

PROTOCONCHS OF MURICIDAE PART 1

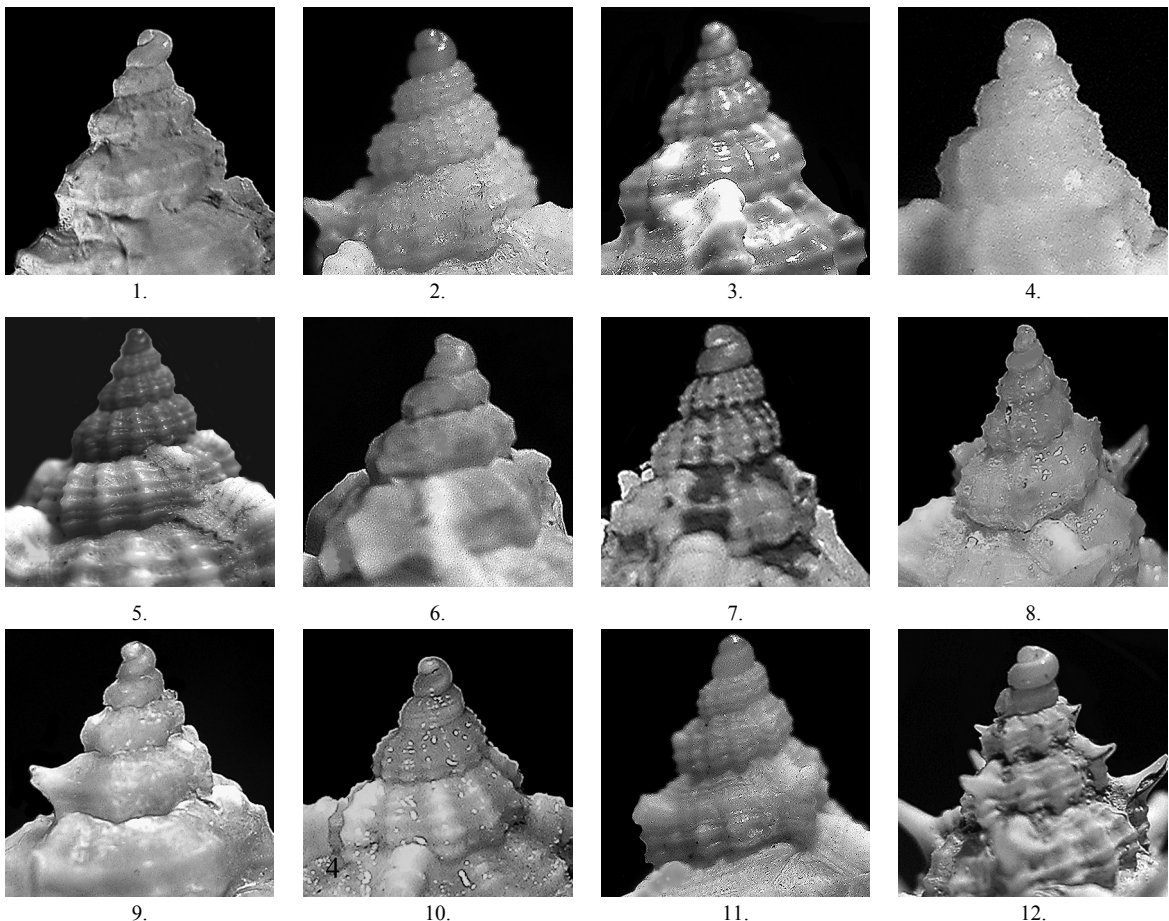
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Abstract: Protoconchs of muricid shells are often used as a diagnostic character for a specific level. The shape of protoconchs, number of whorls and their structure may be different. At first glance these characters can already be seen under a relatively low magnification of about 10 x. However the important point is the angle of view as is shown in this note where 65 protoconchs are pictured. In 62 of them the shape of the protoconch is rather similar and 138 other species with similar protoconchs are listed.

Key words: Mollusca, Gastropoda, Muricidae, taxonomy, diagnostic characters, protoconchs.

The protoconch in shells of gastropod molluscs is important for diagnosing taxa and it is often used as a specific character. In practice the protoconchs of many groups of gastropods show substantial differences, but sometimes they may have much in common and cannot be used to a certain extent in classification. The protoconch may be of a different shape, however, that depends also on the angle of view. Therefore an adequate impression of the true shape is of much importance.

