

New records of *Calliotropis* (Gastropoda: Chilodontidae) from central eastern Atlantic

Claude VILVENS
Rue de Hermalle, 113 – B–4680 Oupeye, Belgium
vilvens.claude@skynet.be

Frank SWINNEN
Lutlommel, 10 – B–3920 Lommel, Belgium
F. Swinnen@skynet.be

KEYWORDS. Gastropoda, Chilodontidae, Solariellidae, *Calliotropis*, *Solariella*, central eastern Atlantic.

ABSTRACT. A total of 10 species, most of them previously known as '*Solariella*' and living in the central eastern Atlantic, are discussed, briefly characterized and illustrated.

Solariella rudecta, *S. mogadorensis*, *S. talismani*, *S. valida*, *S. effossima*, *S. vaillanti* and *S. ambigua* are assigned to the genus *Calliotropis*.

The true identity of shells labelled '*Solariella rhina*' in various collections is established to be *Calliotropis infundibulum* (Watson, 1879).

New records are listed for *Calliotropis infundibulum*, *C. talismani*, *C. valida*, *C. vaillanti* and *C. ambigua*. The presence of the two American species *C. otto* and *C. globosa* in eastern Atlantic needs confirmation.

A key to central eastern Atlantic *Calliotropis* species is proposed.

RESUME. Un total de 10 espèces, la plupart connues auparavant en tant que '*Solariella*' et vivant dans l'Atlantique central oriental, sont examinées, brièvement caractérisées et illustrées.

Solariella rudecta, *S. mogadorensis*, *S. talismani*, *S. valida*, *S. effossima*, *S. vaillanti* et *S. ambigua* sont placées dans le genre *Calliotropis*.

La véritable identité de spécimens classés comme '*Solariella rhina*' dans diverses collections se révèle être en fait *Calliotropis infundibulum* (Watson, 1879).

De nouvelles stations sont enregistrées pour *Calliotropis infundibulum*, *C. talismani*, *C. valida*, *C. vaillanti* et *C. ambigua*. La présence des deux espèces américaines *Calliotropis otto* et *C. globosa* en Atlantique oriental demande confirmation.

Une clé de détermination des espèces de *Calliotropis* de l'Atlantique oriental central est proposée.

INTRODUCTION

Literature refers from time to time to '*Solariella*' species from subtropical and tropical eastern Atlantic, mainly off former French Western Africa (we will consider here an area from off Portugal to Angola). However, these species are in fact poorly known, probably because some of them are of small size or also because they are living at great depth. Moreover, some species are only known from the type material or even only from the original description. Finally, some of these species are not *Solariella* species at all and are indeed, among others, *Calliotropis* species.

Historical expeditions in this area are the English expeditions of the Lightning and Porcupine, conducted from 1868 to 1878, the French expeditions of Travailleur and Talisman that were led from 1880 to 1883, and the scientific campaign of the Prince of Monaco, with the Hironnelle and Princesse Alice ships, that were carried out from 1885 to 1915.

A bit later, Gruvel sampled off Mauritania and Senegal (1904, 1908) and off the African coasts, from

Senegal to Congo (1909–1910).

Jeffreys (1878–1885) reported on the sampling from the Lightning and Porcupine, with the description of some *Solariella* species. Major works publishing the results of the Prince of Monaco's expeditions are the ones of Dautzenberg and H. Fischer (1896, 1906). Locard (1897) reported in another major work the expeditions of Travailleur and Talisman. Dautzenberg alone (1889, 1925, 1927) continued to report the results of the Prince of Monaco's expeditions.

These three authors described many new species in their works, with the genera used in these times. Particularly, many species were described as *Solariella* species, the genus seeming a quite generic term.

Later, Nicklès (1950) identified the known marines species of Western and Equatorial Africa. He described no new species, but gave a valuable account of the western African species that were still poorly known. Only two *Solariella* species were mentioned and none were indeed *Calliotropis*.

In the more northern part of the studied area, the MNHN carried out in 1971 the expedition Biaçores in and off Azores with J. Forest as Principal Investigator. This expedition sampled 21 littoral and 260 deep-water stations. The material (in MNHN) has never been reported.

From 1976 to 1986, the Rijksmuseum van Natuurlijke Historie (NNML) led the CANCAP-project, a large programme of biogeographically oriented marine research in the south eastern part of northern Atlantic. Seven campaigns (CANCAP-I to VII) were carried out, visiting a large area covering Azores, Madeira Archipelago, the Moroccan shelf, Canary Islands, Mauritanian coasts, Senegal and the Cape Verde Islands. Van der Land (1987) listed the stations of the whole CANCAP-project. Most resulting zoological samples are kept in the National Museum of Natural History of Leiden.

Nordsieck (1968, 1982) listed *Solariella* species of the European seas; this is a valuable check list of all available names, but its author doesn't separate *Calliotropis* from true *Solariella* species or others.

Regarding non *Calliotropis* species, Rubio & Rolán (1997) moved some of them from the genus *Solariella* into the genus *Lirularia*. They based their opinion on the study of protoconch, radula and epipodial tentacles. Rolán, Hernandez and Deniz (2005) added two new species of true *Solariella* to the list. Ardovini and Cossignani (2004) published a book about West African Seashells while Rolán (2005) published recently a book about the Cape Verde Islands; these authors mentioned some known *Solariella* species of these area, without new species nor new assignment to different genera.

In the present paper, the authors focus on available material labelled as '*Solariella*' and coming from central eastern Atlantic, mainly western African areas, whose careful study shows that these species are obviously not *Solariella* but *Calliotropis*. The results of these investigations are reported here with illustrations, when possible, of types or representative specimens.

Abbreviations

Repositories

MNHN: Muséum national d'Histoire naturelle, Paris, France – repository for material of TRAVAILLEUR 1882, TALISMAN 1883 and Mission Biaçores campaigns.

MOM: Musée Océanographique de Monaco, Monaco – repository for material of PRINCESSE-ALICE II campaign.

BMNH: Natural History Museum, London, England.

NNML: Nationaal Natuurhistorisch Museum Leiden, The Netherlands – repository for material of CANCAP-II & III campaigns.

USNM: National Museum of Natural History, Smithsonian Institution, Washington, U.S.A.

ZSM: Zoologische Staatssammlung, München, Germany – repository for material of METEOR 36 campaign.

Other abbreviations

H: height

W: width

P1, P2, P3, ...: primary cords (P1 is the most adapical)

S1, S2, S3, ...: secondary cords (S1 is the most adapical)

