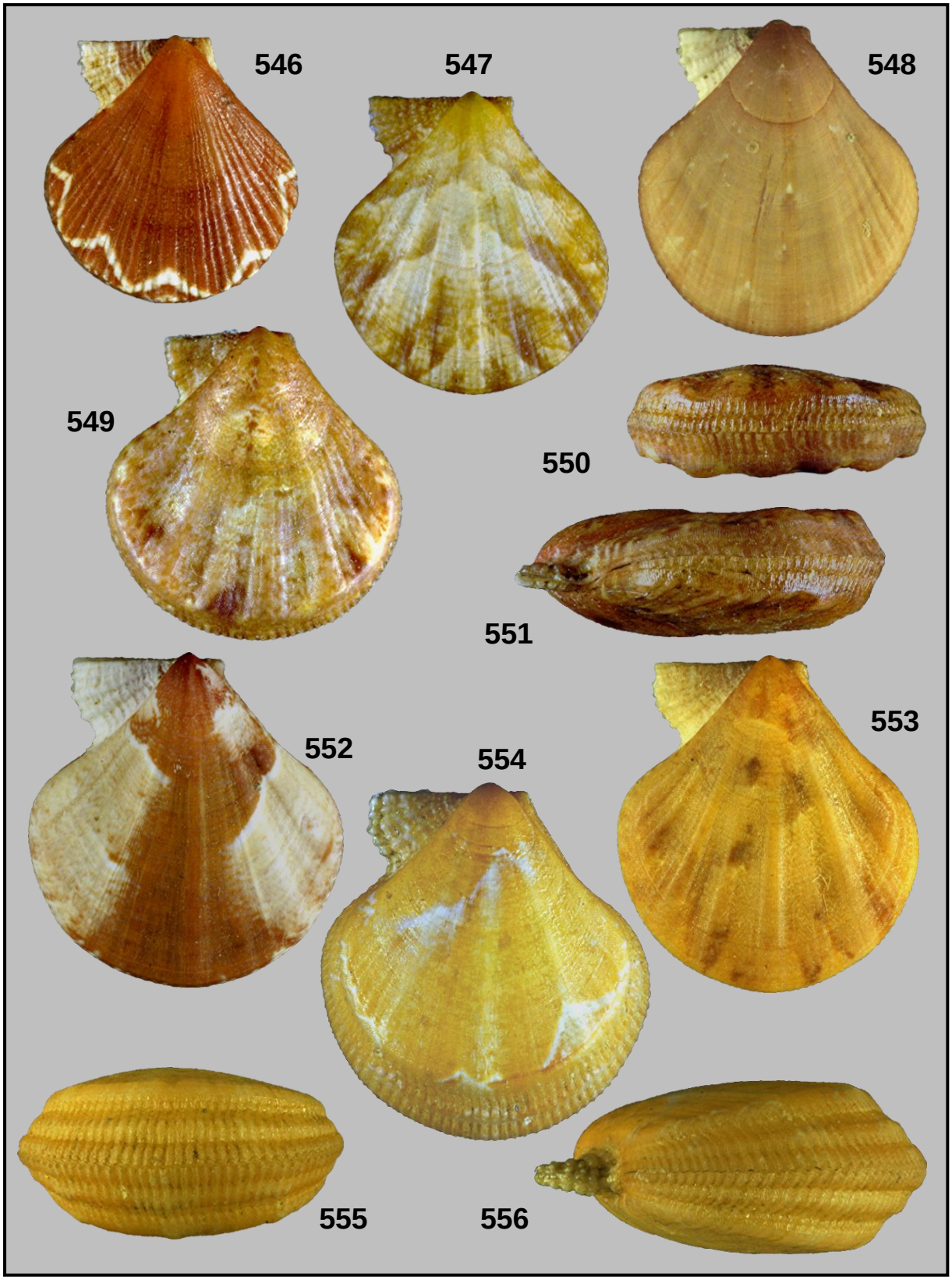


Plate C. Figs 546-556: *Palliolum tigerinum* (O.F. Müller, 1776). Trawled by Belgian fishermen off Land's End, SW England, UK. In stomach of plaice. February 1967. FN; 546-548: LV; 546: H. 16.41 mm L. 14.99 mm; 547: H. 18.09 mm L. 16.39 mm; 548: H. 19.55 mm L. 17.15 mm; 549-551: H. 18.48 mm L. 17.47 mm; 549: LV; 550: bottom view; 551: anterior side; 552-553: LV; 552: H. 19.41 mm L. 18.17 mm; 553: H. 19.92 mm L. 17.89 mm; 554-556: 19.29 mm L. 17.89 mm; 554: LV; 555: bottom view; 556: anterior side.

Plate CI. Figs 557-568: *Palliolum tigerinum* (O.F. Müller, 1776). Trawled by Belgian fishermen off Land's End, SW England, UK. In stomach of plaice. LV. FN; 557: H. 18.93 mm L. 17.53 mm; 558: H. 18.02 mm L. 16.30 mm; 559: H. 19.93 mm L. 18.75 mm; 560: H. 19.32 mm L. 17.78 mm; 561: H. 17.12 mm L. 15.60 mm; 562: H. 19.74 mm L. 18.25 mm; 563: H. 15.48 mm L. 14.43 mm; 564: 19.43 mm L. 17.67 mm; 565: H. 16.18 mm L. 14.54 mm; 566: H. 20.55 mm L. 19.30 mm; 567: H. 19.83 mm L. 17.34 mm; 568: H. 15.50 mm L. 14.40 mm.

Plate CII. Figs 569-580: *Palliolum tigerinum* (O.F. Müller, 1776). Trawled by Belgian fishermen off Land's End, SW England, UK. In stomach of plaice. LV. FN; 569: H. 16.19 mm L. 14.56 mm; 570: H. 19.94 mm L. 18.82 mm; 571: H. 16.18 mm L. 14.85 mm; 572: H. 18.14 mm L. 16.44 mm; 573: H. 18.03 mm L. 16.91 mm; 574: H. 17.87 mm L. 16.23 mm; 575: H. 17.05 mm L. 15.68 mm; 576: H. 18.68 mm L. 17.84 mm; 577: H. 17.94 mm L. 16.57 mm; 578: H. 16.04 mm L. 15.12 mm; 579: H. 16.38 mm L. 15.10 mm; 580: H. 14.91 mm L. 13.72 mm.