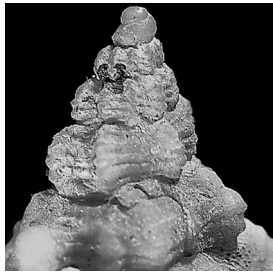
Pictures of the protoconchs of 65 species of the family Muricidae are here given. The photographed specimens belong either to the Malacological Collection of the Tel Aviv University (TAU) or to that of the senior author. Numbers of the specimens from the TAU collection are underlined. In 62 of the 65 species these protoconchs are similar to Figs 1-4: if observed from the same angle then this protoconch consists of about two smooth whorls which are regularly increasing in size.



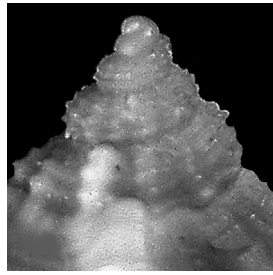
1. *Murex forskoeihii* Röding, 1798.
2. *Haustellum cabritti* (Bernardi, 1858).
3. *Murex chrysostoma* Sowerby, 1834.
4. *Murex spectabilis* Ponder & Vokes, 1988.
5. *Haustellum multiplicatus* (Sowerby, 1895)

6. *Murex carbonnieri* (Jousseaume, 1881)
7. *Murex olssoni* Vokes, 1967.
8. *Siratus formosus* (Sowerby, 1841).
9. *Murex tribulus* Linnaeus, 1758.
10. *Murex tryonia* Hidalgo in Tryon, 1873.

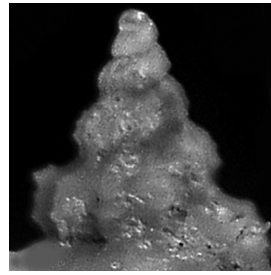
11. *M. acanthostephes* Watson, 1883.
12. *Murex tenuirostrum africanus*
Ponder & Vokes, 1988.