stn: station

lv: live-taken specimens present in sample

dd: no live-taken specimens present in sample

sub: subadult specimen

juv: juvenile specimen

col: private collection

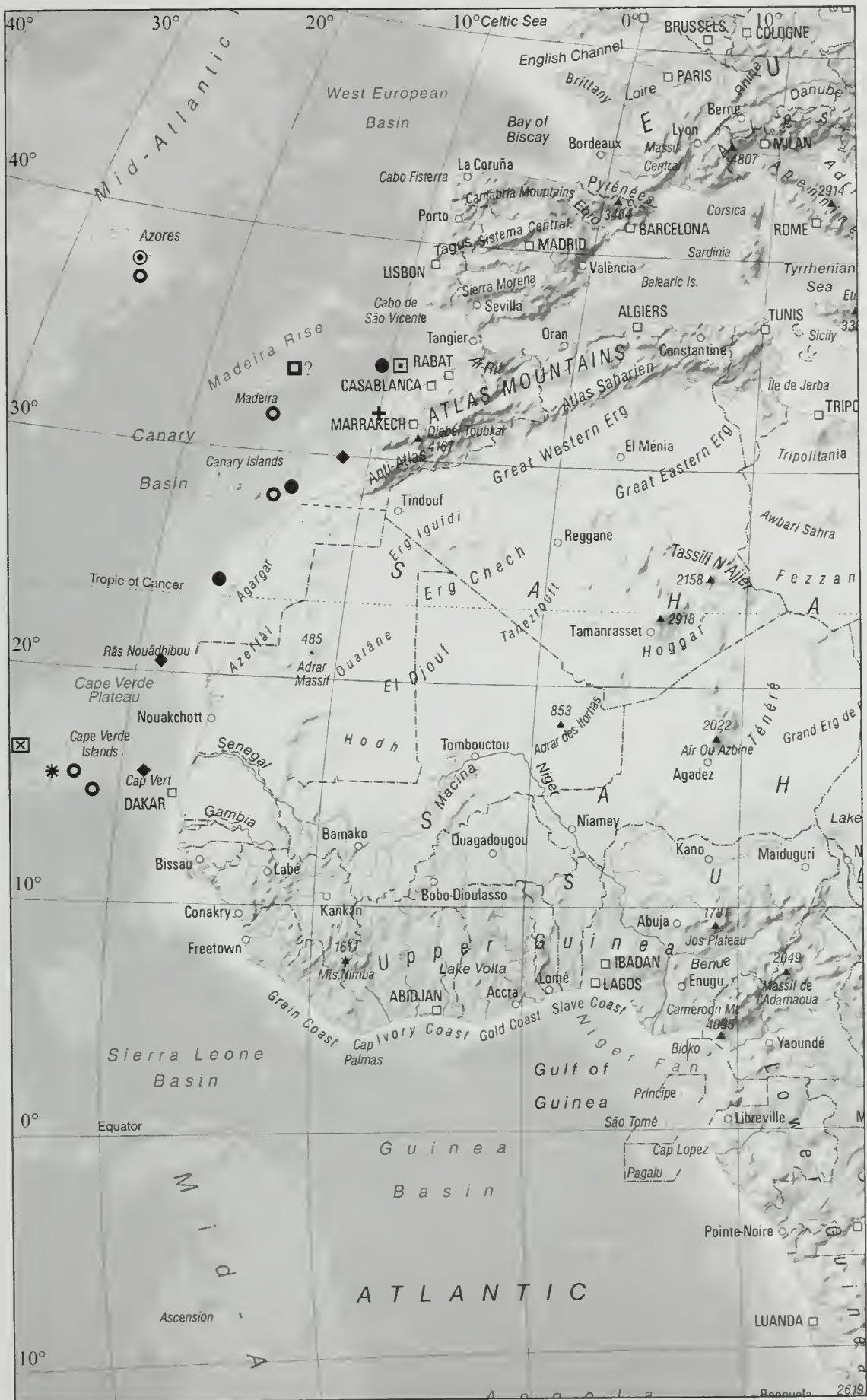
Remark about the distribution ranges

Regarding the extension of the distribution of known species, the range is taken from the internal intervals of the two extremes values.

KEY TO SPECIES

It is easy to distinguish, among the studied species, those that belong to the genus *Calliotropis* Seguenza, 1903, although it is not really easy to give it an operational straightforward definition, because there are in this genus many variations regarding the height of the spire and the presence or absence of umbilicus. But, considering the type species, one can characterize *Calliotropis* by a nacreous layer apparent on the whole surface, a rather small number of granular or nodular spiral cords on the whorls (that is, 3 or 4 primary cords, sometimes up to the same number of secondary cords), a small number of similar cords on the base and often an umbilicus without spiral cord or with up to 3 or 4 spiral cords inside.

We give here a keys system to help to distinguish the Atlantic species studied in this paper (excluding the doubtful *C. globosa*). Criteria used are mainly the shape of the shell and the number (sometimes also the strength or the weakness) of cords on the last whorl, on the base and inside the umbilicus.



Map 1 : Records of cited *Calliotropis* species – ◆ : *C. infundibulum*; ◻ : *C. rufeducta*; + : *C. mogadorensis*; ● : *C. talismani*; * : *C. valida*; ⊠ : *C. effossima*; ⊙ : *C. vaillanti*; ○ : *C. ambigua*; ◻ : *C. ottoi*.

Key to *Calliotropis* species of eastern Atlantic area
(numbers of spiral cords refers to the last whorl of teleoconch)

1. spire high elevated 2
 – spire moderately high or weakly depressed 4
 2. 4 spiral cords, cords similar in size, 1 spiral cord inside umbilicus *C. rudecta* [p.25]
 – 3 spiral cords 3
 3. nodules of P2 stronger than nodules of other cords *C. otto* [p.20]
 – spire a bit more elevated, nodules of P1 the strongest *C. infundibulum* [p.24]
 4. shape slightly coloeconoidal, P2 the strongest, 1 cord inside umbilicus *C. mogadorensis* [p.25]
 – shape conical or cyrtocoidal 5
 5. distance between P1–P2 two times greater than distance between P2–P3 *C. talismani* [p.26]
 – P1, P2 et P3 more or less evenly distributed 6
 6. spire rather depressed 7
 – spire moderately high 8
 7. nodules of cords more or less similar in size *C. valida* [p.26]
 – size of nodules decreasing from P1 to P3 *C. effossima* [p.27]
 8. nodules of P1 sharp, rather small, sometimes 1 weak cord inside umbilicus *C. vaillanti* [p.28]
 – nodules of P1 blunt, rather strong, less numerous, 2 or 3 umbilical cords *C. ambigua* [p.28]

SYSTEMATICS

We follow here the classification of Bouchet & Rocroi (2005), where Calliotropini, earlier treated as a tribe of Trochidae (Hickman & McLean, 1990), are now ranked as a subfamily of family Chilodontidae.

Superorder VETIGASTROPODA Salvini–Plawen, 1980

Superfamily SEGUENZIOIDEA Verrill, 1884

Family CHILODONTIDAE Wenz, 1938

Subfamily CALLIOTROPINAE Hickman & McLean, 1990

Genus *Calliotropis* Seguenza, 1903

Type species: *Trochus otto* Philippi, 1844 (by original designation) – Pliocene–Pleistocene, Italy.

Calliotropis otto (Philippi, 1844)
Figs 29–33

Trochus otto Philippi, 1844: 227, pl.28, fig. 9.

Basilissa otto – Martens & Thiele, 1904: 126, pl.IV, fig. 18.

Lischkeia otto – Abbott, 1974: 39, fig. 265.

Calliotropis otto – Warén, 1991: 56, fig. 1B.

Calliotropis (Calliotropis) otto – Quinn, 1979: 7, figs 5–6.

Lischkeia (Calliotropis) otto – Nordsieck, 1982: 15, pl.7, fig. 10.100.

Lischkeia otto – Abbott, 1991: 37.

Type material. No types located (lost ?).

Type locality. Mediterranean Sea, Pleistocene.

Material examined. **Iceland.** Off Stykkisholmur, Breidafjodur, 45–60 m, coll. F. Swinnen, 1 dd. – Off Hornafjordur, 60–70 m, coll. F. Swinnen, 2 lv sub. – **U.S.A.** Off Jamestown, Rhode Island, coll. F. Swinnen, 1 lv.

Distribution. North–western Atlantic (from Nova Scotia to off north Carolina), north–eastern Atlantic (from Iceland and Faeroe Is. to Azores and Madeira), Indonesia (Sumatra – doubtful), 85–1000 m, Sicily (Fossil).

Warén (1976) pointed out that the bathymetric ranges of the distribution are uncertain because authors made confusions with other species (for example, *C. regalis* (Verrill & Smith, 1880)). We never recorded this species in Azores nor in Madeira, where however it should be expected as a survivor of the deep–water Plio–Pleistocene fauna of the Sicily.

