The Stromboid subgenus *Laevistrombus* (Mollusca: Strombidae) and its occurrence in the Solomon Islands

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Key words: MOLLUSCA, GASTROPODA, STROMBIDAE, *Strombus*, *Laevistrombus*, Solomon Islands.

Abstract: A brief overview of the Stromboid subgenus *Laevistrombus* Kira, 1955 is given and its situation in the Solomon Islands is discussed. A new record for the already rich fauna of the Solomon Islands is added with the first find of *Strombus* (*Laevistrombus*) *guidoi* Man in 't Veld & De Turck, 1998.

Discussion: The Stromboid subgenus *Laevistrombus* Kira, 1955 was elaborately discussed by Man in 't Veld & De Turck (1998), who clearly illustrated that this is not a monospecific subgenus only containing *S*. (*L*.) *canarium* Linnaeus, 1758 with three different varieties *S.* (*L.*). *canarium* s.s., *S.* (*L*.) *turturella* (Röding, 1798) and an albino form restricted to Vanuatu, but that these are actually separate species. They also introduced the final one as a new species: *S*. (*L*.) *guidoi*.

1. *Strombus* (*Laevistrombus*) *canarium* Linnaeus, 1758

Plate I: ***Strombus* (*Laevistrombus*) *canarium* Linnaeus, 1758**
Guadalcanal, Solomon Islands (coll. D. Monsecour)

Original reference: Systema Natura Ed. 10, Vol. I

Type material: One shell in the Linnean Society of London (fide Dodge, 1956).

Type locality: Amboina, Indonesia; as designated by Abbott (1960).

Distinctive features: The easiest way of distinguishing species in this subgenus is studying the shape of the lip. The lip of *S.* (*L*). *canarium* is attached below the suture, slightly curves downwards and subsequently strongly curves upwards.

Remarks: In the Solomon Islands, this species is found in fairly large quantities near Ata'a, Malaita, northern Gizo, Honiara, Guadalcanal and Kolombangara.

2. *Strombus* (*Laevistrombus*) *turturella* (Röding, 1798)

Plate II: ***Strombus* (*Laevistrombus*) *turturella* (Röding, 1798)**
Ata'a Malaita, Solomon Islands (coll. D. Monsecour)

Original reference: Museum Boltenianum.

Type material: No information available. Röding (1798) refered to Martini (1777). Martini's drawing (plate 79, fig. 817) is considered the lectotype, yet the shell itself cannot be traced.

Type locality: Sandakan, Sabah, Malaysia; as designated by Man in 't Veld & De Turck (1998).

Distinctive features: This species can easily be distinguished from the other two species within the subgenus as its lip is attached near the suture, slightly curves upwards near the attachment and then curves downwards.

Remarks: This species is apparently much less common in the Solomon Islands: many collectors passed on their collection data for this subgenus and were only able to confirm Ata'a, Malaita as a locality for *S.* (*L*.) *turturella* within the Solomon Islands.

3. *Strombus* (*Laevistrombus*) *guidoi* Man in 't Veld & De Turck, 1998

Plate III: *Strombus* (*Laevistrombus*) *guidoi* Man in 't Veld & De Turck, 1998
1. Paratype 30, Port Vila, Vanuatu (coll. D. Monsecour)
2. Santa Cruz, Solomon Islands (coll. D. Monsecour)

Original reference: Gloria Maris 36(5-6): 73-107.

Type material: Holotype in the Natuurhistorisch Museum Rotterdam, The Netherlands; collection number NMR 15975. Thirty four paratypes in different musea and private collections.

Type locality: Port Vila, Vanuatu.

Distinctive features: Once again, the attachment and the shape of the upper lip are the easiest characteristics to distinguish the species from the other ones in the subgenus: it is attached below the suture and freely protrudes at the posterior end of the columella. The outer lip also strongly protrudes above the suture. The columella and the outer lip are usually covered with a thick, silverish to goldish gloss. Most specimens belonging to this species are uniformly white, yet some show a faint pattern of yellowish axial zigzag lines.

Remarks: In their original description, Man in 't Veldt & De Truck (1998) state that this species is "only known from the type locality". Since then, only other localities within Vanuatu have been confirmed. We hereby present the first record of *S*. (*L*.) *guidoi* beyond Vanuatu and at the same time a new species to be added to the already rich fauna of the Solomon Islands. Until now, the Solomon Islands' population is only known from two specimens, taken by a local diver at Santa Cruz, the first one stored in the Domenico collection and the second one in the Monsecour collection. It is not unlikely that other localities within the Solomon Islands will be confirmed soon and this find implies that it might one day also be reported from other neighbouring archipelagos.

The population from the Solomon Islands does not differ from the one from Vanuatu in any respect. Even Man in 't Veld & De Turck's remarks (1998) on the occurrence of traces of encrustation by bryozoans (colonial animals living attached to the substratum of living molluscs) can only be confirmed. Unfortunately, we too are unable to identify the bryozoans as only traces are left.

Acknowledgements: We would like to thank Jan Buysse (The Netherlands), Natale Domenico (Italy), Koen De Turck (Belgium), Leo Man in 't Veld (The Netherlands), Russ & Sue Webb (USA), Eric Fritz (USA) and Gijs Kronenberg (The Netherlands) for collection data; Frank Nolf (Belgium) for the lay-out and technical support and Natalie Bruynseels & Sarah Vertongen for supporting our interest in malacology.

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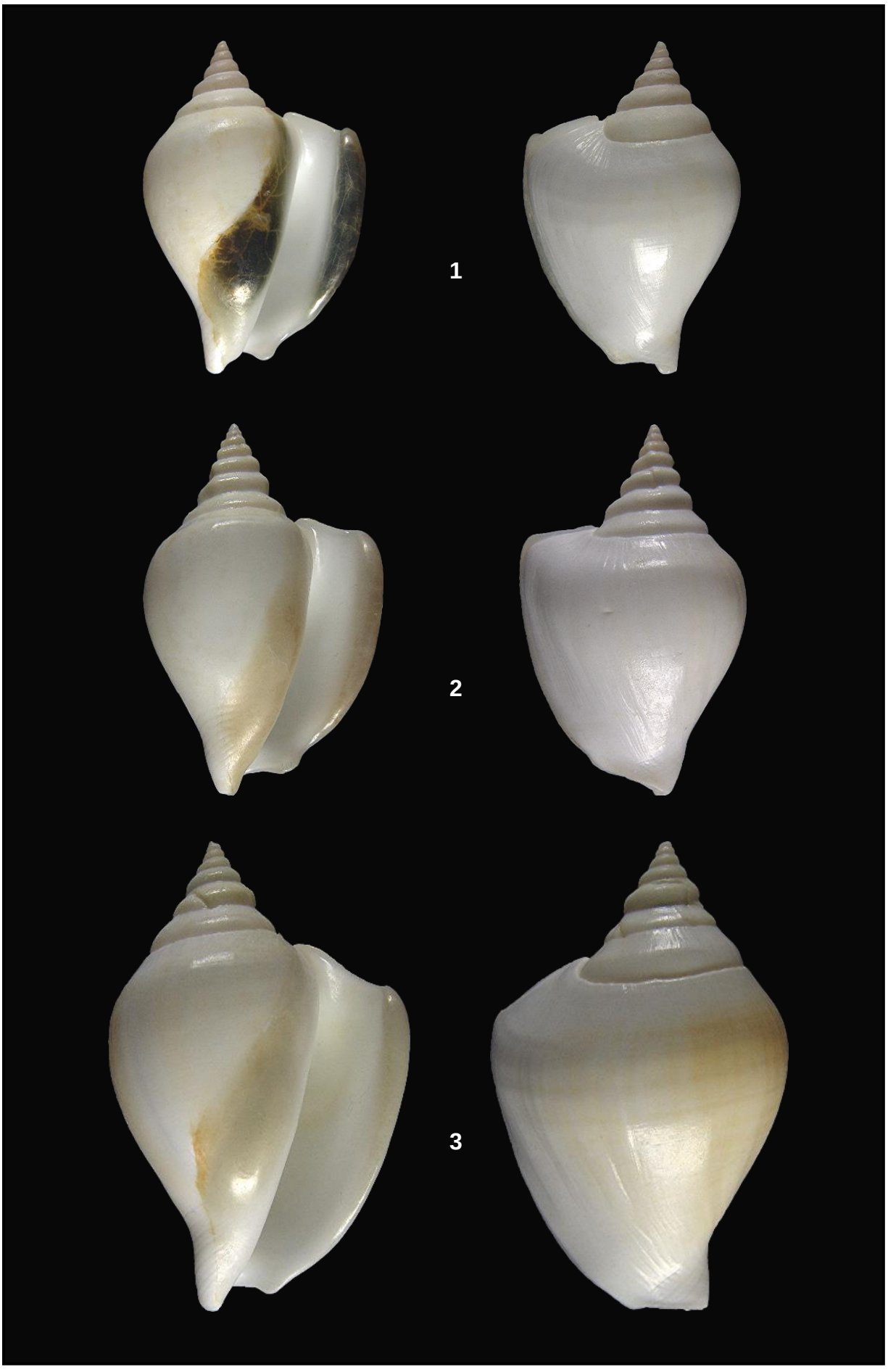
Addendum

Plate IV: Albino specimens of *Strombus (Laevistrombus) turturella* (Röding, 1798).

Fig. 1. 52.8 mm
Fig. 2. 57.2 mm
Fig. 3. 68.0 mm

Samui Island, between Nathan Harbour and Ban Makham, Thailand.
Trawled by fishermen. July 1969.
Coll. F. Nolf (Oostende, Belgium).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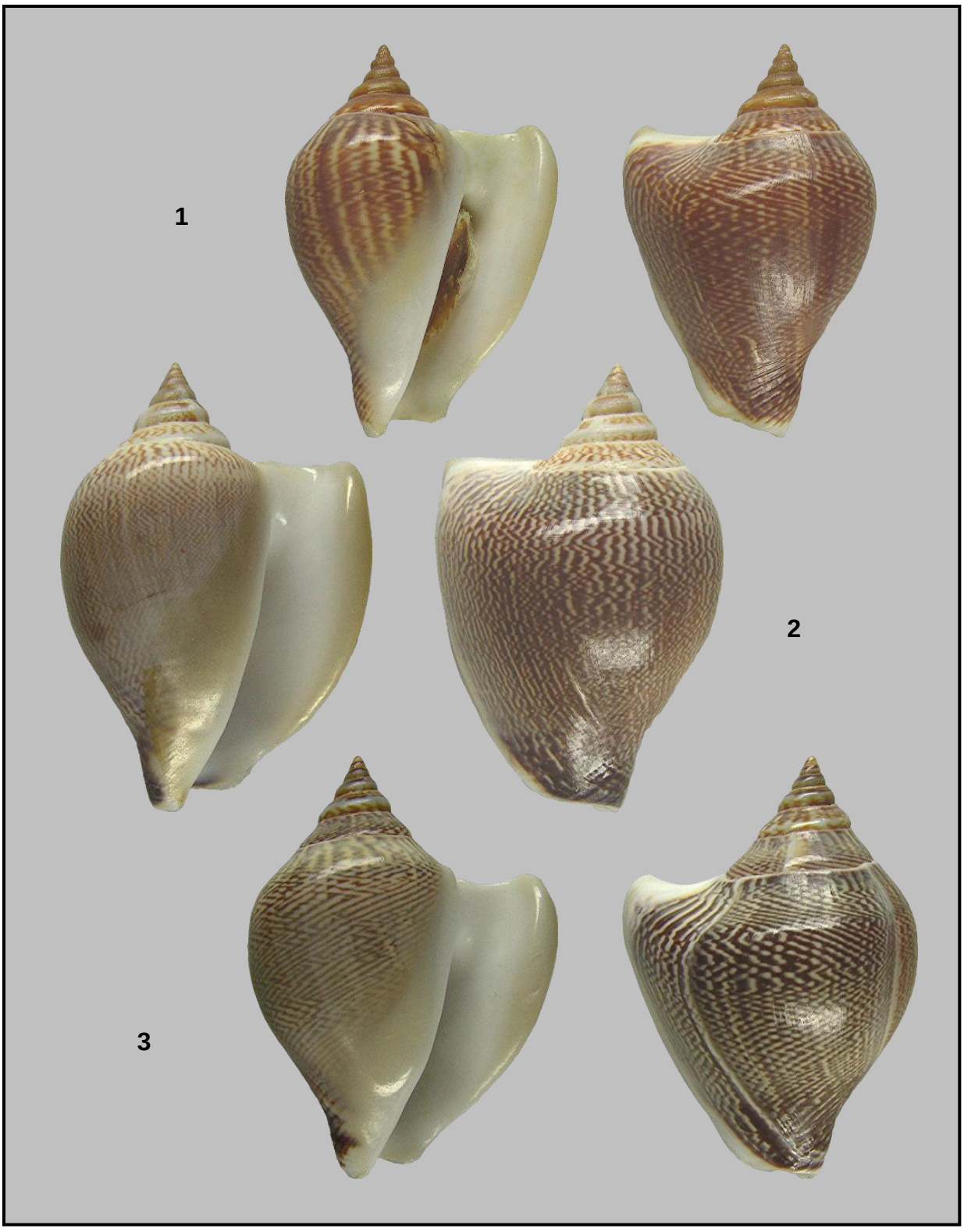