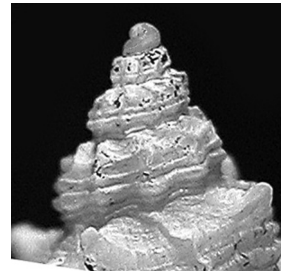
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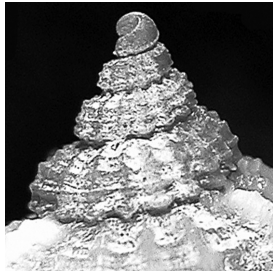
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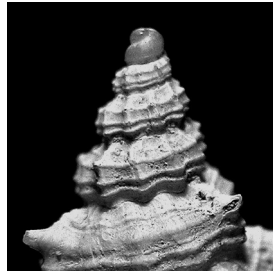
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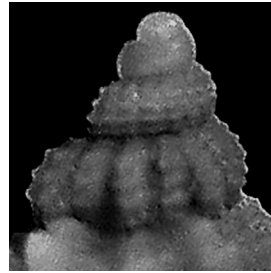
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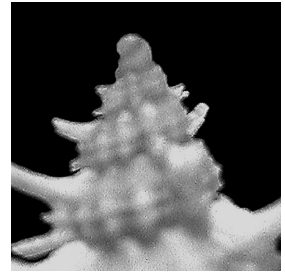
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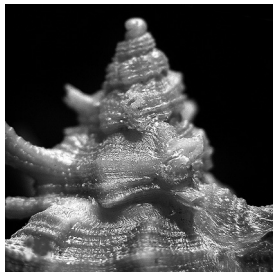
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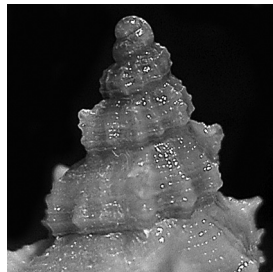
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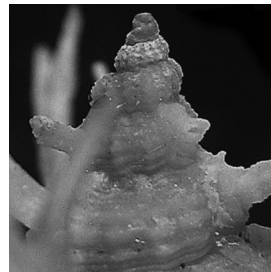
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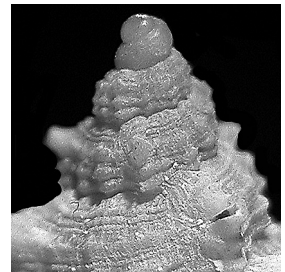
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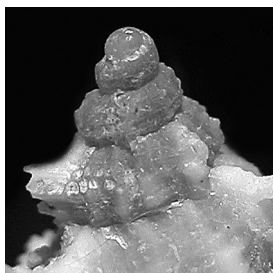
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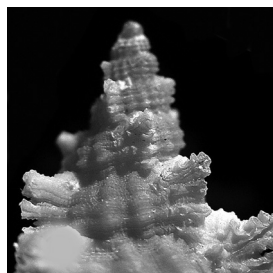
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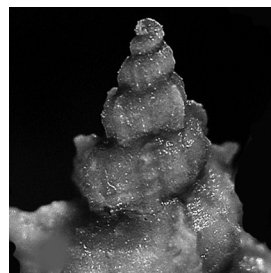
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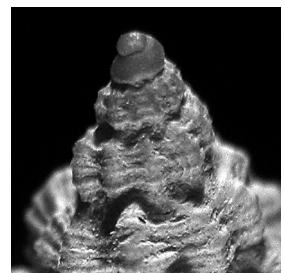
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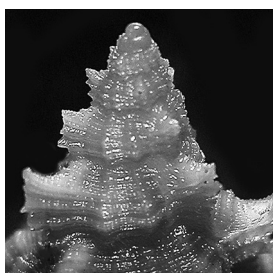
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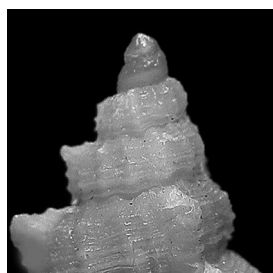
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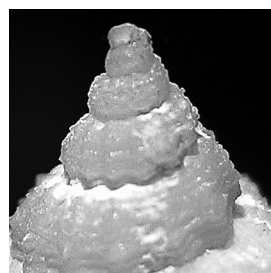
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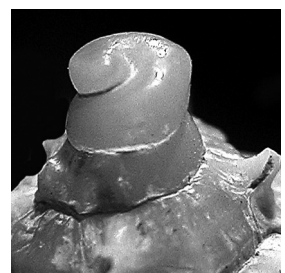
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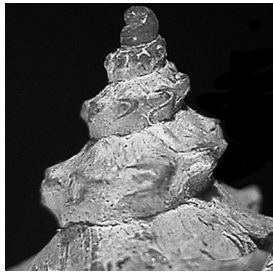
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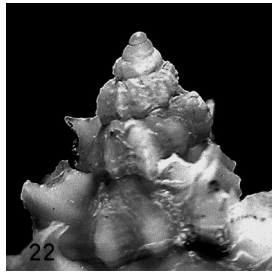
32.

13. *Haustellum rectirostris* (Sowerby, 1841).
 14. *Haustellum rubidus* F.C.Baker, 1897.
 15. *Haustellum ruthae* (Vokes, 1988).
16. *Haustellum mindanaoensis* (Sowerby, 1841).
17. *Haustellum multiplicatus* (Sowerby, 1895).
 18. *Haustellum sobrinus* (A.Adams, 1863).
 19. *Haustellum anniae* (Smith, 1940).
 20. *Haustellum bobyini* (Kosuge, 1983).
 21. *Chicoreus megrus* Vokes, 1974.
22. *Chicoreus damicornis* (Hedley, 1903).

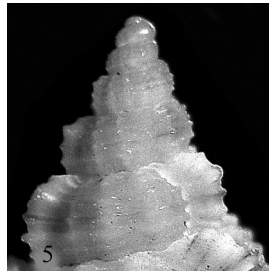
23. *Chicoreus cervicornis* (Lamarck, 1822); NW Australia.
24. *Chicoreus longicornis* (Dunker, 1864); QLD.
25. *Chicoreus denudatus* (Perry, 1811); Sydney.
 26. *Chicoreus strigatus* (Reeve, 1849).
 27. *Chicoreus setionoi* Houart, 2001; Indonesia.
 28. *Chicoreus territus* (Reeve, 1845).
 29. *Chicoreus corrugatus* Sowerby, 1841.
 30. *Chicoreus litos* Vokes, 1978; Mozambique.
31. *Hexaplex hoplites* (P. Fischer, 1876).
 32. *Murex somalicus* Parth, 1990.