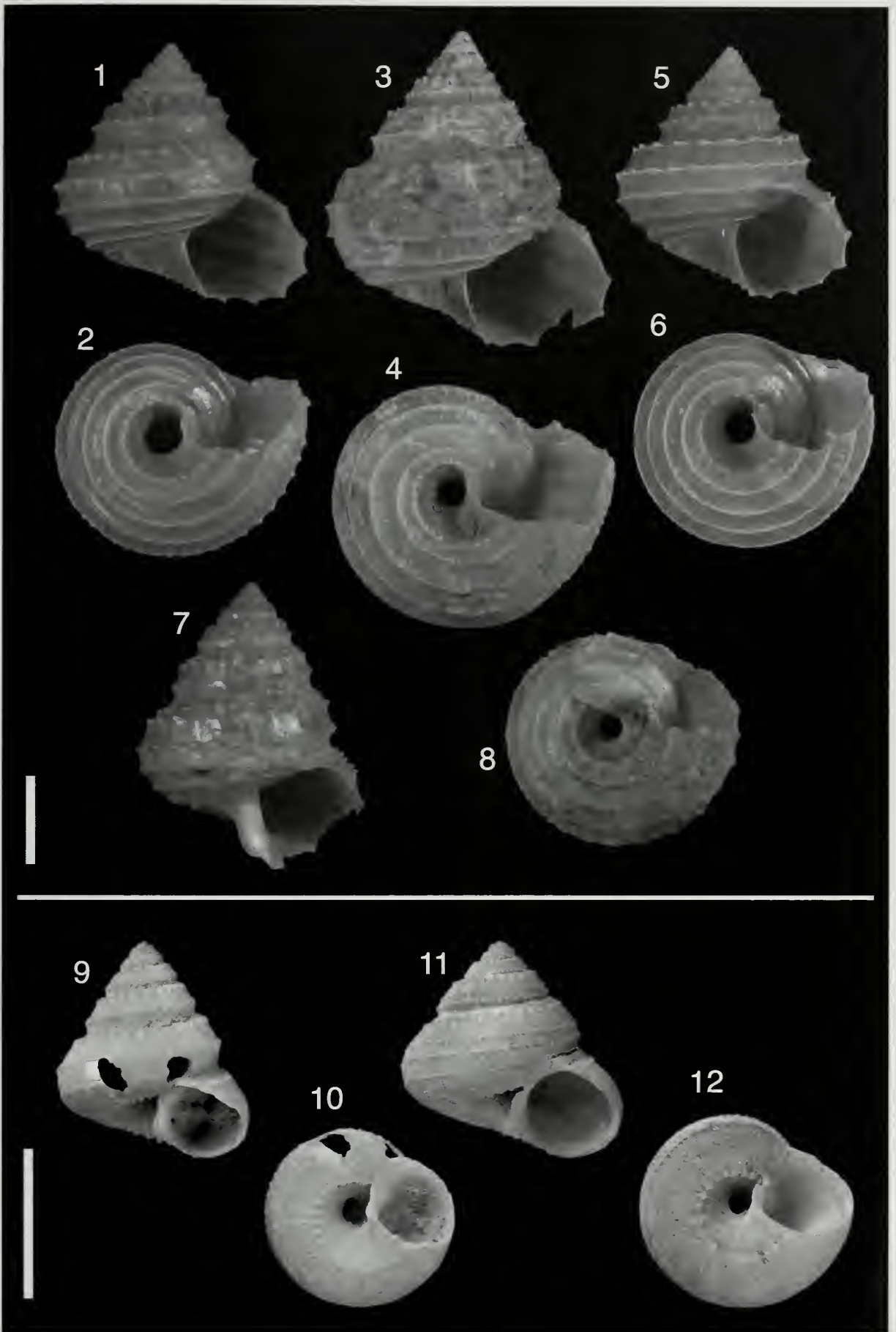
Plate 1. Figures 1–12. Scale bars: 5 mm

1–8. *Calliotropis "rhina"* (Watson, 1886) specimens that are indeed *C. infundibulum* (Watson, 1879).

1–2. MNHN, Atlantic Morocco, 2212 m [TALISMAN 1883, stn DR40], 17.2 x 16.0 mm; 3–4. MNHN, Cape Verde Is., 3200 m [TALISMAN 1883, stn DR101], 23.5 x 20.3 mm; 5–6. ZSM (19960312), off Mauritania, 2110 m [Meteor 36, stn 100], 15.2 x 13.9 mm; 7–8. var. major, MNHN, Atlantic Morocco, 2210 m [TALISMAN 1883, stn DR38], 20.8 x 16.9 mm.

9–12. *Solariella rhina* (Watson, 1885), syntypes BMNH, Azores - photos taken by BMNH.

9–10. BMNH (1887.2.9.302–6), 8.5 x 7.5 mm; 11–12. BMNH (1887.2.9.307), 8.2 x 8.5 mm.



Remarks. The main characteristics of this species are :

- height up to 10 mm, width up to 15 mm;
- a high spire, an almost conical shape, with up to 6 whorls;
- 2 granular cords P1 and P2 on spire whorls and an additional peripheral, granular spiral cord P3 on last whorl; P2 the strongest; axial ribs obsolete on last whorls;
- 4–6 granular spiral cords on the base, the innermost cord with strong nodules; interspace between cords two times as broad as cords;
- a rather narrow umbilicus with one granular spiral cord inside;
- a whitish silvery colour.

See Quinn (1979, figs 5–6) for another illustration.

"Calliotropis" rhina (Watson, 1885)

Figs 9–12

Trochus (Margarita) lima Watson, 1879: 703 (*non* Philippi, 1844).

Trochus (Margarita) rhina Watson, 1885: 80–81, pl.V, fig. 1 (*nom. nov.* for *T. (M.) lima* Watson, 1879).

Solariella rhina – Locard, 1897: 23, pl.XXII, fig. 25–28.

Calliotropis (Solaricida) rhina – Quinn, 1979: 13, fig. 27–28.

Solariella rhina – Nordsieck, 1982: 16, fig. 302.

Type material. 14 syntypes BMNH (1887.2.9.302–6, 1887.2.9.307, 1887.2.9.308–310, 18589.11.11.4–6).

Type locality. Azores, 1829 m. Quinn (1979) noted that Watson selected no holotype and used as type locality the one of the largest BMNH syntype (Challenger stn 78); we do the same here.

Distribution. Azores, 800–1800 m (Locard); Atlantic Morocco, 2075–2212 m; off Senegal, 3200 m, and off Mauritania, 2110–2843 m.

Remarks. Quinn (1979) already pointed out the confusion surrounding Atlantic *Calliotropis* species as *C. aeglees* (Watson, 1879) or *C. rhina* (Watson, 1885). While its arguments about *C. aeglees* are certainly pertinent, it is clear that he never studied the types of *C. rhina* – "the syntypes are probably in the British Museum (Natural History)". They are indeed in the BMNH (14 syntypes), but we were very surprised to note that these shells, that are probably true *Solariella*, are very different from all the studied specimens coming mainly from MNHN or ZSM and labelled "*Solariella rhina* (Watson, 1885)".

We also noticed that much earlier, Locard (1897) mentioned *Solariella rhina* and gave an illustration of the form *major*; but he used only the illustrations of the Challenger report (Watson, 1886), of rather poor quality, to establish that the shells he had before him were *S. rhina*.

Because it is yet clear that the MNHN and ZSM shells labelled "*Solariella rhina*" are definitively not *S. rhina* and because they differ from all other known central eastern Atlantic *Calliotropis*, we looked for similar species from the central western Atlantic. The next table (Table 1) lists these species.

C. diomediae (Verrill, 1880), of which the only illustration was found in the cards of Kaicher (1987), seems to match rather well with our name-lacking shells, except that it has a higher ratio H/W and much more thicker, more spaced and less numerous beads on the two most adapical spiral cords, these two cords being of the same size. In fact, it appeared quickly that all the misidentified specimens were indeed *C. infundibulum* (Watson, 1879).

Figures 13–28. Scale bar: 5 mm.

13–20. *C. infundibulum* (Watson, 1879), syntypes BMNH, Prince Edward Island – photos taken by Phil Hurst (BMNH).

