

# GLORIA MARIS

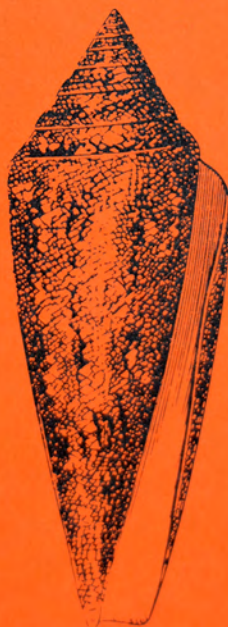
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**RED SEA MALACOLOGY  
IV**

**REVISION OF THE LIMPETS  
OF THE RED SEA**

**Patellidae  
Fissurellidae  
and the genus Hemitoma**

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KEYWORDS:

MOLLUSCA - GASTROPODA - PATELLIDAE, FISSURELLIDAE, HEMITOMA - RED SEA

## ABSTRACT

The paper treats a first group of limpets from the Red Sea. The *Patellidae* with the common *Cellana rota* (Gmel.) (= *C. eucosmia* Pilsbry sensu Powell), *Patelloida profunda* (Desh.) for the first time recorded in the Red Sea, and *Patelloida rolani* nov. spec. The *Fissurelloidea* with 3 genera. The genus *Diodora* (*Fissurellidae*) with several species: *D. ruppellii* (Sow.), a common species with gibbous shell and nodulous structure, *D. ruppellii impedimenta* (Cooke), an extinct, gibbous, round subspec. *D. ruppellii abulatti* nov. subspec. with strongly imbricated ribs, *D. vaillanti* (Fischer) with a different profile, sculpture and radula, *D. imbricata* (Sow.) (= *savignyi* Pall.) with a conical shell and squamate ribs, and *D. yaroni* nov. spec. with *isaaci* nov. subspec. - both collected in a crack south of the Sinai. The genus *Macroschisma* (*Fissurellidae*) with only one species, *M. compressa* (A. Ad.). At last the genus *Hemitoma* with its 5 Red Sea species: *H. panhi* Q. G., *H. subrugosa* Thiele, *H. modesta* H. Ad., *H. arabica* A. Ad. and *H. simpla* nov. spec.

## INTRODUCTION

This paper is dedicated to the memory of Dr. Isaac Yaron, Beer-Sheva, Israel, who was reported missing while diving in the Gulf of Elat in April 1985. Yaron's dream was to review all the molluscan fauna of the Red Sea. As I intended to review the marine limpets, we met in 1982 and started the revision of the false limpets of the Red Sea: the *Fissurellidae*. End 1983 Yaron sent me his preliminary draft, conducted within the framework of his revisions of the malacofauna of the Red Sea. That manuscript treating 4 species "*Diodora rueppelli*, *Diodora funiculata*, *Fissurella impedimentum* and *Macroschisma compressa*" has been completed and changed. When the original text is quoted integrally, I'll indicate "Dr. Yaron ms.". Yaron included in *D. ruppellii* some synonyms which I consider as belonging to valid species. The variability of the shells and radulae of this group are not sufficiently known and have to be studied far more intensively.

As the drawing of one position of the pluricuspid tooth is not always sufficient to identify a species. I'll draw this tooth in some other positions.

In the Red Sea, the limits of which are defined by Yaron (Port Saïd in the North and Bab-el Mandeb Straits in the South), many limpets have been recorded. We studied them as carefully as possible and consulted all available publications belonging to the malacofauna of the Red Sea. I am aware that this paper is far from definitive.

In this paper I include the family *Patellidae*, the family *Fissurellidae* and the genus *Hemitoma*, included by most authors in the family *Emarginulidae* and for which Golikov and Starobogatov, 1975, created the new family *Hemitomidae*. I'll restrict myself to the genus-level and shall not discuss the sub-generic nomenclature nor the diverse and numerous subclassifications of the superfamily *Fissurelloidea*. The family *Emarginulidae* and the other limpets will be treated in a latter paper. For each Red Sea limpet I give the known references, the synonyms and the most relevant records (with eventually some records in the neighbourhood). In the bibliography at the end of the paper, only references with Red Sea limpets are recorded. Other useful references are abbreviated in the text and need not concern us further in this paper.

## ABBREVIATIONS

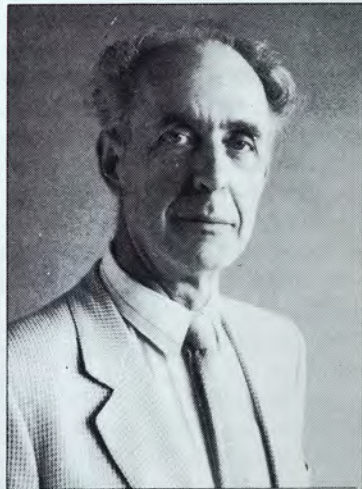
With regards to the museums and collections mentioned in this publication, the abbreviations used are as follows:

- BMNH : British Museum (Nat. Hist.), London, England.  
 HUJ : Zoological Museum, Hebrew University, Jerusalem, Israel.  
 KBIN : Koninklijk Belgisch Instituut voor Natuurwetenschappen, Brussels.  
 MHNP : Muséum National d'Histoire Naturelle, Paris, France.  
 MRAC : Musée Royal de l'Afrique Centrale, Tervuren, Belgium.  
 NHMW : Naturhistorisches Museum, Wien, Austria.  
 RNHL : Rijksmuseum van Natuurlijke Historie, Leiden, Netherlands.  
 TAU : Zoological Museum, Tel-Aviv University, Tel-Aviv, Israel.  
 UMZC : University Museum of Zoology, Cambridge, England.  
 ZMUC : Zoological Museum, University Copenhagen, Copenhagen, Denmark.  
 JC : Collection Jos. CHRISTIAENS, present author, Belgium.  
 YD : Collection Y. DAFNI, Elat, Israel.  
 ER : Collection Emilio ROLAN, Vigo, Spain.  
 IY : Collection Isaac YARON, Beer-Sheva, Israel.

For the references of the species, I use the following genus-abbreviations:

- C. : *Cellana* H. Adams, 1869, in the family *Patellidae*.  
 D. : *Diodora* Gray, 1821, in the family *Fissurellidae*.  
 E. : *Emarginula* Lamarck, 1801, in the family *Emarginulidae*.  
 F. : *Fissurella* Bruguière, 1789, in the family *Fissurellidae*.  
 H. : *Hemitoma* Swainson, 1840, in the superfamily *Fissurelloidea*.  
 M. : *Macroschisma* Sowerby, 1835, in the family *Fissurellidae*.  
 P. : *Patella* Linne, 1756, in the family *Patellidae*.

CHRISTIAENS Joseph, born at Tongeren, Belgium, 9.03.1927. Studied for construction engineer at the university of Liège. He was from 1954 till 1963 in a dredging company at Ostend, worked in 1959 in Wilhelmshaven, Germany and in 1960 in Haifa, Israel, where he started to collect shells. He worked 3 years (1963-67) in the institute of Soil Mechanics at Ghent and afterwards, till now, in a bureau of consulting engineers at Hasselt. Since 1970 he collects and studies exclusively limpets (Patelloidea, Fissurelloidea, Phenacolepadidae, Hipponicidae, Calyptraeidae, Capulidae, Siphonarioidea). He made a lot of publications on limpets, with among them a revision of the genus *Patella* (Paris, 1973).



## SYSTEMATICS

Order *ARCHAEOGASTROPODA*Genus *Cellana* Adams H., 18691. *Cellana rota* (Gmelin, 1791)

- P. rota* Gmelin, 1791 Syst. nat. ed. 13: 3720. Ref. Chemnitz, Conch. Cab. X: 330, fig. 1619, "Das Wagenrad".
- P. variegata* Reeve, 1842. Conch. Syst. II: 15, pl. 136, fig. 1. Indian Ocean. (non Röding, 1798 (= *Fissurella*), nec Blainville, 1825, nec Reeve, 1854 (= *grata* Gld. 1859, = *C. eucosmia* Pilsbry, 1891).
- P. rota*, Chemn., Cooke, 1885: 273. Mozambique, Aden, Mauritius. *P. biradiata* Rve, mentioned by MacAndrew, are worn shells of *rota* and the 5 undetermined spec. are all *rota*.
- P. pharaonis* Val., Jousseume, 1888: 196. Obock. Nomen nudum. (spec. in MHNP)
- Helcioniscus variegatus* Rv., Thiele, 1891: 337, pl. 28, fig. 42. Aden. Radula figured.
- Helcioniscus capensis* Gm., Thiele (non Gmel.), 1891: 337, pl. 28, fig. 43. Red Sea. Radula figured.
- C. eucosmia* Pilsbry, Powell (non Pilsbry), 1973: 147, pl. 119.
- C. radiata radiata* Born, Powell, 1973: 149 (in partim).
- C. rota* (Gmel.), Christiaens, 1986: 105. Discussion of the identity of *C. rota* and restitution of the name.

Discussion. — Recently I proved that *C. rota* is clearly separated from *C. radiata* (Born, 1778) (= *C. capensis* Gmel.), a species from S. Africa, and from *C. livescens* (Rve, 1855) (= *C. novemradiata* Q.G., 1834 (non Fischer, 1807), = *Nacella cernica* H. Ad., 1869, = *P. garconi* Desh., 1863) from Madagascar, Mauritius and Réunion.

*Cellana rota* is very variable and I hope to give more details, characteristics and radular differences in a latter revision of the genus *Cellana*. It is noteworthy that Valenciennes created a lot of new manuscript names for specimens of this variable group present in the MHNP: *P. pharaonis*, ex Lefèvre, 1837, Red Sea (yellow-gold inside and having red spots outside in V-form); *P. hebroeorum*, ex Botta, 1832, Red Sea (with white callosity); *P. bistigmosa*, ex Cloué, 1850, Seychelles; *P. grata*, ex Rousseau, 1841, Bombay; *P. lentigera*, ex Rousseau, 1841, Muscat; *P. lentiginosa*, ex Cloué, 1850, Madagascar; *P. rivulata*, ex Cloué, 1850, India, Madagascar; *P. rousseaui*, ex Rousseau, 1841, Muscat, Bombay; *P. solaris*, ex Jousseume, 1921, locality? (with dark and very pronounced large rays).

Other eventual synonyms are: *C. aster* (Rve, 1855), *C. crocata* (Lesson, 1830), *C. karachiensis* Winckworth, 1930, *C. petalata* (Rve, 1854) (considered by Winckworth ms. BMNH, as unmistakably identical with *C. rota*), *C. reynaudi* (Desh., 1832), *C. travancorica* Preston, 1911 (= *C. aster*, teste Tomlin 1925, Proc. Zool. Soc. 16: 198).

Distribution. — *C. rota* is encountered in whole the Red Sea. I mention shortly: Elat (JC, 1960), Aqaba (HUI; JC ex Rolan), Dahab (HUI; JC ex Wellens, 1986, with a specimen attaining 54 x 48 x 17 mm), Wadi and Magresh (JC ex Rolan), Sharm el Sheikh (HUI; JC), Suez, jetty South (KBIN), Dahlak archipel (HUI; JC ex Trappe), Mesewa (JC ex Ostini), Nadi Magreth (JC ex Wils), Ras el Burka (JC).

The limits of the further distribution are not exactly known. I didn't examine it (Christiaens, 1986: 105) but the oriental Mediterranean (Christiaens, 1967. Bull. Mus. natn. Nat. Hist. (2) 38 (6):903) and the Gulf of Oman are certainly included.

### Genus *Patelloida* Q.G., 1834

#### 1. *Patelloida profunda* (Dehayes, 1863)

(fig. 1-3, 53)

Discussion. — In the species *Patelloida profunda*, I included in 1975 (Inf. Soc. Belg. Malac. 4:93) several subspecies: *profunda s.s.* (Desh., 1863 Cat. moll. Réunion: 44; Kenia, Aden), *albonotata* Smith, 1901 (Natal), *mauritiana* Pilsbry, 1891 (Mauritius, Rodrigues, Madagascar), *omanensis* Christiaens, 1975 (Gulf of Oman), *ivani* Christiaens 1975 (Northwestern Australia) and *ceylanica* Smith, 1911 (Sri Lanka) which later (Gloria Maris, 1976, 15 (6): 127) I considered as a variety of *Patelloida bombayana* (Smith, 1911). I recognised a *Patelloida profunda* group in which *Patelloida calamus* Crosse & Fischer, 1863 (temperate Southern Australia) and *Patelloida conoidalis* Pease, 1868 (Pacific Ocean) were included. Lindberg & Vermeij (1985. Veliger 27 (4): 411-417) recently assigned other species to this group: *Patelloida pustulata* Helbling, 1777 (Caribbean Sea), *Patelloida semirubida* (Dall, 1914) (Panamic) and *Patelloida chamorrorum* Lindb. & Vermeij, 1985 (Guam, Mariannes). This last species has a larger third lateral tooth than the other species and is quickly distinguished in the field by the shape of the strongly developed oral lappets on the mouth. In my collection some preserved specimens from Guam (ex J. Day, 1977) belonging to this new species, were classified as *Patelloida conoidalis* var., with *Acmaea fouae* Test, 1945, as a possible synonym (Christiaens, 1976. Gloria Maris 15(3): 63). This still has to be checked.

Distribution. — In the Red Sea *Patelloida profunda* has never been mentioned before. I have several specimens from Hurghada (ex De Brauwier and ex Palazzi) and from El Hamira Bay (ex Zaleman, -24 m depth). Rolan E. found 44 specimens at Aqaba and 37 specimens 15 Km South of Aqaba at -15 till -30 m depth. All these specimens are very variable and small. From Abulatt Is. I have 2 bigger specimens (the biggest measuring 19 x 13 x 7.5 mm) very akin to one form Kenia and considered by Franc, 1956 (Campagne Calypso, MHNP, ms) as *C. rota*.

In the BMNH three specimens from Aden (BMNH, ex Winckworth, 2.3.1925) have been encountered under the name *Cellana profunda* Desh. var. nov. The two biggest ones (13 x 10 x 5 and 12.5 x 10.8 x 5.3 mm.) are pretty coloured like *Patelloida profunda omanensis* Christiaens, 1975 and may belong to the same subspecies.

#### 2. *Patelloida rolani* nov. spec.

(fig. 4-7, 54,55)

Description. — Together with *Patelloida profunda*, and at the same localities, a lot of white beach *Patelloida* specimens have been collected by E. Rolan. They are generally smaller, with a max. length of 3,5 mm, and differ all from *Patelloida profunda*, not only in shape and depressed form, but also in transparency, design, smoothness and the clear white colour, although the white colour alone is not reason enough to constitute a new species.

The shape is akin to *Patelloida pustulata* but has not the numerous costae as

the Caribbean one. It is transparent and has very fine concentric striae. There are 14-16 radial rays, well-marked by a non translucent white colour. These rays are compact or have a nice design, constituted by 4-6 opaque inversed chevrons. In one specimen the white rays are very large, irregular, and come together half the height, forming an angle of more than 45° at the top.

This new species has a certain affinity with other small *Patelloida*, the identity and limits of which still have to be checked: *Acmaea (Tectura) maraisi* Kilburn, 1977 (Transkei, South Africa, a more conical and solid species of which I have specimens from Gesirah, South Somalia, ex Palazzi); *Helcioniscus illibrata* Verco, 1906 (Tasmania, South Australia), type by original designation of *Asteracmaea* Oliver, 1926; *Patella axiaerata* Verco, 1912 (Australia occidental) and even *Acmaea? cornea* Test, 1945 (Zanzibar). It is perhaps *Helcion sp.* from Annesty Bay (Blanford, 1870: 468).

Material. — At Aqaba E. Rolan collected 42 specimens: 15 Km south of Aqaba, he collected 4 specimens at 3-5 m depth and 19 specimens at 15 - 30 m depth. Yaron examined these specimens, together with the lot of *Patelloida profunda* from the same locality, and in a letter to Rolan, dated 4.11.1984 he wrote: "Acmaea ssp. - these are probably undescribed species". No preserved shells have been collected and I find no essential difference between these 3 lots. The same species was collected at Aqaba at -5 m depth by Palazzi, 1982 (2 spec. JC). In the RNHL, one specimens from Tor, Gulf of Suez (Coll. F. Heybroek, July 1948, n° 799) has been met.

The holotype (fig. 4) has been deposited at the KBIN (n° 27131). A paratype from Aqaba has been given to the BMNH (spec. figured fig. 5). 2 spec. HUI, 2 spec. MNHP, 2 JC and 2 ER.

### Genus *Diodora* Gray, 1821

Synonyms of the genusname. —

*Diodora* Gray, 1821: Type *Patella apertura* Mont., 1803, a young doubtful species from Falmouth, England.

*Lucapina* Sowerby, 1835: *Fiss. cancellata* Sow. and *Lucapina elegans* Gray. Name accepted by Dall, 1915, as priority name.

*Diodora* Gray, 1840: type *Patella noachina*.

*Fissuridea* Swainson, 1840: type *Fissuridea pileus* Swains. (= *F. galeata* Helbling, 1779).