Plate V: *Strombus (Laevistrombus) canarium* Linnaeus, 1758

Area of Port Vila, Vanuatu. In muddy sand. Dived up at a depth of 7 m. Coll. F. Nolf.
Fig. 1. 49.6 mm
Fig. 2. 58.8 mm
Fig. 3. 56.5 mm

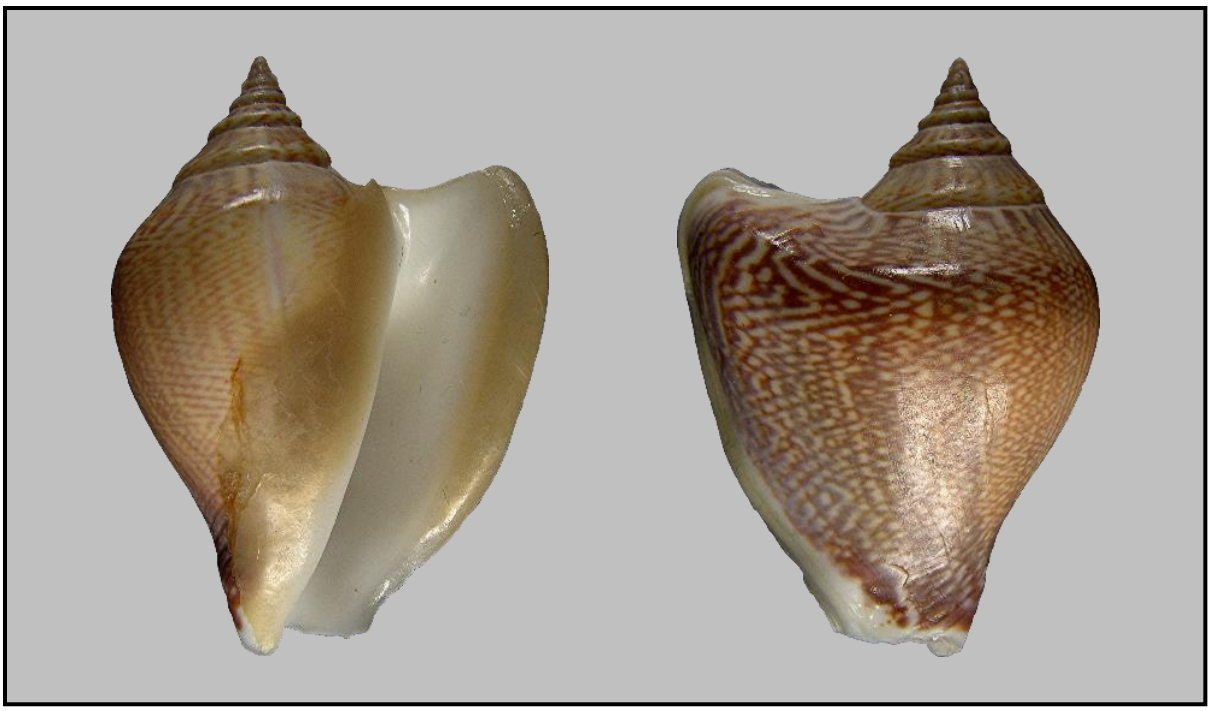
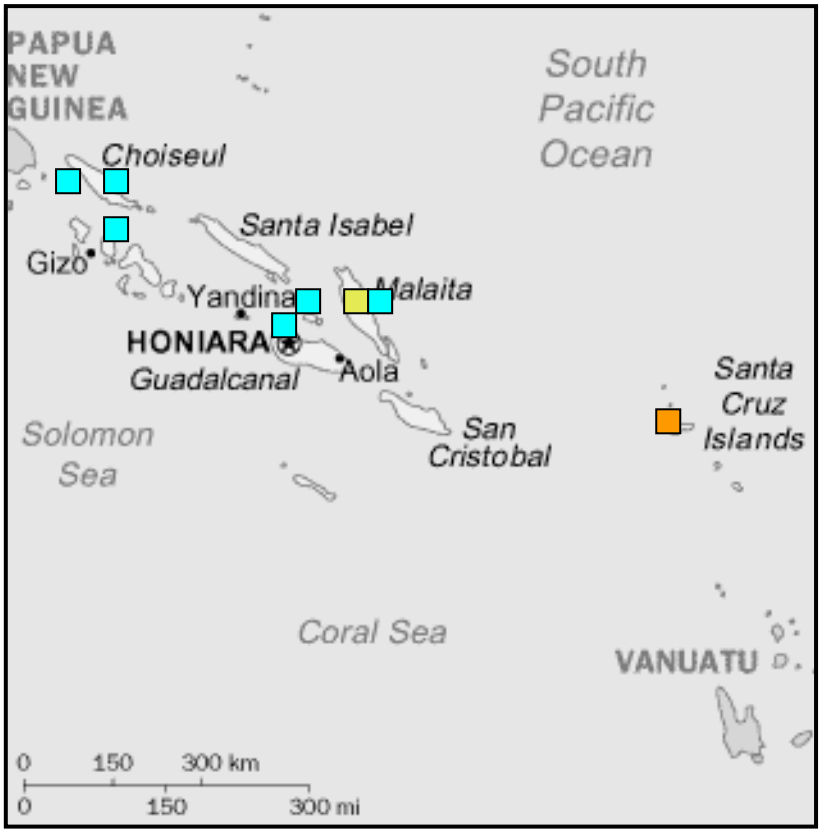
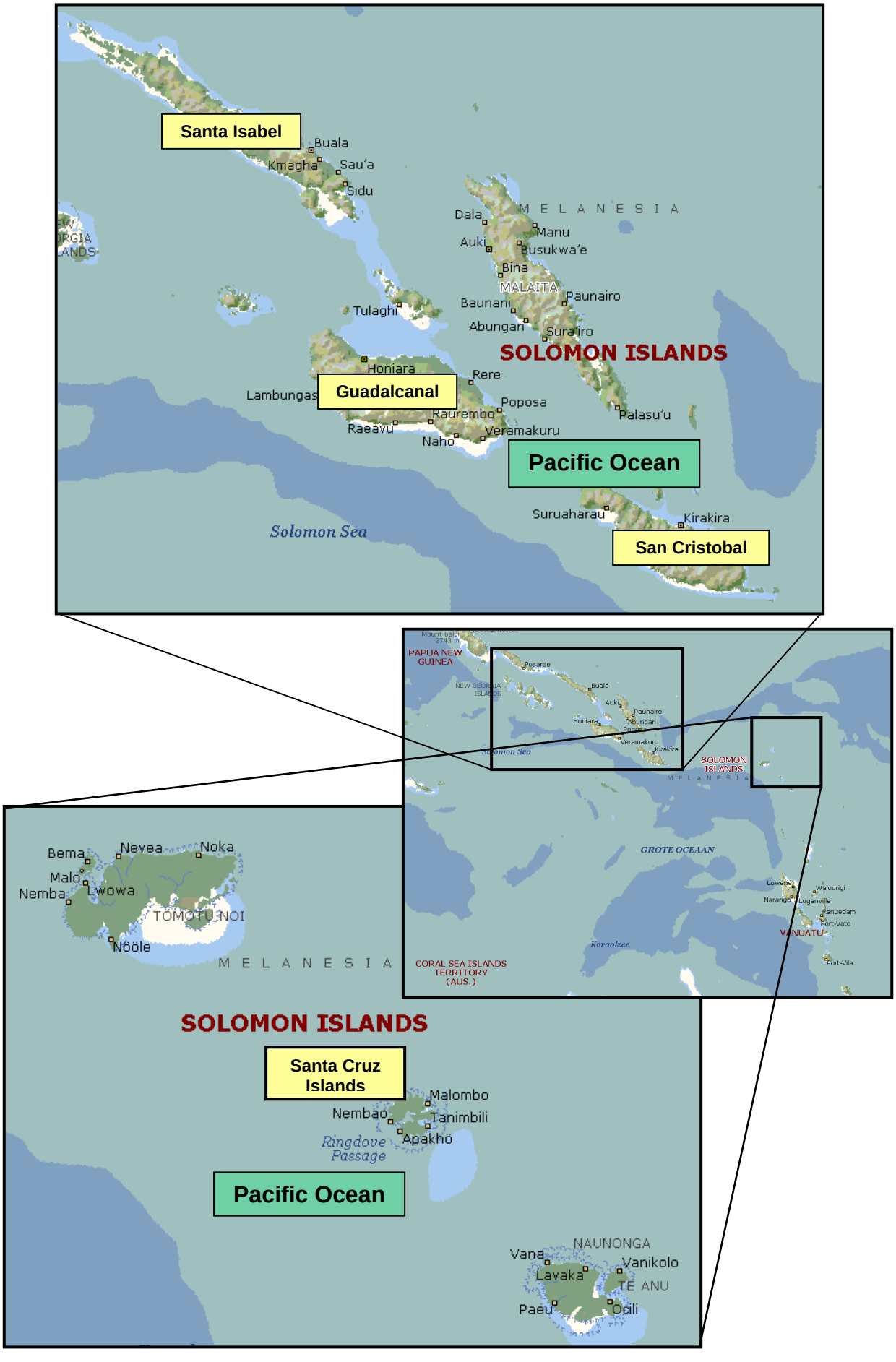


Plate VI: ***Strombus (Laevistrombus) canarium*** **Linnaeus, 1758**
Co Chang, Thailand. Dived up at a depth of 5 m. 1990. 48.9 mm. Coll. F. Nolf.

Distribution of the Stromboid genus *Laevistrombus* in the Solomon Islands



S.* (*L.*) *canarium Linnaeus, 1758
S.* (*L.*) *turturella (Röding, 1798)
S.* (*L.*) *guidoi Man in 't Veld & De Turck, 1998


Santa Isabel
Buala
Kmagha
Sau'a
Sidu
MELANESIA
Dala
Manu
Auki
Busukwa'e
Bina
MALAITA
Paunairo
Baunani
Tulaghi
Abungari
Sura'iro
SOLOMON ISLANDS
Honiara
Rere
Lambungas
Guadalcanal
Poposa
Raurembo
Palasu'u
Raeavu
Veramakuru
Naho
Pacific Ocean
Suruaharau
Kirakira
Solomon Sea
San Cristobal
PAPUA NEW GUINEA
Posarae
Buala
Auki
Paunairo
Honiara
Abungari
Veramakuru
Kirakira
Solomon Sea
SOLOMON ISLANDS
MELANESIA
GROTE OCEAAN
Bema
Nevea
Noka
Malo
Nemba
Lwowa
TOMOTU NOI
Nöole
MELANESIA
CORAL SEA ISLANDS TERRITORY (AUS.)
Koraalzee
VANUATU
Port-Vila
SOLOMON ISLANDS
Santa Cruz Islands
Malombo
Nembao
Tanimbili
Apakhö
Ringdove Passage
Pacific Ocean
NAUNONGA
Vana
Vanikolo
Lavaka
TE ANU
Paeu
Ocili

On the distribution of *Colubraria canariensis* Nordsieck & Talavera, 1979

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Key words: GASTROPODA, COLUBRARIIDAE, *Colubraria canariensis*, distribution, taxonomic position, western Africa.