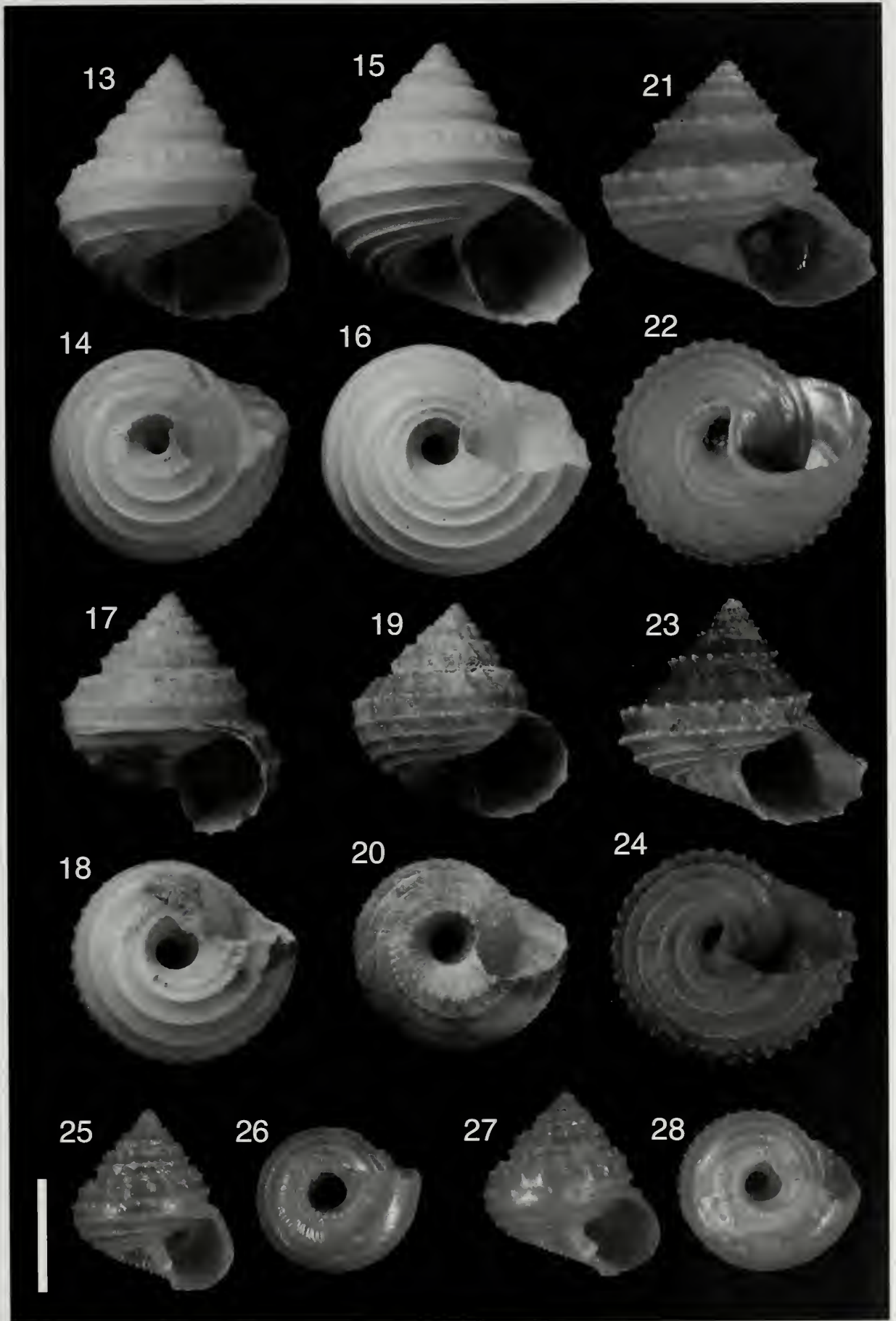
13–14. BMNH (1887.2.9.328–9), 14.8 x 12.5 mm; **15–16.** BMNH (1887.2.9.328–9), 16.0 x 14.9 mm; **17–18.** BMNH (1887.2.9.325–7), 12.0 x 11.9 mm; **19–20.** BMNH (1887.2.9.325–7), 10.9 x 10.7 mm.

21–24. *C. mogadorensis* (Locard, 1897).

21–22. Syntype MNHN, Atlantic Morocco, 912 m [TALISMAN 1883, stn DR36], 13.7 x 15.3 mm;

23–24. MNHN, Atlantic Morocco, 1900 m [TRAVAILLEUR 1882: stn DR40], 12.5 x 13.7 mm.

25–28. *Calliotropis? globosa* Quinn, 1991, said to be from Madeira, south-east of Porto Santo, 790–840 m, B. Van Heugten coll.. **25–26.** 8.8 x 7.7 mm; **27–28.** 9.1 x 8.5 mm.



	spire	largest dimensions (mm)	spiral cords on whorls	spiral cords on base	umbilicus
<i>C. regalis</i> (Verrill & Smith, 1880)	moderately elevated, conical	14 x 15	3, subsutural cord thinner	5–6	wide, with 1 or 2 spiral cords within
<i>C. aeglees</i> (Watson, 1879)	moderately elevated, conical	7 x 7.5	3	3	wide
<i>C. calatha</i> (Dall, 1927)	variable : from moderately high to moderately depressed	10 x 13	2–3	3–4	wide, with a few thin spiral cords
<i>C. lissocona</i> (Dall, 1881)	elevated, conical	6 x 5	3, subsutural cord thinner	3	wide
<i>C. actinophora</i> (Dall, 1890)	moderately depressed	9 x 10	4, subsutural cord thinner	4	wide
<i>C. diomediae</i> (Verrill, 1880)	elevated	23 x 18	3	4	moderately wide
<i>C. infundibulum</i> (Watson, 1879)	rather elevated	20 x 20	3, subsutural cord thicker	4	wide without cord inside

Table 1. *Calliotropis* from central western Atlantic : general features following literature

Calliotropis infundibulum (Watson, 1879)
Figs 1–8, 13–20

Trochus infundibulum Watson, 1879: 707–708.

Trochus (Margarita) infundibulum – Watson, 1885: 84–85, pl.V, fig. 5.

Solariella infundibulum – Dall, 1889: 380–381.

Solariella infundibulum – Dall, 1890: 349–352.

Solariella infundibulum – Abbott, 1974: 41, fig. 287.

Solariella infundibulum – Cernohorsky, 1977: 105, fig. 1.

Calliotropis infundibulum – Marshall, 1979: 531, figs 4E–G, 9C–F.

Calliotropis infundibulum – Kaicher, 1990: 5690.

Calliotropis infundibulum – Sasaki, 2000: 59, pl. 29, fig. 25.

Calliotropis infundibulum – Vilvens, 2004: figs 27–28.

Calliotropis infundibulum – Vilvens, 2007: figs 84–85.

Type material. 5 syntypes. BMNH (1887.2.9.325–7, 1887.2.9.328–9).

Type locality. Prince Edward Island (Indian–Atlantic Ridge area), 46°46'S, 45°31'E, 2514 m.

Material examined. **Atlantic Morocco.** TALISMAN 1883: stn DR38, 30°09'N, 11°41'W, 2210 m, 1 dd. – Stn DR40, 30°03'N, 11°42'W, 2212 m, 1 lv, 2 dd, 2 dd sub. – Stn DR42, 29°58'N, 11°41'W, 2104 m, 2 lv, 2 dd, 1 dd sub. – Stn DR43, 29°52'N, 11°44'W, 2075 m, 1 lv, 3 dd, 1 dd sub. – **Senegal (off Cap Vert).** TALISMAN 1883: stn DR101, 16°38'N, 18°24'W, 3200 m, 1 lv, 1 dd. – **Off Mauritania.** METEOR 36: stn 99, 21°36.2'N, 18°40.6'W, 2843 m, 2 lv. – Stn 100,

21°27.1'N, 18°16.1'W, 2110 m, 2 lv. – **Madeira.** South-east of Porto Santo, 32°26'N, 15°11'W, 790–840 m, F. Swinnen coll., 1 dd.

Distribution. Western Atlantic (from northern America to Brazil), 230–3259 m (Clarke, 1962), eastern Atlantic (Azores, 800–1800 m (Locard, 1898); Atlantic Morocco, 2075–2212 m; off Senegal, 3200 m, and off Mauritania, 2110–2843 m), Indian–Atlantic Ridge, 1965–2514 m (Watson, 1879); South Africa, 2750 m (Martens, 1903); Japan, 2000–2150 m (Higo et al., 1999); south-western Pacific, 2040–2315 m; New Zealand, 2080–2515 m (Marshall, 1979).

Remarks. This is an extension of this widespread species, known from western Atlantic to western Indo-Pacific.

The main characteristics of this *Calliotropis* species are :

- height up to 23.5 mm, width up to 20.3 mm;
- a high spire, an almost conical shape, with up to 7.5 whorls;
- 2 granular cords P1 and P2 on spire whorls and an additional peripheral, granular spiral cord P3 clearly visible on last whorl, the granules of the adapical cord being the strongest; axial ribs still visible near the granules;
- 4 thin granular spiral cords on the base, the innermost cord with strong nodules; interspace between cords three times as broad as cords;
- a broad umbilicus without spiral cord inside;
- a whitish silvery colour.

On some specimens, P1 may divide in two cords, giving three cords on last spire whorls instead of two

(this is the variety *major* of authors for "*Solariella rhina*").

The three examined syntypes registered as 1887.2.9.325–7 have a more depressed spire and a spiral cord P2 with thicker, less numerous, more spaced beads than the two syntypes registered as 1887.2.9.328–9. The labelled "*S. rhina*" specimens are intermediate between the two kinds of syntypes, with a rather elevated spire (as 1887.2.9.328–9 syntypes) and thick, isolated beads on P2 (as 1887.2.9.325–7 syntypes).

***Calliotropis rudecta* (Locard, 1897)**

Figs 48–49

Solariella rudecta Locard, 1897: 33–34, pl.I, figs 17–19.

Solariella rudecta – Nordsieck, 1982: 16, fig. 303.

Type material. Holotype MNHN.