*Diadora* "Gray 1821", Gray, 1847: Type *Patella Noachina*.

*Diadora sp.* Gray 1821, *Patella apertura*, Gray, 1847. Is given as a synonym of *Fissurella*.

*Glyphis* Carpenter, 1856 (non Agassiz, 1843): type *Fissuridea aspera*.

*Capiluna* Gray, 1857: Type *Fiss. cuvieri* (= *Fiss. graeca* Lam. in Cuvier, non L.).

In this systematic arrangement Gray gives 3 genera: *Fissurella*, *Lucapina*, *Capiluna* and omits *Diodora*.

*Diodora* Gray, 1821, Iredale, 1915. Iredale says that it is acknowledged without argument (sic!) that *Patella apertura* is an immature stage of *F. graeca* and that the name *Diodora* has priority.

*Diodora* Gray, 1821, sensu Iredale, 1915, Christiaens, 1974, Info. Soc. Belg. Malac. 3(4): 39-47. The validity of the names is discussed and for the stability of nomenclature I accepted the name *Diodora*, in use since 1915.



1. **Diodora ruppellii** (Sowerby, 1834)  
(fig. 8-19, 44, 56-58)

- F.sp.* Audouin, 1826: 151 (in pars). re Savigny 1817, Atlas pl. 1, fig. 4-7.  
*F. Ruppellii* Sowerby GB, 1834: 128. Nevis Is.; Gulf of Arabia.  
*F. Roupellii* nobis, Sowerby, 1835, part 78: fig. 65.  
*F. Ruppellii* mihi, Sowerby, 1835, part 80:6. Nevis Mr. Powers; Red Sea, Rüppel.  
*F. Ruppellii* nobis, Sowerby, 1835, part 90, Cat. List: spec. 75. Red Sea.  
*F. Ruppellii* Sow., Catlow & Rve, 1845, Conch. Nomenclat.: 104. Ref. Conch. III. fig. 65.  
*F. Ruppellii* Sow., Reeve, 1849: spec. 54. Red Sea, Rüppel.  
*F. nigiradiata* Reeve, 1850: spec. 81, pl. xv (not fig. 81, pl. xii). Hab.?  
*F. Ruppellii* Sowb. Sowerby, 1862: 197, pl. 140 (= pl. *Fiss. v*), fig. 107, 108. "Z.P. 1834, C; ill, 65. Red Sea. Var. *F. quadriradiata* Rve, *Fiss.* 108?" (non Rve).  
*F. Ruppellii* Sow., Issel, 1869: 230. Chaeb el Mellah, Enruk Katah el Kebir, near Suez. Id.: 301. Fossil ex Torino Museum. Equivalent tot the mediterranean *F. graeca* L.  
*Lucapina Ruppellii* Sow., MacAndrew, 1870: 444. Red Sea, shore, frequent.  
*Lucapina spec.* MacAndrew, 1870: 444. Red Sea, low water, frequent. Is *ruppellii*, teste Cooke, 1885: 270, of which the 4 dark rays are not always constant.  
*F. Ruppelli* Sowerby, Fisher, 1870: 161. Suez.  
*F. Ruppellii* Sowerby, Pagenstecher, 1877: 60. Red Sea, shore frequent.  
*F. reticulata* Liénard (non Récluz, 1843, teste Martens, 1880, Moll. Maskarenen: 122), 1877. Cat. malac. île Maurice: 50. Red Sea (Philippines) with *F. quadriradiata* as synonym  
*F. Ruppellii* Sow., Cooke, 1885: 270. ex MacAndrex, 1870.  
*F. Ruppelli* Sow., Martens, 1887: 90. Suez Canal, ex Keller, 1882.  
*F. Ruppelli* Sow., Kobelt, 1887: 131. Suez Canal.  
*F. Ruppelli* Sow., Paetel, 1888: 585. Red Sea.  
*F. Ruppelli* ? var. Sow., Caramagna, 1888: 133. Aseb, frequent.  
*F. Ruppelli* Sowerby, von Martens, 1889. J. Linn. Soc. Lond. 21: 198. Red Sea, King Is., Mauritius. Idem: 1902. Sitz. Ber. Gesell. naturf. Freunde Berlin, 6: 198.  
*Glyphis ruppellii* Sowerby, Pilsbry, 1890: 217. Red Sea, pl. 39, fig. 8 given with the name *ruppellii*. Syn. are: *F. elevata* Dkr., *F. australis* Krauss *F. imbricata* Sowb., *F. nigiradiata* Rve.  
*F. Ruppellii* Reeve, Hart, 1891: 195. Agun Mussa.  
*R. ruppellii* Sowerby, Smith, 1891: 420. Aden, Mergui, Mauritius, Red Sea, E. Africa.  
*F. Ruppelli* Sow., Shopland, 1896: 13. Aden, rocks everywhere L.W.  
*Capiluna Ruppelli* Sowerby, Newton, 1900: 502. Ras Gharib, fossil (non var. *Barroni* which is *F. impedimentum*).  
*F. nigiradiata* Rve, Smith, 1901. J. Conchol. 10 (4): 105. Is a small halfgrown *ruppellii*.  
*F. Ruppelli* Sow., Shopland, 1902: 176. Aden.  
*Glyphis ruppellii* Sow., Sturany, 1903: 266. Dahab (Mersa Dahab), Sherm Sheikh, Shadwan, Is., Noman Is. (Ras Abu Massarib), Ras Abu Somer, Yenbo, Port Berenice, St. John Is., Jidda, Raveiya (Mohammed Ghul), Sarso Is., Massawa (Massaua).

- Glyphis rueppellii* Sow., Sturany, 1905: 146. Dahlak, leg Jickeli.
- F. Ruppellii* Sow., Tillier & Bavay, 1905: 176. Suez Canal, Seuil de Chalouf, Small Bitter Lake, Seuil de Sérapeum, Timsah Lake, N. entry of Canal.
- F. (Glyphis) Rüppelli* Sowerby, Lamy, 1905. Bull. Mus. Hist. nat. 4: 268. Gulf of Tadjourah, Musha Is., Djibouti; Red Sea.
- F. (Capiluna) Rüppelli* Sowerby, Pallary, 1926: 34. re Savigny 1817, pl. 1, fig. 4, 6, 7.
- D. ruppellii* (Sowerby), Tomlin, 1927: 298, 318. Suez Canal. P.O. Km. 24, Km. 46, K. 9, K. 5, K.O, Km. 149, Km. 152, Pt. 12, Pt. Darse.
- F. (D.) ruppellii* G. Sowerby, Cox, 1931: 5. Zizaf Is., fossil.
- F. Rüppelli* Sowerby, Gruvel & Moazzo, 1933: 144. Great Bitter Lake, common.
- F. (D.) Rüppelli* Sowerby, Lamy, 1939: 83. Ismailia, Tor, Mersa Thlemel, Ras Metarma beach, Gulf of Suez Sts x, xvi, xvii, Ras Zeiti beach, Sherm Sheikh.
- F. (Capiluna) Rüppelli* Sow., Moazzo, 1939: 213. Crique de Suez, Ras Adabieh, Fontaine de Moïse, baie de Suez, Port Saïd, Geneffé, Kabret, Grand Lac, Timsah, N. of Ismailia, el Ferdane, el Guishr, Kms 57, 36, Raz el-Esch, Km. 4.
- F. Ruppelli* Sow., Ryland, 1950 (1951): 12. Bitter Lakes, Suez Canal. In list p. 26: *F. Ruppelli*.
- D. ruppellii* (Sowerby, 1838), Rees & Stuckey, 1952: 191. Sharm Sheikh, under rock.
- F. Ruppelli* Sow., Nickles, 1952. Moll. Test. littoral AEF. J. Conchyl. 92 (3): 144. Port Tewfik, Gulf of Suez.
- D. Rüppelli* (Sowerby), Franc, 1956: 22. Abulatt Is., Camp beach near TSF, récif, St. 9, Djeddah port.
- D. rueppellii* Sow., Steinitz, 1967: 168.
- D. ruppellii* (Sow.), Ghisotti & Melone, 1970. Conchiglia 6 (3-4): 44. Red Sea. Haifa (Mediterranean, leg Barash 24 x 16 x 12 mm. "40 cordoni radiali, 20 cordoni concentrici, 8 fascie bruno scuro o nero").
- D. ruppelli* (Sowerby), Biggs, 1971: 147.
- D. ruppelli* (Sowerby), Biggs, 1972: 498. Kad Norah Is., 6 samples dead.
- D. rueppelli* (Sowerby, 1834), Barash & Danin, 1973: 303. Great Bitter Lake, E. of Deversoir.
- D. ruppellii* (Sow., 1835), Christiaens, 1974: 89.
- D. rueppelli* (Sowerby), Mienis, 1975. Info Soc. belge Malac. (4) 1: 19. Eastern part of the Mediterranean, Red Sea.
- D. rueppelli* (Sowerby). Mastaller, 1978: 126. Port Sudan, Harvey reef platform and Suakin.
- D. rueppelli* (Sowerby, 1834), Mastaller, 1979: 27. Aqaba, under bouldern, "Strandfelszone, selten; Pt. Sudan, Suakin, Strandfunde".
- D. rueppellii* (Sowerby, 1866), Brauwer & Al., 1981: 153. Hurghada.
- D. rueppellii* (Sowerby, 1834), Bosch D. & E., 1982: 30. Oman, uncommon.
- D. rueppelli* (Sow., 1834), Barash & Danin, 1982: 112. Suez Canal, intertidal and infralittoral.
- D. rueppellii* Sow., Abott & Dance, 1982. Compendium of Seashells (2 ed.), corrected by Dance, 1986. Pallidula 1 (65): 4, to *D. ruppellii*.
- D. rueppelli* (Sow., 1834), Sharabati, 1984: pl. 2., fig. 6, 6a; 25 mm.
- ? *D. cf. proxima* and ? *D. sp.*, Sharabati, 1984: p. 2, fig. 7, 7a, and fig. 8, 9.

Original description. — *Fissurella Ruppellii*. - Fiss. testa oblonga-ovata, elevata, decussata, lateraliter subdepressa, postice longiore: intus alba, margine crenulato;

extus albicante, radiis plerumque nigris, nonnumquam viridiscienti-nigris, concinne picta, costis costellisque alternantibus submuricatis radiantibus ornata; apertura dorsali parva ovata postice subquadrata, antice infra verticem posita, intus postice depressione distincta: long. 0.9, lat. 0.6 poll. Hab. ad Insulam Nevis, Capt. Powers; in Sinu Arabica, Rüppell. A specimen of this pretty species was lately obtained by Mr. Cuming from M. Rüppell. About twenty were in the collections of the late Mr. Humphreys. - G.B.S.

Discussion. — In 1834 Sowerby gives for the species *F. ruppellii* two different localities (Nevis Is., Caribbean and Gulf of Aqaba), and in 1835 he gives two different figures. The first figure, fig. 65, shows a specimen with a round central keyhole. This figure had been cited by very few authors (Sowerby, 1862, Catlow & Rve, 1845). The second figure, fig. 75, is the only one which Sowerby in his list of 79 Fissurellids provided with a locality, namely the Red Sea. It is obvious that Sowerby wished to stress this locality, rejecting perhaps Nevis Is. given previously. I choose figure 75 as hypotype of *D. ruppellii*. I disregard fig. 65, which I consider as a Caribbean shell from Nevis Is., Lesser Antiles, probably a white *F. barbadensis* var. *intensa* Pilsbry (1890: 165, pl. 60, fig. 8, without locality and refigured by Farfante, 1943, Johnsonia X: pl. 1, fig. 13, Virgin Is.). The probability that fig. 65 represents a special form of a Red Sea Fissurella is very little but not completely excluded as Y. Dafni collected one specimen identified as *F. barbardensis* (teste Yaron) on the beach of Elat on 3.4.1959.

In 1862, Sowerby gives another description and 2 other figures than in 1835, and gives as an observation: "the rounded and beaded large ribs distinguish this species from others".

I consider as typical *D. ruppellii* the *Diodora* with gibbous form, with alternating larger and smaller ribs, latticed with concentric ridges which are nodulous upon the ribs; whitish, ivory with 8 black rays, less or none. Ryland, 1950, gives a short and nice description: "the exterior is covered with a raised and intricate pattern like geometrical lace". The number of concentric ridges increase in age and is generally greater in bigger specimens. The 4 "possible syntypes" (BMNH, n° 197579) have 17 till 24 concentric ridges, while a very big one from Mauritius (an unnamed specimen in the BMNH, measuring 32.2 x 22.2 x 20.9) has approximately 46 concentric ridges. With such a number of ridges it is obvious that the structure has less relief and that the carvings and pits are seriously reduced.

The name *ruppelli* has got a lot of incorrect subsequent spellings. The original spelling not being incorrect according to the international Code of Zoological Nomenclature (except for the capital letter), we have to keep the initial name: *ruppelli*.

Distribution. — This species is common throughout the Red Sea. Yaron, ms., prepared a long list of Red Sea records, a list which I don't reproduce here while Yaron made no distinction among *D. ruppellii*, *abulatti*, *vaillantii* and *imbricata* as I do.

*D. ruppellii* has immigrated via the Suez Canal into the Eastern Mediterranean and has established itself permanently there (Haas, 1948, J. Conchyl. 88: 143, Haifa; Steinitz, 1967: 168, Barash & Danin, 1973: 303, id. 1977: 88, id. 1982: 107; Ghisotti & Melone, 1970, Conchiglie, 6: 44; Ghisotti, 1974, Quad. Civ. Staz. Idrobiol. Milano 5: 12).

Further distribution mentioned in the literature but not checked: Arabian Gulf (Smythe, 1979, J. Conchol. 30: 63; Smythe, 1982, Seashells Arabian Gulf). South Arabia (Biggs, 1969, Arch. f. Molluskenk. 99: 202, Masirah Is.). Persian Gulf (Smythe, 1972, J. Conchol. 27: 493 Bahrain Is.; Melville & Standen, 1901, Proc. Zool. Soc., 2: 344). Madras (Melville & Standen, 1898, J. Conchol. 9: 78). Somalia (Priolo, 1969: 5). Inhaca (da Franca, 1960, Mem. Junta Invest. Ultram. (2) 15: 53). Madagascar (Dautzenberg, 1923, J. Conchyl.: 57; id. 1929, Faunes Col. Fr. iii: 546; Lamy, 1909, Mem. Soc. Zool. Fr. 22: 332). Mauritius (Viader, 1937, Mauritius Inst. Bull. 1: 57; von Martens, 1889, J. Linn. Soc. 21: 198). French Polynesia (Richard, 1985, 5th Intern. coral reef Congress Tahiti: 414; Salvat & Rives, 1975 Coq. Polynesia: Tuamotu, Society Is). Hawaii (Kay, 1979, Hawaiian marine Shells: 42) etc.

For the 3 radulae I examined, I refer to the pictures, while the differences and comparisons with other species are not easy to describe.

### 1.a *Diodora ruppellii* subspec. *impedimenta* (Cooke, 1885)

*F. impedimentum* Cooke, 1885: 270, ex MacAndrew, 1870: 444.

*Capulina Ruppelli* var. *Barroni* Newton, 1900: 502, pl. 22, fig. 1-4. From the raised beach deposits of Ras Gharib, Egypt (ex Barron). A dozen specimens. (teste Mienis, 1981).

*Glyphis impedimentum*, Cooke, Pilsbry, 1890: 292. Gulf of Suez.

*D. impedimenta* (Cooke). Mienis, 1981: 303-304, pl. 12, fig. 1-8.

Original description. — 4 spec... "Fiss. testa elevata, albida, gibbosa, perarcuata, aequae fere altitudine atque longitudine, costis numerosis alterne majoribus radiata, liris transversis concentricis cancellata, apice supra marginem posteriorem, nec ultra, posito, marginibus intus valide denticulatis, foramine oblongo; altit. '35 in., long. '375 in. This remarkable shell is of the same type as *arcuata* Sow. The noteworthy features are the extreme elevation, the very gibbous form and the fact that the apex, which is not at all prominent, is almost over the margin so that the posterior end of the shell is almost perpendicular. Viewed from underneath the margins form an almost complete circle".

Discussion. — According to Mienis (1981: 303) all shells of the type series "show a radial sculpture consisting of 17 main ribs alternated with 3 less developed ribs, of which the one in the middle is the strongest, though, less developed than the main ribs". In the opinion of Mienis, Cooke was dealing "with material collected from the raised shell-beds which are found here and there along the Gulf of Suez". Mienis regarded *D. ruppellii* var. *barroni* as a synonym of *D. impedimenta* and agreed with Newton that the form is probably extinct. (This was the reason that I didn't mention it in 1974, as I only treated the recent *Diodora*!). The var. *barroni* is nearly circular in outline, is more conical and elevated than *D. ruppellii* type and has as largest dimensions 18 x 18 x 15 mm.