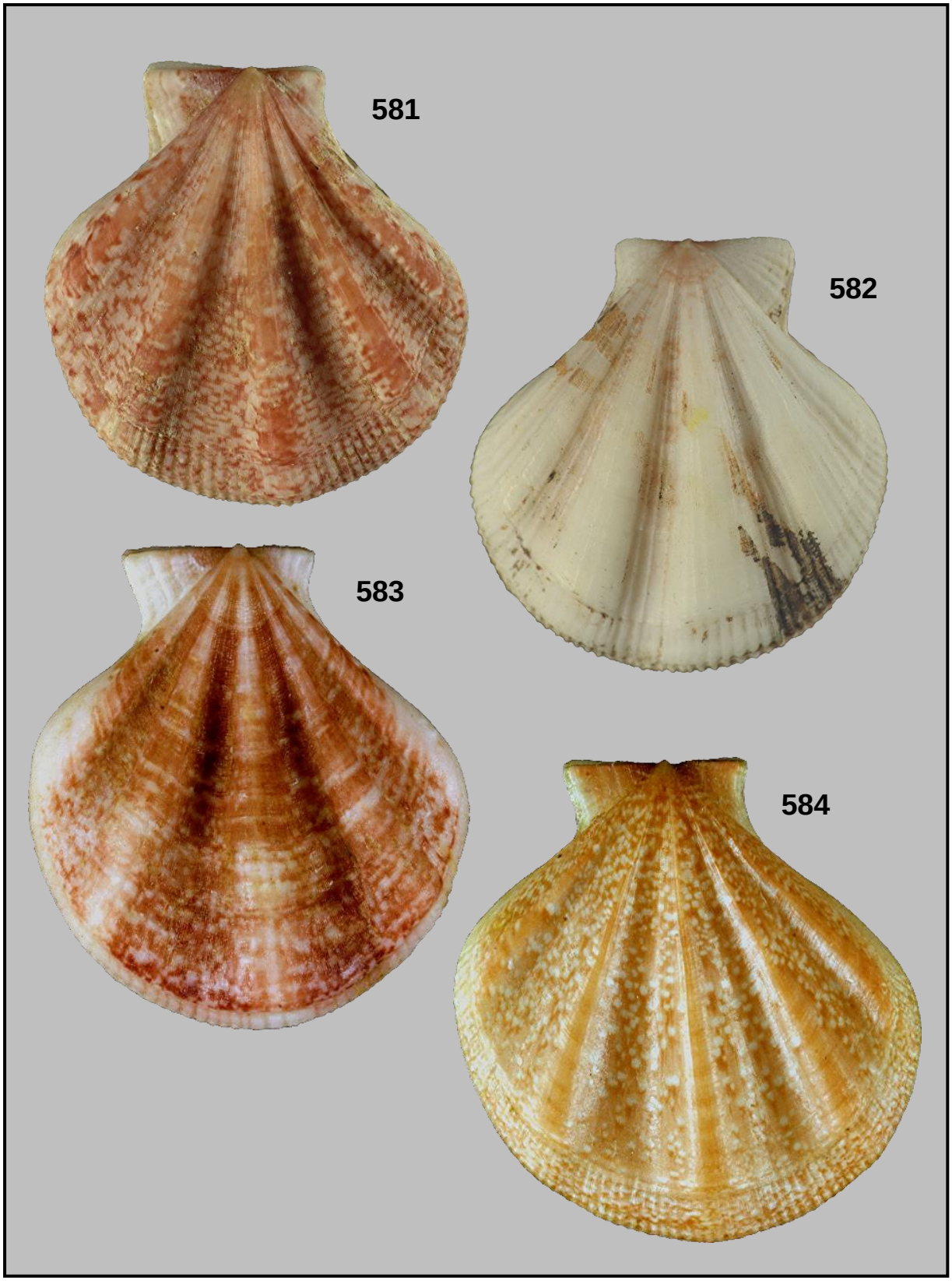


Plate CIII. Figs 581-582: *Pseudamussium clavatum (*Poli, 1795). South of La Rochelle, Bay of Biscay, W France. Trawled by Belgian fishermen at a depth of 130 m. July 2007. H. 25.6 mm L. 24.1 mm. JPK; 581: LV; 582: RV; Fig. 583: *P. clavatum* var. *dumasii* (Payraudeau, 1826). Galicia, Bay of Biscay, North Spain. Trawled by Spanish fishermen. H. 30.39 mm L. 27.52 mm. LV. FN; Fig. 584: *P. clavatum* var. *inflexa* (Locard, 1888). Off Melilla, Alboran Sea, Spain. Trawled by fishermen. 1963. H. 31.67 mm L. 29.94 mm. LV. FN.

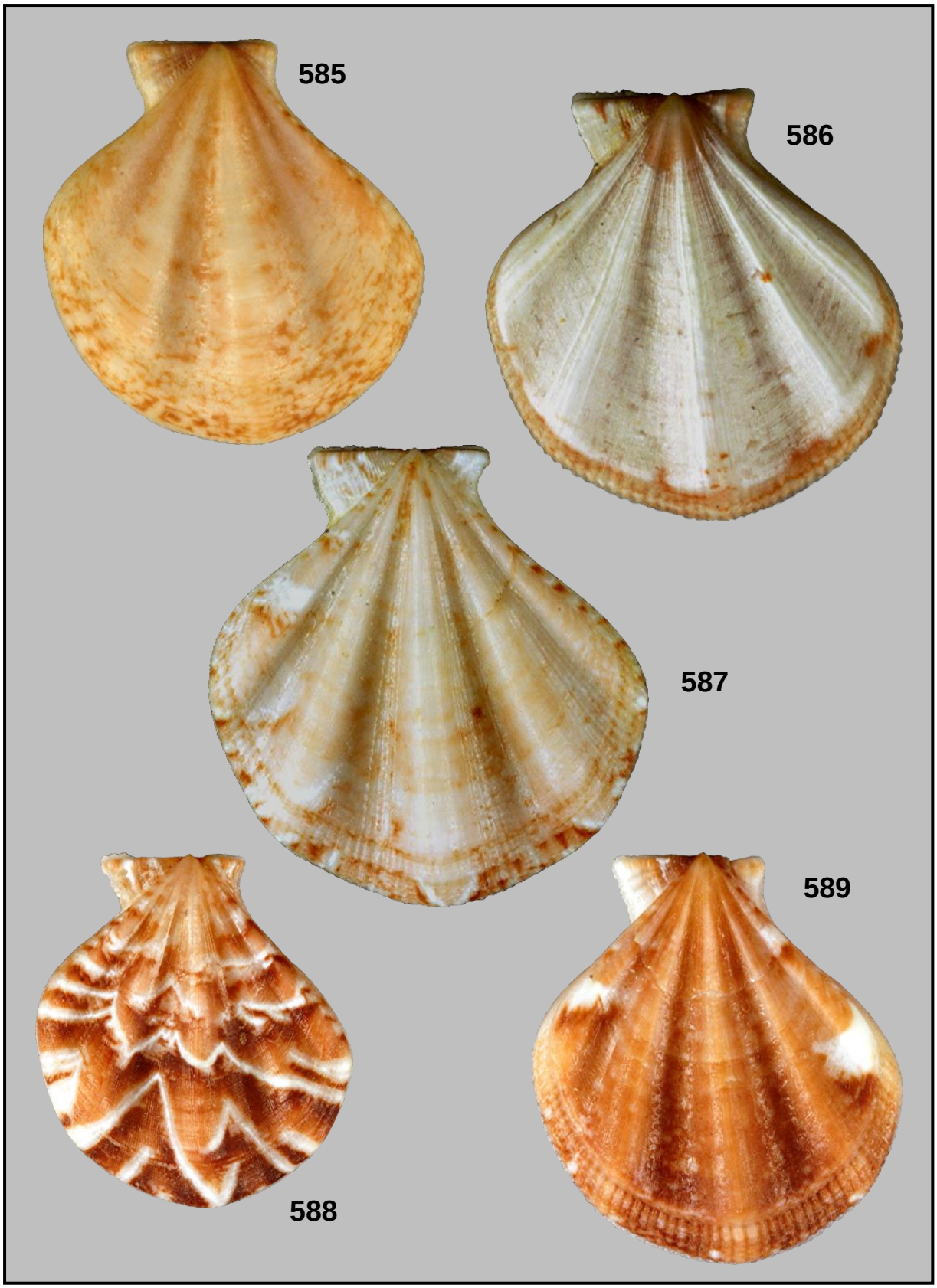


Plate CIV. Figs 585-586: *Pseudamussium clavatum (*Poli, 1795). Ibiza, Balearic Islands, Spain. Dredged by fishermen at a depth of 140 m. 1962. LV. FN; 585: H. 25.09 mm L. 23.11 mm; 586: H. 27.46 mm L. 25.64 mm; Figs 587-589: *P. clavatum* var. *inflexa* (Poli, 1795). Ibiza, Balearic Islands, Spain. Dredged by fishermen at a depth of 140 m. 1962. LV. FN; 587: H. 29.79 mm L. 28.33 mm; 588: H. 21.45 mm L. 18.79 mm; 589: H. 27.55 mm L. 24.06 mm.