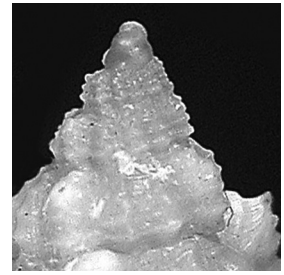
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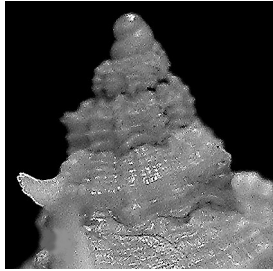
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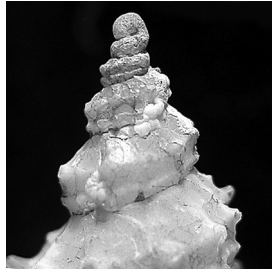
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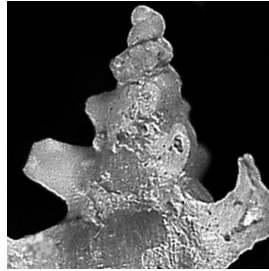
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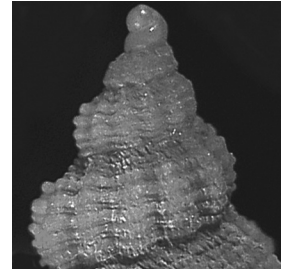
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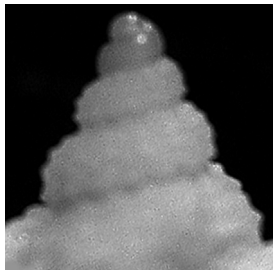
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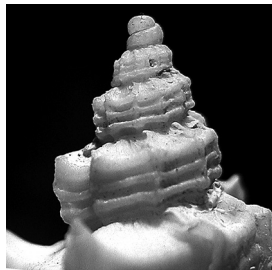
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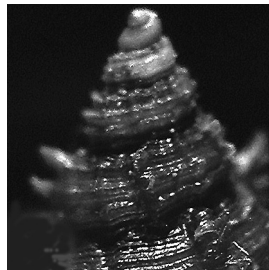