Abstract: The distribution of *Colubraria canariensis* Nordsieck & Talavera, 1979 is discussed and its occurrence in São Tomé is confirmed. Moreover, its status is commented and it is once again re-established as a full, separate species.

Discussion: *C. canariensis* is a very well-known species amongst collectors who specialize in the western African region, yet it is mainly offered from the Canary Islands themselves and to a lesser extent from the African mainland. The latter is until now restricted to reports from Senegal (coll. Fraussen, Monsecour, Nolf). When José & Marcus Coltro (Brazil) visited the São Tomé & Principe archipelago in 2004, they brought back quite a number of interesting molluscan species, amongst which a considerable number of specimens they tentatively identified as *Colubraria* cf. *canariensis*. The present authors acquired a number of them for study and soon found that the specimens at hand indeed belonged to *C. canariensis* through thoroughly comparing the new material with specimens from the Canary Islands (i.e. Lanzarote and Gran Canaria) and Senegal. The range of *C. canariensis* is therefore hereby considerably extended to the south. However, it remains striking that – except for records from Senegal - no records from the African mainland have yet been confirmed. At present, we are trying to conduct a more thorough survey on the distribution of the species discussed here, but as material from many countries in the western African region is extremely hard to get due to political instability in the region, we are afraid our survey will only advance very slowly. Therefore, we plan further articles on the distribution of *C. canariensis* when more data become available.

The newly discovered material deserves some more detailed discussion as there are some differences with the 'typical' shells from the Canary Islands and Senegal when it comes to shell characteristics and habitat data. First of all, it is very striking that *C. canariensis* seems to be much more common in São Tomé than in the northern part of its distributional range. José & Marcus Coltro brought back some dozens of specimens from a single collecting trip and other shell dealers such as Simon Aiken (United Kingdom) and Werner Massier (Namibia) were able to offer quite a few specimens, whereas the Canary Islands only seem to yield a few specimens in collectors' quality a year. Moreover, all shells from São Tomé were live-taken (thus with operculum), whereas this is even rarer in the Canary Islands. This can possibly be explained by the depths at which they are usually collected: in the Canary Islands it is usually found in between 25 and 60 metres deep, whereas the São Tomé specimens were only found down to 15 metres. Unfortunately, we cannot provide an explanation for these differences in depth at the different localities. Second, specimens from São Tomé are usually much smaller and seem to show more variability than the ones from the Canary Islands. As to the size, only two São Tomé specimens studied reach about the same length as Canary Islands specimens (41.1 and 35 mm); all other specimens are not larger than 17.8 to 29 mm, thus considerably smaller than specimens from the Canary Islands and Senegal. As to the variability, specimens from São Tomé range from the regular completely pustulated specimens to specimens with a mix of pustulations and small axial riblets to specimens with only axial riblets from the suture of the body whorl down to the posterior end of the siphonal canal, yet strongest at midwhorl level. We hereby illustrate a series of specimens from São Tomé to show the variability.

Throughout our survey on the distribution of *C. canariensis* in more southern regions, Johan Verstraeten (Belgium) kindly offered us to study the *C. canariensis* specimens in his private collection. They included a single, dead-taken specimen dredged at 13-14 m deep in the Bay of Funchal, Madeira (Portugal).

Even though records of live-taken specimens are still missing, we hereby add Madeira to the distributional range of *C. canariensis*. Moreover, the occurrence of *C. canariensis* near this island will elaborately be discussed by Willy Segers (forthcoming publication).

The finding of *C. canariensis* this far south and north also has some consequences for the debate on the status of the species. Until now, different opinions have been voiced on its status, hesitating between a separate species and a subspecies of *C. obscura* (Reeve, 1844) or *C. reticulata* de Blainville, 1826 (= *Fusus intertextus* Helbling, 1779). For a more detailed discussion on this matter, we refer to Monsecour & Monsecour (2004), who considered it a subspecies of *C. obscura*. Yet, the extension of its distributional range discussed in the present article and the Cape Verdian records of *C. obscura* by Monsecour & Monsecour (2004) and Rolán (2005) knock down this opinion as a subspecies with a separate range as both *C. obscura* and *C. canariensis* occur in the regions south of the Cape Verde Archipelago. Thus, we can only conclude that *C. canariensis* is a separate, valid species.

Acknowledgements: We would like to thank Koen Fraussen (Aarschot, Belgium) for collection data and Frank Nolf (Oostende, Belgium) for collection data and perusing the manuscript.

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Figures:

1-2: *Colubraria canariensis* Nordsieck & Talavera, 1979. Canary Islands. Lanzarote. Puerto del Carmen. In sand at 25-30 metres. By divers.(44.0 mm; coll. D. Monsecour)

3-4: *Colubraria canariensis* Nordsieck & Talavera, 1979. São Tomé & Principe. Rolas Island. By divers. October 2004. (41.4 mm; coll. D. Monsecour)
5-6: *Colubraria canariensis* Nordsieck & Talavera, 1979. São Tomé & Principe. Off Cabras Island. In coral sand at 10-15 metres. By divers. October 2004. (coll. D. Monsecour)
Showing the variation within the species.

7-8: *Colubraria canariensis* Nordsieck & Talavera, 1979. São Tomé & Principe. Off Cabras Island. In coral sand at 10-15 metres. By divers. October 2004. (coll. D. Monsecour)
Showing the variation within the species.
9: *Colubraria canariensis* Nordsieck & Talavera, 1979. Madeira. Bay of Funchal. 13-14 metres deep. Dredged. (coll. J. Verstraeten).

Afrocardium richardi (Audouin, 1826) alive on *Spondylus spinosus* Schreibers, 1793 in the Gulf of Iskenderun (Eastern Mediterranean Sea)

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Keywords: Mollusca, Bivalvia, Cardiidae, *Afrocardium richardi*.

Abstract: Record of the lessepsian Cardiidae *Afrocardium richardi* (Audouin, 1826) alive between the lamellae of the upper valve of a *Spondylus spinosus* Schreibers, 1793 collected in front of Yumurtalik harbour (Gulf of Iskenderun, Eastern Mediterranean Sea).

Introduction: *Afrocardium richardi* (Audouin, 1826) is a small bivalve of the Cardiidae family. The shell is oval, slightly rostrated in its anterior part, and bearing 35 to 42 radiating ribs covered by numerous thin lamellae. The size of the shell varies from about 10 mm to 16 mm and even more. The colour varies from whitish to light red.
A. richardi is easily recognisable amongst all the other small Cardiidae a.o. *Parvicardium* by three main characteristics:

- The number of radiating ribs which is around 35 - 42 (much less in *Parvicardium*);
- The number of thin lamellae on these ribs;
- The presence of alternating strong and weak ribs on the surface of the shell at least in juvenile specimens (ter Poorten & van Gemert, 2004).

First recorded by Bogi & Galil (1999) along the coast of Israel in the Mediterranean Sea (Haifa), it was afterwards reported by van Aartsen (2000) in the area of the Gulf of Iskenderun (Eastern coast of Turkey) and again from Israel (Akziv) by ter Poorten & van Gemert (2004). Most of the records are separate valves or dead specimens. This species is present in the Red Sea and is also mentioned in the Suez Canal (Zenetos et al. [2003] 2004). Its introduction via the Suez Canal into the Mediterranean Sea makes it a lessepsian migrant.

Personal records: A specimen of *Afrocardium richardi* was found alive between the lamellae of the upper valve of a *Spondylus spinosus* Schreibers, 1793 in May 2005. This *Spondylus* itself is a lessepsian migrant. The surface of this bivalve offers an environment for a lot of epifauna which can be attached or simply embedded between the lamellae of the shell. Our *Spondylus* had been caught between 20 and 30 m deep in front of the harbour of Yumurtalik. *A. richardi* present on this *Spondylus* has a pure red colour and its size is 5.6 mm x 4.6 mm (Fig. 1).

Another specimen of *A. richardi* is also illustrated here. It was already found on the beach of Iskenderun in 1991. The empty shell is perfectly preserved. Its colour is white with brown streaks mainly on its posterior part. Size: 5.8 mm x 4.8 mm (Fig. 2). This specimen was found by Doğan Çeviker (Turkey).

Conclusions: The record of a living specimen of this rarely found Cardiidae, in the Mediterranean Sea, confirms that this species is already strongly established in this area of the Turkish Sea (Gulf of Iskenderun). Moreover, data concerning the depth (20-30 metres) and the place (in front of Yumurtalik) where it is effectively living provide interesting information concerning the biotope of this lessepsian migrant in the Mediterranean Sea.

Note: Nomenclature of Molluscs is issued from CLEMAM, «Check List of European Marine Mollusca» www.somali.asso.fr/clemam/index.clemam.html

Acknowledgements: Many thanks go to Doğan Çeviker for providing us a specimen already collected at Iskenderun in 1991. The English text was carefully controlled by D. Monsecour, J. Verstraeten and F. Nolf.

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Figures

Fig. 1. *Afrocardium richardi* (Audouin, 1826): Yumurtalik.
Gulf of Iskenderun. Turkey. Size: 5.6 x 4.6 mm.
Collection R. Scaillet.

Fig. 2. *Afrocardium richardi* (Audouin, 1826): Iskenderun beach. Turkey.
Size: 5.8 x 4.8 mm.
Collection C. Delongueville.

A critical study of the samples of "*Lima inflata*" (Bivalvia: Pectinoidea: Limidae) from the '*Atlantide*'-expedition (1945-1946)

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Key words: *Limaria tuberculata*, *Limaria hians*, *Limea loscombii*, Limidae, '*Atlantide*'-expedition.

Abstract: After a critical investigation of the samples dredged by the '*Atlantide*'-expedition (1945-46) along the coast of West Africa, it appears that three species of the family Limidae are represented in the so-called '*Lima inflata*'-shells, identified by Maurice Nicklès.

The '*Atlantide*'-expedition

Mr. Viggo Jarl was a Danish sculptor, who showed great interest in furthering natural science. In a letter, dated 25 June 1945, he placed his three-masted auxiliary motor yacht '*Atlantide*' at the disposal of the University of Copenhagen. Mr. Jarl in addition promised to defray all expenses connected with the running of the ship during the expedition and further allocated a sum of 10.000 kr. for the equipment of the ship for this special purpose. Mr. R. Spärck took the necessary steps for carrying through this expedition on behalf of the Zoological Museum of the University of Copenhagen. As the war with Japan was still in progress, possible fields of research were restricted. It was decided the most profitable and safe way to undertake marine investigations was to explore the West African coast. After obtaining permits to obtain foreign currency and fuel in July 1945 a plan was drafted to make a start in October and to return in June 1946. A comprehensive programme was set up with special regard to the design of the ship, its capacity and that of the crew inexperienced in the practical aspects of marine research. It was clear from the beginning that it might not be possible to realize all targets. Dr. A.F Bruun of the Zoological Museum of the University of Copenhagen was acting as scientific leader of the expedition and he was assisted by two young zoologists, Mr. J. Knudsen and T. Wolff. Dr. F.C. Fraser joined the expedition as a representative of the British Museum (Nat. Hist.). The cooperation with the Royal Society, the Colonial Office in London and the Colonial Fisheries Advisory Committee resulted in more facilities in assistance when visiting four British colonies in West Africa.