Mienis considers *F. impedimentum* as a valid species, while the size, height, circular outline and sculpture are so different from *D. ruppellii*. Personally I have never been very convinced of the validity of this species. A high recent *D. ruppellii* (JC, 24.7 x 17.5 x 13.8 mm, ex Diana-Pierre, Ostend), having the same gibbous shape

and posterior inclination of  $70^\circ$ , gives the proportion  $b/l = 0.71$  and  $h/l = 0.56$ , while the paralectotype n° 1 of *F. impedimentum* (10.4 x 8.2 x 6.7 mm, UMZC, 2354/1) gives  $b/l = 0.79$  and  $h/l = 0.64$ , which invalidates partially the so called "noteworthy features" given by Cooke. Having recently received the paralectotype n° 1 on loan, and as it concerns an extinct form, I now consider it as an extinct, gibbous and nearly round subspec. of *D. ruppellii*, which truncation of the internal callus is a bit inexistent as it is the case in some other very gibbous *Diodora*.

The habitat and distribution of this subspecies are not known with certainty.

1.b *Diodora ruppellii* subspec. **abulatti**, nov. subspec.  
(fig. 20, 21, 45, 59)

From Abulatt Is., south of Jeddah, Red Sea, there are in the MHNP (Exp. Calypso and Mission Cherbonnier) 7 lots of *Diodora*, all named *D. ruppellii*. A few specimens have the same domed profile and nearly the same coloured rays as *D. ruppellii*, but have a completely different sculpture, namely: the intersections of the numerous radial and concentric ridges are not at all nodulous but are highly imbricated. I consider them as a new subspecies: *D. ruppellii abulatti*, nov. subspec.

The holotype in the MHNP measures 21.9 x 14.9 x 11 mm. It has 37 ribs, nearly all attaining the top, having an overlapping concentric structure with 35 well marked imbrications, led one over another like roof tiles (see fig. 45). The name imbricata would suite if that name was not employed by Sowerby for another species from the Red Sea, a squamated one with projecting scales. As Dr. Yaron was not aware of this species (which was not cleaned in the MHNP and which I have not met in other Museums), as I can't clearly indicate the constant differences in the radula (I admit that the examined radulae of *D. ruppellii*, fig. 56-58, are variable), and as it has been collected at only one locality, I provisory consider it as a subspecies of the variable *D. ruppellii* and not as a new species.

Three specimens have been collected with animal. The radula of the first specimen (Paratype n° 1, JC, ex MHNP, "Récifs plage Camp", measuring 19.1 x 12.6 x 9 mm) has been examined (see fig. 59). Paratype n° 2 (MHNP) from the same locality at Abulatt Is., measures 20.9 x 14.4 x 11 mm, and the third specimen (MHNP, Stat. 9., Abulatt Is.) measures 11 x 7.5 x 4.6 mm.

One specimen (MHNP, "Tête de corail vers TSF, Abulatt Is.; 18.5 x 12.5 x 9.1 mm) has an intermediate structure. There are 30 concentric rings with an undulating ridge, a little bit distanced with small furrows between them, not imbricated and not covering one another.

2. *Diodora vaillanti* (Fischer, 1865)  
(fig. 22, 23, 46, 61)

*F. costaria*, Desh. (in 2d ed. t. vii, 1836: 602), Vaillant (non Desh.), 1865: 109. In pars. Bay of Suez, Fairly common. Considered by Vaillant identical with the Mediterranean species. No limpets collected by Vaillant in the Bay of Suez have been found in the MHNP.

*F. Vaillanti*, Fischer P., 1865: 244. Suez, Red Sea. New name for *F. costaria* sensu Vaillant (non Desh.). This species has not been found in the MHNP.

Discussion. — Fischer, 1865, gave to the specimens, named *F. costaria* Desh. and collected by Vaillant in the Bay of Suez, the new name *F. Vaillanti*. Fischer (1865: 245) mentions very shortly that this species differs from *F. costaria*, "par ses côtes plus saillantes et plus décussées, son sommet plus marginal, etc.". The description given by Vaillant for his Red Sea specimens was as follows: *Fissurella costaria* (Deshayes). Lam. vii: 602, n° 27 (2 éd.). Nous avons trouvé un certain nombre d'échantillons de cette intéressante espèce, les uns à une certaine distance de la mer, sur des terrains émergés; d'autres vivants sur les pierres, à une certaine profondeur. Il ne nous paraît pas possible de la distinguer de celle de nos mers. Nous regardons comme formant simplement une variété certains échantillons où les côtes sont plus saillantes que celles de l'espèce-type. Assez commune".

Fischer and Vaillant certainly knew *D. ruppellii* figured in the Conchological Illustrations, the Thesaurus Conchyliorum and the Conchologia Iconica, but didn't mention this species. I keep *D. vaillanti* and *D. ruppellii* separated and note that *F. costaria*, figured by Deshayes, is completely different from *D. ruppelli*, called by Reeve "a very elaborated sculptured and characteristic species". *F. costaria* figured by De Gregorio, 1891 (Ann. Geol. Paleont. 9: pl. 1, fig. 1) is also different from *D. ruppellii* but has the same profile as the specimen treated hereafter.

At El Bilaiyim, Gulf of Suez, 5 specimens were collected on 13.1.1970 (H.U.J. SRL 2708, of which 1 spec. in J.C.), different from *D. ruppellii* in profile, sculpture and radula, and which I consider here as *D. vaillanti*. The specimen I figure fig. 22, 23 (J.C.), measures 17.7 x 11.9 x 6.6 mm. It has 20 main ribs with nearly equal intermediate riblets and 12 concentric ridges, the spaces between being deep rectangular pits.

The radula is figured fig. 61. The latero-marginal plate, or the alate first marginal plate, and the pluriscuspid tooth are both presented in 3 different positions. This shows how difficult it is to identify a radula on base of one figure taken in an arbitrary position. The number of marginal teeth of *D. vaillanti* is  $14 + 12 + 10 + 8 + 6 = 50$ . The number of rows and marginal teeth of *D. ruppellii* is greater and is:  $13 + 12 + 11 + 10 + 9 + 8 + 7 = 70$ .

### 3. *Diodora imbricata* (Sowerby, 1862)

(fig. 24-26, 47, 51)

- F. sp.*, Audouin, 1826: 151, re Savigny 1817; Atlas: pl. 1, fig. 4-7 (in pars).  
 ? *F. clathrata* Philippi, 1826 (sic!). Reference and description nowhere found. (non Sowerby J., 1826, fossil England, nec Reeve, 1849, spec. 57, China Seas).  
 ? *F. cyathulum* Reeve, 1850: spec. 114. Hab.?  
*F. imbricata* Sowerby, 1862: 194, without loc.; pl. 242 (= pl. vii), fig. 62, with "Red Sea" as locality. Type in BMNH, measuring 18.9 x 12 x 7.5 mm.  
 ? *F. costaria* (Desh.), Vaillant (non Desh.), 1865: 109 (see spec. 2).  
 ? *F. Vaillanti*, Fischer P., 1865: 244. Suez (see spec. 2).  
*F. Ruppellii* Sow., Issel, 1869: 319, re Savigny, 1817.  
*F. cyathulum* Rve, Blanford, 1870: 468. Annelly Bay.  
*F. italica* Deufr., Carus (non Deufr.), 1889: 238. Mediterranean Sea, with *F. costaria* Desh. and *F. neglecta* Desh. as synonyms. In the "distribution", Carus only gives "Mare Rubrum" with some fossil places.  
 ? *Glyphis clathrata* Phil., Thiele, 1891: 292, pl. 27, fig. 5. Radula. Red Sea.

- F. (Capiluna) Savignyi* Pallary, 1926: 34, re Savigny 1817, pl. 1, fig. 5. (fig. 6, a juvenile *F. Rüppelli* teste Pallary, seems *D. imbricata* to me)  
*F. savignyi* Pallary, Bouchet & Danrigal, 1982: 15, fig. 50.

Original description. — Ovale, depressa, sordide alba, fusco radiatim fasciata, liris concentricis et costis alternatim inaequalibus acute imbricatis cancellata; foramine parvo, subcentrali. Obs. An ordinary patellaeform species, but cancellated by concentric ridges and imbricated ribs.

Discussion. — I lay great stress on the fact that Sowerby kept this species separated from *F. Rupellii*. the only other species from the Red Sea he mentioned. Pilsbry (1890: 217) gives *F. imbricata* as synonym of *Glyphis rüppellii*. Smith (1901. J. Conchol. 10: 105) considers both as perfectly distinct. Winckworth (1928. Proc. Malac. Soc. 18: 136) and Satyamurti (1952. Bull. Madras Govt. Mus. NS, Nat. Hist. 1(2): 31) consider *D. imbricata* as a synonym of *D. funiculata* Rve. Biggs (1973. Bull. Br. Mus. (NH), Zool. 24 (8): 348) keeps *D. imbricata* as a valid species from the Crucial Coast and writes: "This is the first record of this species from the Persian Gulf. No locality is given for the type, the only other specimen examined was a juvenile from Karachi collected by Winckworth".

Smythe (1979. J. Conchol. 30: 63; 1982, Seashells Arabian Gulf: 35) states for *D. imbricata* from the Arabian Gulf: "A small oval shell with the apex near the centre. The radial ridges have sharp projecting scales or imbrications. White, 15 mm."

Pallary, 1926, separates *F. savignyi* from *F. rüppellii* and states for fig. 5 of Savigny: "Espèce bien caractérisée par son profil conique droit et ses côtes d'inégale valeur, alors que *F. Rüppelli* a le profil concave et des côtes de même valeur. De plus, la perforation est placée plus en arrière et est plus petite que dans *F. Rüppelli*. Vivante à Suez!"

The structure of the ribs of the type of *D. Savignyi* (Savigny, 1817, pl. 1, fig. 5) is not clearly indicated in Savigny's Atlas but is well shown by the picture of Bouchet & Danrigal, 1982. This specimen is a little akin to *D. mamillata* Risso, 1826 (= *graeca* Payr. (non L.) from the Mediterranean). I consider it as a squamated *D. imbricata* (Sow., 1862), whose type in the BMNH is near to *D. funiculata* (Rve. 1850) but which has the apex more centrally situated than *D. funiculata*. This Red Sea species is also akin to *F. cyathulum* Rve, a possible synonym or subspecies of *D. funiculata* Rve (see further).

I discard the name *F. clathrata* Phil., the latticed fissurella, mentioned by Thiele. This name is not reliable and no references have been found of this species which is probably preoccupied by Sowerby J., 1826. The identification of *D. imbricata* with Mediterranean *Diodora* is too adventitious, specially that the Mediterranean *Diodora* are not satisfactorily known. *D. imbricata* is allied to a *Diodora* from Réunion Is. (JC. ex Drivas, 1983). received under the name "cf. *D. sieboldi*, Kira II" and identified as *D. subcalyculata* Shepman (= *calyculata* Auct.). It is also near to *D. foveolata* Garrett, 1872, as figured by Di Geronima & Robba (1979. Boll. Malac. 15: pl. 2, fig. 6) from Benadir (non Garrett, a species from Viti Is.).

The radula of the only preserved specimen I met (JC, Hurghada) has been examined and shows an essential difference with *D. funiculata* (compare the bicuspid teeth fig. 51 and fig. 62). It is not impossible that the one figured by Thiele, 1891, under the name *Glyphis clathrata*, belongs to *D. imbricata* (Sow.).

Distribution. — Seven specimens from Great Bitter Lake (RNHL, coll. C. Beets, Stat. 16, 18, 45; 46) are good *D. imbricata*. The biggest one (Stat. 18: -4.6 m depth, on 8.9.1950) figured fig. 24, 25 (courtesy Dr. Gittenberg) clearly shows the conical profile and the squamate ribs. I further identify some unidentified specimens from Aqaba (HUJ 36126, HUI 36127) as young *D. imbricata*, not squamated as the type, with less concentric ridges and with square and more marked pits. As *D. imbricata* I also consider the type of *D. savignyi*, two specimens from Hurghada (JC, ex Brauwer, 1980, with one of them with dried animal) and one specimen from Elat (JC, 1961; 8.6 x 5.5 x 3.2 mm; see fig. 26) near to a specimen (IY 2367, North of Taba) considered by Yaron as *D. funiculata* (Dr. Yaron ms.)

4. ***Diodora yaroni*** Christiaens, nov. spec.  
(fig. 37-39, 65)

"Very high-shelled keyhole limpet", Tor & Tsurnamal, 1973: 43.  
*D. ruppelli*, Tsurnamal (non Sow.), 1975: 40. Elongated crack, Ras Muhammad.

Description. — Small keyhole, shell, higher than large. Base oblong with compressed partially paralleled sides with front and back sides almost circular. Anterior slope strongly concave, posterior slope convex. Small elliptic fissure on the top, anteriorly at 1/8 till 1/3 of the length and horizontally situated at the highest point of the sharp conical upper part of the shell. The internal callus surrounding the fissure is thickened and reaches the shellsides inside the small conetop. The callus is rectilinear at the posterior end and is lightly truncated. The sculpture of this frail shell is regular in shape, nearly smooth at the upper part. There are approximately 24 main radial ribs, regular in shape, light undulating, with smaller intermediate ribs, principally on the anterior and posterior sides. Few concentric irregular ridges, not always cutting the radial ribs, but often showing a good reticulated sculpture. Colour outside whitish to ivory. At the top inside the keyhole section, there is a blackish colour, well visible outward on the anterior top. Such a black colour at the apex is rare and can be encountered e.g. in *D. benguelensis* from West Africa. The form of this species is a little allied to *D. parviforata* Sow., 1889, from South Africa and to *D. punctifissa* McLean, 1970, from the Galapagos Is. The proportion h/b of the types is situated between 1.0 and 1.21 and the proportion b/1 between 0.66 and 0.71.

Types. — Holotype: HUI 36118; 8.6 x 6.0 x 7.1 mm., figured fig. 37-39. Paratypes: 7 specimens HUI 36118, respectively measuring: 9.8 x 6.5 x 6; 7.0 x 4.9 x 5.2; 6.7 x 4.5 x 4.5; 6.5 x 4.3 x 5.0; 6.0 x 4.1 x 5.0; 5.6 x 4.0 x 4.0; 5.6 x 3.9 x 4.3 mm. One paratype (JC, ex same lot) damaged specimen 6.6 x 4.5 x 5.3 mm, which radula is figured fig. 65.

Distribution. — Elongated crack, Ras Muhammad, Sinai. Leg. M. Tsurnamal, 22.6.1972 (SRL 3408) (HUI 36118, HUI 36119). Only habitat where all the known specimens come from.

Note. — Tor & Tsurnamal, 1973, give a description of an open crack near the



southern top of the Sinai Peninsula, Cape Ras Muhammad, discovered in 1971 in a raised Pleistocene coral reef. The crack of about 40 m length and 0.20 till 1.50 m width, later called the elongated crack, is underground in contact with the seawater. In the crack a mixture can be found of light-avoiding subterranean species and shadow-loving marine species. Three mollusca are noted and "a very high-shelled keyhole limpet" (collected 22.6.1972, HUI 36118 & 36119). Later, Tsurumal (1975: 40) mentions it as follows: "...found in somewhat deeper parts of the crack where specimens of a *Cardita*-like bivalve and of the key-hole limpet *Diodora ruppelli* are also common".

In April, 1973, only 36 m away from this crack, a second one 2.6 x 4.5 m, called the round crack, was discovered, opened after the collapse of its roof. Tsurumal (1975: 40) mentions for this new crack: "The flora and fauna were found to be very similar to those of the nearby elongated crack". A small lot of *Diodora* was collected here on 18.4.1974 (HUI 36120 & 36121). They are less high, more solid and more sculptured than these from the elongated crack.

I consider the *Diodora* from the round crack as a subspecies of the one of the elongated crack and not as a new species. A new subspecies is commonly formed through the divergence of populations separated from one another by geographic barriers, or is formed by differentiation resulting from a particular diet, environment, climate etc. Here in the round crack they always lived in the dark and there was no necessity for them to grow higher in the direction of the sunlight, as *D. yaroni* perhaps did.

The names of the new species and subspecies are dedicated to late Dr. Yaron Isaac, initially co-author of this paper and good friend of mine.

4b. *Diodora yaroni* subsp. *isaaci*, nov. subsp.  
(fig. 40-42, 64)

Description. — White shell, fairly high (h/b between 0.83 and 0.93). The base with nearly parallel sides is more elongated than *D. yaroni* and has a proportion of b/l between 0.56 and 0.69. Anterior slope nearly straight forming an angle of 25-30° with the vertical; posterior slope convex. Highest point of the shell situated at 1/3 of the shell-length, with the aperture in front of the top and inclined anteriorly. Callus thickened, on the backside straight and slightly truncated. Shell more solid and with more pronounced sculpture than *D. yaroni*. More than 20 main radial ribs, well marked and elevated, with smaller intermediate ribs not reaching the apex. The radial ridges are crossed by concentric well-marked striae, running over the ribs.

Types. — Holotype: HUI 36120; 14.1 x 8.3 x 7 mm, figured fig. 40-42. Paratype n° 1: HUI 36121, measuring 10 x 6.9 x 6.4 mm. Paratype n° 2: JC., 8.2 x 5.5 x 4.6 mm, which radula is figured fig. 64. Initially I have seen a fourth specimen SLR, measuring 11.1 x 6.2 x 5.5 mm.