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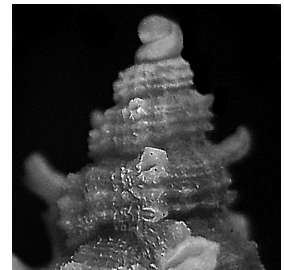
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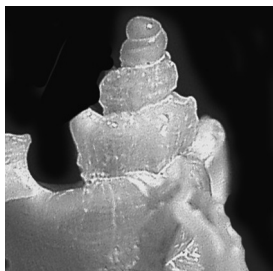
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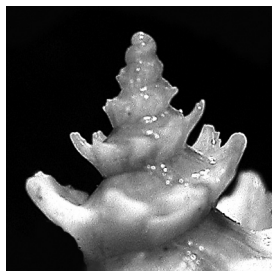
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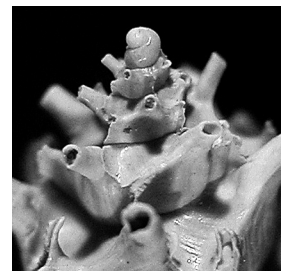
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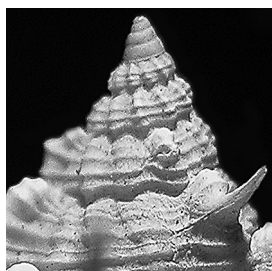
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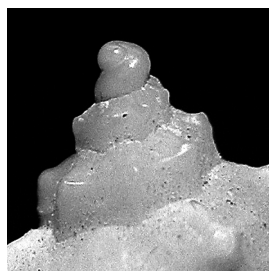
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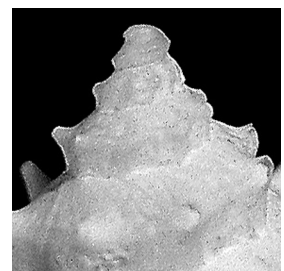
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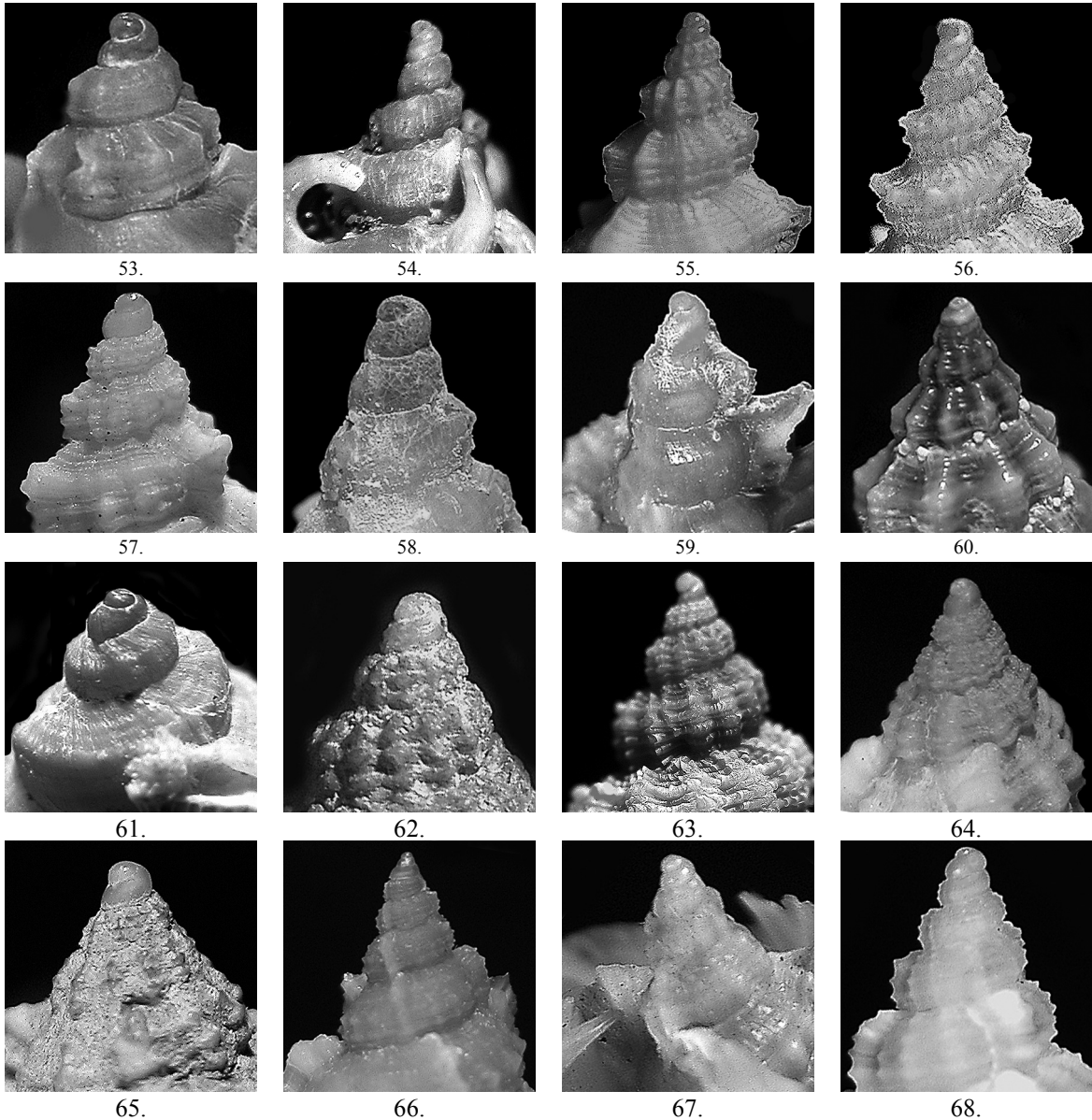
51.