Equipment and working conditions

The '*Atlantide*' was a three masted auxiliary motor yacht, schooner rigged and built of steel. The water line length was 100 feet, draught measured 15.1 feet, the tonnage was 225 net and the crew consisted of twelve members. The auxiliary engines consisted of two diesel motors of 125 h.p. each.
Because of the war the opportunities to obtain fishing gear and general equipment were restricted to pre-war quality. More gear was bought in Sweden and wire was loaned by the British Museum (N.H.). The Danish Royal Navy installed electric winch and an echosounding apparatus. One of the cabins on board was modified into a small laboratory, making facilities for one researcher at a time. As a result most of the storing and preservation activities had to be done on deck. Ten large wooden containers and twelve large packing cases filled with tubes, jars and glass vessels were also lashed on deck, because of a lack of space below.
The work in inshore waters, estuaries and rivers was seriously curtailed by the total loss of the ship's motor at São Vicente, Cape Verde Islands, on 8 December 1945. This was compensated to a much lesser extent by the loan of boats at various harbours and the use of the ship's life boat.

Itinerary

The original purpose was to go to the Cape Verde Islands to start work, and from there to travel along the western African coasts southwards to Cape Town (South Africa) and to return via St. Helena and Ascension to again further survey the West Coast as far north as Dakar (Senegal).
This plan proved to be too optimistic because of the speed of the yacht, and it was therefore decided at a very early stage of the expedition that Luanda (Angola) should be the southernmost point to aim at and that visits to São Tomé and Principe, St. Helena and Ascension should be cancelled.

A hundred and forty three days were spent between arrival at the Cape Verde Islands and departure from Dakar. Eighty days were spent in eighteen different ports, leaving sixty three days spent at sea for passages and working nets. Only 156 hours distributed over forty two days were spent working gear and on the passage between Luanda and Freetown (Sierra Leone). The remaining fifteen days, only one day was dedicated to fishing. During the sixty three days in the fishing area 6116 nautical miles were covered.
This expedition brought up additional material in the area between 30 and 80 m, filling the gap between the investigations resulting from the dredgings of the '*Travailleur'* and the '*Talisman'* in deeper water and the '*Gruvel'*-expedition from Mauritania and Angola in shallow coastal waters.

Collecting material

The biggest kinds of gear used were light Otter Trawls of the same kind as those used in the Danish commercial fishery for deep sea shrimps and Norwegian lobster. The total number of hauls was 44 of which 28 were successful. Most of the fishing was in coastal waters in depths less than 100 m, but two hauls were successful in depths ranging from 400 to 600 m. Various smaller gear was used to obtain animals from the sea bottom, namely a toothed Triangular Dredge (edge 45 cm) especially to be used on hard bottoms, a Rectangular Dredge of 80 cm width and an Agassiz Trawl (Sigsbee Trawl) 1 m width. The gear was used at 41 stations with a total of 54 hauls, 50 of which were successful. Most of the hauls were made in depths of less than 100 m, only four in greater depths. The Van Veen Grab and the Petersen Grab were used for bottom sampling. 149 hauls were made at 50 stations, 106 of which were successful. Only ten samples were taken in depths bigger than 10 m, due to the difficulty of using vertical gear from this type of ship. In addition to dredging, plankton nets were used and some hydrographical observations were made (surface and bottom temperature records). Every opportunity was taken to obtain supplementary material in the harbours, tidal zones, rocky shores and mangrove swamps. Fishes and molluscs were also obtained in fish markets.

Methods

One of the aims of the expedition was to make representative samples as large as space permitted. So all the preserving containers, vessels and glass tubes were used in the course of the trip. When the catch was too large to preserve as a whole, a selection of the abundant forms was made to include the size range, and before any material (especially fishes) was discarded numbers and measurements were recorded. Most of the animals were fixed in formalin as only a very limited amount of alcohol was carried along because of a lack of space. The formalin was neutralised with borax and diluted to 4% with sea water. A general log was kept to record data relating to time, position, gear used or nature of bottom. Another log for biological observations was used to give an impression of the general composition of the catch. Provisional determinations were made of as many species as could be distinguished by means of a very limited library on board. Special attention was given to fishes and molluscs because members of the scientific staff were acquainted with these groups.

General observations

As far as molluscs were concerned, the general impression was that gastropods were especially numerous and that bivalves were moderately numerous. Of special biological interest was a fairly large collection of prosobranch egg capsules which were mostly at least identified to genus level.
The group Polyplacophora (Chitons) was represented by only a few species and members. This was to be expected from the very few rocky localities investigated. Amongst the Prosobranchs the Nassariidae, Conidae, Marginellidae, the genera *Clavatula* and *Turris* were found equally abundant in species and specimens. The Opisthobranchs were especially rich, mainly in the genera *Ringicula* and *Philine*. Amongst the Bivalvia the families Arcidae, Pectinidae, Cardiidae and Veneridae were most common. The Scaphopod genus *Dentalium* was represented by numerous specimens from many localities. Cephalopoda were rare in species but many *Sepia* were caught. A characteristic feature of the Canary current was the large number of floating cuttlebones (*Sepia*). These were seen when the ship was approaching the African coast of Portuguese Guinea (the present Guinea-Bissau) and southwards on the return trip from Luanda in the same area in which *Physalia* was abundant. In this area too some very large *Pelagia* and a few *Spirula* were seen.
The general impression obtained from the samples was that the number of animals per square metre along the West Coast of Africa was much less than for instance in the North Sea.

It can be supposed food available for fishes at any time is much less than in more northern waters, but this may to some extent be counterbalanced by a more continuous reproductive period.

The study of the Scaphopoda and the Bivalvia by Maurice Nicklès

In 1950, Dr. A.F. Bruun trusted Prof. E. Fischer-Piette with the study of the Scaphopoda and the Bivalvia collected by the '*Atlantide*'-expedition. He would be supported by Maurice Nicklès in this tremendous task. Because of health problems, E. Fischer-Piette was obliged to leave the complete work on the shoulders of his assistant. M. Nicklès was most unfortunate to get the total responsibility to finish this project himself, but he was thankful to Dr. Bruun for the confidence. In spite of his professional activities, he was a regular worker at the Laboratory of Malacology of the Zoological Museum in Copenhagen for three years and a half. After that period he was unsatisfied, and he was totally aware of the many imperfections in his manuscript. Moreover, he wondered if it had really been wise to accept such an extended work. Much more time had to be dedicated to explore all the secrets held in the dredged material. To identify most of the samples, M. Nicklès used the collections of the 'Muséum national d'Histoire naturelle' (MNHN, Paris) and the collection of Ph. Dautzenberg in the Belgian Royal Institute for Natural Sciences (KBIN, Brussels, Belgium). Some shells were compared with types in the Oceanographic Institute of Monaco. A large number of books had to be consulted and the 'Révisions' by E. Lamy proved to be of a great help. Unfortunately M. Nicklès missed financial resources to travel to London to consult type material in the British Museum (Natural History) (now: The Natural History Museum in London, UK), but fortunately Dr. W.J. Rees was helpful in comparing some samples with types in the BMNH. Maurice Nicklès mentioned 13 species of Scaphopoda and 199 species of Bivalvia. Among these he described 24 new species and one new subspecies. He concluded that many zoologists and geologists would be surprised in passing through the vast list of species. Some of them belong to genera that were never mentioned from the East Atlantic before 1955, other species had only been known from the Indo Pacific and finally a third group was considered as being typically European, but in fact is living from northern Europe to southern Angola.

A critical view on the identification of '*Lima inflata*'-samples by Maurice Nicklès

1. First of all it must be stated that ***'Lima inflata* Chemnitz, 1784'** is in fact:

***Limaria tuberculata* (Olivi, 1792) (Plate II, Figs 2-4; Plate VII, Figs 21-24; Plate VIII, Figs 25-28)**
Lima inflata Chemnitz, 1784: vol. 7, p. 346, pl. 68 fig. 649 (unavailable following ICZN direction 1); available from Link, 1807.

= *Limaria inflata* Link, 1807 ex Chemnitz
= *Limaria imbricata* Risso, 1826
=? *Lima exilis* Wood, 1839
= *Limaria ventricosa* Sowerby G.B., 1843

This byssate shell is relatively large, oval in outline, very elongated obliquely, inequilateral, equivalve, thin and fragile, swollen and strongly gaping at the anterior and posterior margins to the extent that the two valves touch each other on the ventral margin and at the hinge line.
The sculpture consists of about 45 radial ribs, not very raised and fairly wavy, crossed by some concentric growth striae, irregularly spaced out and rather vague or absent at the anterior side. The ribs are closer together towards the posterior margins.
Towards the ventral and posterior margins, miniscule granulous scales make the surface rough. The anterior margin is short, rounded, strongly gaping especially towards the ear. The posterior margin is short and gaping, the ventral margin is rounded and finely denticulated.
The umbo is small, narrow, prominently angled and rather inflated. The ears are small, unequal and triangular. The hinge is not very thick. There is a triangular, wide pit, slightly arched at the base. The inside is very concave, with radial shallow grooves, corresponding to the outer ribs. The adductor muscle scar is not very distinguishable, but large, rounded and located anteriorly. The outside is white or light yellowish and opaque. The inside is shiny. Size: attaining 45 mm in height.

In his 'Mollusques testacés marins de la Côte occidentale d'Afrique' (1950), M. Nicklès described **'*Lima inflata* Chemnitz'** as a shell of 30-50 mm in height, being very oblique, swollen and very gaping anteriorly as well as posteriorly. Valves are only meeting at the hinge line and at the base.
The surface is decorated with some 35 narrow radiating ribs, only slightly elevated and squamose. The shell is whitish.

Range: according to M. Nicklès the distributional range of '*L. inflata*' does not only include the Red Sea and the Mediterranean Sea, but also the Atlantic Ocean, from Cape Hatteras to Florida (U.S.A.) and the Antilles, the Canary Islands, the Cape Verde Islands and some localities in West Africa, namely Congo-Brazzaville. In fact ***Limaria inflata* Auct**. is used both for the compressed and small ***Limaria pellucida*** (C.B. Adams, 1846) – completely different from *L. tuberculata* – living from North Carolina, both sides of Florida, Texas, Bermuda and Brazil and also for an inflated shell very similar to *L. tuberculata*, occurring from Florida and the Bahamas to Brazil.

As ***Limaria tuberculata*** (Olivi, 1792) can easily be confused with ***Limaria rotundata*** (Sowerby G.B. II, 1843) **(Plate I, Fig. 1)** we thought[1] some samples of the '*Atlantide*'-expedition could contain specimens of the latter, especially the single valve from Station 136 (8°30' S. - 13°14' E.; off Luanda, Angola). No other valves are mentioned south of 6°06' (Nigeria) except this one and no *L. tuberculata* was trawled by fishermen of the PEMARCO[2] in this area. To our great surprise the shell of Station 136 **(Plate X, Figs 36-39)** belongs neither to *L. tuberculata* nor to *L. rotundata*, but to ***Limea loscombii*** **(Sowerby G.B. I, 1824)**.

As a first conclusion we can state that ***Limaria rotundata*** **(Sowerby G.B. II, 1843)** most probably lives from Eastern Cape to Saldanha Bay (Western Cape, Republic of South Africa), extending northwards to northern Angola (Ambriz). It is a mollusc that is found in shallow waters offshore from 4 to 30 m.
The most surprising result of our study is that only one station yielded specimens of ***L. tuberculata***, namely Station 45 (Guinea), which means only 6 of the 19 studied specimens. This could mean *L. tuberculata* does not live south of Guinea and *L. rotundata* not north of Ambriz (Angola).
In the future, we hope to obtain more samples from the area between Sierra Leone and Congo so we can definitively establish the real range of both species. Of course it is possible that they are not found in this 'twilight zone'.

2. At a first glance it is already evident that most of the shells are not *Lima tuberculata*, except the 6 larger valves of Station 45. Most of the shells are juvenile valves (mostly in bad to very bad condition) of a third representative of the Limidae, namely ***Limaria hians*** **(Gmelin, 1791)**, a very fragile and nearly transparent shell: Station 44: Guinea (3 valves), Station 45: Guinea (1 valve), Station 60: Liberia (3 valves), Station 145: Guinea (1 valve) and Station 100: Nigeria (1 valve). As far as we know this is a range extension for this species.