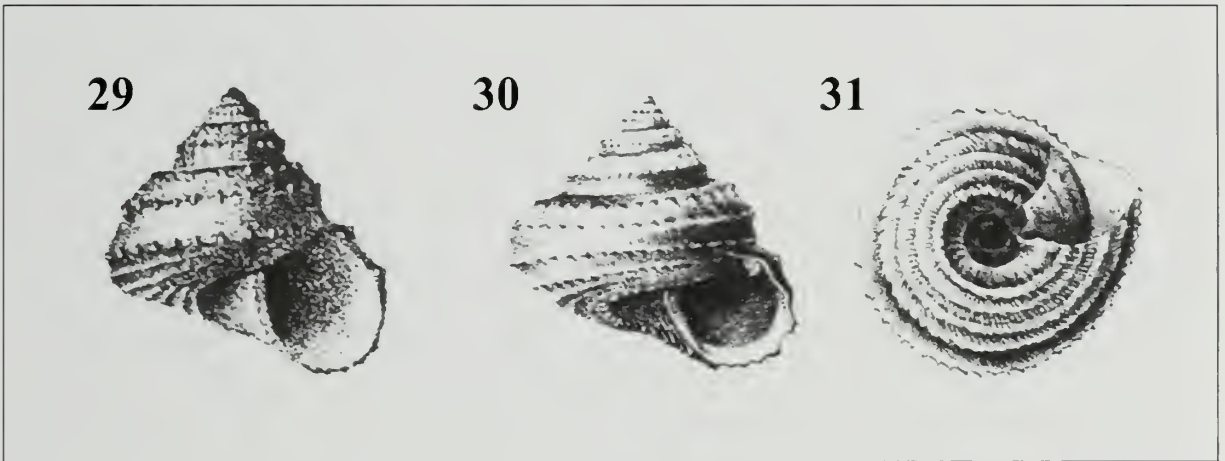
Type locality. Off western Morocco, 1900 m.

Material examined. Off Morocco. TRAVAILLEUR 1882: stn DR40, 33°09'N, 09°38'W, 1900 m, 1 dd (holotype).

Distribution. Only known from the type locality.

Remarks. The main characteristics of this species are :

- height 5 mm, width 3.5 mm;
- a high spire, a slightly coeloconoidal shape, with 5.5 whorls;
- 3 primary granular cords on spire whorls, 2 secondary cords S1 and S2 on last whorls and an additional peripheral, granular spiral cord P4 on last whorl; granules of cords sharp and similar in size: axial ribs visible, connecting nodules;
- 3 thin granular spiral cords on the base; interspace between cords two times as broad as cords;
- a deep, rather broad umbilicus with a spiral cord within;
- a beige colour.



Figures 29-31. *Calliotropis ottoi* (Philippi, 1844).

29. Illustration from the original description from Philippi (1844); 30-31. Illustrations from Martens & Thiele (1904)

***Calliotropis mogadorensis* (Locard, 1897)**

Figs 21–24

Solariella mogadorensis Locard, 1897: 24–25, pl.I, fig. 1–4.

Solariella mogadorensis – Nordsieck, 1982: 16, fig. 307.

Type material. 10 syntypes MNHN.

Type locality. Off western Morocco, 1900 m.

Material examined. Off Morocco. TRAVAILLEUR 1882: stn DR40, 33°09'N, 09°38'W, 1900 m, 1 dd (syntype MNHN). – TALISMAN 1883: stn DR34, 32°27'N, 09°55'W, 1123 m, 1 lv, 1 dd (syntypes

MNHN). – Stn DR36, 31°34'N, 10°21'W, 912 m, 1 lv, 2 dd (syntypes MNHN). – Stn DR37, 31°31'N, 10°27'W, 1050 m, 4 dd (syntypes).

Distribution. Only known from type locality

Remarks. The main characteristics of this species are :

- height up to 13.5 mm, width up to 15 mm;
- a moderately high spire, a slightly coeloconoidal shape, with up to 7 whorls;
- 3 primary granular cords on spire whorls; P2 the strongest with sharp spaced nodules, P1 almost obsolete on last whorls, P3 with more crowded, smaller nodules than P2;

- 4 or 5 thin granular spiral cords on the base; interspace between cords about 1.5 times as broad as cords;

- a deep, broad umbilicus with a spiral cord inside;

- a silvery white colour.

Calliotropis talismani (Locard, 1897)

Figs 44–47

Solariella talismani Locard, 1897: 25–26, pl. 1, figs 5–8.

Type material. 2 syntypes MNHN.

Type locality. Off western Morocco, 1350 m.

Material examined. **Atlantic Morocco.** TALISMAN 1883: stn DR33, 33°31'N, 09°48'W, 1350 m, 1 dd (syntype MNHN). – **CANCAP-II:** stn 2.039, 28°02'N, 13°26'W, 1010 m, 1 dd. – **Western Sahara.** CANCAP-III: stn 3.107, 24°17'N, 16°49'W, 1000–1100 m, 1 dd. – **Canary Is.** CANCAP-II: stn 2.079, 28°01'N, 14°26'W, 870 m, 1 dd.

Distribution. Atlantic Morocco, 840–1350 m (Locard, 1898), western Sahara, 1000–1100 m, and Canary Is., 870 m.

Remarks. The main characteristics of this species are :

- height up to 8 mm, width up to 9 mm;

- a rather high spire, a more or less conical shape, with up to 5.5 whorls;

- 2 primary granular cords on spire whorls; nodules of P1 the strongest, spaced, nodules of P2 more crowded, smaller than nodules of P1; granular spiral cord P3 on last whorl, with small granules; distance between P1 and P2 1.5 to 2 times greater than distance between P2 and P3; axial sculpture obsolete;

- 4 thin granular spiral cords on the base; interspace between cords about 2 times as broad as cords;

- a deep, rather broad umbilicus without clearly visible spiral cord within;

- a silvery white colour.

Calliotropis valida (Dautzenberg & H. Fischer, 1896)

Figs 50–53

Solariella valida Dautzenberg & H. Fischer, 1896: 8–9, pl.III, figs 22–27.

Solariella valida – Dautzenberg & H. Fischer, 1906: 57–58, pl.III, figs 22–27.

Solariella valida – Nordsieck, 1982: 16, fig 306.

Solariella valida – Rolán, 2005: 47, figs 107–108.

Type material. 63 syntypes MOM (INV-19940, INV-19941, INV-21029, INV-1725).

Type locality. Cape Verde Islands, 1311 m.

Material examined. **Cape Verde Islands.** PRINCESSE-ALICE II: stn 1193, 15°17'N, 23°01'45"W, 1311 m, 63 lv (syntypes MOM).

Distribution. Off Morocco (Nordsieck, 1982) and Cape Verde Islands, 1311 m.

Remarks. The main characteristics of this species are :

- height up to 15 mm, width up to 16 mm;

- a moderately high spire, a slightly cyrtoconical shape, with up to 6.5 whorls;

- 3 primary granular cords on spire whorls, similar in size; nodules of P1 and P2 strong, bluntly sharp, widely spaced; nodules of P3 a bit smaller, not sharp; S1 may be present at fifth whorl; axial sculpture obsolete as early as second whorl;

- 4 (sometimes 5) granular spiral cords on the base; interspace between cords about 1.5 to 2 times as broad as cords;

- a deep, rather broad umbilicus without spiral cord within;

- a silvery beige colour.

The numbers of station used here are the general ones, that is an incremental numbering across all the expeditions of the Monaco's Prince. The scientists of these campaigns used, before publication, a new numbering for each campaign (these numbers are used on labels of specimens), but they transformed for their paper the campaign numbers in general numbers, valid whatever the campaign they belonged to (Bruni, personal communication).

Figures 32–43. Scale bar: 5 mm.

32–33. *Calliotropis otto* (Philippi, 1844), Iceland, coll. F. Swinnen, 13.9 x 14.4 mm.

34–35. *C. effossima* (Locard, 1897), syntype MNHN, Cape Verde Islands, 550–760 m [TALISMAN 1883, stn DR113], 7.6 x 10.7 m.