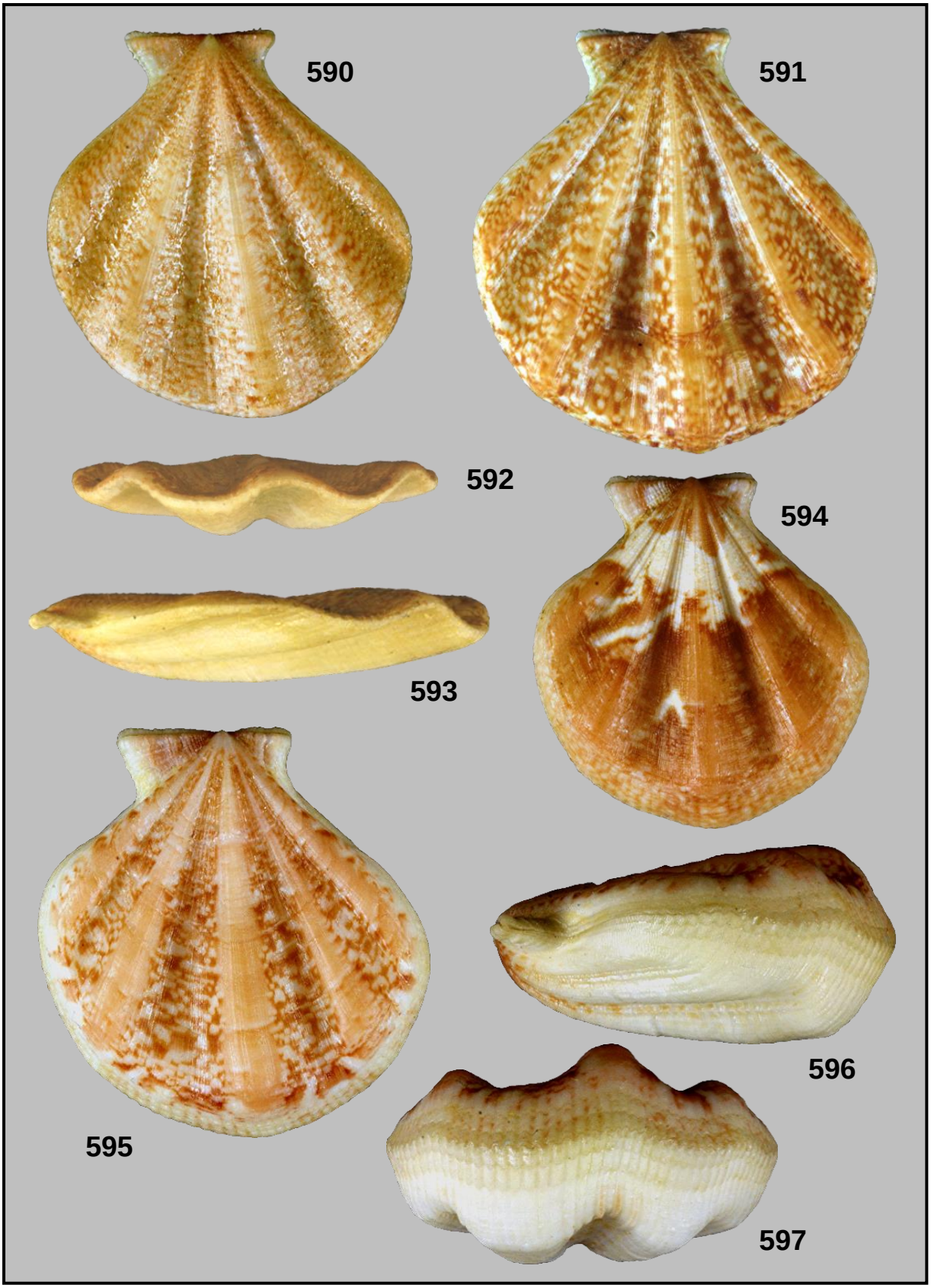


Plate CV. Figs 590-593: *Pseudamussium clavatum* var. *depressa* (Locard, 1888). Anzio, Italy. Trawled by local fishermen. FN; 590, 592 & 593: H. 28.20 mm L. 25.33 mm; 590: LV; 592: bottom view; 593: anterior side; 591: H. 30.30 mm L. 28.07 mm. LV; Figs 594-597: *P. clavatum* var. *dumasii* (Payraudeau, 1826). Syracuse, Italy. Trawled at a depth of 90 m. FN; 594: H. 21.62 mm L. 19.56 mm. LV; 595-597: H. 26.01 mm L. 24.46 mm; 595: LV; 596: anterior side; 597: bottom view.

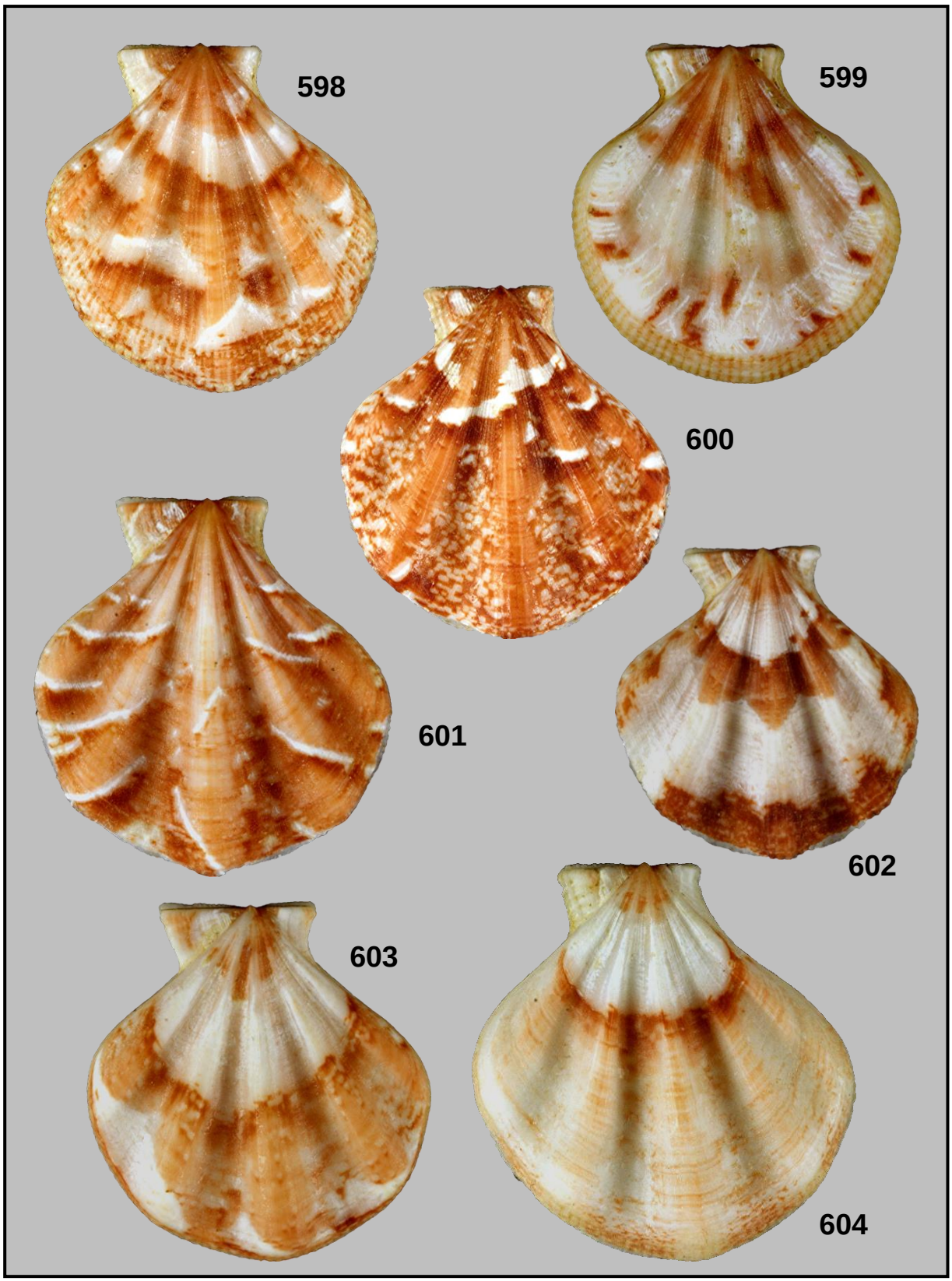


Plate CVI. Figs 598-599: *Pseudamussium clavatum* var. *dumasii* (Payraudeau, 1826). Ibiza, Balearic Islands, Spain. Dredged by local fishermen. 1962. LV. FN; 598: H. 26.31 mm L. 24.83 mm; 599: H. 24.09 mm L. 22.42 mm; Figs 600-601: *P. clavatum* var. *marmorata* (Monterosato, 1875). Ibiza, Balearic Islands, Spain. Dredged by local fishermen. 1962. LV. FN; 600: H. 26.13 mm L. 24.04 mm; 601: H. 28.30 mm L. 26.39 mm; Figs 602-604: *P. clavatum* var. *zonata* (Locard, 1888). Ibiza, Balearic Islands, Spain. Dredged by local fishermen at a depth of 140 m. 1962. LV. FN; 602: H. 22.79 mm L. 21.81 mm; 603: H. 25.70 mm L. 24.17 mm; 604: H. 28.78 mm L. 27.04 mm.