Limaria hians **(Gmelin, 1791)**
(Plate III, Figs 5-7; Plate VI, Figs 16-19; Plate VII, Fig. 20; Plate IX, Figs 29-33; Fig. 40)
= *Limaria linguatula* Lamarck, 1819;
= *L. tenera* Turton, 1825;
= *L. laevigata* Risso, 1826 ;
= *Limaria vitrina* Brown, 1827
= *Lima aperta* Sowerby G.B. II, 1843

Shell thin, solid, equivalve. Markedly inequilateral, the anterior ears a little larger and more pointed than the posterior, with a very small byssal notch in the right anterior ear. Obliquely oval, subquadrangular in outline, the longer axis being directed posteriorly from the beaks. Anteriorly there is a rather wide dorsal gape between the valves, which thins out ventrally, whereas posteriorly there is a long constantly narrow gape. Translucent and white when young, becoming progressively discoloured to off-white or brown in the adult. Beaks far apart exposing a wide cardinal area with a central triangular ligament pit (resilifer). Prominent and small umbones. Sculpture of 40-60 or more radiating ribs cut by concentric growth-striae, ribs are absent from the ears and adjacent marginal areas. Growth stages clear. Margins crenulated where met by the ribs. Outside colour whitish. Inside of the valves bright white with light radiating grooves. Much more slender than *Limaria tuberculata*.
Limaria hians is able to swim, doing so in a series of almost feeble movements, in which it exposes long fringes of red and orange tentacles which present a most beautiful sight as they rise and fall around the shell.
The species may also occupy a nest, which it builds with solid fragments of stones and gravel held together with filaments of the byssus.

[1] Nolf, F. 2005. About the presence of *Limaria rotundata* (Sowerby G.B II, 1843) (BIVALVIA: PECTINOIDEA: LIMIDAE) off the coast of Angola. Neptunea, 4(5), 22-30.
[2] PEMARCO = Pêche maritime du Congo

Limaria hians may be found from shallow water to 100 m, preferring bottoms of coarse sand, gravel, broken shells and stones. Sometimes on *Posidonia* fields and often on holdfasts of *Laminaria*,
Size: from 15 to 35 mm in height.
Range: It is widely distributed from the Lofoten Islands (N. Norway) to the Iberian Peninsula, the Mediterranean Sea, the Canary Islands and the Azores. As yet it was not reported from West Africa in the existing literature, but actual data from this study result in a range extension as far as Nigeria.

3. The most important profit of this study results in the identification of the valves from Station 65: Ivory Coast (1 valve), Station 136: Angola (1 valve), Station 148: Guinea (1 complete live caught specimen) and Station 153: Guinea (1 damaged live caught specimen), which all belong to ***Limea loscombii* (Sowerby G.B. I, 1824)**. This is confirmed by the recent find of a small specimen, dived at a depth of 3 m under stones, by a French expedition at Lagoa Azul (São Tomé) (coll. J.-L. Delemarre; **Fig. 15**).

***Limea loscombii* (Sowerby G.B. I, 1824)**
(Plate IV, Figs 8-11, Plate V, Figs 12-14; Fig. 15, 34 & 35; Plate X, Figs 36-39; Plate XI, Figs 41-43; Fig. 44)

= *Lima bullata* Turton, 1822 [non Lamarck, 1807];
= *Lima loscombei* Auct.
= *Ostrea inflata* Auct.

Shell thin and fragile, equivalve, fairly swollen. Inequilateral, anterior ears slightly larger and more prominent with a very small byssal notch. Obliquely oval in outline towards the anterior part, not gaping, except for a small opening on the upper part of the dorsal margin. Translucent white. Beaks apart exposing a wide cardinal area. Ligament pit internal, broadly based, central, triangular. The ligament is thin and olive green, the pit is central, triangular and is widened towards the base. The cartilage is large, very wide and yellow.
Sculpture of 40 to 60 fine sharp radiating ribs, sometimes with finer intermediate riblets in the interstices. The ribs are slightly sinuous of unequal strength alternatingly strong and weak, or two-three weak ones between two stronger ones. Radial ribs are missing on the ears and in the adjacent marginal areas. Fine concentric striae are present all over the surface, which consequently is rough to touch. Growth stages visible. Margins crenulated where met by the ribs in juvenile shells, but when adult they are thickened and smooth. The anterior margin is slightly convex, the posterior one is very arched and convex. The pallial scar is distinct, but the muscle scar is not very visible.
Inside white, slightly mother-of-pearl and granulose, it fairly clearly reflects the outer sculpture. The shell is white, translucent, the animal is bright orange.
Lima loscombii lives offshore from 30-185 m preferring bottoms of mud, sandy mud, muddy gravel, gravel and broken shells among which it is able to build a nest, binding shell fragments together with its byssus. Recorded from 2704 m. Often found with sponges.
Size: from 10 to 20 mm in length.
Range: Its distribution ranges from Newfoundland, the Norwegian Sea, south to the Iberian Peninsula, into the Mediterranean Sea, Madeira and the Azores and along the Atlantic coast of West Africa south to Angola and perhaps Tristan da Cunha.

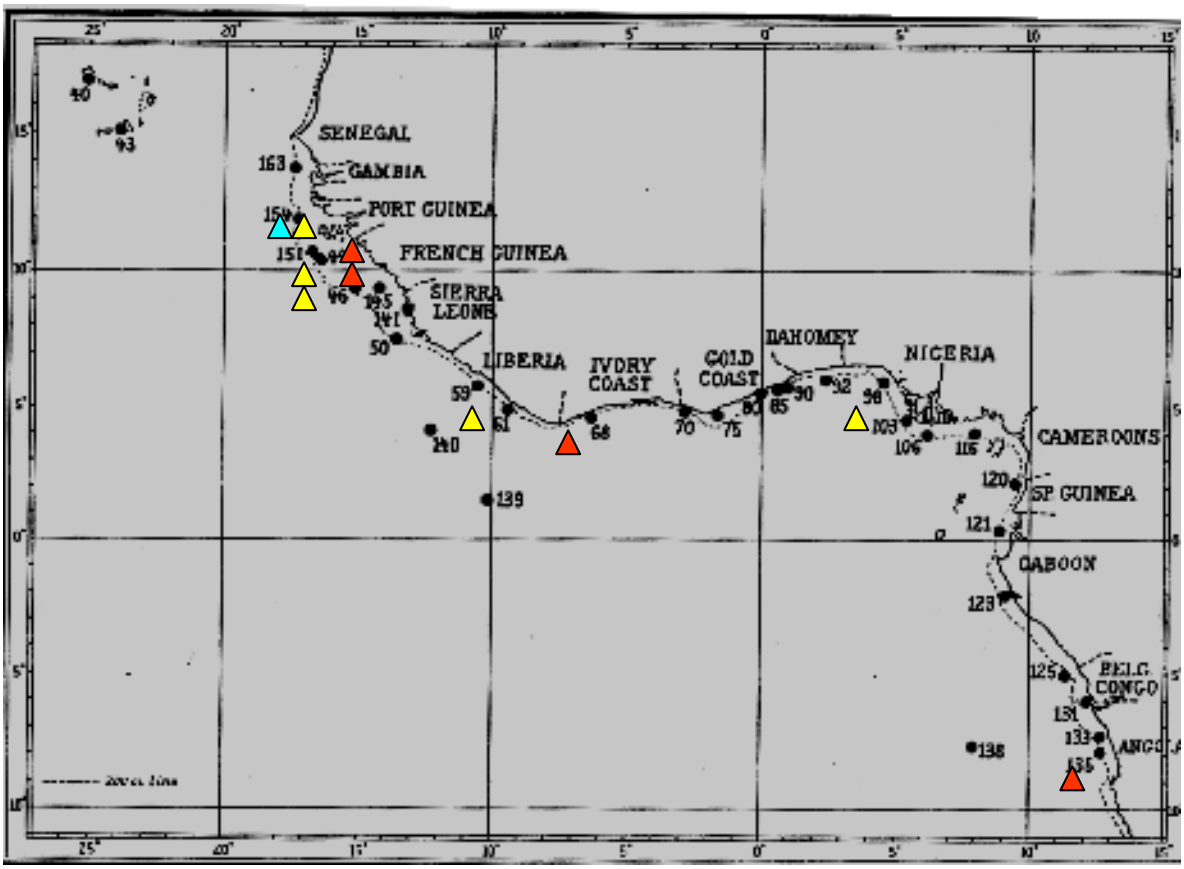
Conclusion

It is very strange M. Nicklès made the error to decide all the specimens in the different samples were *L. tuberculata*, especially because he had consulted the Ph. Dauzenberg collection in Brussels (Belgium), which contains specimens of *Limaria hians* and *Limea loscombii* (**Plate V, figs 12 & 13**). It is only too obvious that at least the small and tiny fragments or valves belong to another species. These mistakes can only be explained by the impossibility of M. Nicklès to achieve the tremendous task of identifying all the specimens gathered during the expedition in a limited period.

Additions from the present research to the study of M. Nicklès:

- The total list of bivalve species found by the "*Atlantide*"-expedition is increased by two units, namely ***Limaria hians*** and ***Limea loscombii***;
- There is a range extension for ***Limaria hians*** (provisional southern limit Nigeria);
- Confirmation of the southern distribution of ***Limea loscombii*** (Angola);
- As yet no findings are known of ***Limaria rotundata*** north of Ambriz (Angola).

Selected stations of the '*Atlantide*'-expedition



Limaria tuberculata **(Olivi, 1792)** △

Limaria hians **(Gmelin, 1791)** △

Limea loscombii **(Sowerby G.B. I, 1824)** △

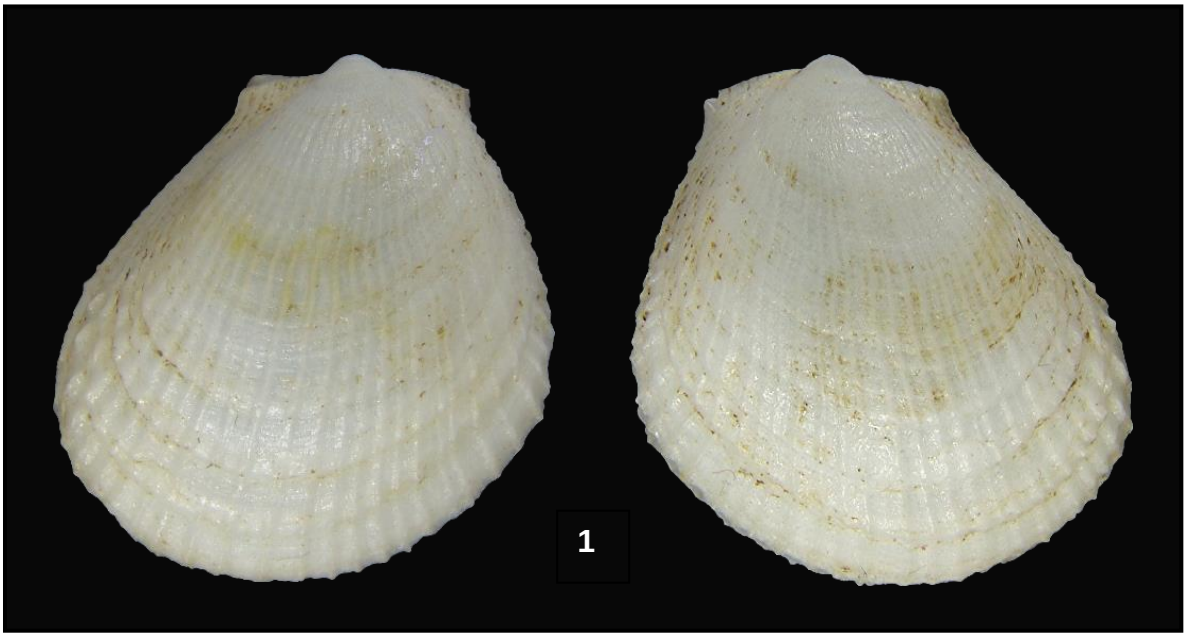


Plate I: Fig. 1: *Limaria rotundata* (Sowerby G.B. II, 1843)
Quicombo, Angola. Dived at 4 m. H. 31.2 mm L. 27.3 mm. Coll. F. Nolf.