52.

33. *Poirieria zelandica* (Quoy & Gaimard, 1833).
 34. *Siratus pliciferoides* (Kuroda, 1942); Philippines.
 35. *Siratus formosus* (Sowerby, 1841).
 36. *Siratus consuela* (Verrill, 1950); British W Indies.
 37. *Siratus cailleti* (Petit de la Saussaye, 1856).
 38. *Nipponotrophon gorgon* (Dall, 1913) Japan.
 39. *Favartia crouchi* (Sowerby, 1894).
 40. *Hadriania orecta* (De Gregorio, 1885).
 41. *Chicoreus florifer* (Reeve, 1846); Florida.
 42. *Chicoreus boucheti* Houart, 1983.

43. *Chicoreus dunni* Petuch, 1987.
 44. *Chicoreus bullisi* Vokes, 1974; Honduras.
 45. *Poropteron uncinarius* (Lamarck, 1822).
 46. *Trophon echinatus* (Kiener, 1848); Italy.
 47. *Murexsul azami* Kuroda, 1929; Japan.
 48. *Typhinellus sowerbyi* (Broderip, 1833).
 49. *Murex queenslandicus* Ponder & Vokes, 1988.
 50. *Murex ternispina* Lamarck, 1822.
 51. *Murex scolopax* (Dillwyn, 1817); Masirah I.
 52. *Murex occa* Sowerby, 1834.



53. *Pteropurpura plorator* (Adams & Reeve, 1849).

54. *Poropteron graagae* (Coen, 1947); Natal, S. Africa.

55. *Pteropurpura bequaerti* (Clench & Farfante, 1945); Florida.

56. *Pteropurpura modesta* (Fulton, 1936); Japan.

57. *Pteropurpura adunca* (Sowerby I, 1834); Japan.

58. *Pterynotus swainsoni* (Hertlein & Strong, 1951); Gulf California.

59. *Pterynotus vespertilio* (Kira, 1959).

60. *Ergalatax constricta* (Reeve, 1846); Japan.

61. *Pteropurpura esycha* (Dall, 1925) Japan.

62. *Ocenebra lurida* (Middendorf, 1848).

63. *Hadriania oretea* (De Gregorio, 1885); Spain.

64. *Siratus thompsoni* (Bullis, 1964) Surinam

65. *Poropteron multicornis* Houart, 1991.

66. *Naquetia annandalei* (Preston, 1910).

67. *Pterynotus miyokoae* Kosuge, 1979. Philippines.

68. *Haustellum dentifer* (Watson, 1883).

The pictures above belong to a first batch of various species belonging to the Muricidae in order to give a preliminary impression of the shape of their protoconchs. More detailed structure will perhaps be revealed if equipment with a better resolution is used.

The species of which the protoconchs are figured in this work are listed in Table. 1. The names underlined in the table are of those taxa, of which the protoconchs look differently from those figured in Ponder & Vokes (1988).

In Ponder & Vokes (1988) protoconchs of the species belonging to two genera: *Murex* and *Haustellum*, are given. Above we pictured the protoconchs of 14 species of genus *Murex* (## 1, 3-4, 6-7, 9-12, 32, 49-52) and 10 species of the genus *Haustellum* (## 2, 5, 13-20, 68). As can be seen in Table 1 our figures of 6 taxa in *Murex* and 4 in *Haustellum* are different from those in Ponder and Vokes (1988).