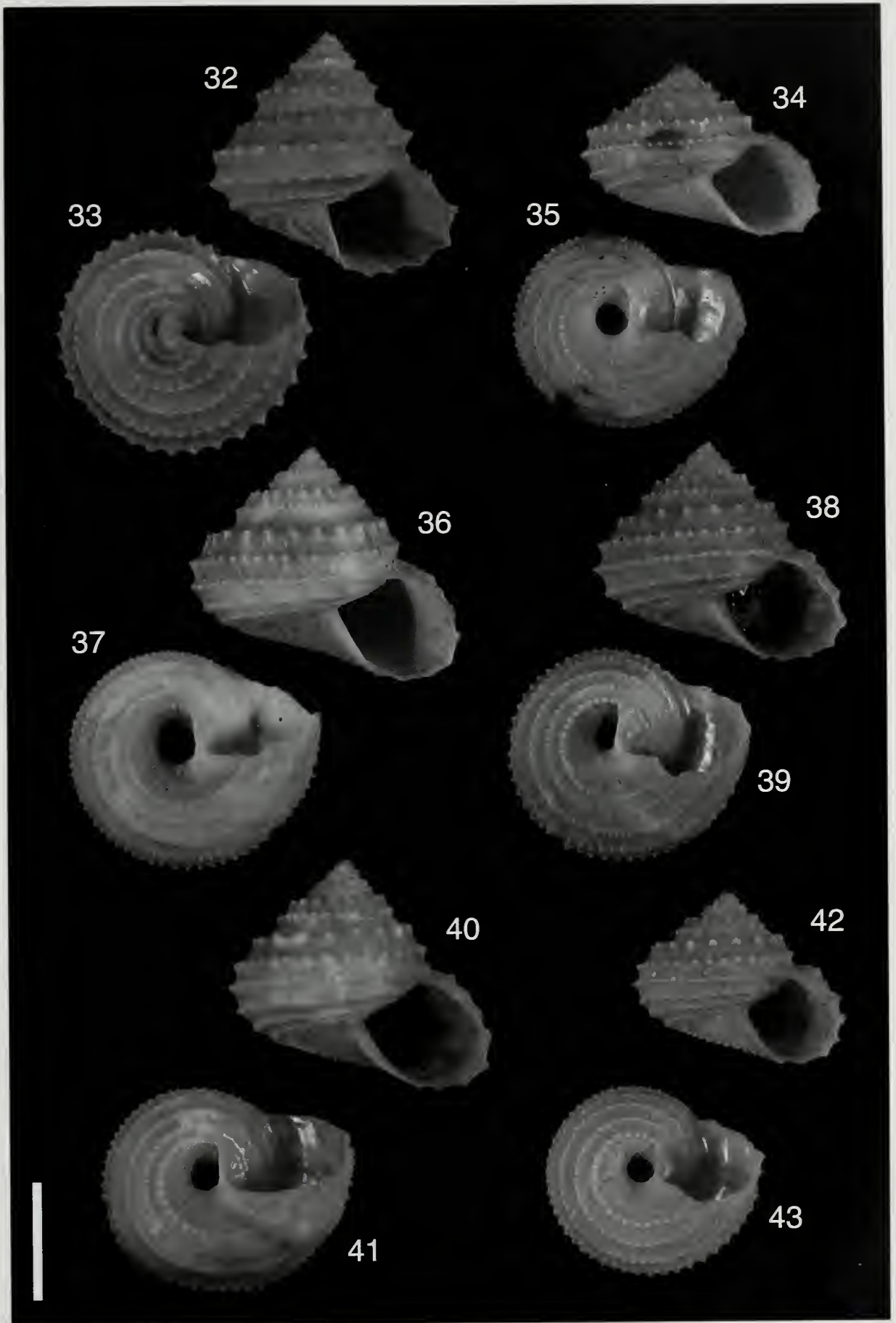
36–39. *Calliotropis vaillanti* (P. Fischer, 1882), MNHN, Azores.

36–37. 1590–1665 m [Mission Biazores, stn 179], 10.6 x 12.2 mm. **38–39.** 1200–1240 m [Mission Biazores, stn 64], 9.8 x 11.0 mm.

40–43. *C. ambigua* (Dautzenberg & Fischer, 1896).

40–41. Syntype MOM (INV-19937), Azores, 1385 m [Princesse Alice, stn 46 (=553?)], 9.7 x 11.4 mm.

42–43. NNML, Cape Verde, 950–1040 m [CANCAP VI, stn 6–065], 6.7 x 8.4 mm.



Calliotropis effossima (Locard, 1897)
Figs 34–35

Solariella effossima Locard, 1897: 27–29, pl. I, figs 9–12.

Solariella effossima – Nordsieck, 1982: 16, fig. 309.

Solariella effossima – Rolán, 2005: 47, figs 109–110.

Type material. Holotype MNHN.

Type locality. Cape Verde Islands, 493–618 m.

Material examined. Cape Verde Islands. TALISMAN 1883: stn DR113A, 16°52'N, 25°11'W, 618 m, 1 dd (holotype).

Distribution. Off Morocco, 1900 m (Locard, 1898) and Cape Verde Islands, 618 m.

Remarks. The main characteristics of this species are:

- height up to 7.5 mm, width up to 10.5 mm;
- a moderately depressed spire, a slightly cyrtconoidal shape, with up to 5.5 whorls;
- 2 primary granular cords on spire whorls; P1 the strongest with big, sharp, spaced nodules; P2 weaker than P1; P3 the weakest with more crowded, smaller nodules than P2;
- 4 thin granular spiral cords on the base, the innermost stronger; interspace between cords about 2 to 2.5 times as broad as cords;
- a deep, broad umbilicus with two or three thin spiral cords within;
- a light brownish colour.

Calliotropis vaillanti (P. Fischer, 1882)
Figs 36–39

Trochus vaillanti P. Fischer, 1882: 50.

Solariella vaillanti – Dautzenberg & H. Fischer, 1894: 477, pl. XX, fig. 12.

Solariella vaillanti – Locard, 1897: 27, pl. II, fig. 5–8.

Solariella vaillanti – Dautzenberg, 1927: 188, pl. V, figs 33–34;

Calliotropis vaillanti – Quinn, 1979: 9, figs 9–10.

Lischkeia (Calliotropis) ottoii vaillanti – Nordsieck, 1968: 19.

Solariella vaillanti – Nordsieck, 1982: 16, fig. 308.

Solariella vaillanti – Rolán, 2005: 47, figs 104–105, 111–112.

Type material. 5 syntypes MNHN.

Type locality. West of Portugal, 1224 m.

Material examined. Azores. Mission Biaçãores: stn 64, 38°43'N, 28°29'W, 1200–1240 m, 1 d. – Stn 179, 38°05.5'N, 25°46'W, 1590–1665 m, 1 lv. – Madeira. SEPLAT Madeira: COV7, 769 m, coll. F. Swinnen, 2 dd sub, 3 dd juv.

Distribution. Off Portugal and western Spain, 1224–1674 m (Dautzenberg & Fischer, 1896), Azores 1240–1590 m (Locard, 1898), Cape Verde, 495–618 m (Locard, 1898); Madeira, 769 m.

Remarks. The main characteristics of this species are:

- height up to 10.5 mm, width up to 12 mm;
- a moderately high spire, a cyrtconoidal shape, with up to 6 whorls;
- 2 primary granular cords on spire whorls; P1 the strongest with strong, sharp, spaced nodules; P2 weaker than P1; P3 the weakest with more crowded, smaller nodules than P2;
- 4 thin granular spiral cords on the base; interspace between cords about 1.5 to 2 times as broad as cords;
- a broad umbilicus, with gently sloping walls; sometimes a thin spiral cord within;
- a light brownish colour.

Calliotropis ambigua
(Dautzenberg & H. Fischer, 1896)
Figs 40–43

Solariella ambigua Dautzenberg & H. Fischer, 1896: 476–477, pl. XX, fig. 11.

Solariella ambigua – Dautzenberg & H. Fischer, 1897: 171.

Type material. 4 syntypes MOM (INV-19937, INV-21030).

Type locality. Azores, 1385 m.

Figures 44–53. Scale bars: 5 mm.