Distribution. — Round crack, Ras Muhammad, Sinai. Leg M. Tsurumal 18.4.1974. Only habitat from where all the known specimens come.

**NOTES ON SOME DOUBTFUL RECORDS OF DIODORA IN THE RED SEA**

Note 1. — Philippi, 1836 (Enum. Moll. Siciliae: 248), comparing his Mediter-

ranean collections with those made in the Red Sea and deposited at Berlin by Hemprich and Ehrenberg, came to the conclusion that *F. graeca* L., *F. costaria* Desh. and *F. rosea* Lam. are common to both seas. Fischer, 1865, in an article on the shells collected by Vaillant at Suez, rejects common species in both seas. Later he'll suggest a common derivation in the Miocene when the isthmus was finally closed. Issel, 1869, considers the Red Sea species as equivalent species of the Mediterranean species and mentions *F. Rüppellii* as equivalent of *F. graeca*. Cooke (1886: 389-393) criticises Issel's equivalent species, but admits that no one can deny that in Pliocene and Postpliocene times, Mediterranean species migrated into the Red Sea as for instance *P. caerulea* found in Postpliocene beds at Suez. Recent species are now considered as being different in both area, with a possible migration from the Red Sea to the Mediterranean. This is the case for *D. ruppellii* here treated.

Note 2. — *F. nigriradiata* Rve, 1850 (spec. 81, pl. xv, not fig. 81 pl. xii) from unknown habitat, has been located in the Red Sea by Paetel (1888: 585). It has been united with *D. ruppellii* by Pilsbry, 1890, and Smith, 1901. Sykes (1903. J. Malac. Soc. X (4): 47) thinks it different. Shepman (1908. Prosobr. Siboga Exp. Monogr. 49: 87) considers *nigriradiata* as a valid species form Kei Is. "whose orifice is round-oval, while in *D. Rüppellii* it is squarish-oblong". Dautzenberg & Bouge (1933. J. Conchyl. 77: 413) situate it in French Polynesia. I gave (1974: 90) *D. australis* as a possible synonym, species mistakably put by Pilsbry in synonymy of *D. ruppellii*. I now consider the type of *F. nigriradiata* (BMNH, n° 197550; dimensions 10.2 x 7.9 x 5 mm) as a *D. ruppellii*, with the 17 main ribs nearly equal to the intermediate ribs, with less concentric ridges (13) and with black spotted nodules forming interrupted black radial rays on a white background. This species is near to the West-Caribbean *D. dysoni* (Rve) (Reeve, 1850: spec. 86, Honduras) which is "a beautifully sculptured species allied in form to *F. Ruppellii*". It is possible that Sowerby mixed a specimen of *D. dysoni* with *D. ruppellii* in 1834 and in 1835, identification-error also made by Braga (1952: 93) for a specimen from Lourenço Marques, Mozambique, called *D. dysoni*. Even in an old lot of *D. alternata* from Guadeloupe in the BMNH, specimens can have been mixed: one of the 3 specimens seems to me *D. ruppellii*.

Note 3. — *D. quadriradiata* (Rve) (1850, spec. 108, Bais, Is. of Negros, Philippines) is "very similar in form and sculpture to *F. Ruppellii* from which it differs in respect of the orifice". Sowerby, 1862, treats this species as "*F. Ruppellii*, Red Sea. Var. *F. quadriradiata*, Rve". Cooke, 1885, considers it as a synonym of *F. Ruppellii* and says that in the adult ones the difference of orifice disappears. This last statement is not always exact. In a lot of mixed *D. ruppellii* from the Red Sea and Nossi-Bé (BMNH, coll. MacAndrew), a specimen measuring 21.2 x 13.7 x 9.5 mm, with 18 main ribs and 23 concentric ridges, has been encountered, having a well pronounced trilobed orifice. A different keyhole-shape is also not enough to separate two species. However, I consider *D. quadriradiata* (Rve) as a valid species, having approximately 28 very slightly granulated main ribs with maximum 20 concentric ridges and with a trilobed apex. Four uncoloured paratypes, in shape resembling *D. vaillanti*, are present in the BMNH. The distribution of *D. quadriradiata* is not known. It is cited e.g. at Japan (Kira, 1960. Ill. Shells Japan, rev. ed.), Queensland (Cotton, 1957, Rec. S. Austr. Mus. 13 (1): 128 and 1959, S. Austr. Moll.: 51, Type) and Dar es Salaam (Spry, 1961. Shells Dar es Salaam).

Note 4. — Pilsbry, 1890, considers *F. elevata* Dkr. and *F. australis* Krauss as synonyms of *F. ruppellii*, error also made in the collection of Dautzenberg. The name *F. australis* Krauss, 1848, from South Africa, is preoccupied by *F. australis* Philippi, 1845 (Arch. f. Naturk. xi (1): 61) from Magellan and has to be changed. *F. elevata* Dunker, in Philippi, 1846 (Abbild. 2: 63, pl. 2, fig. 4, Cape of Good Hope) has a very differently shaped foramen and a greatly superior number of finer costae. Smith, 1901 (J. Conchol. 10(4): 105) considered Pilsbry's statement as a most unfortunate lumping. Nickles, 1953 (Moll. test. AEF., J. Conchyl. 92 (3): 144) follows Pilsbry and Dautzenberg and keeps *F. australis* and *F. elevata* as synonyms of *D. Ruppelli*, a species he even recorded from Pointe-Noire, Congo. He states that the specimens from Pointe-Noire are "conformes aux spécimens de la collection Dautzenberg, provenant de Port-Alfred, Natal, des îles Saint-Paul et Amsterdam, de Madagascar, de la Mer Rouge et du Golfe de Suez (Port-Tewfik)". I have not seen the specimen from Pointe-Noire, but I examined the collection Dautzenberg and can't agree with Nickles's statement.

Note 5. — *Diodora funiculata* (Rve, 1850). - *F. funiculata*, *F. indusica* and *F. dactylosa*, 3 species coming from the same locality, Kurrachee, and described by Reeve in 1850 (spec. 65, 67 and 93), belong to the same species. The type of *D. funiculata* (BMNH: 25 x 18 x 13 mm) has a nodulous structure and the biggest syntype (35.7 x 25 x 15 mm) has a less marked relief without pits. Both have more than 39 concentric ridges. The type of *D. dactylosa* (BMNH: 20.5 x 13.6 x 6.4 mm) is not nodulous, has 17 main ribs with  $1 + 2 + 2 \times 2 = 7$  intermediate riblets and 21 concentric ridges which are less beaded. *D. dactylosa* can be considered with Sowerby, 1862, as a variety of *D. funiculata*. The type of *F. indusica*, considered by many authors as synonym of *D. funiculata*, has not been met in the BMNH.

The known range of this species is the Arabian Sea and the Persian Gulf. The distribution, West Pacific to the Indian Ocean, given by Cernohorsky (1972, Marine Shells Pacific, II: 29, pl. 2, fig. 6) needs to be checked. For the first time Yaron records this species in the Red Sea. He mentions: "Gulf of Aqaba: Elat (TAU, 1 sp., 3.4. 1955; YD 69); North of Taba (IY 2367); Red Sea: Marsa el'Et (IY 4122, 1 sp. beach, 9.4.1976; IY 5021, 1 sp. beach, 20.10.1978)" (Dr. Yaron ms.).

The few *D. funiculata* cf. from the Red Sea I have seen, I identify as *D. imbricata* Sow., a species more squamated and imbricated than *D. funiculata* and having a different radula. *D. funiculata* is bigger than *D. imbricata* and in the MNHP there is a specimen from Masrah Is., Oman, ex coll. Fuller, measuring 46.2 x 30.8 x 14 mm.

Pictures of *D. funiculata* are given fig. 27-29 and the sculpture is drawn fig. 48. Figure 62 presents the radula of a specimen from Masirah Is. (JC. leg. J. Taylor, 29.5.1976, BMNH) to permit comparisons with *D. imbricata* from the Red Sea or with *D. cyathulum* from the Eastern Seas.

The lateral teeth, in four rows, have per line  $7 + 12 + 14 + 17 = 50$  teeth. I show 4 different views of the bicuspid tooth to illustrate the cavity of this tooth and to give an idea of the complicated tridimensional structure of the folded thin tooth-sheet. The animal has a mufle coloured with black stains and the border of the mantle is covered with many dark-brown small dots.

Tadjalli-Pour (1974. Contrib. Moll. iraniennes, Montpellier: 39) gives a small central radular tooth for his *D. funiculata*. This is a characteristic of the genus *Fissurella*, and is not applicable for the species here considered.

Note 6. — *Diodora cyathulum* (Rve, 1850). - Blanford (1870: 468) mentions *F. cyathulum* Rve at Annesty Bay. Yaron noted: "The present whereabouts of the material collected by Blanford at Annesty Bay, now Zula Bay, Ethiopia, are not known, and therefore Blanford's record cannot be substantiated as yet" (Dr. Yaron ms.). In the BMNH, I met 1 specimen collected by Blanford at Kurrachee (BMNH: 9.2 x 6 x 3.3 mm) named *F. imbricata* Sow. and near to typical *D. cyathulum*. Why used Blanford here another name?

The description of *F. cyathulum* given by Reeve (1850: spec. 114. Hab.?) suits to my specimen *D. imbricata* from Elat and can complete its description. "Shell ovately conical, elevated, radiately sharply squamately ribbed, ribs alternately larger, latticed with narrow concentric ridges, orifice small, ovate; whitish, variegated with brown. Hab.? Somewhat like the preceding species, but not so elevated, more coarsely latticed, and differently perforated". The proportion height to length of the 4 syntypes of *F. cyathulum* in the BMNH, is  $h/l = 0.43, 0.50, 0.52$  and  $0.58$ . The preceding species, *F. excelsa* (Rve, spec. 113, from Eastern Seas), is not always elevated and between the 11 syntypes in the BMNH there are 3 specimens with  $h/l = 0.50$ . I consider *F. cyathulum*, from unknown locality identical with *F. excelsa* of which I have no preserved material. The name *excelsa* is preoccupied by Adams & Reeve, 1848, for a species from China, renamed *Glyphis Reevei* Shepman, 1908. We have to keep the priority name *D. cyathulum* Rve, a species which may constitute a subspecies of *D. funiculata* Rve. As further probable synonyms of *D. cyathulum*, I consider *F. octagona* Rve (1850: spec. 116, Ticao, Philippines; type not in BMNH) and *F. nigro-ocellata* Rve (1850: spec. 117, Ticao). For *F. nigro-ocellata*, Sowerby, 1862, gives as observation: "In form scarcely differing from *F. excelsa*, but with a minute black spot between each of the principal ribs near the margin". The 3 small syntypes in the BMNH are very close to *F. cyathulum* and I consider them as identical. The statement of Sowerby, 1862, that *F. cyathulum* "by the coarseness and sharpness of its cancellations holds a middle between the *F. excelsa* group and the next species (= *F. imbricata* from the Red Sea)" is very correct, as *F. imbricata* can be very squamated a shown fig. 47.

I provisory keep *D. cyathulum* Rve (= *excelsa* Rve, = *octagona* Rve, = *nigro-ocellata* Rve) from the Eastern Seas and Philipinnes, as valid species. I am aware that it needs more study and that the squamation of the ribs not a sufficient indication is to separate two species.

Note 7. — *Diodora elongata* Philippi. - *F. elongata* Philippi, 1845 (non M'Coy, 1844, in Griffith, Syn. Carb. Lst foss. Ireland: 43), Arch. f. Naturgesch. 11 (1): 144; Hab.?.; id. 1845 (1847) Abb. Conch. II (2): 33, pl. 1, fig. 2, is not a well identified species. It has been mentioned in the "Red Sea" by Jay (1852: 105) and Paetel (1888: 584). Pilsbry (1890: 1997) considers *F. elongata* Phil. as a *Lucapina* from West Indies, for which Farfante (1943. Johnsonia 10: 16) selects El Canal, Cabo Macoris, Hispaniola, as type localtity. This species sensu Pilsbry is different from *F. elongata* Adams C.B., 1848 (Proc. Boston Soc. NH. 2 (1845): 8; Jamaica) which is identical wiht *F. minuta* Lam. (non Gmel.), 1822, species to be renamed. Let me shortly remember that the West Indian *F. minuta* is different from the Mediterranean *F. minuta* Lam. sensu Sowerby, 1835, 1862, synonym of *D. gibberula* (Lam., 1822) which received the new names *F. granulata* Anton, 1862 and *F. gemmulata* Rve, 1850. Other authors consider *F. elongata* Phil. as an Australian species, which has been renamed *D. philippiana* Finlay, 1930 (Trans. Proc. N.Z. Inst. 61: 39), name

preoccupied by a *Diodora* from West Africa, *F. philippiana* Dunker, 1846 and by *F. philippiana* Rve. The Australian species has to be renamed again.

A specimen from Elat (HUI 36124, coll. G. Haas, May, 1949) figured fig. 36, can be this species. It has the same structure and form as *D. townsendi* Melville, 1897, from Kurrachee, but is more probably *D. crucifera* cf.

*F. elongata* sensu Jay and Paetel (non Phil.) is probably *D. crucifera* (see further). In the BMNH there is a specimen from the Red Sea, ex Tomlin, named *D. elongata* Phil. It seems to me a *Lucapina* (cf. my ms. notes, 1978).

Note 8. — *Diodora crucifera* Pils Krauss. - *F. cruciata* Kraus, 1848 (non Gould, 1846) from Natal, has been renamed *Glyphis crucifera* Pilsbry (1890: 225). Jousseume (1888: 195) mentions *F. cruciata* at Obock, Gulf of Aden, as a species with 8 black rays instead of 4.

I consider the specimens recorded in the Red Sea by Jay, Paetel and Jousseume as belonging to *D. crucifera*, species with locotype Natal. This identification is not impossible. Indeed, Nomura, 1935 (Sci. Rep. Tohoku Imp. Univ. Geol. 18 (2): 220, pl. 10, fig. 50, a, b) records *D. crucifera* from Byoritz Bed, Pliocene, Taiwan. Otuka Y., 1937 (*Diodora* in Japan, J. Geol. Soc. Japan, 44: 941) reports it from Japan. I have several specimens from the Indo-Pacific that I identify as *D. crucifera* aff. Besides South Africa, I mention: Seychelles (JC, ex Drivas, 14.12.1983, n° 63, received as *D. mus* Rve); Sri Lanka: Hikkaduwa (JC, ex Hemmen); Trincomalee (JC); Bombay (JC, received as *D. bombayana* Sow., 1862); Masirah (JC, ex BMNH); Kotok Is., Djakarta (JC, ex Poppe); Port Montesby, Papua (JC, ex Buick, n° 2836); Phuket, Thailand (JC, ex Vissers, 1983); Okinawa (JC, ex Minzak as *D. elaborata*); Fuhin, China (JC, ex Inst. Ocean Acad. Sinica, Tsingtao, 1979, as *D. mus*); Keppel Bay (JC, ex Rutherford, as *D. corbicula* Sow.; JC ex Marrow, n° 4724 c, as *D. mus*); Mackay, Queensland (JC, ex Van Belle, as *Elegidion audax*).

It is the first time that such a large distribution is suggested for the species *D. crucifera*, a species belonging to an Indo-pacific group of elongate *Diodora*, a group including for instance: *D. bombayana* Sow., 1862, *D. singaporensis* Rve, 1850, *D. townsendi* Melville, 1897, *D. ticaonica* Rve, 1850, etc.

The exact distribution and identity of *D. crucifera* needs further investigation, certainly concerning the quoted records in the Red Sea. In case this wide proposed range proves to be exact, or partially exact, it is likely that *D. crucifera* Pils. has to be replaced by an older prioritary name. I show the radula (fig. 63) and the shell (fig. 32) of a specimen from Masirah (JC, ex BMNH) identified as *D. crucifera* aff.

Note 9. — *Discosoma nummiforme*. — The figure of this shell (Rüppel & Leuckart, 1828: 3, pl. 1, fig. 1. a) looks like a nice, flat *Diodora* with a central keyhole. Rüppel found this species very often at Tor, Red Sea, living between stones. It is the monotype of the genus *Discosoma* Rüppel & Leuckart, 1828 (*Zoophyta*). The animal has no tentacles and the horizontal section (fig. 1. c) show no head, only a simple mouth-opening in the middle of the body. In the book in the Royal Library, Brussels (book nowhere else found) is with a pencil indicated: "*Discosoma nummiforme* Leuck, = *Actinia isacmaca tapetium* Ehrenb."

Other limpets are not mentioned in this book by Rüppel and Leuckart, except *Parmophorus australis* (non Blainv.) (= *Scutus rueppeli* Phil. 1851).

Note 10. — *F.sp.*, Caramagna, 1888: 133. Aseb, Red Sea. Is a nomen nudum.