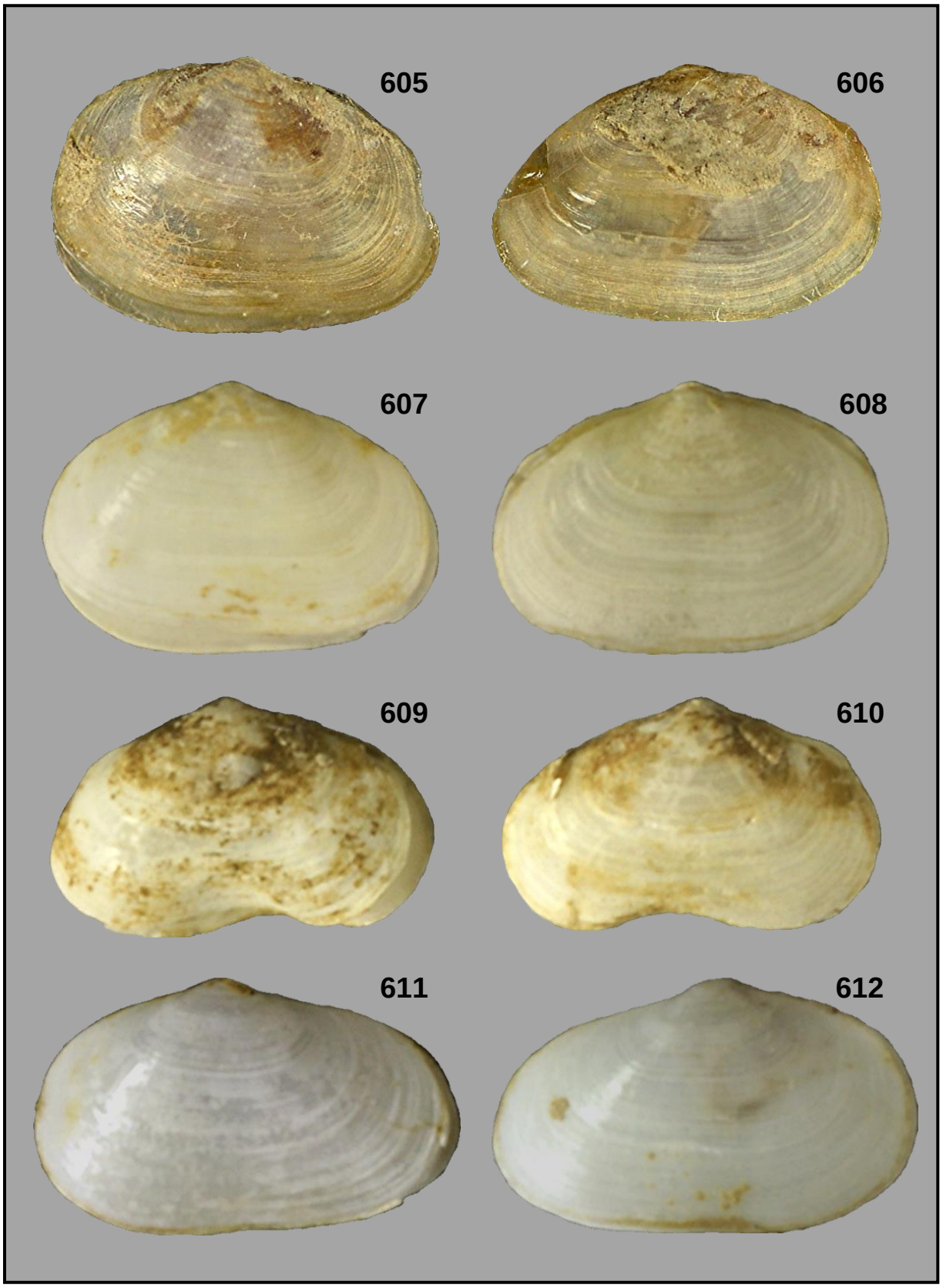


Plate CVII. Figs 605-612: *Montacuta phascolionis* Dautzenberg & H. Fischer, 1925. South of La Rochelle, Bay of Biscay, W France. Trawled by Belgian fishermen at a depth of 70 m, buried in *Aporrhais pespelecani* var. *bilobatus* Clément, 1875; 605-606: H. 3.5 mm L. 5.6 mm. JPK;605: LV; 606: RV; 607-612: FN; 607-608: H. 3.56 mm L. 5.58 mm; 607: LV; 608: RV; 609-610: H. 3.28 mm L. 4.87 mm; 609: LV; 610: RV; 611-612: H. 3.39 mm L. 5.47 mm; 611: LV; 612: RV.

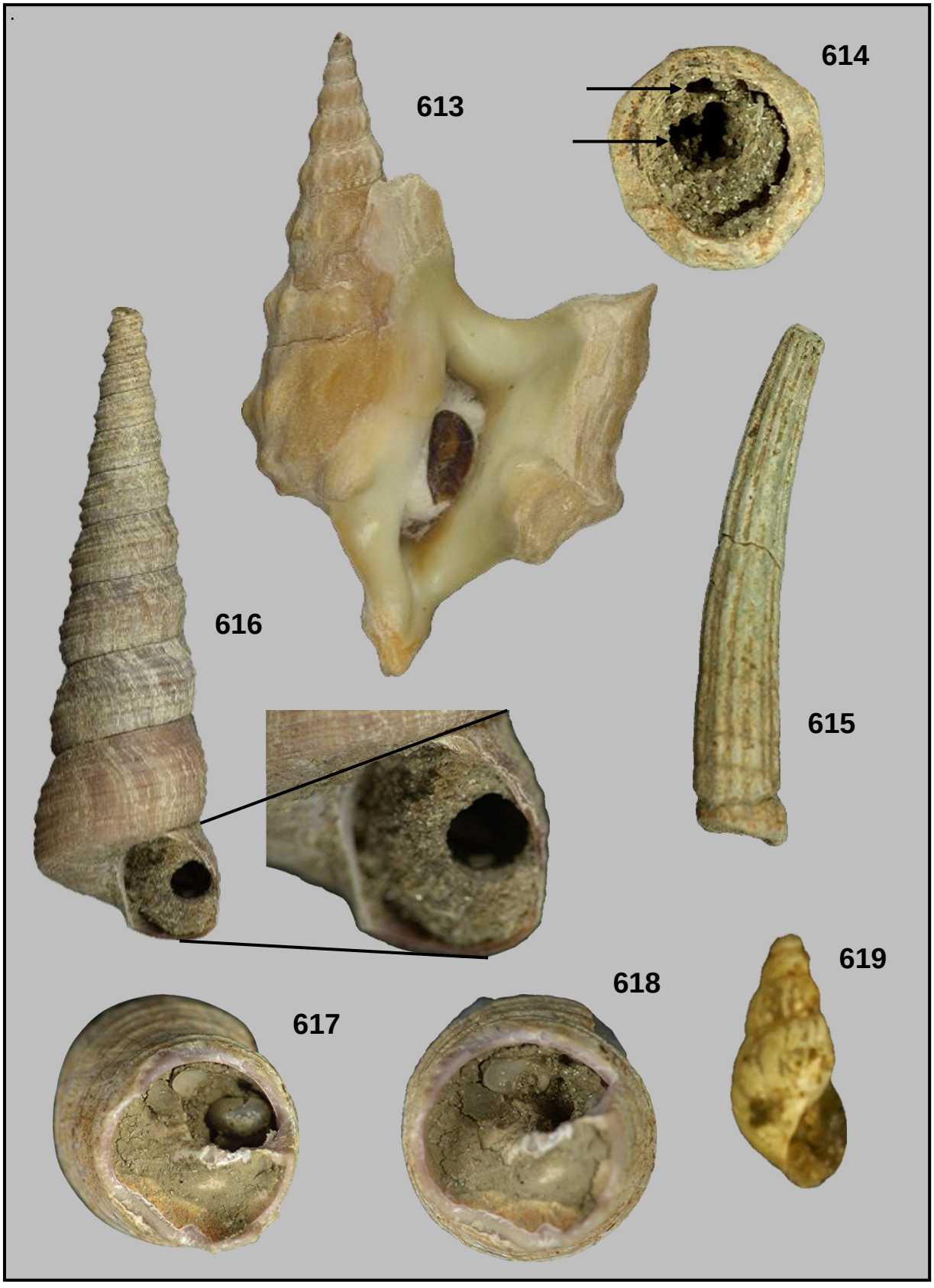


Plate CVIII. Figs 613-619: South off La Rochelle, Bay of Biscay, W France. Trawled by Belgian fishermen at a depth of 70 m. July 2006. FN; 613: *Aporrhais pespelecani* var. *bilobatus* Clément, 1875. 46.57 mm; 614-615: *Dentalium novemcostatum* Lamarck, 1811. 31.52 mm; 614: the two channels buried by the sipunculid *Phascolion strombi* (Montagu, 1804) in a plug of sand; 616-618*: Turritella communis* Risso, 1826 housed by *M. phascolionis* Dautzenberg & H. Fischer, 1925. 34.21 mm; 619: *Ondina* sp. 3.15 mm.