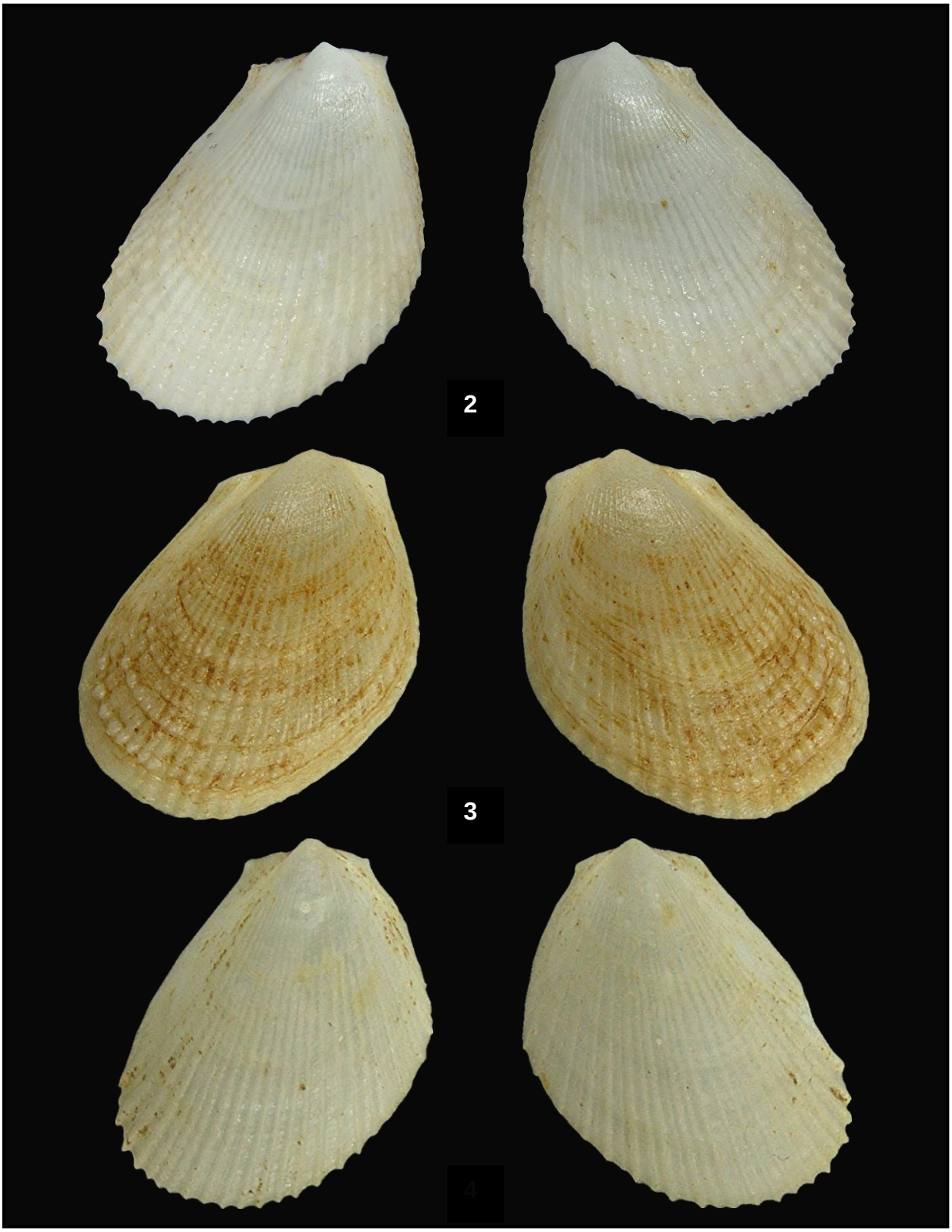


Plate II: ***Limaria tuberculata*** **(Olivi, 1792)**
Fig. 2: Off Marseille. South France. Dredged. 1962. H. 27.6 mm L. 22.5 mm. Coll. F. Nolf.
Fig. 3: Canary Islands. H. 22.5 mm L. 23.1 mm. Coll. F. Nolf.
Fig. 4: Santa Cruz de la Palma, La Palma, Canary Islands. Trawled by fishermen. 2000. H. 21.5 mm L. 17.9 mm. Coll. F. Nolf.

Plate III: *Limaria hians* (Gmelin, 1791)
Fig. 5: Loch Sunart, Scotland, UK. Trawled by local fishermen. H. 31.8 mm L. 23.0 mm.
Fig. 6: Machico, Madeira. Under stones. Dived at a depth of 20 m. July 1976. H. 18.1 mm L. 13.1 mm.
Fig. 7: Santa Cruz de la Palma, La Palma, Canary Islands. Trawled by fishermen. 2000. H. 20.0 mm L. 12.8 mm.
Coll. F. Nolf.

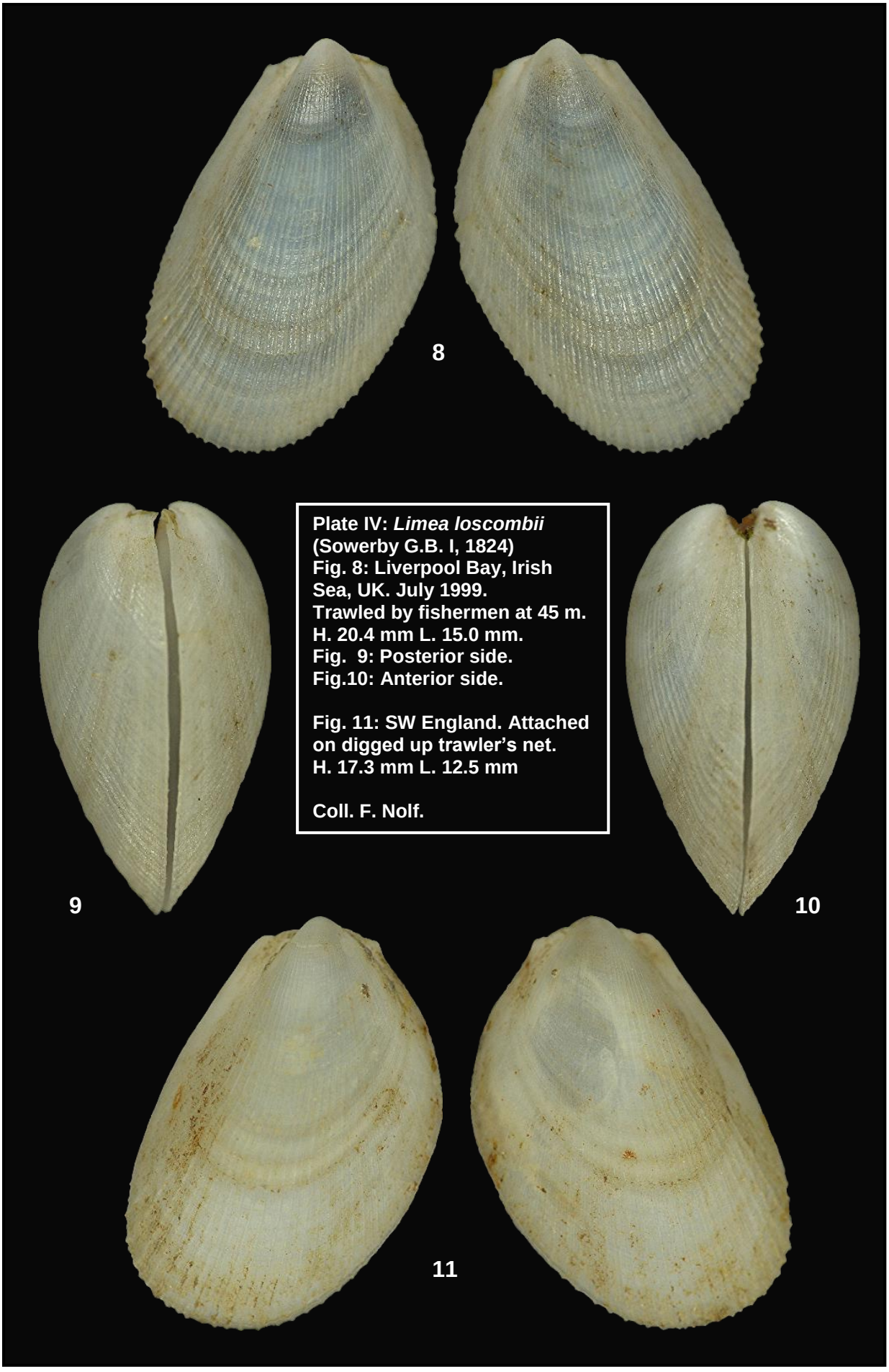


Plate IV: *Limea loscombii* (Sowerby G.B. I, 1824)
Fig. 8: Liverpool Bay, Irish Sea, UK. July 1999. Trawled by fishermen at 45 m. H. 20.4 mm L. 15.0 mm.
Fig. 9: Posterior side.
Fig.10: Anterior side.

Fig. 11: SW England. Attached on digged up trawler's net. H. 17.3 mm L. 12.5 mm

Coll. F. Nolf.