Note 11. — *Fissurella nubecula* (L., 1758). - "One specimen identified ad *F. nubecula* was collected by Y. Dafni on the beach at Elat on 3.4.1959. This species is common in the Eastern Mediterranean. While migration of Mediterranean species via the Suez Canal into the Red Sea has been recorded, it is considerably less common than the migration from the Red Sea into the Mediterranean. In the absence of additional specimens of this species collected at various localities along the Suez Canal and the Red Sea, the presence of this species in the Red Sea should be considered as occasional". (Dr. Yaron ms.)

Note 12. — "One unidentified *Fissurella* specimen has been collected by Y. Dafni at Elat (YD 166). It is close to *F. scrobiculata* Nevill from Sri Lanka, but could also be identified with *F. keppeliana* Sow. from Sierra Leone. Until further material from various localities in the Red Sea becomes available, it would be best to regard the occurrence of this species as adventitious" (Dr. Yaron ms.)

Note 13. — Collection Forsskal. - "In the collection of the ZMUC there are several lots of Fissurellids, which have been attributed to the material collected by Forsskal within the framework of the Royal Danish Expedition to "Arabia Felix" in 1761-63. In the "Universitetes Zoologiske Museum Tilgangsjournal for Blodder I; 1846-53", under the heading Forskals Samling, are found the following entries in Mörch's handwriting: 142 *Fissurella barbadensis* Lam., 143 *F. nodosa* Lam., 144 *F. graeca* L., 145 *F. graeca* L. var.?, fossil?, 146 *F. graeca* var., 147 *F. viridula* Lam., 148 F. Of these lots 142, 143, 145 and 147 were found in the general collection of the ZMUC. Lot 143 contains 6 specimens of *F. nodosa* (Born, 1780) and 2 specimens of *F. barbadensis*. Finally, lot 147 contains 2 specimens of *D. viridula* Lam., 1822. All these species, except for *F. cumingii*, which is a Western Pacific one reported from Coquimbo, Chile, are known from the West Indies, some distributed from Florida to Brazil. Their West Indian origin was already noted by Mörch. It seems most unlikely, that these specimens were actually collected by Forsskal anywhere during the "Arabia Felix" expedition. However, it is noteworthy that, as mentioned previously, one specimen of *F. barbadensis* was also found by Y., Dafni on the beach at Elat." (Dr. Yaron ms.)

N.B.: To known more about Forsskal, see Wolff, 1968 (Bull. Inst. Océanogr. Monaco, n° special 2: 581-601).

NOTE concerning *D. listeri* (Orb., 1841). — In 1974 (Inf. Soc. Belg. Malac. 3: 75) I gave the species *F. listeri* Orb., 1850 (non Nardo, 1847) the new name *D. habanensis*, which has to be considered as synonym. Indeed, Aguayo, 1943 (Rev. Soc. Malac. Carlos de la Torre 1(1): 37) gives for the french atlas of d'Orbigny (Hist. Cuba, in R. de la Sagra) the date 1842 and for the spanish atlas the date 1845. But Métivier, 1969 (Ann. Inst. Océan. 47: 121) correctly situates *D. listeri* in d'Orbigny's Voy. Amér. Mérid. V: 476, in *F. patagonica*. The year of publication of the pages 409 till 488 is 1841 (cfr. Sherborn, 1901, Ann. Mag. N.H., vii, 7 ser., 40: 389 teste Wiegmann, 1842, Arch.: 377) (not 1840 as give by Métivier, 1969).

**Genus *Macroschisma* G.B. Sowerby, 1835**

The original name *Macroschisma* Sow., 1835 (ex Gray ms) has to be retained and not the name *Macrochisma* Sw. published in 1840 by Swainson and used by so many authors. Iredale, 1940 (Austr. Zool. 9 (4): 431) states: "it must be reiterated that the first introduction of *Macroschisma* is by Sowerby 1839 (Conch. Ill. Fiss., p. 5, n° 45) with type the Japanese species incorrectly known as *maxima* A. Ad.". The date 1839 and the Japanese type mentioned by Iredale seem not correct. The date is 1835 (Shaw, 1909. Proc. Malac. Soc. 8: 333) and the type (*macroschisma* figured by Sowerby, 1835, and type by monotypy) is not clearly defined. Indeed, three different species have been confused under the name *macroschisma*, namely: Spec. 1) *Patella*. Da Costa E.M. (1771). Conchology, pl. 7, fig. 3. (Book also known as Humpfr. Conch.). Only figure.

= *P. macroschisma* Lightfoot, 1786. Cat. Portland Mus.: 71 Book also known als Solander (cf. Dance, 1962, J. Soc. Bibliogr. Nat. Hist. 4: 30-35) or as Humphrey (cf. Dodge, 1957, Conch. Club S. Calif.: 14). Based on "Humpfrey's Conch. Plate 7 fig. 3.3".

= *F. macroschisma* Sowerby, 1835. Conch. Ill. Cat. (30. vi. 1835): 5. "Humpfrey, Conchology. Conch. Ill. f. 39, New South Wales, var. f. 39, Swan River. Obs. This forms the Genus *Macroschisma* of Gray".

Spec. 2) *P. macroschisma* Chemnitz, 1795. Syst. Conch. Cab., IX: 184, p. 197. fig. 1923, 1924, Japan (ex coll. Spengler). Work not binominal.

= *P. macroschisma* Holten, 1802. Enum, syst. Conch. Chemn.: 86. Refers to Chemnitz and not to Lightfoot, 1786.

= *P. macroschisma*, Dillwyn, 1817. Cat. Shells: 1062. "Inhabits the coasts of Japan. Chemnitz".

= *F. macroschisma* Chemn. Schrenck, 1867. Reisen Amurland, II: 308.

= *M. maxima* A. Adams, 1850. Proc. Zool. Soc.: 202.

= *M. sinensis* A. Ad., Habe, 1951 in Kuroda, Ill. Cat. Jap. Shells. Uses the name *M. sinensis* while he considered *M. maxima* A. Ad. as preoccupied by *F. maxima* Sow., 1835. Amendment unjustified.

= *M. maxima* A. Ad., 1850, Cernohorsky, 1974. Rec Auckl. Inst. Mus. 11: 148. Figures the syntypes of *macroschisma* Chemn. and says that *maxima* is an available substitute name.

Spec. 3) *F. macroschisma* Sowerby GBI (non Lightfoot, nec Holten), 1823. Genera recent and fossil Shells: n° 21, pl. 147, fig. 5.

= *M. hiatula* Sw., Swainson, 1840. Treat. malac. 1: 356 (non *M. hiatula sensu Gray, 1847, nec Gray M.E., 1850* (Fig. Moll. IV: 92) who placed this species in *Fissurellidaea* and confounded probably *hiatula* Sw. with *hiatula* Lam., which is *Amblychilepas scutellum* (Gmel.) (teste Mermod, 1950. Rev. Suisse Zool. 57 (34): 709).

Adams A., 1850, who first monographed the genus *Macroschisma*, only mentions one known species, *F. macroschisma* Sow., without habitat, and describes 7 new species, all unfigured of which 5 from unknown locality. Gray, 1847, indicates *P. macroschisma* Sow. as type of the genus, but doesn't mention if it is the species given by Sowerby in 1823 or in 1835.

As Da Costa and Lightfoot gave no description, as Dillwyn, 1817, mixed this species with Chemnitz's Japanese *macroschisma*, some doubts remain concerning the identity of the species Sowerby referred to in 1835, date of the creation of the genus *Macroschisma*.

I keep the name *macroschisma* Lightfoot, 1786, sensu Sowerby, 1835, for a species from Australia, which is the genotype of the genus *Macroschisma* Sow., 1835, a genus having the animal much larger than the shell, a long foramen near to the posterior end and a small central radular tooth. The genus *Macroschisma* has been included in the subfamily *Fissurellinae* by Thiele, 1931, Wenz, 1931, Knight & Yochelson (in Moore), 1960, Franc, 1968 and in *Fissurellidinae* by Pilsbry, 1890, Christiaens, 1974.

1. ***Macroschisma compressa*** A. Adams, 1850.

(fig. 52)

? *P. lobata* Donovan, 1821. In Rees's Cyclopaedia. Conchology, pl. 1 (not to be confused with *P. lobata* Blv., 1825). (Not found in the Cycl. Vol. IX, under the entry: Conchology). Iredale (1924: 220) says that this species "apparently refers to the Red Sea spec. named *M. compressa* by A. Ad."

*M. compressa* A. Adams, 1850. Proc. Zool. Soc. Lond.: 202. Hab.?

*Macrochisma compressa* A. Ad., Sowerby, 1862. Thes. Conch. xxi: 205, pl. 244, fig. 218. Hab.?

*Macrochisma megatrema* A. Ad., MacAndrew, 1870: 444. Gulf of Suez, shore, dead, rare. Later reported by Cooke (1885: 270) as *F. megatrema* (non *M. megatrema* A. Ad., a species with larger foramen and without locality that never has been identified or mentioned again).

*Macrochisma compressa* Adams, Fisher P., 1871. J. Conchyl. 19: 211. Ref. Sow. Thes. fig. 218. Hab. Suez, rare.

non *M. compressa* Ad., Brazier, 1877. Proc. Lin. Soc. NSW 32:51. Dannley Is., Australia.

*M. compressa* A. Ad., Caramagna, 1888: 133. Assab, not frequent.

*M. compressa* A. Ad., Paetel, 1888: 587. Suez.

*M. compressa* A. Ad., Pilsbry, 1890: 193, pl. 59, fig. 64. Suez.

? *Macrochisma compressa* A. Ad., Sowerby, 1897. Appendix to marine shells of South Africa: 19. (re Sow., Thes. Conch. iii: 205, fig. 218, S. Afr.).

*M. compressa* A. Adams, Lamy, 1938: 83. Gulf of Suez.

Original description. — "M. testa anguste oblonga, albida, rosea radiatim picta, costellis granulosis striisque concentricis decussata, utrinque rotundata, dorso convexa, lateribus compressis, in medio inflexis, extremitate postica valde elevata; foramen magnum, lanceolatum, postice dilatatum. Hab.?" A. Adams, 1850: 202.

Description. — "Shell relatively small, rather thin, elongated, laterally strongly compressed, depressed, almost rectangular in outline. Anterior and posterior edges elevated, anterior end rounded, posterior truncated. Fissure very large, narrow, elongate, wedgeshape, close to posterior end where terminates in excavated depression. External sculpture of numerous, equal, rounded, rather narrow radial ribs with somewhat broader shallow interspaces, intersected by numerous close, fine concentric threads, which give radial ribs somewhat beaded appearance particularly on the side. Internally smooth, fissure very heavily calloused at posterior edge, with a less prominent callus rim at anterior end of fissure. Colour whitish to flesh with occasional darker irregular blotches." (Dr. Yaron ms.)



Specimens from area studied. - "Gulf of Aqaba: Elat - 21. vii. 1981, on eel grass in  $\pm 2.5$  m.; 1 sp. (IY 5118); 2 sp. (YD 250). Gulf of Suez: 1 sp. ex. R.P. Dollfus (MHNP); Ras Matarma: 1 sp. ex Beets 1948/49 (RNHL). Red Sea: Marsa el 'Et - 21. v. 1981, beach, 3 sp. (IY 5032)". (Dr. Yarons ms.) 2 sp. (BMNH) under the name *F. macrochisma*.

Discussion. — The identity of *M. compressa* is a little problematic. It is first Fischer P. who indicates an habitat for this species. that as all the *Macroschisma*, has not been too well described. The type is not in the BMNH. This species is not to be confound with *M. africana* Tomlin, 1932, which can be as much compressed as *M. compressa* ( $1/b = 0.37$ ) and whose distribution comes far more North than mentioned by Tomlin (JC: Madagascar and Réunion Is.). In *M. compressa*, the margin is entire and normal, while *M. africana* is "noticeably depressed and strongly thickened at the broad end of the slit".

The distribution of *M. compressa*, from unknown locality, is not exactly known. It is accepted to live in the Red Sea. From Réunion Is. (JC, leg Drivas, n° 76, 14.12.1983) I have 5 small specimens, near to *M. elegans* Preston, 1908, from Andaman Is., which I prefer to identify with *M. compressa*. Drivas noted: "Trouvé vivant dans la nuit, au début des lagoons hors de l'eau, se promenant sur un rocher. L'animal est entièrement crème et la coquille n'est pas du tout recouverte. L'animal ne peut pas de toute façon se protéger sous sa coquille, il n'est pas rétractile". I copy fig. 52 *M. compressa*, as figured by Sowerby, 1862.

#### Genus *Hemitoma* Swainson, 1840

*Hemitoma* Swainson, 1840. Treatise on Malacology: 356. With type *H. tricostata* Sow., 1823, ex Humphrey ms (non Gmel.); = *H. octoradiata* Gmel. 1791.

*Montfortia* Récluz, 1843. Rev. Zool.: 259. Type *Emarginula australis* Q.G., 1834, SD. Iredale, 1915. (= *subemarginata* Blainv. 1819).

*Subemarginula* Gray, 1847. Proc. Zool. Soc. 15: 147. Type *S. octoradiata* by monotypy.

*Siphonella* Issel, 1869 (non Hagenov, 1851). Malac. Mar Rosso: 233. Type *Emarginula (Siphonella) arconatii* Issel, by monotypy.

Yaron, 1981, in his published notes on some *Hemitoma (Montfortia)* from the Red Sea, recorded 3 species: *H. panhi*, *H. rugosa* and *H. modesta*. A few months later Yaron admitted in a letter to me that some corrections have to be done. I don't know all the corrections he intended to make, but I'll treat the *Hemitoma* species from the Red Sea shortly again, with description of a new species.

In the genus *Hemitoma* 3 subgenera are accepted: *Hemitoma s.s.*, *Montfortia*, Récluz, 1843, and *Montfortista* Iredale, 1929 (not to confound with *Montfortulana* Habe, 1961). The value of these subgenera are not discussed now as too many species are unsatisfactorily known or identified. Glibert for instance revised some *Hemitoma* in the collection of Dautzenberg in 1960. Only 2 of the 5 labels are correct: *H. octoradiata* from the Caribbean Sea and *H. panhi* from Amboina, Philippines, Tonga and Djibouti (leg Moazzo, 14.6.1929). The specimens from Lifuka, Ha'apai Group, Tonga, labeled *H. australis*, are beach specimens of *Patella flexuosa*. *H. emarginata* from the Bahamas, has been named *H. cumingi* and the

Australian *H. australis* Q.G., 1834 (= *subemarginata* Blv., 1819) received the name *H. emarginata*.

I also use the opportunity to correct the 2 radula-figures of the Caribbean *Hemitoma* made by Turner, 1959 (*Johnsonia* 39: 335-342), who figures *H. octoradiata* with a bicuspid tooth and *H. emarginata* with a quadricuspid one, while the contrary is true. *H. octoradiata*, type of *Hemitoma s.s.*, has a quadricuspid lateral tooth (JC; Thiele, 1916) and *H. emarginata* a bicuspid tooth (see fig. 66) The radulae I examined of *H. panhi* and *H. polygonalis*, have both a quadricuspid tooth, conform to the type. At fig. 66, I figure also the latero-marginal plate of *H. emarginata* (Blainv., 1825). It is a folded plate and not a quite flat, squarish one as mentioned by Turner, 1959.

Few *Hemitoma* from the Red Sea have been mentioned in the literature. Most of them were not figured and are not clearly described. I'll give first a short chronological review, followed by certain data of the 5 Red Sea species.

Historical review of the Red Sea *Hemitoma*. — A. Adams, 1851, in the first monograph of the genus *Hemitoma*, mentions only one specimen from the Red Sea: the new and unfigured *Emarginula (Subemarginula) arabica*. Sowerby, 1862, gives none from the Red Sea, figures *H. panhiensis* from the Philippines, *H. imbricata* A. Ad. from Australia, and describes the new species *H. cumingii* from Australia, considered by many authors as living at East Africa. Issel, 1869, keeps *H. arabica* and creates the new subgenus *Siphonella* with the new species *arconatii* as type. H. Adams, 1872, describes two new species from the Red Sea: *H. rugosa* (non Q.G.) and *H. modesta*. Reeve, 1873, mentions no *Hemitoma* from the Red Sea and gives only *Emarginula thomassi*. Cooke, 1885, gives *Emarginula rugosa* with 3 synonyms (*modesta*, *cumingii*, *scutellata*) and *H. panhiensis* with several other synonyms. Pilsbry, 1890, mentions only unfigured species: *H. arabica*, *H. arconatii*, *H. rugosa*, a "supposed new spec. preoccupied by Quoy", and *H. modesta*, considered as "doubtless a synonym of an East Indian species". Sturany, 1903, mentions two species: *H. arabica*, unfigured as always, and *H. tricarinata* Born, primary homonym of *P. tricarinata* L. and synonym of *H. panhi*. Thiele, 1916, gives to *H. rugosa* the new name *subrugosa*, shortly mentions the unfigured species *H. arconatii* and *H. arabica*, and keeps *H. imbricata* in N.E. Australia. Franc, 1956, only records *H. imbricata* A. Ad. 1851, a species originally described from the Mouth of Victoria River, Australia and often mentioned in the MHNP for Red Sea species. Yaron, 1981, gives 3 species for the Red Sea: *H. panhi*, *H. rugosa* and *H. modesta*. He figures the types of *H. rugosa* and *H. modesta* in the UMZC, and clearly indicates the differences between *H. panhi* and *H. rugosa*. *H. rugosa* has two very projecting radial ridges alongside the central selenizone-bearing ridge and is more depressed than *H. panhi*. The morphometric relation height to length  $h/l$  of *H. rugosa* H. Ad. (non Q.G.; = *H. subrugosa* Thiele, 1916) varies between 0.17 and 0.35; that of *H. panhi* ranges from 0.41 to 0.86.