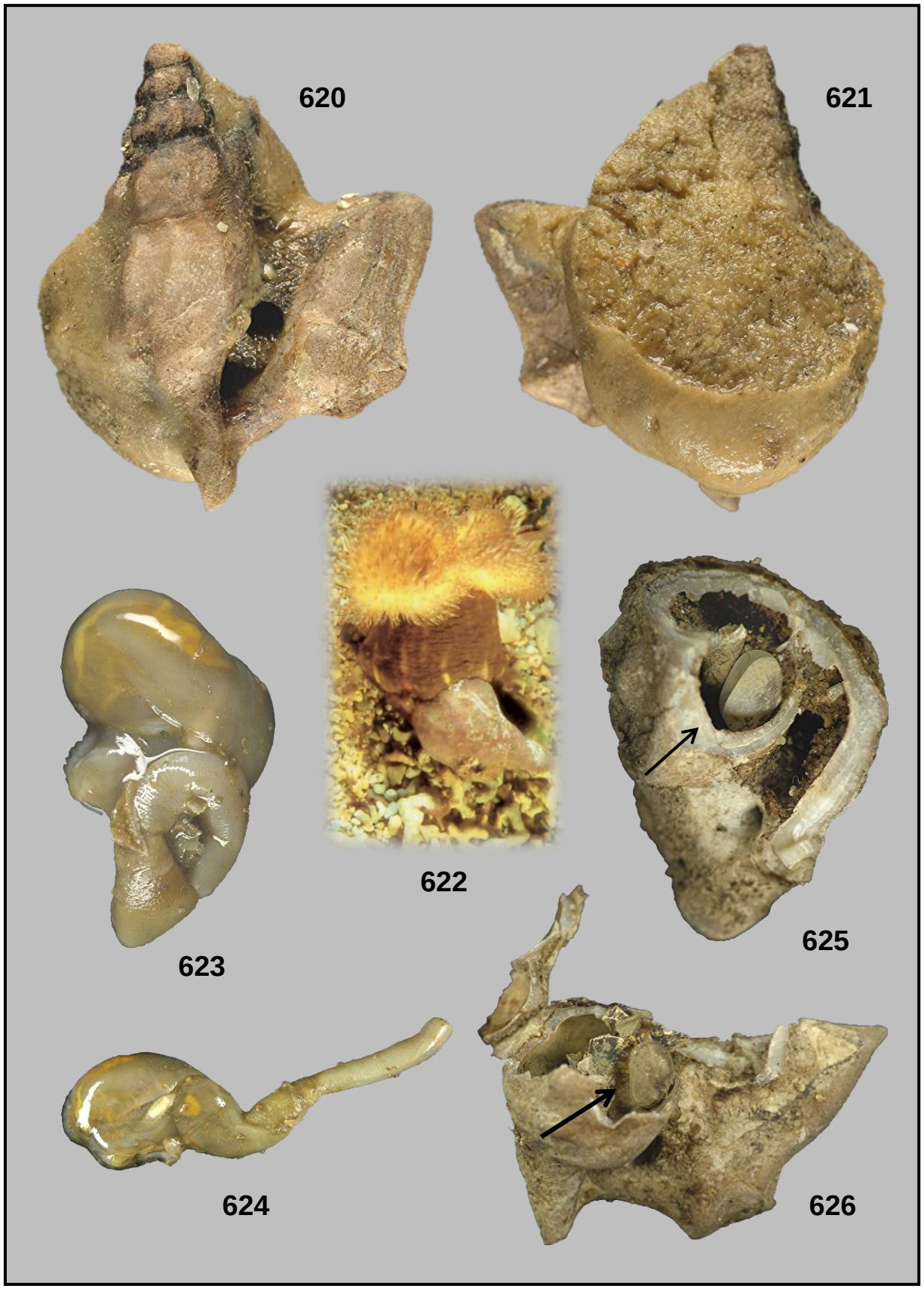


Plate CIX. Figs 620-621: *Aporrhais pespelecani* var. *bilobatus* Clément, 1875. South off La Rochelle, Bay of Biscay, W France. Trawled by Belgian fishermen at a depth of 70 m. July 2007. Specimen covered by the sea anemone *Calliactis parasitica* (Couch, 1842). FN; 622: *Calliactis parasitica* (Couch, 1842); 623-624: Sipunculid *Phascolion strombi* (Montagu, 1804); 625-626: *Montacuta phascolionis* Dautzenberg & H. Fischer, 1925 buried in the penultimate whorl of *Aporrhais pespelecani* var. *bilobatus* Clément, 1875.

Plate CX. Figs 627-632*: Astarte sulcata* (da Costa, 1778). South of La Rochelle, Bay of Biscay, W France. Trawled by Belgian fishermen at a depth of 100 m. July 2002. JPK; 627-628: H. 26.46 mm L. 28.91 mm; 627: RV; 628: LV; 629-630; H. 28.2 mm L. 28.8 mm; 629: RV; 630: LV; 631-632: H. 27.14 mm L. 30.67 mm; 631: RV; 632: LV.

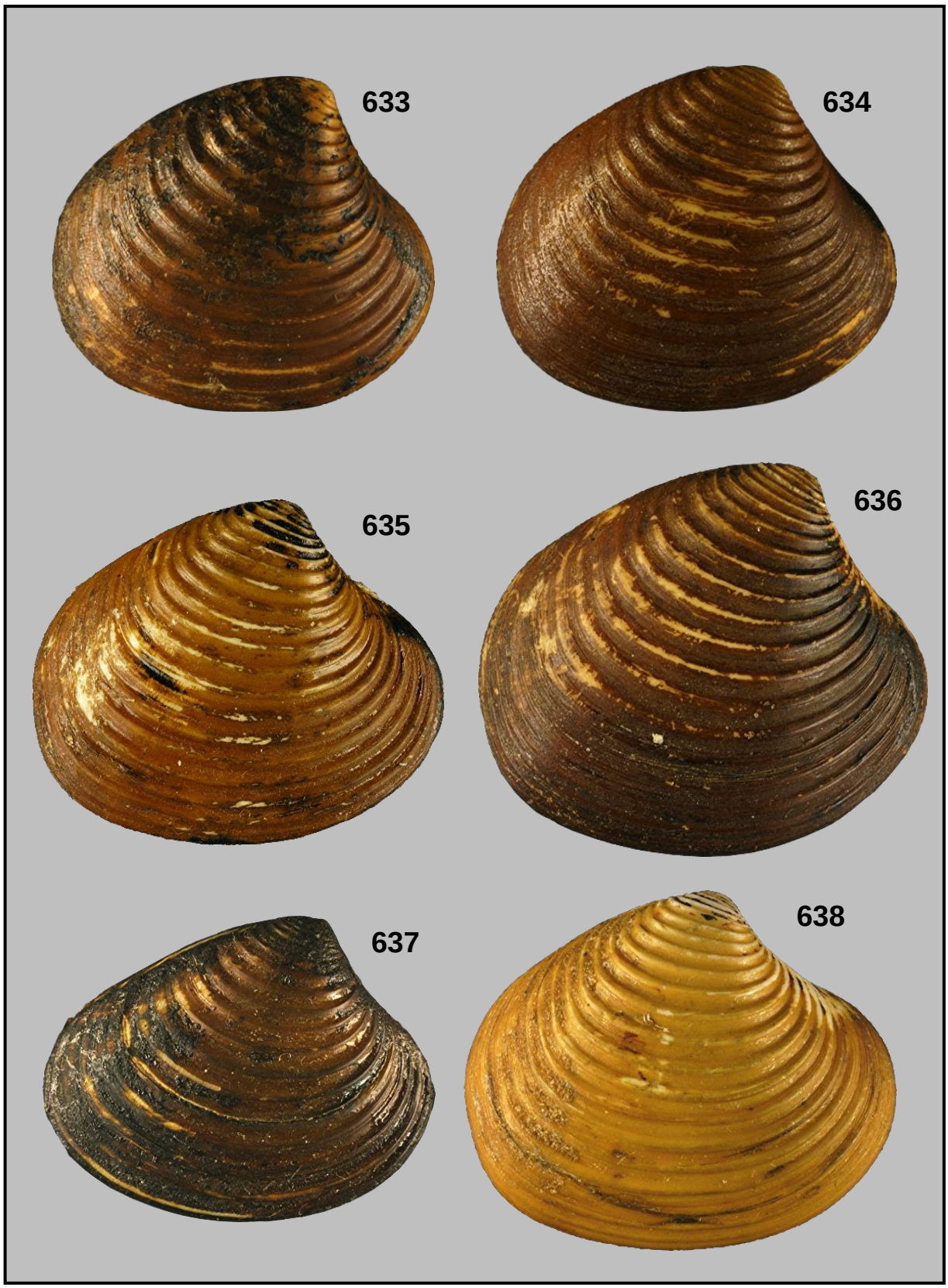


Plate CXI. Figs 633-638*: Astarte sulcata* (da Costa, 1778). RV. FN; 633-636: South of La Rochelle, Bay of Biscay, W France. Trawled by Belgian fishermen at a depth of 100 m. July 2002; 633: H. 23.35 mm L. 26.30 mm; 634: H. 24.02 mm L. 28.03 mm; 635: H. 24.53 mm L. 29.40 mm; 636: H. 26.70 mm L. 30.08 mm; 637-638: Cardigan Bay, W England, UK. On rocky bottom. Trawled at a depth of 37 m, entangled in nets with hydroids. May 1971; 637: H. 18.03 mm L. 22.91 mm; 638: H. 24.10 mm L. 28.80 mm.