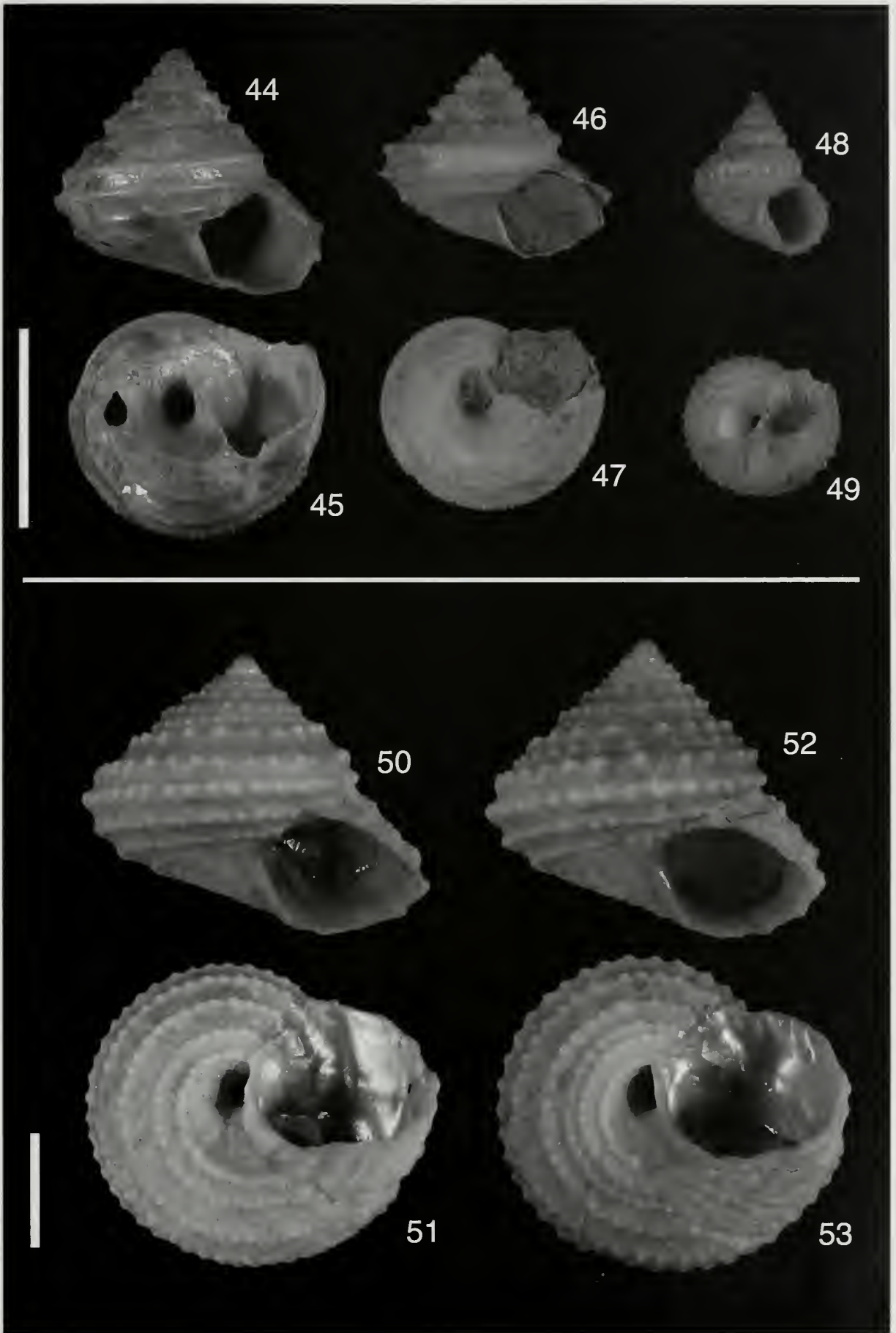
44–47. *Calliotropis talismani* (Locard, 1897).

44–45. Syntype MNHN, Atlantic Morocco, 1350 m [TALISMAN 1883, stn DR33], 7.9 x 8.9 mm;

46–47. NNML, Canary Islands, south Fuerteventura, Punta de Jundia, 870 m [CANCAP-II, stn 2.079], 5.2 x 5.6 mm.

48–49. *C. rudecta* (Locard, 1897), holotype MNHN, Atlantic Morocco, 1900 m [TRAVAILLEUR 1882, stn DR40], 4.3 x 3.5 mm.

50–53. *C. valida* (Dautzenberg & H. Fischer, 1896), syntypes MOM (INV-21029), Cape Verde Islands, 1311 m [PRINCESSE-ALICE II, stn 1193]. **50–51.**, 13.6 x 17.2 mm; **52–53.** 13.7 x 15.3 mm.



Material examined. Azores. PRINCESSE ALICE I: stn 553, 37°42'40"N, 25°05'15"W, 1385 m, 3 lv (syntypes MOM). – MNCN, 1250 m, 2 dd. – **Canary Islands.** CANCAP II: stn 2.082, 28°00'N, 14°26'W, 1130 m, 3 dd juv. – **Madeira.** CANCAP I: stn 1.031, 32°40'N, 16°43'W, 1085 m, 10 dd juv. – Stn 1.044, 32°42'N, 16°42'W, 815 m, 1 dd, 1 dd sub & 2 dd juv. – Stn 1.062, 32°40'N, 16°46'W, 680 m, 1 dd & 4 dd juv. – CANCAP III: stn 3.028, 33°01'N, 16°20'W, 740 m, 9 dd juv. – Stn 3.051, 32°40'N, 16°40'W, 1100 m, 3 dd juv. – **Cape Verde Islands.** CANCAP VI: stn 6.065, 15°58'N, 22°33'W, 950–1040 m, 2 lv.

Distribution. Azores, 454–1557 m (Dautzenberg & Fischer, 1896), Canary Islands, 1130 m, Madeira, 680–1100 m, Cape Verde, 950–1040 m.

Remarks. The main characteristics of this species are :

- height up to 9.5 mm, width up to 11.5 mm;
- a moderately high spire, a cyrtococonoidal shape, with up to 6 whorls;
- 2 primary granular cords on spire whorls; P1 the strongest with strong, rounded blunt, spaced nodules; P2 weaker than P1; P3 the weakest with more crowded, smaller nodules than P2;
- 4 thin granular spiral cords on the base; interspace between cords about 1.5 to 2 times as broad as cords;
- a broad umbilicus, with gently sloping walls; sometimes a 3 spiral cords within;
- a light brownish colour.

This species is clearly close to *C. vaillanti* (P. Fischer, 1882). Dautzenberg and Fischer (1896) seem to consider that the two species are the same in comments of their description of *C. valida* (1906). So did also Dautzenberg (1927) in his records of *C. vaillanti*. But, considering the available material, *C. ambigua* seems to be different in having larger, blunt (not clearly sharp), less numerous nodules on P1 (about 8 instead of about 10) and 3 spiral cords inside the umbilicus (instead of only one at the most).

Calliotropis globosa Quinn, 1991

Figs 25–28

Calliotropis globosa Quinn, 1991: 168–170, figs 7–8.

Type material. Holotype and 2 paratypes USNM (859419 & 859420); 2 paratypes Academy of Natural Sciences of Philadelphia – ANSP (383289), 2 paratypes Florida Marine Research Institute – FSBC I (39515), 2 paratypes Florida Museum of Natural History – UF (169956), 2 paratypes Museum of Comparative Zoology Harvard University – MCZ (302452), 2 paratypes American Museum of Natural History – AMNH (232160), 2 paratypes University of Miami – UMML (308358).

Type locality. Jamaica, *John Elliott Pillsbury* stn P-1262, 17°21.4'N, 77°34.8'W, 805–1089 m.

Material examined. Madeira. Said to be found at south-east of Porto Santo, 32°26'N, 15°11'W, 790–840 m, B. Van Heugten coll., 2 dd.

Distribution. Jamaica, Cuba and American coast, from Yucatan to Venezuela and Suriname, 700–1100 m (Quinn, 1991); Madeira, 790–840 m.

Remarks. The main characteristics of this species (following the original description) are :

- height up to 9.7 mm, width up to 8.7 mm;
- a high spire, a slightly cyrtococonoidal shape, with up to 6 whorls;
- 3 granular cords on spire whorls;
- 4 granular spiral cords on the base;
- a sigmoid columella with a median tooth;
- a broad umbilicus without spiral cord within;
- a white nacreous colour.

The fact that this western Atlantic species, of which we got only one single record of 2 dead specimens, belongs to eastern Atlantic malacofauna needs certainly confirmation.

On the other hand, the presence of such a median columellar tooth (that can be seen on the illustration of the holotype in the original description) is amazing for a *Calliotropis* species. Further studies could maybe lead to move this species into Seguenziidae Verrill, 1884.

ACKNOWLEDGEMENTS

We would like to thank P. Bouchet (Muséum national d'Histoire naturelle, Paris) for reading the manuscript, giving advice and access to the malacological resources of the MNHN. We also warmly thank V. Héros (MNHN) for her dynamic help in our search of types and various scientific papers.

Also especially, the first author would like to thank M. Bruni (MOM) for her careful work regarding types of Dautzenberg and H. Fischer.

We are very grateful to J. Goud (NNML), K. Way and A. McLellan (NMH), E. Rolán (MHNSC), E. Schwabe (ZSM) and O. Soriano (MNCN) for the loan of types and specimens belonging to their institutions, to F. Deniz, J. Hernandez-Otero and B. Van Heugten for the loan of specimens of their collections, and to P. Hurst and R. Miguez (BMNH) for the kind sending of photographs of *Calliotropis infundibulum* types.