### 1. *Hemitoma panhi* Q.G., 1834 (fig. 67, 70)

*E. panhi* Quoy & Gaimard, 1834. *Voy. Astrolabe* 3: 327, pl. 68, fig. 7,8.

- E. (Submarginula) Panihensis*, Q.G., Adams, 1851: 90.
- E. (Siphonella) arconatii* Issel, 1869: 232. Gulf of Aqaba. One specimen ex Arconati who had to publish a figure of it. Publication of this figure and holotype not known.
- H. panhiensis* Quoy, Cooke, 1885: 272. With *H. australis* as typical form and *sculptilis* A. Ad., *nodulosa* A. Ad., *imbricata* A. Ad. as varieties.
- Siphonella arconatii* Issel, Caramagna, 1888: 133. Assab, common on corals.
- Submarginula tricarinata* Born (non L.), Lamy, 1938: 84. Gulf of Suez.
- Submarginula tricarinata* Born, Moazzo, 1939: 215. Ayun Mussa, Lavalley jetty, Gulf of Suez.
- H. panhi* Q.G., Cernohorsky, 1972. Mar. Shells Pacific II: 35. Gives *H. clathrata* Ad. & Rve, 1850, (non Desh., 1824) as synonym.
- H. (Montfortia) panhi* (Q.G.), Yaron, 1981: 275-279, pl. 1. Six specimens from Assab, ex Caramagna (HUJ, coll. Coen) are indicated as neotypes of *Emarginula (Siphonella) arconatii* Issel, 1869, which "undoubtly" is synonym of *H. panhi*.

Distribution. — Type locality: Panhi Is. The Indo-Pacific distribution is not exactly known. The West of the Indian Ocean extends to the Red Sea and to Mozambique from where I figure a specimen and the radula (fig. 67) (specimen on loan, courtesy Natal Museum, G 4902, coll. Roscoe, Santa Carolina, Mozambique).

In the RNHL there is a big *H. panhi* from the Red Sea (18 x 12 x 13 mm., ex J. Mulder) and one from Ras Gharib (21.2 x 15.5 x 11 mm.  $h/l = 0.52$ , ex Beets, 1948), the last one having 3 strong anterior ribs like *H. subrugosa*. I doubt whether the morphometric relationship given by Yaron is enough to classify all the intermediate forms.

## 2. *Hemitoma subrugosa* Thiele, 1916 (fig. 68-69)

- E. rugosa* H. Adams, 1872: 10, pl. 3, fig. 7. Gulf of Suez. This name is junior primary synonym of *E. rugosa* Q.G., 1834, now *Clypidina (Montfortula) rugosa* Q.G. from Australia.
- E. rugosa* Ad. H., Cooke, 1885: 272. With *modesta* Desh., *scutellata* Desh. and *cumingii* Sow. as synonyms.
- H. subrogosa* Thiele, 1916: 125, pl. 13, fig. 22. Nomen novum pro *E. rugosa* Ad. (non Q.G.). Red Sea. Dimensions: 19 x 13 x 6 mm with  $h/l = 0.32$ .
- H. (Montfortia) rugosa* (H. Ad.), Yaron, 1981: 279, pl. 2. Figure of the holotype in the UMZC, measuring 19.48 x 12.47 x 5.36 mm.
- H. imbricata* A. Ad. (non Ad., a N.E. Australian species), Franc, 1956: 22. Abulatt Is.

Discussion. — Yaron incorrectly stated that the primary homonym of *E. rugosa* Ad. (non Q.G.) became available again at the moment that *E. rugosa* Q.G. was designated as type of a new genus *Montfortula* Iredale 1915. Article 52 (6) of the Code says that a junior primary homonym is permanently invalid. We have to take the substitute name *H. subrugosa* given by Thiele, 1916.

Cooke, 1885, considers *H. comingii* Sow., 1862, and *H. scutellata* Desh., 1863, as synonyms of *H. rugosa*. Yaron doesn't accept this synonymy while both lack the characteristic of two very strong projecting radial ridges. I give fig. 68 a drawing

of a specimen from Elat (YD 81, on loan by Yaron, 1982) measuring  $12.5 \times 8 \times 3$  mm, which clearly shows the strongly accentuated ribs on the anterior side. *H. subrugosa* is very variable and young specimens can have a shield instead of three ribs (see fig. 69). I am inclined to consider the h/l relationship given by Yaron and the two exclusive projecting radial ribs of *H. subrugosa*, not too rigorously. Cooke doubts even whether *H. panhi* can be kept separate from *H. australis* Q.G., *H. sculptilis* A. Ad., *H. nodulosa* A. Ad., and *H. imbricata* H. Ad. I consider specimens from Socotra, Somalia, collected with *H. panhi*, measuring  $21.3 \times 15 \times 8.5$  (h/l = 0.40) (MHNP, coll. Lavranos, 1967) and  $15.5 \times 11.9 \times 7.1$  (h/l = 0.46) (JC; see fig. 70) and two specimens from Djibouti (JC)  $16.1 \times 12.8 \times 7.9$  (h/l = 0.47) and  $7.3 \times 5.5 \times 2.3$  (h/l = 0.31), all having 3 very pronounced ribs on the front side, as an intermediate form between *H. panhi* and *H. subrugosa*.

This needs further investigation on the hand of preserved and more material. However, the specimen from Djibouti, Mission Gravier, 1904, (MHNP,  $12.2 \times 8.2 \times 3.5$  mm) called *Submarginula imbricata* A. Ad. by Lamy, 1905, (Bull. Mus. H.N., 4: 268) is a good *H. subrugosa*.

Distribution. — The type is not known. *H. subrugosa* is not reported beyond the Red Sea. I think however that *H. nodulosa* A. Ad., 1851 from Zebu Is. (figured by Sowerby, 1862: fig. 77) and *H. sculptilis* A. Ad., sensu Thiele, 1916, are very near to *H. subrugosa* and may constitute an extension of this Red Sea species into the Indian Ocean, in which case priority has to be given to *H. nodulosa* A. Ad., 1851.

### 3. *Hemitoma modesta* Adams H., 1872 (fig. 71)

*E. modesta* Adams H., 1872: 10, pl. 3, fig. 8. One single specimen from the Gulf of Suez. It "could be a junior specimen of *rugosa*".

*E. rugosa* Ad. (in pars), Cooke, 1885: 272. Considers the single specimen as "merely a young form of *rugosa*".

*Submarginula modesta* Ad., Pilsbry, 1890: 284. "This form is doubtless a synonym of an East Indian species".

*E. (Tugalia) modesta* H. Ad., Thiele, 1916: 107, pl. 13, fig. 21. Red Sea;  $7 \times 4 \times 2.5$  mm.

*H. (Montfortia) modesta* H. Ad., Yaron, 1981: 282, pl. 3. Figure of the holotype in the UMZC, measuring  $6.23 \times 4.07 \times 1.80$  mm.

Discussion. — Yaron, 1981, knows only two specimens, figures the holotype, states that it is a valid species and gives a redescription of it. I follow Yaron and keep *H. modesta* as a valid species. If later records should prove that *modesta* is only a variety of *H. subrugosa*, priority has to be given to the name *modesta*. I show fig. 71 a drawing of a small smooth specimen from Aqaba (JC. leg Yaron, 1982) which is akin to the holotype figured by Yaron.

### 4. *Hemitoma arabica* Adams A., 1851 (fig. 72)

*E. (Submarginula) arabica* Adams A., 1851: 90. Red Sea. Idem Issel, 1869: 23 and

Issel, 1873: pl. 3, fig. 20, 21. (plate nowhere found!)

? *Submarginula arabica* A. Ad., Sturany, 1903: 266. Mersa Halaib, Pola Expedition, NHMW, considered by Yaron as *H. rugosa* (= *H. subrugosa*).

*H. arabica* (A.Ad.), Thiele, 1916: 125. Suez. Dimensions 16.5 x 11 x 7.5 mm giving  $h/l = 0.45$ , which excludes it from *H. subrugosa*.

Discussion. — Yaron, in a letter dated 4.10.1981. writes to me: Pilsbry and Thiele "neither have examined the types of most of the species that they discuss and have uncritically compiled their monographs from various sources". He adds: "*H. arabica* is very vaguely described by Adams and illustrated by him. Issel gives a very good description but a very poor drawing of this species, and there is no specimen of *arabica* in Issel's collection. We do not know whether Issel ever saw Adams' *arabica* and his specimen. Thiele never saw the type material and he merely copied and translated Issel's description. We are thus probably faced with a nomen dubium" (Dr. Yaron ms).

Adams, the author of *H. arabica*, certainly knew *H. panhi*, to which he gives the new name *Panhiensis*. He describes *H. arabica* as a new species, the first mentioned in the Red Sea. In my opinion the 3 species already treated, may be eliminated at the hand of the characteristics given by Adams: depressed, conical, vertex obtuse, elevated ribs, and of the fact that Adams doesn't mention the big ribs near the raised siphonal groove or selenizone. I keep the name *H. arabica* for the species figured fig. 72, specimen from Marsa el'At (JC, ex Yaron 21.4.1981; beach drift), measuring 5.7 x 4.6 x 21 mm, with  $h/l = 0.35$ .

This species is near to specimens I have from the Seychelles and Réunion Is., called *H. cumingii* (Sow., 1863) by Drivas and May (Conchiglia 1985, 17 (194): 3). Like *H. polygonalis* A. Ad. it is larger posteriorly (not anteriorly like *H. subrugosa*) and has 10 well marked ribs, like some young *H. octoradiata* from the Caribbean, but which has only 8 strong ribs.

I identify the specimen from Suez (MHNP, coll. Jousseume, 1928; 7.2 x 5.5 x 3 mm.) as *H. arabica*, the specimen called by Franc *H. imbricata* (MHNP, Abulatt Is; 5.5 x 3.8 x 1.9 mm.) as *H. subrugosa*, aff. *arabica*, and *H. imbricata* (BMNH, loc.?) as a beach specimen of *H. octoradiata*.

The type of *H. arabica* is not known.

##### 5. *Hemitoma simpla* (nov. spec.) (fig. 43, 73)

Description. — Simple *Hemitoma*, very thin and depressed, almost circular-oval in shape, apex slightly recurved and situated from the anterior margin at 0.26 of the shell length. Posterior side flat, without slope, very slightly folded, with broad, not elevated, radial ribs, marked by concentric smooth and lightly undulating threads. The anterior side has a central ridge bearing the selenizone. The profile of this little raised siphonal groove is not convex but is practically horizontal as the shell itself. This central ridge is flanked by two side folds, which are a little stronger than the other folds. The concentric sculpture is here more pronounced than in the posterior part and forms near the siphonal groove 4 or 5 furrows. Margin not crenulated. Interiorly smooth, greyish, with an almost circular horseshoe shaped muscle-scar.

This new species is much more depressed than *H. plana* Shepman, 1908, and is more roundish. It is a pity that no material has been found alive. Indeed, as the

margin is not crenulated, as the shell is not domed and has no interior place, I expect that the animal will be thicker and larger than the shell and that it can belong to a new subgenus.

Types and distribution. — Holotype: HUI 11841. Marsa Murach (the Fjord) entrance, dept 30 m. Gulf of Aqaba. Type measuring 11 x 8.4 x 0.8 mm. (figured fig. 43, 73). Paratypes: 1 sp. HUI 11842. Marsa Murach entrance (the Fjord) depth 30 m., 20 Km South of Elat, Gulf of Aqaba. Dimensions: 8 x 6.1 x 0.8 mm. 1 sp. HUI 20625. Elat, near Beth William. Coll. G. Haas 10.10.1951. Dimensions: 6.1 x 4 x 0.7 mm. White colour.

Species only known from the holotype and the two paratypes.

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## FIGURES

- 1-3 : *Patelloida profunda* Q.G., 1834 (JC, ex Rolan). Aqaba.  
 4 : *Patelloida rolani*, nov. spec. Holotype (KBIN, 27131) (ex coll. Dr. E. Rolan). Aqaba.  
 5 : *P. rolani*. Paratype (BMNH) (ex coll. Rolan). Aqaba.  
 6-7 : *P. rolani* (JC, ex Rolan) Aqaba. (7 = var. with large rays)  
 8-9 : *Diodora ruppellii* (Sow., 1834) (HUJ, 36123). Elat (picture courtesy H. Mienis) 16.8 x 11.5 x 7 mm. (Detail see fig. 44)  
 10-11 : *D. ruppellii*. (JC; ex MRAC, 1969, n° 796303). Inhaca, Mozambique 16.1 x 10.4 x 6.3 mm. Radula figured fig. 57  
 12-13 : *D. ruppellii* (JC, ex HUJ, SRL 3063). Ras en Sudn. 17.1 x 11.8 x 7 mm. (Radula figured fig. 58)  
 14 : *D. ruppellii* (JC, ex de Brauwer) El Kabir Is., Hurghada. 9.9 x 6.1 x 5 mm.  
 15 : *D. ruppellii* (JC) idem as fig. 14; 19.2 x 12.2 x 9.7 mm.  
 16 : *D. ruppellii* aff. (JC, ex ir. V. Putte, 1980) Ras Tamura, Saudi Arabia (near to *D. funiculata* Rve). 20.2 x 13.2 x 8 mm.  
 17 : *D. ruppellii* (JC, leg MRAC, n° 779352) Abou Dabi, Persian Gulf. 13.9 x 9.1 x 6.1 mm  
 18 : *D. ruppellii* (JC, ex Donald, sub nom. *D. cruciata* Kr.) Muscat, Gulf of Oman. 13.1 x 9 x 6 mm  
 19 : *D. ruppellii* (JC, ex Aversano, 1983, coll. Touriel) Nahariya, Mediterranean. 14.7 x 10 x 5.5 mm. Var. bifasciated  
  
 20-21 : *D. ruppellii* *abulatti*, nov. subspec. (MHNP, Exp. Calypso -2 m.) Holotype 21.9 x 14.9 x 10 mm (Detail see fig. 45)  
 22-23 : *D. vaillanti* (Fischer, 1865) (JC ex HUJ, SRL 2708) El Bilaiyim, Gulf of Suez. 17.7 x 11.9 x 6.6 mm (Detail and radula see fig. 46 and 61)  
 24-25 : *D. imbricata* (Sow., 1862) (RNHL, leg Beets) Great Bitter Lake, St. 18, -4.6 m. Picture courtesy Dr. Gittenberg). 14.5 x 9.5 x 5.8 mm.  
 26 : *D. imbricata* (JC, 1961) Elat. shell not cleaned. 8.6 x 5.6 x 3.2 mm. (Detail see fig. 47)  
 27 : *D. funiculata* (Rve, 1850) (JC) Kurrachee. 15 x 9.7 x 6.8 mm  
 28 : *D. funiculata* (JC, ex ir. V. Putte) Damman, S. Arabia. 21 x 14.5 x 7.2 mm.  
 29 : *D. funiculata* (JC, leg O. Peel) Side view. Oman (?) 33.5 x 24.2 x 11.8 mm (Detail see fig. 48).  
  