Table 1
Protoconchs of Muricidae pictured in this work

<i>Chicoreus boucheti</i> Houart, 1983. <i>Chicoreus bullisi</i> Vokes, 1974. <i>Chicoreus cervicornis</i> (Lamarck, 1822) <i>Chicoreus corrugatus</i> Sowerby, 1841. <i>Chicoreus damicornis</i> (Hedley, 1903). <i>Chicoreus denudatus</i> (Perry, 1811) <i>Chicoreus dunni</i> Petuch, 1987. <i>Chicoreus florifer</i> (Reeve, 1846) <i>Chicoreus litos</i> Vokes, 1978. <i>Chicoreus longicornis</i> (Dunker, 1864). <i>Chicoreus megrus</i> Vokes, 1974. <i>Chicoreus setionoi</i> Houart, 2001 <i>Chicoreus strigatus</i> (Reeve, 1849) <i>Chicoreus territus</i> (Reeve, 1845). <i>Ergalatax stricta</i> (Reeve, 1846) <i>Favartia crouchi</i> (Sowerby, 1894). <i>Hadriania oretea</i> (De Gregorio, 1885). <i>Haustellum anniae</i> (Smith, 1940). <i>Haustellum bobyini</i> (Kosuge, 1983). <i>Haustellum cabritti</i> (Bernardi, 1858); Honduras. <i>Haustellum dentifer</i> (Watson, 1883). <i>Haustellum mindanaoensis</i> (Sowerby, 1841). <i>Haustellum multiplicatus</i> (Sowerby, 1895). <i>Haustellum rectirostris</i> (Sowerby, 1841). <i>Haustellum rubidus</i> F.C.Baker, 1897. <i>Haustellum ruthae</i> (Vokes, 1988). <i>Haustellum sobrinus</i> (A. Adams, 1863). <i>Hexaplex hoplites</i> (P. Fischer, 1876). <i>Murex acanthostephes</i> Watson, 1883. <i>Murex carbonnieri</i> (Jousseume, 1881); Eritrea. <i>Murex chrysostoma</i> Sowerby, 1834; Tobago. <i>Murex forskoehlui</i> Röding, 1798; East Sinai. <i>Murex occa</i> Sowerby, 1834.	<i>Murex olssoni</i> Vokes, 1967. <i>Murex queenslandicus</i> Ponder & Vokes, 1988. <i>Murex scolopax</i> (Dillwyn, 1817). <i>Murex somalicus</i> Parth, 1990. <i>Murex spectabilis</i> Ponder & Vokes, 1988. <i>Murex ternispina</i> Lamarck, 1822. <i>Murex tribulus</i> Linnaeus, 1758; Papua New Guinea. <i>Murex tenuirostrum africanus</i> Ponder & Vokes, 1988. <i>Murex tryonia</i> Hidalgo in Tryon, 1873. Florida, Sarasota. <i>Murexsul azami</i> Kuroda, 1929 <i>Naquetia annandalei</i> (Preston, 1910). <i>Nipponotrophon gorgon</i> (Dall, 1913) <i>Ocenebra lurida</i> (Middendorf, 1848). <i>Poirieria zelandica</i> (Quoy & Gaimard, 1833). <i>Poropteron graagae</i> (Coen, 1947). <i>Poropteron multicornis</i> Houart, 1991 <i>Poropteron uncinarius</i> (Lamarck, 1822). <i>Pteropurpura adunca</i> (Sowerby I, 1834) <i>Pteropurpura bequaerti</i> (Clench & Farfante, 1945) <i>Pteropurpura esycha</i> (Dall, 1925) <i>Pteropurpura modesta</i> (Fulton, 1936). <i>Pteropurpura plorator</i> (Adams & Reeve, 1849). <i>Pterynotus swainsoni</i> (Hertlein & Strong, 1951) <i>Pterynotus vespertilio</i> (Kira, 1959). <i>Pterynotus miyokoeae</i> Kosuge, 1979. <i>Siratus cailleti</i> (Petit de la Saussaye, 1856). <i>Siratus consuela</i> (Verril, 1950) <i>Siratus formosus</i> (Sowerby, 1841). <i>Siratus thompsoni</i> (Bullis, 1864). <i>Siratus pliciferoides</i> (Kosuge, 1942). <i>Trophon echinatus</i> (Kiener, 1848). <i>Typhinellus sowerbyi</i> (Broderip, 1833).
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One can find in the works, mentioned below, drawings and photographs of the protoconchs of another 138 Muricid species of which the shape is similar to Fig. 1 above. Perhaps we can already consider such a shape of protoconchs as typical to a large group of Muricidae and name it Type 1.

Discussion and preliminary conclusions:

1. A protoconch—the larval shell—is widely used for separating species of Muricid gastropods (Radwin & D'Attilio, 1976). It is often considered to be an important distinguishing feature of a species in the family Muricidae. As mentioned in Ponder and Vokes (1988): “In some cases species are hardly separable on teleoconch characters but have completely different protoconchs, presumably at least partly, as a result of the species employing a different development strategy.”
2. At first glance one can easily examine the protoconch with the help of a simple magnifying glass of at least 10 x and good light. When doing this it is important to examine the protoconch from different angles in order to find the most adequate view of its three dimensional shape.

3. It is of course an oversimplification just to look at the protoconchs using only a magnifying glass because with better equipment giving a higher resolution one can examine also details of the structure of the whorls of the protoconch.
4. Pictures of the protoconchs of 65 Muricid species given above are similar and can be treated as "Type 1". More detailed pictures will be given when new equipment becomes available.
5. A shape of a protoconch in many species of Muricidae may be similar if observed at the proper angle. Hence several questions arise:
 - To what extent does the protoconch vary in shape and structure within a species?
 - Does the shape of the protoconch always functions as a diagnostic character at the specific level?

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