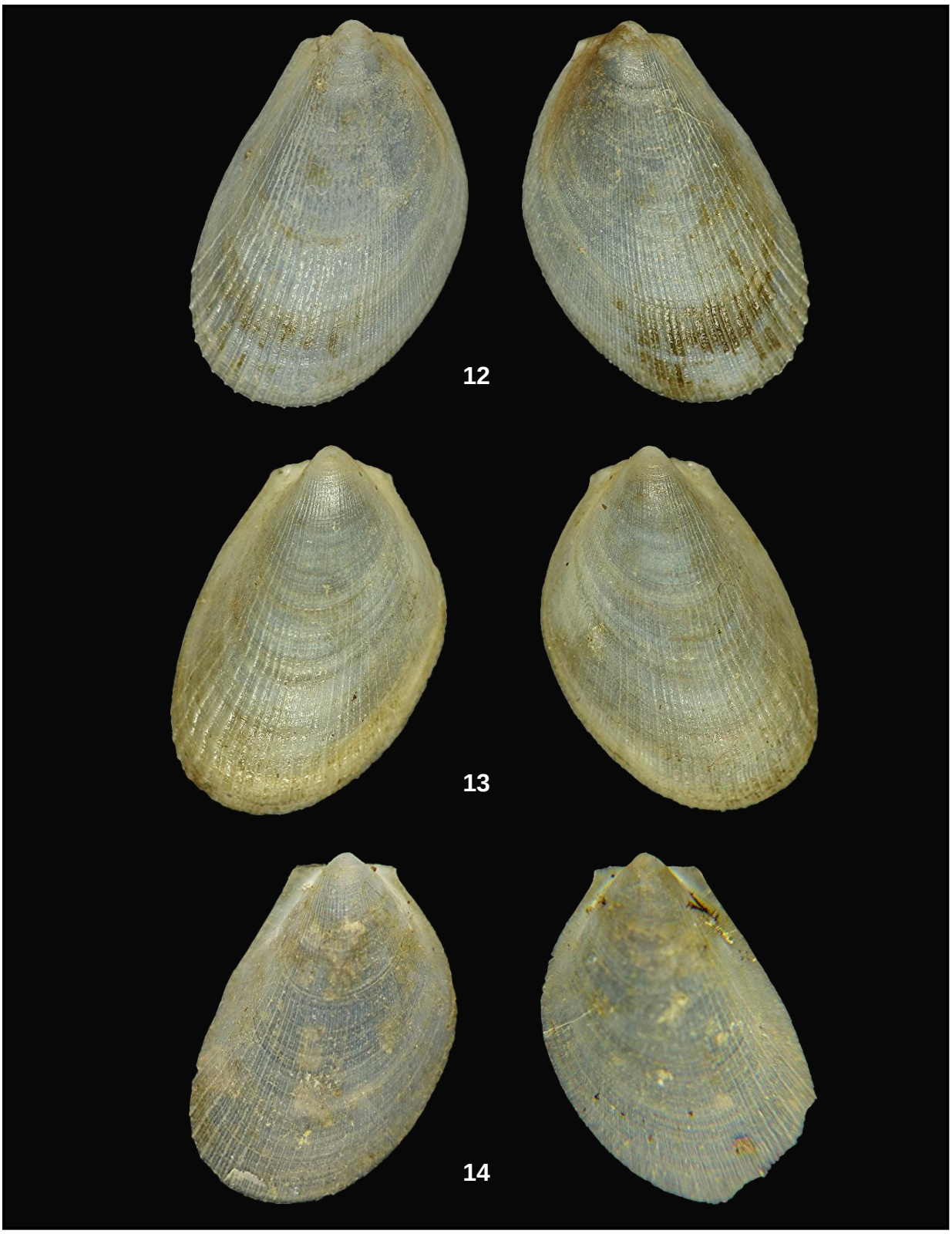


Plate V: *Limea loscombii* (Sowerby G.B. I, 1824)
Fig. 12: Vestfjord, Norway. 69° 46' N. 16°15' E. Dredged at 1187 m. 15 February 1911. H. 14.0 L. 11.0 mm. Coll. Ph. Dautzenberg (KBIN).
Fig. 13: Gullmarsfjorden, Bohuslän, Sweden. 1877. H. 15.4 mm L. 11.8 mm. Coll. Ph. Dautzenberg (KBIN).
Fig. 14: Aci Trezza, Sicily, Italy. Dredged. H. 9.0 mm L. 6.9 mm. Coll. F. Nolf.

Fig. 15: *Limea loscombii* (Sowerby G.B. I, 1824)
Lagoa Azul, São Tomé, West Africa.
Under stone. Dived at 3 m.
H. 7.8 mm L. 6.3 mm
Coll. Jean-Louis Delemarre (France).

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Specimens in the collection of the University of Copenhagen

Abbreviations

H: height (dorsal-ventral); **L**: length (anterior-posterior); **LV**: left valve; **RV**: right valve.

1. Station 44, 10°22' N. 16°22' W.

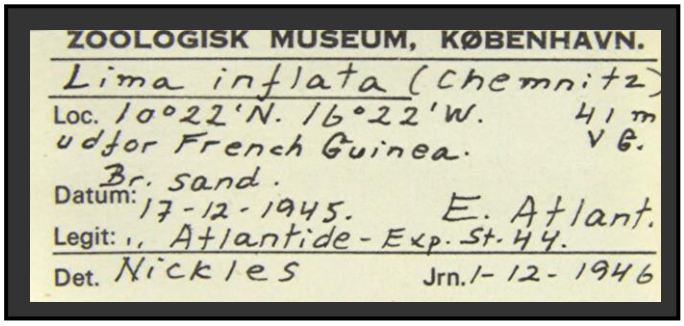
5 valves.

The sample was dredged off French Guinea (the present Guinea) at a depth of 41 m in brown sand on 17 December 1945.

Only 3 valves were present, two of them badly broken.

They all belong to:

***Limaria hians* (Gmelin, 1791)**



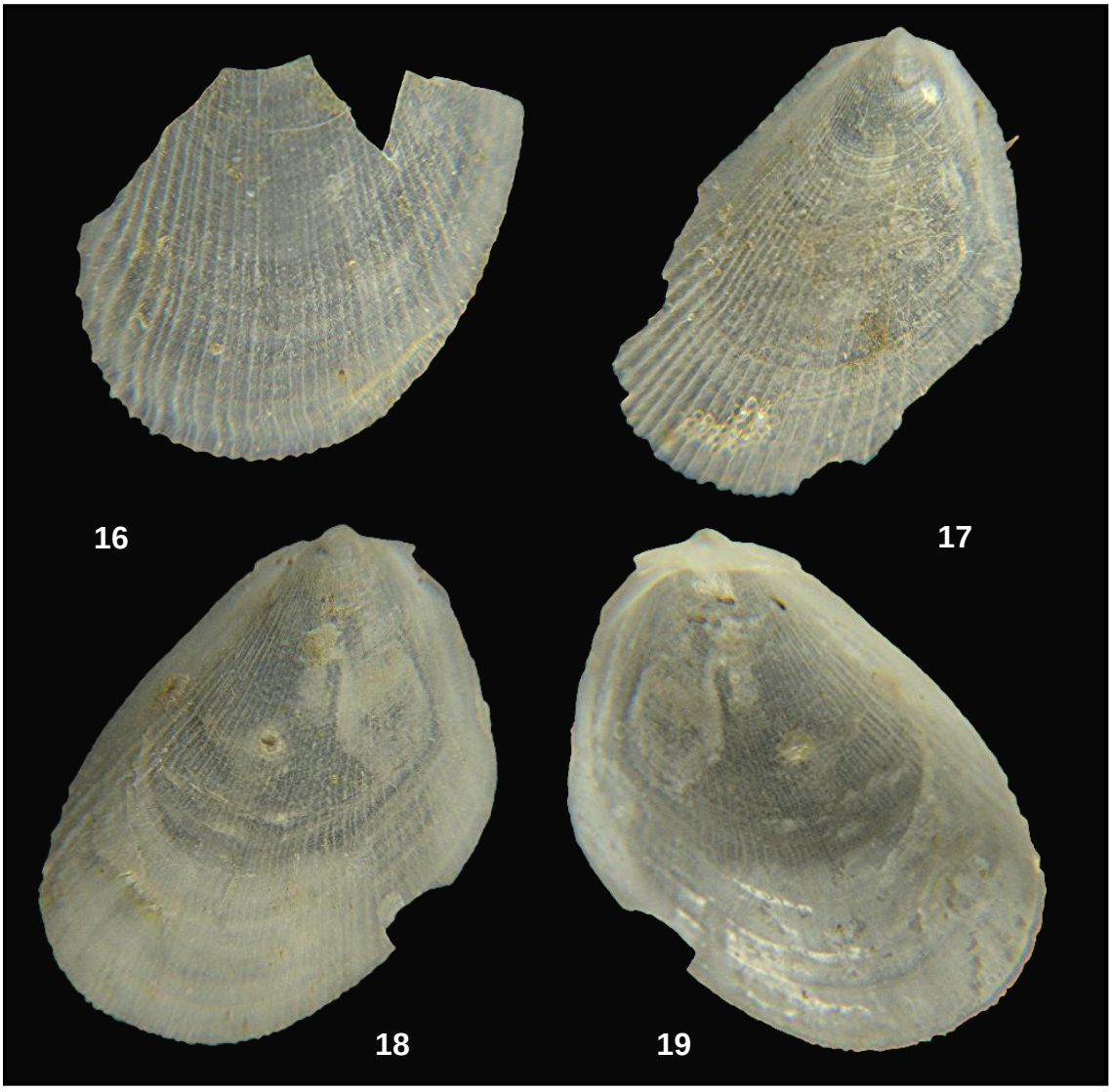


Plate VI: Station 44

***Limaria hians* (Gmelin, 1791)**

Fig. 16: LV: H. 9.7 mm L. 8.8 mm
Fig. 17: LV: H. 12.8 mm L. 9.6 mm
Fig. 18: LV: H. 16.4 mm L. 12.5 mm
Fig. 19: LV: H. 16.4 mm L. 12.5 mm – inside view

2. Station 45, 9°23' N. 15°07 W.

9 valves.

Dredged off French Guinea (Guinea) at a depth of 34 m in sand on 18 December 1945.

Only 7 valves were present, all in bad condition, among them 6 specimens of ***Lima tuberculata*** and 1 valve of ***Limaria hians***.

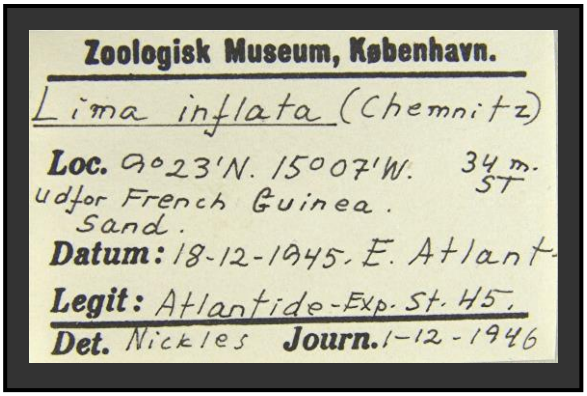


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Plate VII: Station 45

Fig. 20: *Limaria hians* (Gmelin, 1791)
RV: H. 11.9 mm L. 9.0 mm

Figs 21-24: *Limaria tuberculata* (Olivi, 1792)

Fig. 21: RV: H. 10.8 mm L. 8.4 mm
Fig. 22: RV: H. 15.0 mm L. 12.7 mm
Fig. 23: RV: H. 18.3 mm L. 15.5 mm
Fig. 24: RV: H. 18.3 mm L. 15.5 mm (inside view)

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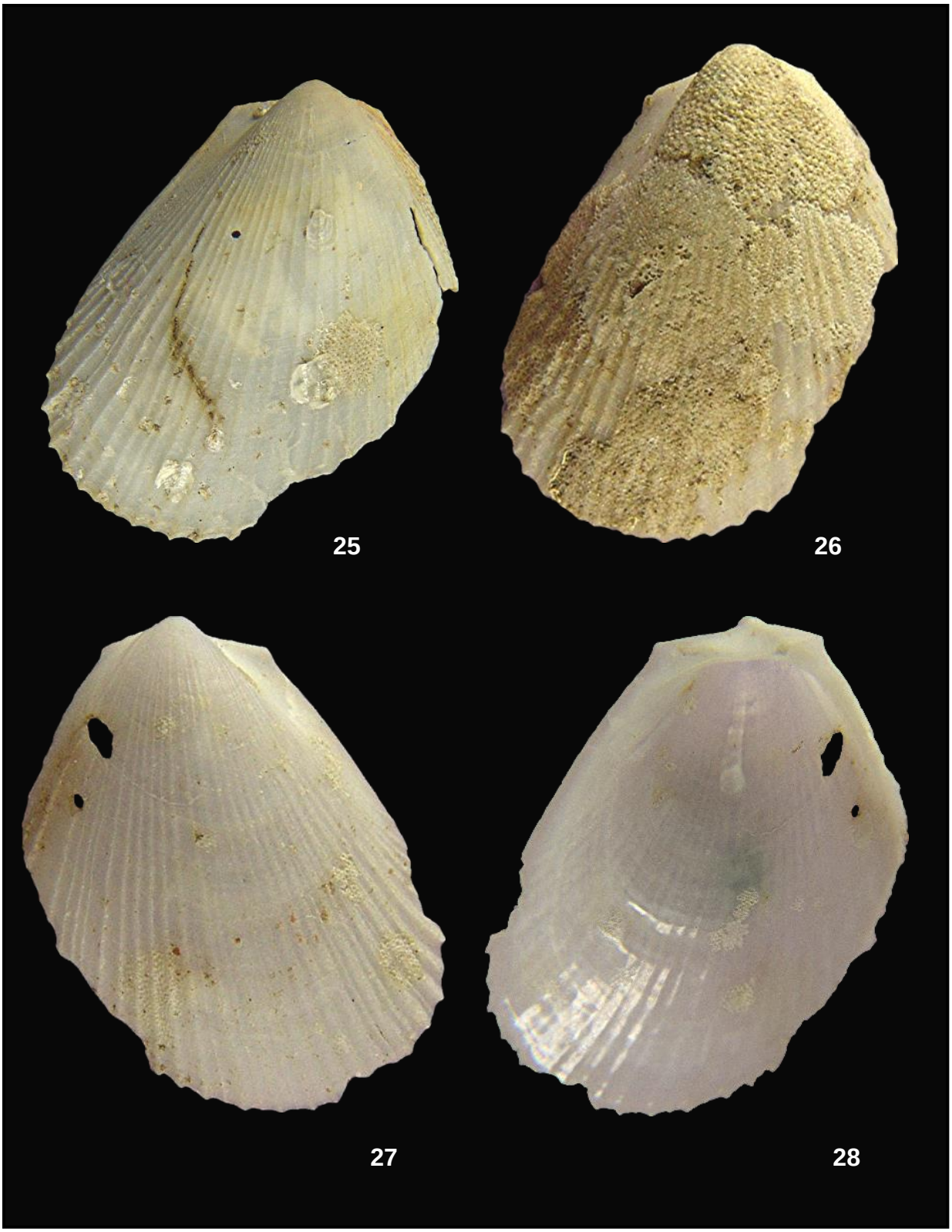


Plate VIII: Station 45
***Limaria tuberculata* (Olivi, 1792)**
Fig. 25: LV: H. 23.0 mm L. 18.6 mm
Fig. 26: LV: H. 24.2 mm L. 18.5 mm
Fig. 27: RV: H. 24.3 mm L. 19.7 mm
Fig. 28: RV: H. 24.3 mm L. 19.7 mm (inside view)

3. Station 60, 5°06' N. 9°34' W.

3 valves.