 30 : *D. crucifera* Pilsbry, 1890 (JC, ex Dressler). Umhlanga, Natal 16.7 x 9.1 x 5.6 mm.  
 31 : *D. crucifera* aff. (JC, ex Vissers); Phuket. Thailand. 14.3 x 8.5 x 4.5 mm.  
 32 : *D. crucifera* aff. (JC, leg Taylor, 1978) Masirah Is., Arabian Gulf. 18.8 x 11.8 x 5.9 mm (Detail and radula see fig. 49 and 63)  
 33 : *D. crucifera* (JC) Natal. 16.1 x 9.9 x 5.4 mm.  
 34 : *D. crucifera* (JC, leg Drivas, 1983). Seychelles. 8.6 x 5.1 x 3 mm.  
 35 : *D. crucifera* aff. (JC) Sri Lanka, Trincomalee. 15.9 x 9.7 x 5.1 mm.  
 36 : *D. spec.* (HUJ 36124) Elat. See note 7  
 37-39 : *D. yaroni* nov. spec. (HUJ 36118) Holotype. Ras Muhammad, Sinai.  
 40-42 : *D. yaroni isaaci*, nov. subspec. (HUJ 36120) Holotype. Ras Muhammad.  
 43 : *Hemitoma simpla* nov. spec. (HUJ 11841) Holotype. Marsa Nurach (see also fig. 73)  
  
 44 : *D. ruppellii*. Detail of fig. 8  
 45 : *D. ruppellii* *abulatti*. Detail of fig. 20  
 46 : *D. vaillanti*. Detail of fig. 22  
 47 : *D. imbricata*. Detail of fig. 26 (specimen cleaned)  
 48 : *D. funiculata*. Detail of fig. 29  
 49 : *D. crucifera*. Detail of fig. 32  
 50 : *D. ruppellii*. (JC, ex Diana Pierre). Red Sea. (Radula figured fig. 56)  
 51 : *D. imbricata*. Radula of specimen from Hurghada (JC, ex de Brauwer)  
 52 : *Macroschisma compressa* A.Ad., 1850. Figure copied from Sow., 1862.  
 53 : *Patelloida profunda*. Drawing of species figured fig. 1  
 54 : *P. rolani*. Drawing of holotype figured fig. 4  
 55 : *P. rolani*. Drawing of var. figured fig. 7

- 56 : *D. ruppellii*. Radula of specimen fig. 50. Red Sea  
 57 : *D. ruppellii*. Radula of spec. fig. 10 Inhaca, Mozambique.  
 58 : *D. ruppellii*. Radula of spec. fig. 12. Ras es Sudn.  
 59 : *D. ruppellii abulatti*. Paratype n° 1 (JC) Right pluricuspid tooth of radula.  
 60 : *D. clathrata* Phil. sensu Thiele, 1891. Copy. of fig. Thiele  
 61 : *D. vaillanti*. Radula of spec. fig. 22  
 62 : *D. funiculata*. Radula of spec. from Masirah Is. (JC. ex Taylor, 1978)  
 63 : *D. crucifera aff.* Radula of spec. fig. 32  
 64 : *D. yaroni isaaci*. Radula of paratype n° 2 (JC)  
 65 : *D. yaroni*. Radula of paratype (JC)  
 66 : *Hemitoma emarginata* (Blv, 1825) (JC, ex Bändel) Santa Marta, Columbia. Radula with 4th lateral tooth. pluricuspid tooth and latero-marginal plate. left side.  
 67 : *H. panhi* Q.G., 1834. (Natal Museum, G. 4902, on loan, 1975). Mozambique. Radula and shell 10.5 x 7 x 5.5 mm.  
 68 : *H. subrugosa* Thiele, 1916. (YD 81, on loan ex Yaron). Elat. Shell 12.5 x 9 x 3 mm.  
 69 : *H. subrugosa* juv. (JC) Aqaba. Shell 2.4 x 1.6 x 0.9 mm. (Var. with 3 anterior costae in shield-form)  
 70 : *H. panhi* (JC) Socotra. Shell 15.5 x 11.9 x 7 mm. Shell-form intermediate between *H. panhi* and *H. subrugosa*.  
 71 : *H. modesta* H. Ad., 1872. (JC, ex Yaron, 1982) Aqaba. Shell 3.2 x 2 x 0.7 mm.  
 72 : *H. arabica* A. Ad., 1851 (JC, ex Yaron, 1981). Marsa el'Et. Shell 5.7 x 4.6 x 2 mm.  
 73 : *H. simpla* nov. spec. Drawing of holotype fig. 43.

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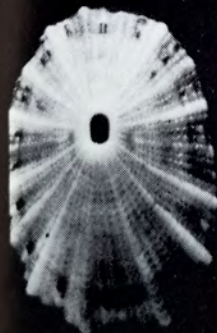
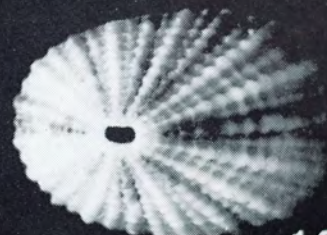
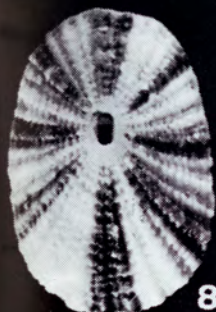
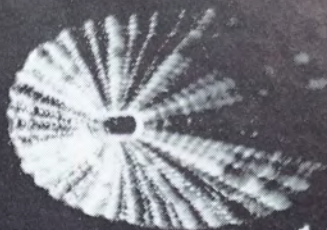
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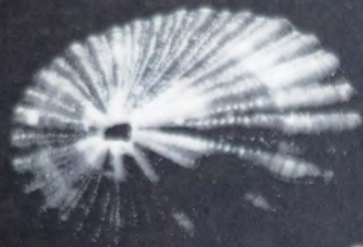
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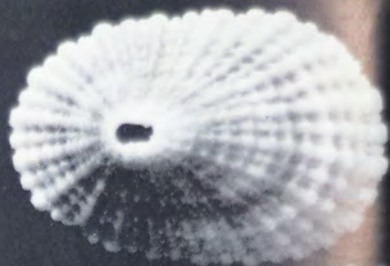
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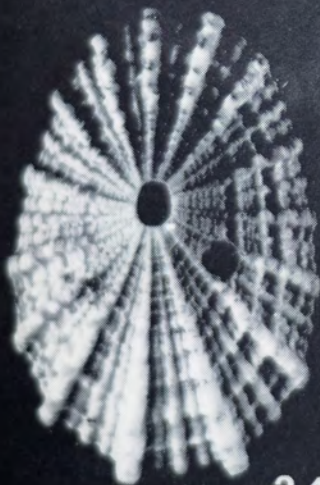
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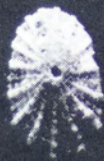
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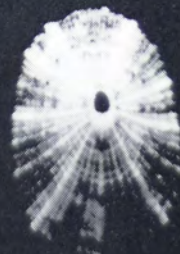
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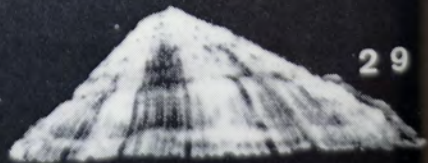
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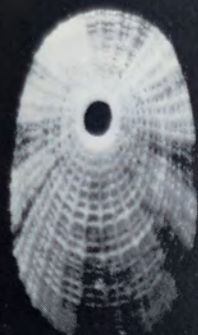
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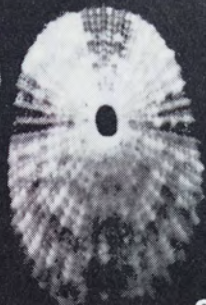
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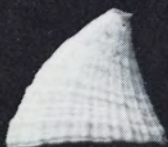
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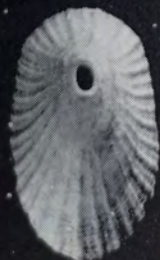
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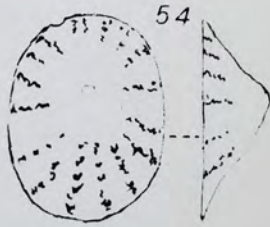
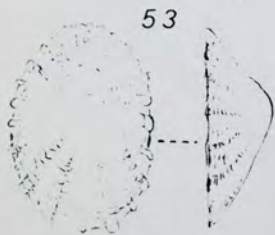
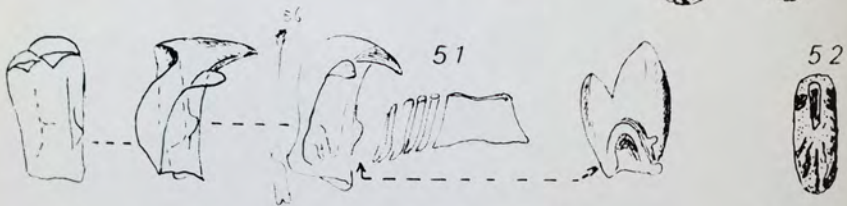
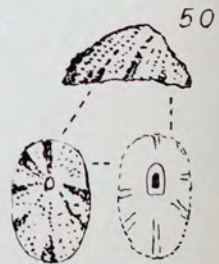
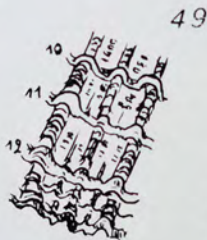
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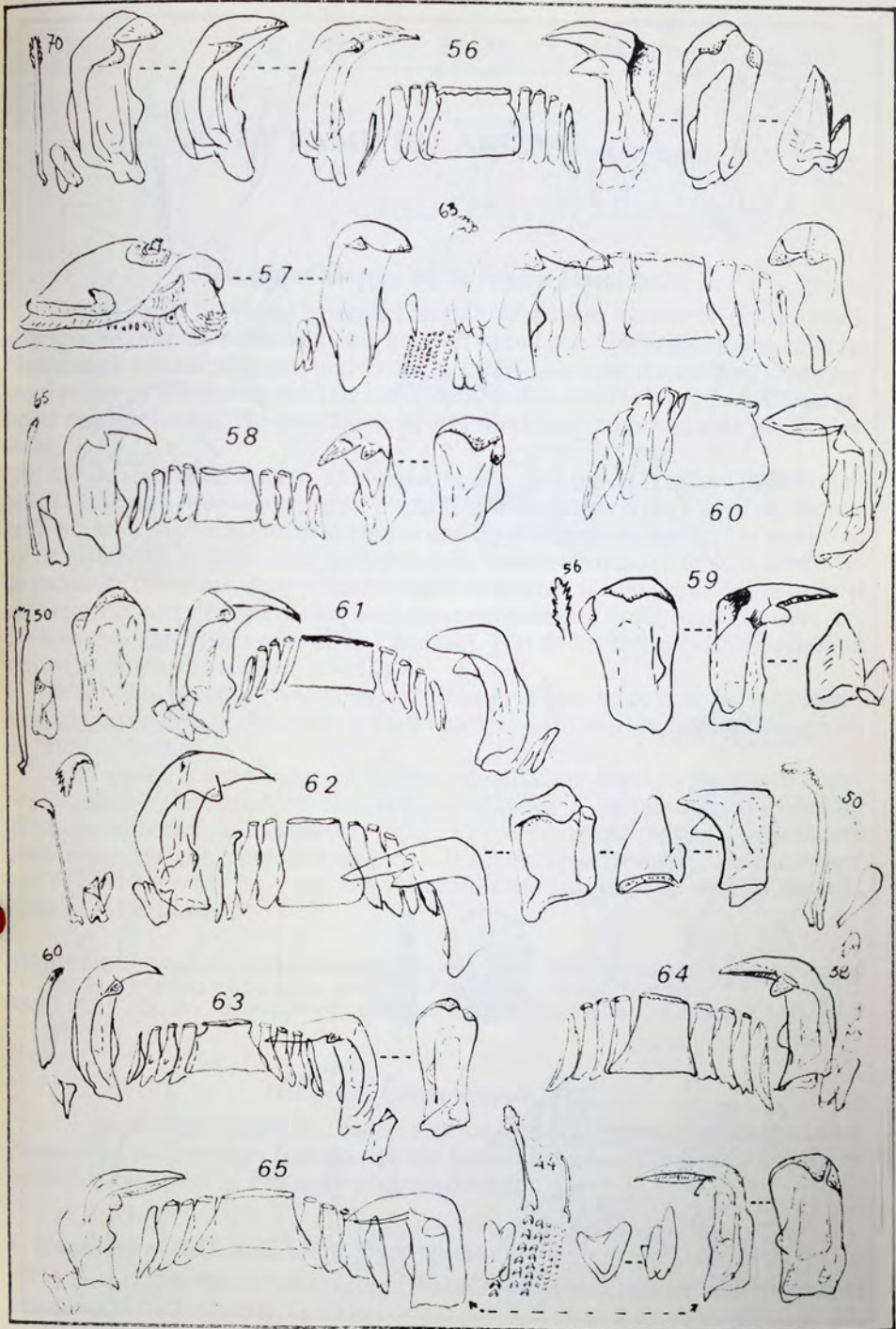


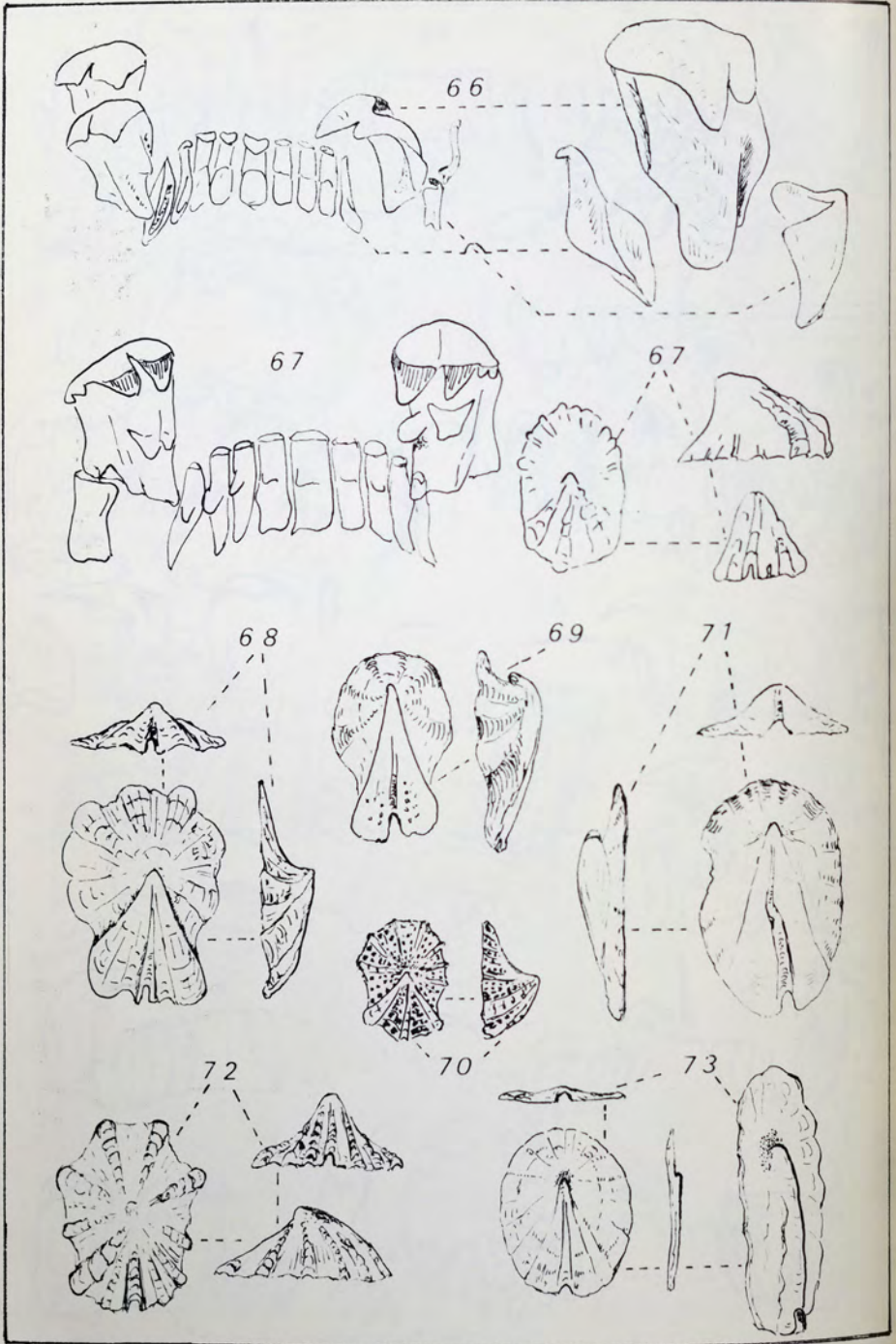
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42









## DE FAMILIE CASSIDAE. (2)

A. DELSAERDT

### Het genus *Morum* bij de familie Harpidae?

Sinds Linné (1758) zijn *Systema Naturae* opbouwde, werd er bij de taxonomische indeling van de mollusken vaak gewerkt vanuit conchyliologische vergelijking. Naarmate het malacologisch onderzoek zich verfijnde en de kennis zich verdiepte, werd er aan de klassering van families en genera dan ook flink geschud. En dat gebeurt nog regelmatig. Nu ook binnen de schijnbaar eenvoudige familie van de Cassidae.

Uit de resultaten van zijn anatomisch onderzoek moest Hughes (1986) besluiten dat het genus *Morum* eigenlijk helemaal niet thuishoort bij de Cassidae. Het zou zelfs eerder bij de Neogastropoda horen dan bij de Mesogastropoda. Dit bleek o.a. uit de plaats van de twee speekselklieren (niet in de proboscis) en de sterk afwijkende radulaire structuur. Bovendien bewegen de soorten van dit genus zich opvallend snel en ontbreekt de klier die het zuur moet produceren, nodig om zeeëgels te verorberen (het dagelijks menu van de Cassidae). Wat de *Morum*-soorten eten, schijnt trouwens nog helemaal niet geweten.

Waar dan dit genus onderbrengen? De kenmerken van de voet, het lang siphonaal kanaal en de mogelijkheid zichzelf te amputeren, zou ons terecht brengen bij de familie Harpidae!

In afwachting van de voor dit jaar aangekondigde revisie door Hughes en Emerson, houden wij het in onze studiegroep bij het oude: Conchyliologisch vinden we de stap naar de familie Harpidae te groot en zekere overeenkomsten met de andere genera van de Cassidae doorslaggevend. Wachten op een totaal nieuwe opvolger van Thiele? De vraag is of ooit een systematische klassering, op welke basis ook, volledig zal voldoen...