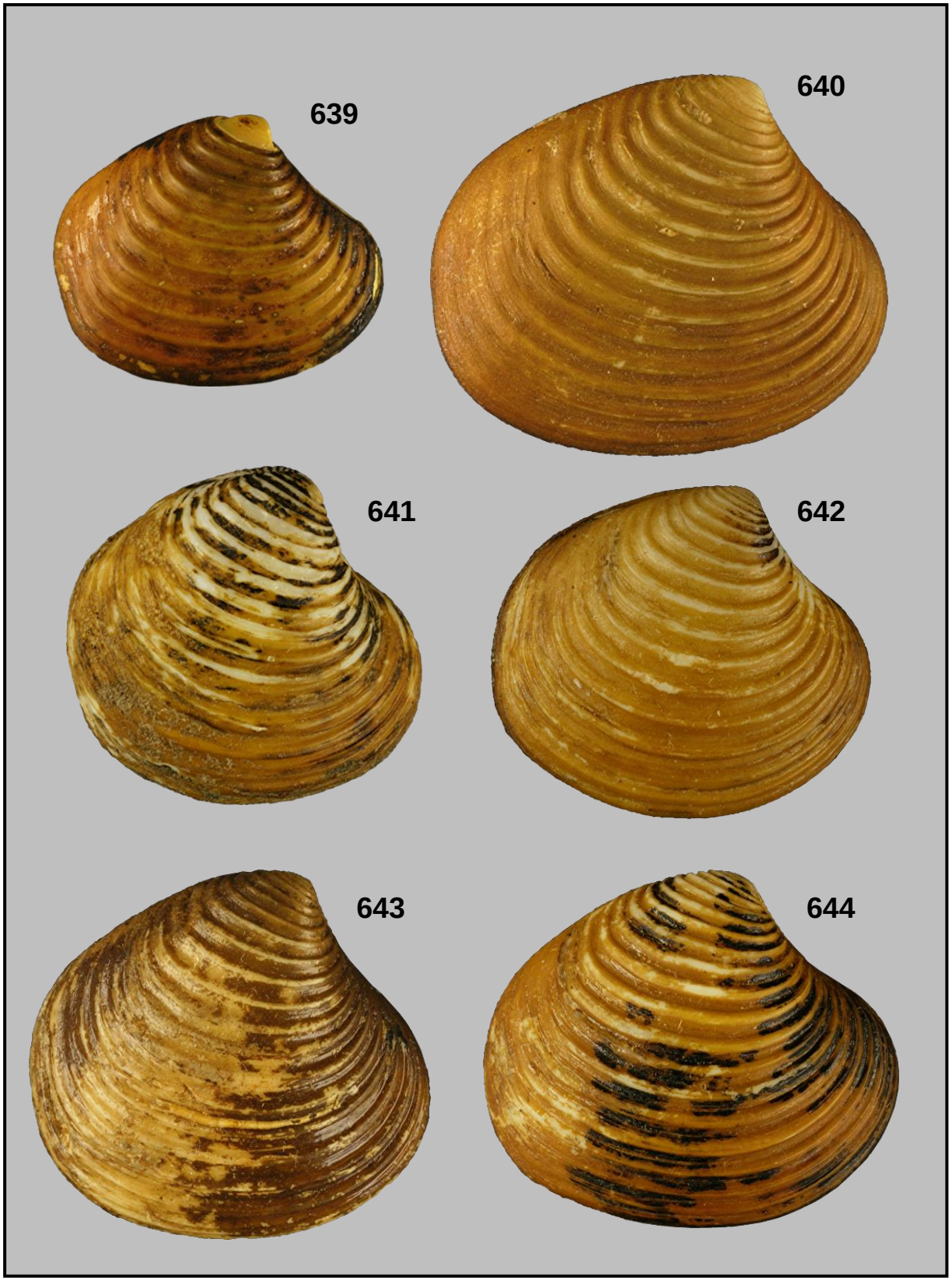


Plate CXII. Figs 639-640*: Astarte sulcata* (da Costa, 1778). RV. FN; 639: South Iceland. Trawled by Belgian fishermen. October 1972. H. 17.89 mm L. 21.64 mm; 640: Roscoff, Finistère, Brittany, France. Trawled by local fishermen. July 1996. H. 25.04 mm L. 29.69 mm;
Figs 641-644: *Astarte sulcata* var. *scotica* (Maton & Rackett, 1807). Firth of Clyde, W Scotland, UK. Trawled by fishermen. 1990. RV. FN; 641: H. 23.35 mm L. 26.30 mm; 642: H. 24.02 mm L. 28.03 mm; 643: 24.53 mm L. 29.40 mm; 644: 26.70 mm L. 30.08 mm.

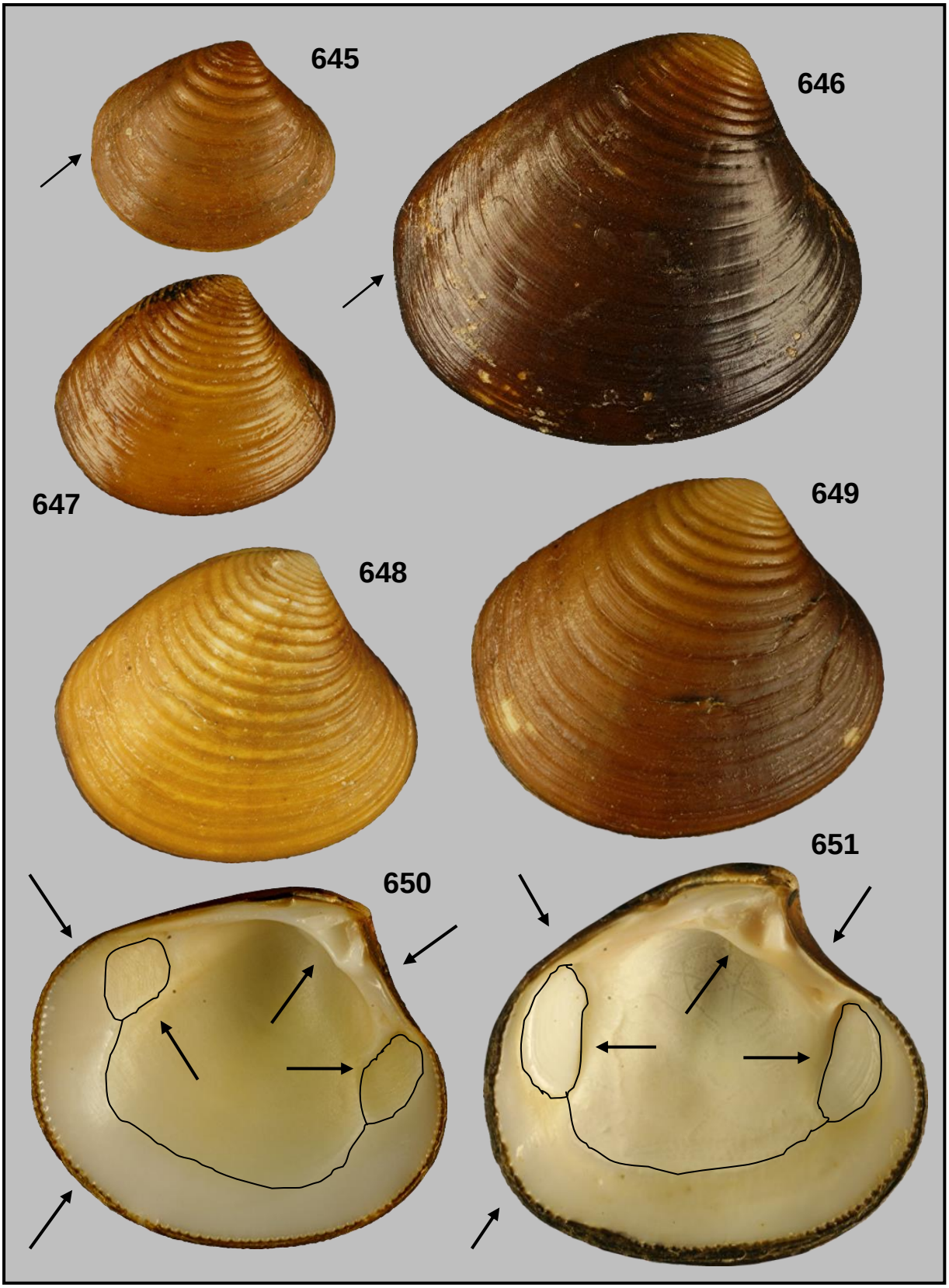


Plate CXIII. Figs 645-651: FN; 645-650: *Astarte fusca* (Poli, 1791); 645: Mauritania, NW Africa. On coral sand. H. 13.78 mm L. 16.55 mm. RV; 646: Sicily, Italy. 5 January 1972. H. 24.16 mm L. 27.38 mm. RV; 647-650: Barcelona, Spain. Trawled by fishermen at a depth of 100 m. 17 April 1972. RV. FN; 647: H. 13.20 mm L. 15.32 mm; 648: H. 16.42 mm L. 18.84 mm; 649: H. 22.08 mm L. 24.98 mm; 650: LV; Fig. 651: *Astarte sulcata* (da Costa, 1779). LV.