Dredged off Liberia at a depth of 78 m in sandy mud on 9 January 1946.

This material belongs to:

***Limaria hians* (Gmelin, 1791).**

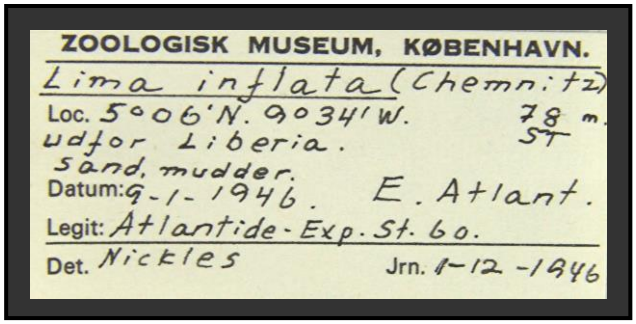


Plate IX: Station 60
***Limaria hians* (Gmelin, 1791)**
Fig. 29: RV: H. 12.0 mm L. 8.7 mm
Fig. 30: RV: H. 15.3 mm L. 12.4 mm (inside view)
Fig. 31: RV: H. 15.3 mm L. 12.4 mm
Fig. 32: RV: H. 17.1 mm L. 12.8 mm (inside view)
Fig. 33: RV: H. 17.1 mm L. 12.8 mm

29

30

31

32

33

4. Station 65, 4°24’ N. 7°05’ W.

1 valve.

Dredged off Ivory Coast, in sandy mud at 78 m on 11 January 1946.

This is a specimen of:

***Limea loscombii* (Sowerby G.B I, 1824)**

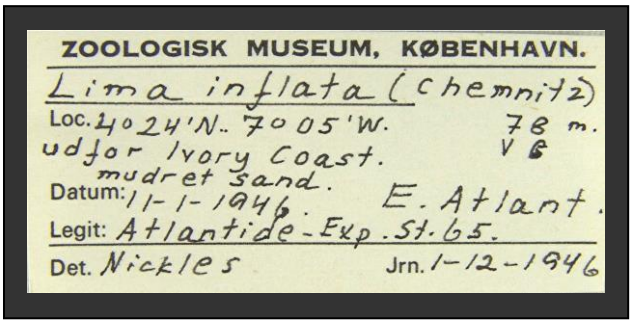


Fig. 34: *Limaria loscombii*
LV: H. 7.4 mm L. 5.4 mm

5. Station 100, 6°06’ N. 4°29’ E.

1 valve.

Dredged off Nigeria at 29 m on 15 February 1946.

This is a specimen of:

***Limaria hians* (Gmelin, 1791)**

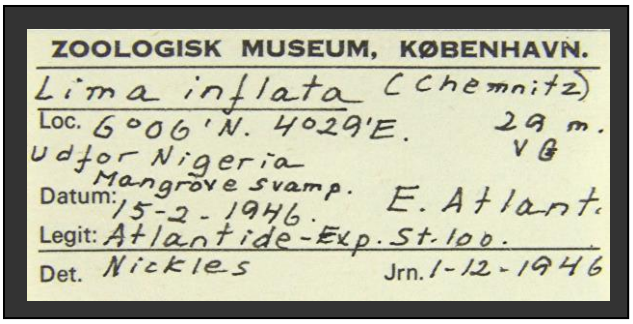


Fig. 35: *Limaria hians*
LV: H. 10.2 mm L. 8.1 mm

6. Station 136, 8°30’ S. 13°14’ E.

1 valve.

Dredged off Angola in mud at a depth of 45 m on 18 March 1946.

This shell belongs to:

***Limea loscombii* (Sowerby G.B I, 1824)**

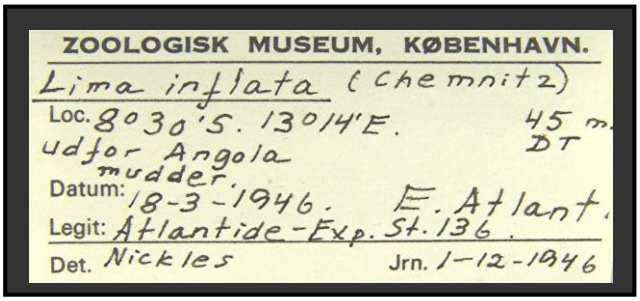


Plate X: Station 136

***Limea loscombii* (Sowerby G.B. I, 1824)**
Fig. 36: RV: H. 8.1 mm L. 6.8 mm
Fig. 37: RV: H. 8.1 mm L. 6.8 mm (inside view)
Fig. 38: RV: H. 8.1 mm L. 6.8 mm (anterior view)
Fig. 39: RV: H. 8.1 mm L. 6.8 mm (posterior view)

7. Station 145, 9°20' N. 14°15' W.

1 valve.
This broken valve was dredged off French Guinea (the present Guinea) at 32 m on 13 April 1946.
It belongs to:
***Limaria hians* (Gmelin, 1791)**

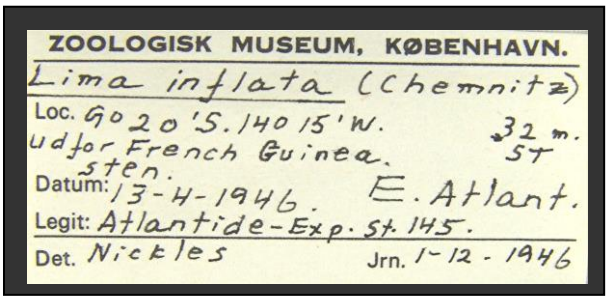
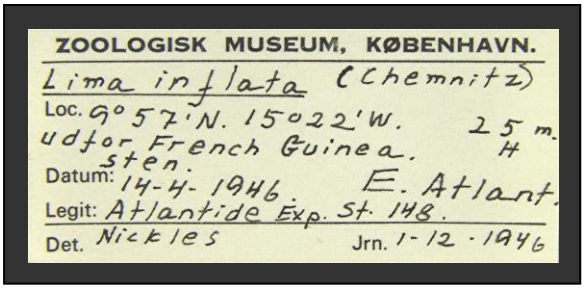

ZOOLOGISK MUSEUM, KØBENHAVN.
Lima inflata (Chemnitz)
Loc. 9° 20'S. 14° 15'W. 32 m. ST
ud for French Guinea.
sten.
Datum: 13-4-1946. E. Atlant.
Legit: Atlantide-Exp. St. 145.
Det. Nickles Jrn. 1-12-1946

Fig. 40: *Limaria hians*
RV: H. 8.4 mm L. 8.0 mm

8. Station 148, 9°57' N. 15°22' W.

1 juvenile specimen.
This shell was dredged at 25 m off French Guinea (Guinea) on 14 April 1946.
It is **not** a juvenile specimen of ***'Lima inflata'*** but a complete live caught ***Limea loscombii***.



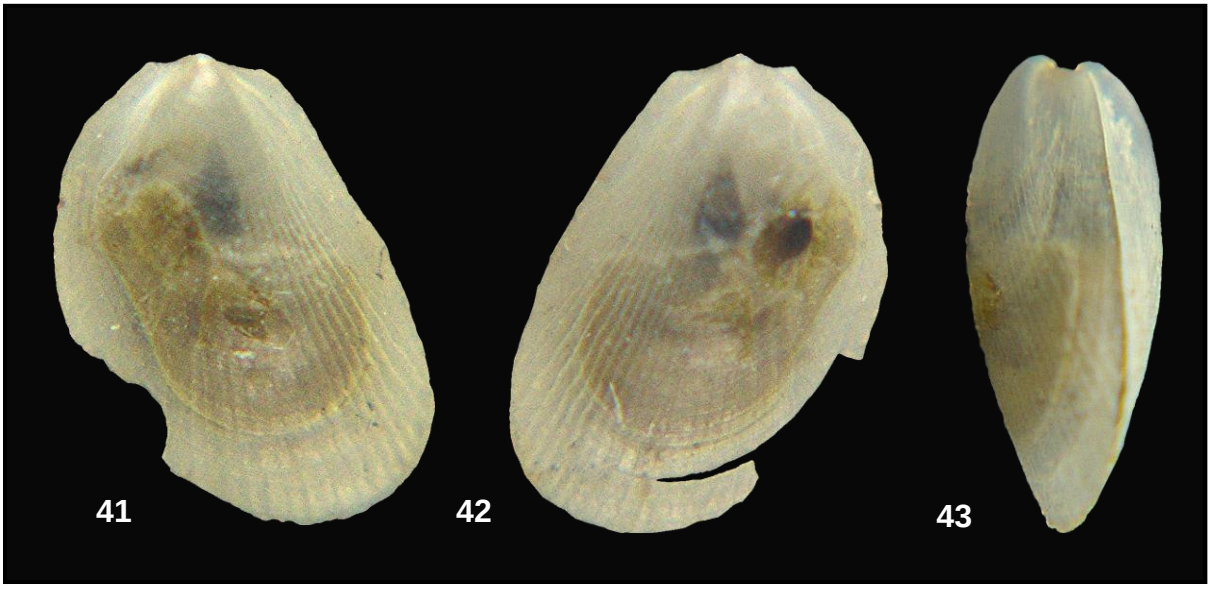


Plate XI: Station 148

***Limea loscombii* (Sowerby G.B. I, 1824)**
Fig. 41: RV: H. 4.8 mm L. 3.1 mm
Fig. 42: RV: H. 4.8 mm L. 3.1 mm
Fig. 43: RV: H. 4.8 mm L. 3.1 mm (anterior view)

9. Station 153, 10°49' N. 16°39' W.

1 valve with animal dried in.
Dredged off French Guinea in green sand at a depth of 42 m (16 April 1946).
This live caught specimen has one broken valve and belongs to ***Limea loscombii***.

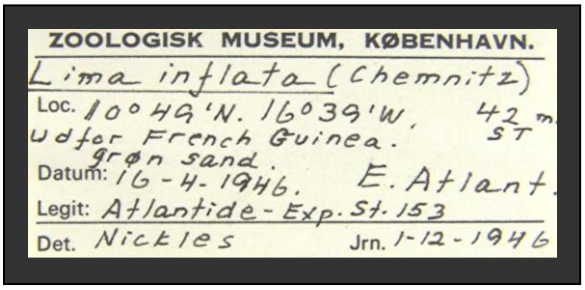


Fig. 44: *Limea loscombii*
RV: H. 5.1 mm L. 3.6 mm

10. Dakar, H. Madsen, 1 juvenile specimen.
This shell has not been studied because it was not dredged by the '*Atlantide*'-expedition.