HUGHES, R.N., Anatomy of the foregut of *Morum*, Röding, 1798 (Gastropoda, Tonnacea) and the taxonomic misplacement of the genus. (in) *Veliger* 29 (1): 91-100. July 1986.

CAILLIEZ, J.-Cl., Du Nouveau chez les Harpidae. (in) *Bull. Soc. Intern. Conch. Suisse*, 1986, vol. 8 (4): 4-5.

### Het genus *Cassis* Scopoli, 1777.

De oudste van de ruim 20 fossiele soorten schijnen te worden gevonden in het Eoceen van Indonesië en Europa. Recent bestaat het genus *Cassis* uit 7 species en wordt het niet meer in Europa vertegenwoordigd.

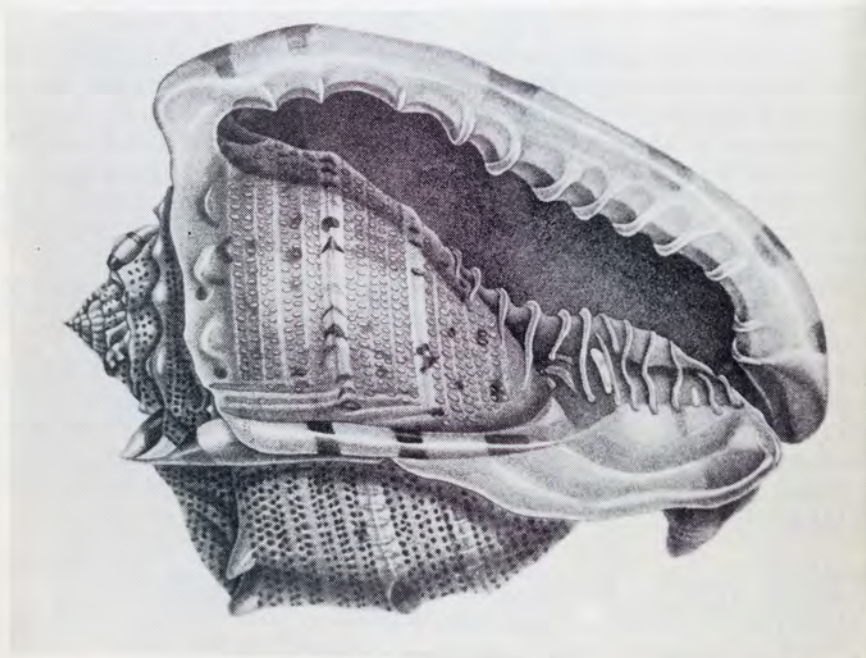
#### 1. *Cassis cornuta* (Linné, 1758). Type species.

Linné (1758: 735, n° 384) refereert zijn *Buccinum cornutum* naar figuren in Bonanni (1684: 3, pl. 155), Gualtieri (1742: pl. 40, f. D) en Rumphius (1841: pl. 23,

f. 1); deze laatste beeldt een jong exemplaar af en geeft de duidelijkste figuur. Een sublieme illustratie van alle typische kenmerken vonden we in Quoy & Gaimard (1835) en wordt hierbij afgebeeld.

Verspreidingsgebied. — Het grootste van de familie: Vanaf de zuidelijke helft van de Rode Zee, op O. Afrika (Madagascar inbegrepen), over de Indo-Pacific tot de Hawaii eilanden op het noordelijk halfrond en tot de Tuamotu Archipel op het zuidelijk halfrond. De meest noordelijke vindplaatsen liggen bij Japan, de meest zuidelijke bij Madagascar en Nieuw Caledonië.

Opmerkingen. — De schelpen van *Cassis cornuta* zijn moeilijk te verwarren met deze van andere soorten. *Cassis cornuta*, die volwassen een schelpenlengte van 35 cm kan bereiken, is de grootste soort van alle Cassidae. Leeft in kolonies op een diepte van 1-15 fathoms (Albott, 1968: 47), op zandige bodem tussen koraalriffen.



## 2. *Cassis tuberosa* (Linné, 1758).

Type: Figuur in Gualtieri, 1742: pl. 41. aangeduid door Clench (1944: 12). Type localiteit: Onbekend aan Linné; Hispaniola (Brugière, 1792) = Santo Domingo, geselecteerd door Clench (idem).

Verspreidingsgebied. — Van Noord Carolina zuidwaarts tot Brazilië.

Opmerkingen. — Het uitgesproken driehoekig columellair vlak heeft dikke randen. Het is licht bruin met een chocoladekleurige vlek op de bovenste helft van de columella en dito vlekken op de callus van de buitenlip. In deze callus, tegenover

de columella, 10-12 witte, sterke plooien die donkerbruin afgelijnd zijn. De juvenielen vertonen ingesneden spiraallijnen op het schelpoppervlak, vertikaal doorkruist door dicht op elkaar volgende axiale lijnen (waar juvenielen van *C. cornuta* rijen ingeprikte puntjes en streepjes vertonen). Juvenielen van *C. flammea* en *C. madagascariensis* hebben een glad schelpoppervlak.

De schelpenlengte van een volwassen *C. tuberosa* kan een 20 cm bereiken.

### 3. *Cassis flammea* (Linné, 1758).

Type: Figuur in Rumphius, 1741: pl. 23, f. 2, door Clench (1944: 13) aangeduid.

Type localiteit: Onbekend aan Linné; Cape St. Maria, Long Island, Bahama Islands door Clench (1944: 14).

Verspreidingsgebied. — Van de Bahamas tot de Kleine Antillen.

Opmerkingen. — Typische kenmerken van deze soort zijn de kleur van het columellair schild (crèmig-geel), de halvemaanvormige bruine vlekken op de laatste omgang en het ontbreken van vlekken op de buitenlip. Omdat het gladde schelpoppervlak een gevlamd voorkomen heeft, werd ie "flammea" genoemd. De talrijke knobbels zijn bol en regelmatig geschikt in 3 of 4 spiraalrijen op de laatste omgang. Voor een volwassen exemplaar is een schelpenlengte van 13 cm al heelwat.

### 4. *Cassis madagascariensis* Lamarck, 1822.

Type: Figuur in Kiener, 1835 (8), pl. 2, f. 2, aangeduid door Clench (1944: 15).

Type localiteit: "Madagascar" (Lamarck) is foutief. Beaufort, North Caroline (Stimpson, 1860, 29: 443) werd geselecteerd als correcte type localiteit door Clench (idem).

Verspreidingsgebied. — Van Noord Carolina en Bermuda Eil. tot de Kleine Antillen.

Opmerkingen. — Een oorspronkelijk foutief gelokaliseerde soort met een daarvoor geïnspireerde naam is natuurlijk misleidend. Denken we bijvoorbeeld aan de eveneens Caraïbische *Conus caledonicus*!

Het gladde, monochroom (gebroken wit of lichtbruin) schelpoppervlak vertoont drie spiraalrijen knobbels. Het schild heeft een opvallende zalmkleur, met een grote donkere vlek op de columella. De columellaire plooien zijn veel grilliger dan bij *Cassis tuberosa* en *C. flammea*.

### *Cassis madagascariensis spinella* Clench, 1944.

Holotype in Mus. Comp. Zool. Cambridge (n° 140761), off Tortugas, Florida; afgebeeld in Clench (1944: pl. 8).

Opmerkingen. — De door Clench (1944: 15-16) beschreven ondersoort, wordt door Abbott (1968: 52) en Abbott & Dance (1982: 110) als forma beschouwd. De schelp heeft een meer gezwollen vorm en de knobbels zijn veel talrijker en kleiner. Vooral op de schoudertrand van de laatste omgang zijn ze meer uitgesproken, terwijl ze elders op de laatste omgang nauwelijks voelbaar kunnen zijn. *C. madagascariensis spinella* is vooral gekend van de Lower Florida Keys. In de verzameling van de auteur een exemplaar van 24 cm lengte.

*Sleutel om de Caraïbische soorten van elkaar te onderscheiden.*

1. a Het schelpoppervlak is glad zie 2.  
b Het schelpoppervlak is opvallend ingesneden (dicht op elkaar volgende axiale lijnen kruisen spiraallijnen) = *Cassis tuberosa*.
2. a Het schelpoppervlak is monochroom gekleurd (gebroken wit of heel licht bruin): Zie 3.  
b Het schelpoppervlak is niet monochroom gekleurd, maar gevlamd = *Cassis flammea*.
3. a Drie spiraalrijen uitgesproken knobbels = *Cassis madagascariensis* s.s.  
b Een groter aantal van kleinere knobbels springen vrij puntig uit de schouder-rand = *Cassis madagascariensis* (forma) *spinella*.

**5. *Cassis tessellata* (Gmelin, 1791).**

Gmelin refereert onder *Buccinum tessellatum* naar Seba (1758: pl. 73, figs. 12, 13) en Martini (1773: figs. 369, 374). Type localiteit: "In Oceano australi" (Gmelin) was foutief en werd gecorrigeerd tot Accra, Ghana, door Abbott (1968: 54).  
Verspreidingsgebied. — West Afrika, van Senegal tot Angola.

Opmerkingen. — In verhouding met de afmetingen is de eivormige schelp een lichtgewicht. Het licht bruine, gladde schelpoppervlak, waarin axiale lijnen elkaar dicht opvolgen, wordt onderbroken door 4-6 concentrische banden van donkere vlekken. In deze banden kunnen ook lichte knobbels voorkomen. Rijen fijne knobbeltjes op de spira. Het columellair schild komt alleen bij werkelijk volwassen schelpen voor. Dit callus-schild is gebroken wit van kleur, met dikke randen. Schelpen van de vrouwelijke dieren kunnen gemakkelijk 25 cm lengte bereiken. Deze van de mannelijke dieren zijn opvallend kleiner.

**6. *Cassis nana* Tenison-Woods, 1879.**

Holotype in Nat. Mus. Victoria, Queensland, Australië (n° F 666), afgebeeld in Abbott, 1968 (plaat 39: 65). Type localiteit: Moreton Island (bij Brisbane).

Verspreidingsgebied. — Queensland tot en met N.S. Wales, Australië.

Opmerkingen. — Dit is de kleinste soort van het geslacht *Cassis*, met een lengte tot 6 cm. 4-5 rijen kleine knobbeltjes sieren het schelpoppervlak. Het meest opvallend zijn de bovenste twee rijen met 10-15 knobbeltjes. De mondopening is wit. Het callus-schild is dun en broos.

Abbott (1968) plaatst *Cassis nana* in het subgenus *Hypocassis* Iredale, 1927. Maar vanwege de algemene vorm, en het duidelijk van het schelplichaam losstaand callus-schild, zien we de noodzaak hiervan niet in en verkiezen we deze soort gewoon bij het geslacht *Cassis* s.s. te klasseren.

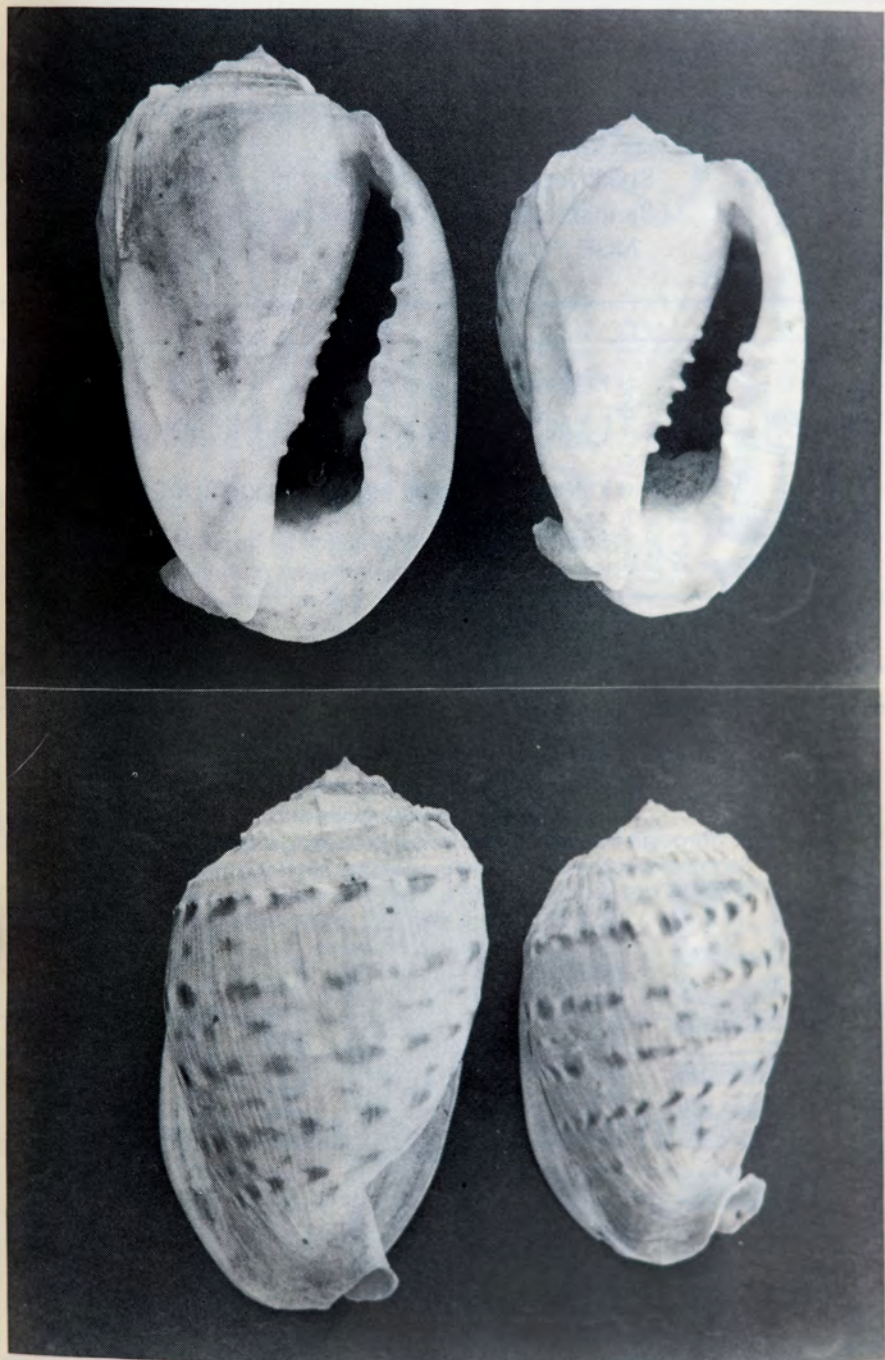
(vervolgt)

**PLAAT: *Cassis tessellata* (Gmelin, 1791).**

Het exemplaar links, 220 x 131 mm, is de schelp van een volwassen (vrouwelijk) dier. In Coll. Steppe, n° 875: Conakry, Guinea, West Afrika.

Het exemplaar rechts, 183 x 118 mm, is de schelp van een volwassen (mannelijk) dier. In Coll. Delsaerd, n° 1277: Conakry, Guinea, West Afrika.

Dezelfde exemplaren werden ventraal en dorsaal afgebeeld.



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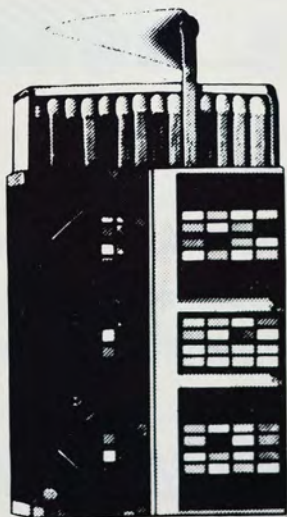
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## WAT STAAT ER OP ONS PROGRAMMA?

- Op de **eerste zondag van september** hebben wij de eer dhr. R. Houart als spreker in ons midden te hebben. Meer en meer maakt hij naam in de wereld als specialist van de Muricidae. We maken kennis met een boeiend man en een boeiende schelpenfamilie. Een vergadering die behoort!
- Tussen de Nederlandse Malacologische Kring en de Belgische Vereniging voor Conchylologie heeft altijd een bovenste beste verstandhouding geheerst. In **oktober** organiseren onze Nederlandse gastheren weer eens een internationale ontmoeting tussen onze verenigingen. Op het ogenblik dat dit tijdschrift ter perse ging, kon nog niet officieel bevestigd worden wanneer deze reuze dag zal plaats vinden. In alle geval zal dhr. R. Moolenbeek een voordracht geven over de marine mollusken van de Madeira Archipel. Dhr. Ripke (onder voorbehoud) over de landslakken op deze eilanden. Dhr. F. Van Nieulande bespreekt de fossiele fauna van Cadzand. Dhr. Strack (onder voorbehoud) zal zijn ervaringen weergeven op de Caribische Eilanden en de voorzitter van onze BVC over de Salomon Eilanden (als hij heelhuids terugkomt natuurlijk). Deze dag moet U meemaken: Boeiend en gezellig.

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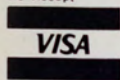
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