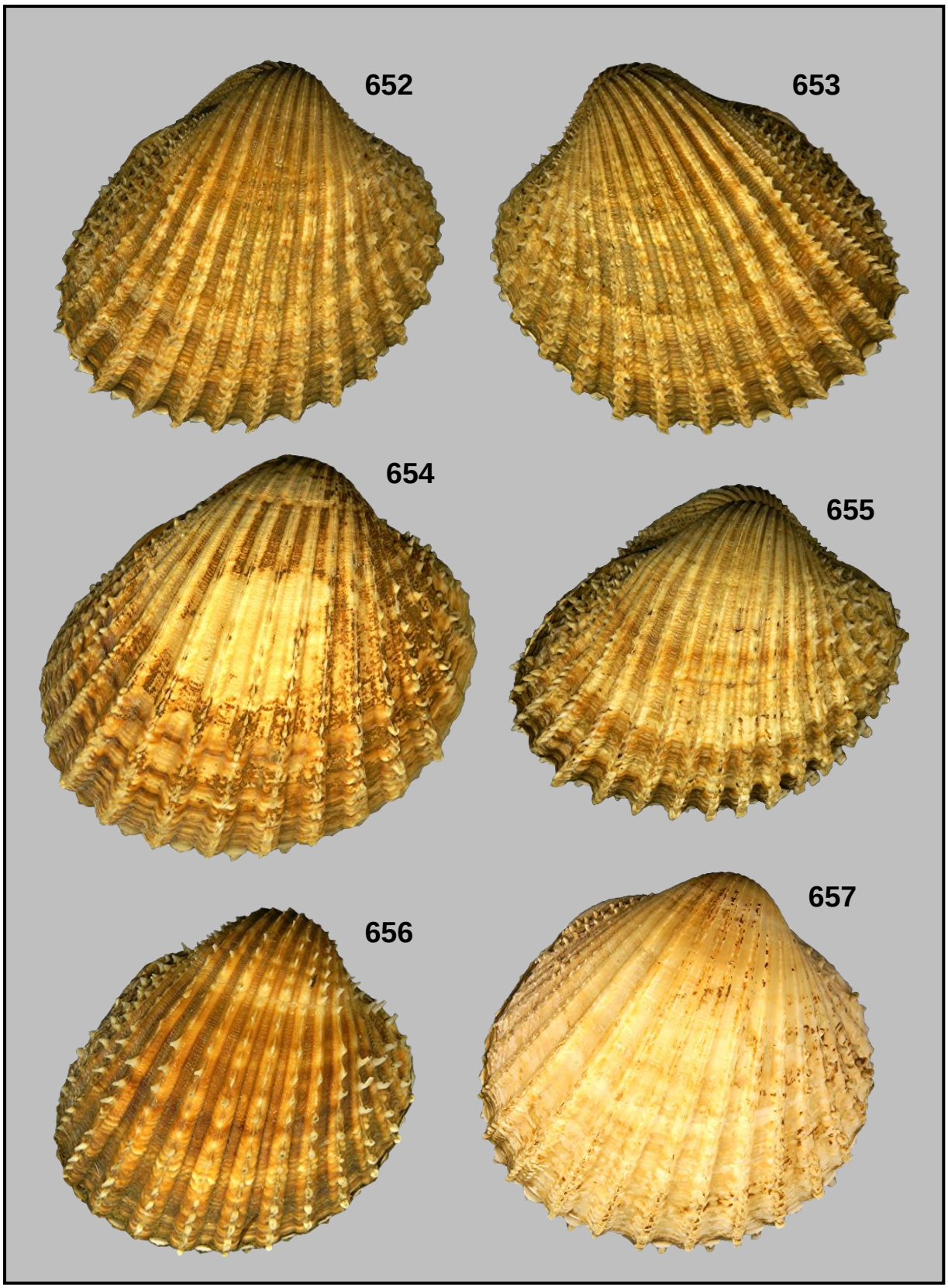


Plate CXIV. Figs 652-657: *Acanthocardia echinata* (Linnaeus, 1758). FN; 652-655: South of La Rochelle, Bay of Biscay, W France. Trawled by Belgian fishermen at a depth of 80 m. July 2006; 652-653: H. 56.61 mm L. 62.56 mm; 652: RV; 653; LV; 654-657: RV; 654: H. 60.19 mm L. 63.69 mm; 655: H. 53.41 mm L. 65.62 mm; 656: Boyardville, Ile d'Oléron, W France. In sand at extreme low tide. 7 April 2004. H. 46.61 mm L. 49.26 mm; 657: Off Faroe Islands, North Sea. Trawled by Belgian fishermen at a depth of 180 m. March 1973. H. 55.92 mm L. 58.22 mm.

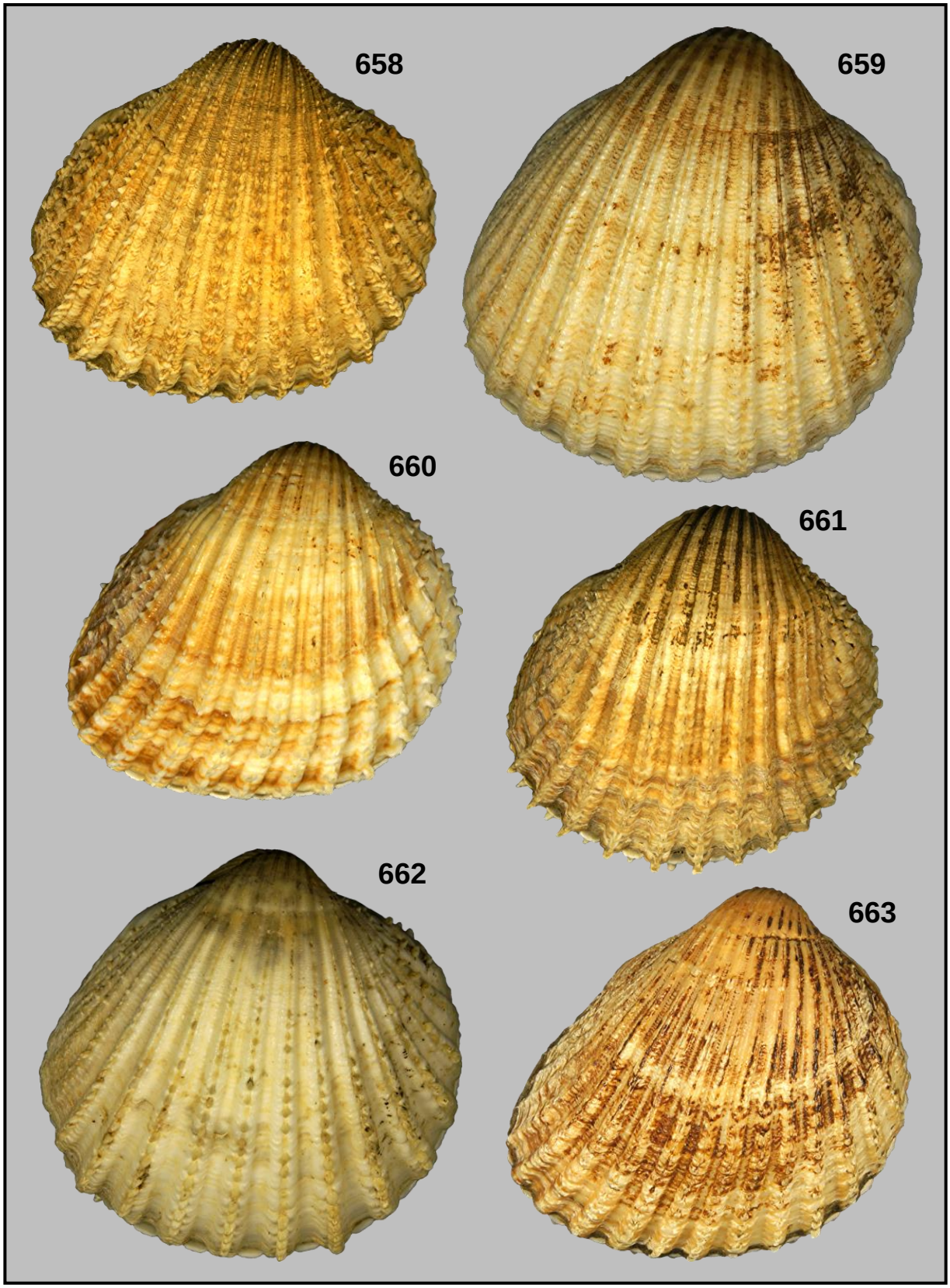


Plate CXV. Figs 658-663: *Acanthocardia echinata* (Linnaeus, 1758). RV. FN; 658-662: Cardigan Bay, W England, UK. Trawled by Belgian fishermen at a depth of 36 m. On ferruginous bottom. 1972; 658: H. 55.84 mm L. 62.47 mm; 659: 62.63 mm L. 63.59 mm; 660: H. 42.45 mm L. 47.11 mm; 661: H. 54.88 mm L. 57.18 mm; 662: Albinistic specimen. H. 55.64 mm L. 56.66 mm; 663: North Sea. Trawled by Belgian fishermen. 1962. H. 43.32 mm L. 49.26 mm.