And we thank A. Gittenberger (NNML) for providing documents about CANCAP-project and E. Rolán (MHNSC) for bibliographic help.

REFERENCES

- Ardovini, R. & Cossignani, T. 2004. *West African Seashells*. L'informatore Piceno, Ancona. 319 pp.
- Bouchet, P. & Rocroi, J.P. 2005. Classification and nomenclator of gastropod families. *Malacologia* 47(1–2): 1–397.

- Abbott, R.T. 1974. *American seashells (2d edition)*. Van Nostrand Reinhold company, Inc. New York. 663 pp.
- Abbott, R.T. 1991. *Seashells of the Northern Hemisphere*. Gallery Books, W.H. Smith Publishers, Inc. New York. 191 pp.
- Cernohorsky, W.O. 1977. The taxonomy of some Southern Ocean mollusca mainly antarctic and subantarctic. *Records of the Auckland Institute and Museum* 14: 105-119.
- Dall, W.H. 1889. Reports on the results of dredging under the supervision of Alexander Agassiz in the Gulf of Mexico and in the Caribbean Sea (1879-80), by the U.S. coast survey steamer "Blake"... *Bulletin of the Museum of Comparative Zoology at Harvard College*. XXIX Report on the Mollusca. Part II.- Gastropoda and Scaphopoda. XVIII:1-492, 40 pls.
- Dall, W.H. 1890. Scientific results of explorations by the U.S. fish commission steamer Albatross. N° VII - Preliminary report on the collection of mollusca and brachiopod obtained in 1887-88. *Proceedings of the National Museum* XII(773): 219-362, pl. 5-14.
- Dautzenberg, P. 1889. *Contribution à la Faune Malacologique des Iles Açores. Résultats des campagnes scientifiques accomplies sur son yacht par Albert Ier prince souverain de Monaco* 1: 1-112.
- Dautzenberg, P. 1925. Mollusques nouveaux provenant des croisières du prince Albert Ier Monaco. *Bulletin de l'Institut océanographique* 457: 1-12.
- Dautzenberg, P. 1927. *Résultats des campagnes scientifiques accomplies sur son yacht par Albert Ier, prince souverain de Monaco. LXXII. Mollusques provenant des campagnes scientifiques du prince Albert Ier de Monaco dans l'Océan Atlantique et le Golfe de Gascogne*. Imprimerie de Monaco, 400 pp.
- Dautzenberg, P. & Fischer, H. 1896. Résultats des campagnes scientifiques de S.A. le Prince de Monaco. Dragages effectués par l' "HIRONDELLE" et par la "PRINCESSE-ALICE", 1888-1895. *Mémoires de la Société zoologique de France pour l'année 1896* 9: 395-498.
- Dautzenberg, P. & Fischer, H. 1897. Dragages effectués par l'Hirondelle et par la Princesse Alice 1888-1895. *Mémoires de la Société zoologique de France pour l'année 1897* 10: 139-234.
- Dautzenberg, P. et Fischer, H. 1906. Mollusques provenant des dragages effectués à l'Ouest de l'Afrique pendant les campagnes scientifiques du Prince de Monaco. 1: 1-112 (15 octobre 1889). *Résultats des campagnes scientifiques accomplies sur son yacht par Albert Ier, Prince souverain de Monaco* 32: 1-126.
- Hickman, C.S. & McLean, J.H. 1990. Systematic revision and suprageneric classification of trochacean gastropods. *Natural History Museum of Los Angeles County Science Series* VI+169 pp.
- Jeffreys J. G., 1878-1885. On the mollusca procured during the H. M. S. "Lightning" and "Porcupine" expedition. *Proceedings of the Zoological Society of London* - Part 6 (1883): 88-115 pl. 19-20.
- Kaicher, S.D. 1987. Card catalogue of world-wide shells. Trochidae Part 4. Pack #50. Cards 5048-5153.
- Land (van der), J. 1987. Report on the CANCAP-project for marine biological research in the Canarian - Cape Verde region of the North Atlantic Ocean (1976-1986). Part I. List of stations. *Zoologische verhandelungen* 243: 1-94.
- Locard, A. 1897. *Expéditions scientifiques du Travailleur et du Talisman pendant les années 1880, 1881, 1882, 1883. Mollusques testacés*. Tome 1: 1-516. Ed. Masson, Paris.
- Locard, A. 1898. *Expéditions scientifiques du Travailleur et du Talisman pendant les années 1880, 1881, 1882, 1883. Mollusques testacés*. Tome 2: 1-515. Ed. Masson, Paris.
- Marshall, B.A. 1999. A revision of the recent Solariellinae of the New Zealand region. *The Nautilus* 113(2): 4-42.
- Martens, E. von, & Thiele, J. 1904 "1903". *Dis beschalten Gastropoden der Deutschen Tiefsee-Expedition, 1898-1899*. A. Systematisch-geographischer Teil. Wissenschaftliche Ergebnisse der deutschen Tiefsee-Expedition auf dem Dampfer "Valdivia" 1898-1899, 7(A): 1-146.
- Nicklès, M. 1950. *Mollusques testacés marins de la côte occidentale d'Afrique*. Ed. P. Lechevalier. 269 pp.
- Nordsieck, F. 1968. *Die europäischen Meeres-Gehäuseschnecken (Prosobranchia)*. Gustav Fischer Verlag, Stuttgart. 273 pp.
- Nordsieck, F. 1982. *Die europäischen Meeres-Gehäuseschnecken (Prosobranchia)*. Gustav Fischer Verlag, Stuttgart. 539 pp.
- Quinn, J.F. Jr. 1979. Biological results of the University of Miami deep-sea expeditions. The systematics and zoogeography of the gastropod family Trochidae collected in the Straits of Florida. *Malacologia* 19(1): 1-62.
- Quinn, J.F. Jr. 1991. New species of *Gaza*, *Calliotropis* and *Echinogurges* from the North-West Atlantic Ocean. *The Nautilus* 105: 166-172.
- Rolán, E., Hernandez, J.M. & Deniz, F. 2005. Description of two new species of the genus *Solariella* (Gastropoda, Trochidae) from Canary and Mauritania. *Visaya* 1(5): 4-11.
- Rolán, E. 2005. *Malacological fauna from the Cape Verde archipelago*. Conchbooks, Hackenheim. 455 pp.
- Rubio, F. & Rolán, E. 1997. A new species of *Lirularia* de la islas de Sao Tomé y Príncipe, Africa Occidental. *Iberus* 15(1): 23-29.
- Thiele, J. 1925. Gastropoda der Deutschen Tiefsee-Expedition II Teil. *Wissenschaftliche Ergebnisse*

- der deutschen Tiefsee-Expedition auf dem Dampfer "Valdivia" 1898-1899*, 17(2): 35-282.
- Vilvens, C. 2004. Description of four new species of *Calliotropis* (Gastropoda: Trochidae: Eucyclinae: Calliotropini) from New Caledonia, Fiji and Vanuatu. *Novapex* 5(1):19-31.
- Vilvens, C. 2007. New species and new records of *Calliotropis* (Gastropoda: Chilodontidae: Calliotropinae) from Indo-Pacific. *Novapex* 8(HS 5): 1-72.
- Warén, A. 1976. New and little known mollusca from Iceland and Scandinavia. *Sarsia* 76: 53-124.
- Warén, A. 1993. New and little known mollusca from Iceland and Scandinavia. Part 2. *Sarsia* 78: 159-201.
- Warén, A. & Bouchet, P. 1991. Systematic position and revision of *Haloceras* Dall, 1889 (Caenogastropoda, Haloceratidae fam. nov.). *In*: Résultats des Campagnes MUSORSTOM, volume 7. *Mémoires du Muséum national d'Histoire naturelle (A)*150: 111-161.
- Warén, A. & Bouchet, P. 1993. New records, species, genera and new family of gastropods from hydrothermal vents and hydrocarbon seeps. *Zoologica scripta* 22(1): 1-90.
- Watson, R.B. 1886. Report on the Scaphopoda and Gasteropoda collected by HMS Challenger during the years 1873-1876. Report on the scientific results of the voyage of HMS Challenger, 1873-1876. *Zoology* 15: 1-680.
- CLEMAM (taxonomic database of the European Marine Mollusca), Department of Systematics & Evolution of the Muséum national d'Histoire naturelle, Paris, France: <http://www.somali.asso.fr/clemam> (last visit : 9/12/2007).