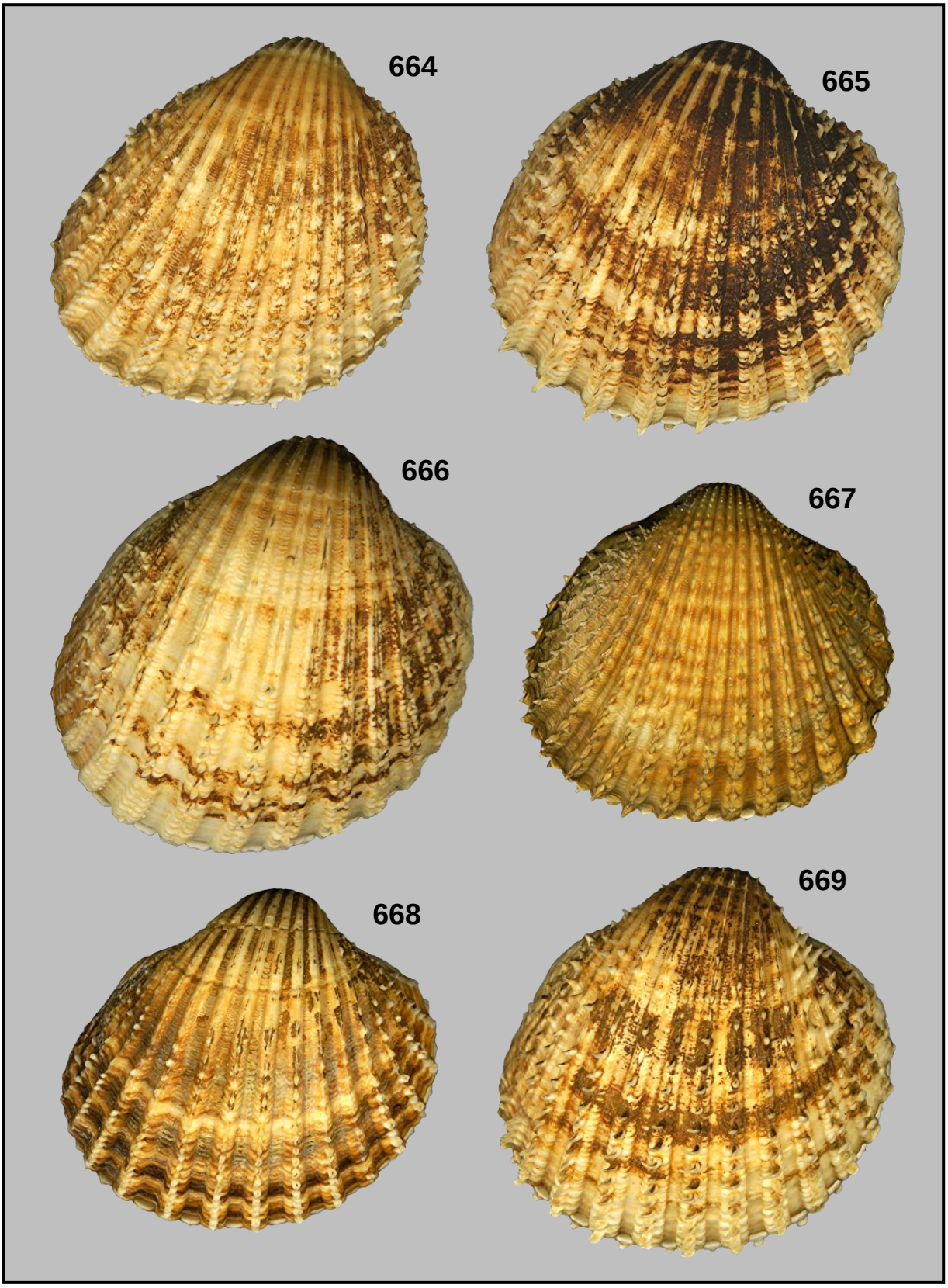


Plate CXVI. Figs 664-668: *Acanthocardia echinata* (Linnaeus, 1758). RV. FN; 664-666: Locquémeau, Brittany, France. Trawled by local fishermen. June 1976; 664: H. 56.11 mm L. 57.63 mm; 665: H. 56.36 mm L. 61.20 mm; 666: H. 63.65 mm L. 66.93 mm; 667: St. Lunaire, Brittany, France. In sand at low tide. 30 August 1992. H. 52.20 mm L. 56.37 mm; 668: Cabourg, Normandy, France. In sand at low tide. 17 August 2000. H. 48.67 mm L. 53.83 mm. Fig. 669: *Acanthocardia echinata* var. *duregnei* (Monterosato, 1891). Locquémeau, Brittany, France. Trawled by local fishermen. June 1976. H. 54.85 mm L. 55.31 mm.

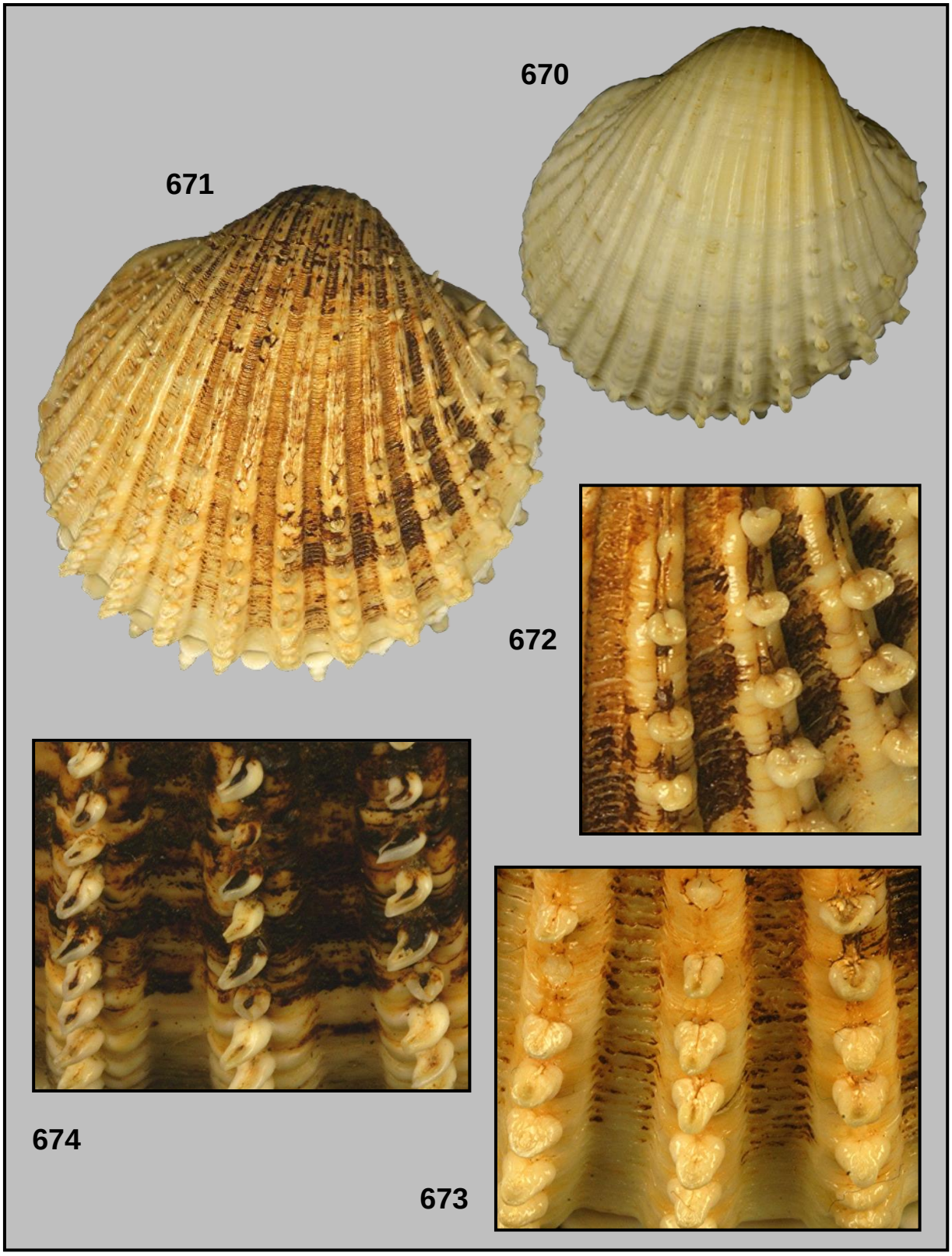


Plate CXVII. Figs 670-673: *Acanthocardia echinata* var. *mucronata* (Poli, 1791). FN; 670: Benicarlo, Spain. Trawled by local fishermen. July 1973. Albinistic specimen. H. 41.42 mm L. 43.56 mm. RV; 671-673: Torrevieja, Spain. Trawled by local fishermen; 671: H. 61.68 mm L. 64.18 mm. RV; 672-673: details of spoon-like spines on ridge of radiating ribs; 674: *A. echinata* (Linnaeus, 1758). Details of hooked spines on lower ridge of radiating ribs.