

A HISTORICAL REVIEW OF THE
MOLLUSKS OF LINNAEUS

PART 5. THE GENUS *MUREX* OF THE
CLASS GASTROPODA

HENRY DODGE

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COLLATERAL NOTES

1. IN THE PRESENT SERIES of papers I have frequently quoted from the footnotes in the second edition of Lamarck's "Histoire naturelle des animaux sans vertèbres," by Deshayes and Milne Edwards. These footnotes are extremely useful in any historical study of the molluscan names, particularly those of the Linnaean species, as they represent the most critical, if not the first, of the early attempts to solve the many nomenclatural tangles caused by the frequent unauthorized changes of specific names by the earlier post-Linnaean writers. Born, Röding, Link, Lamarck, Kiener, and many others not only proposed new names for an appreciable number of Linnaeus' species, but at times borrowed the Linnaean names themselves for new species not known to Linnaeus. These latter cases were not always due to a mere error in identification, as it sometimes appears that these writers misused a Linnaean name with full knowledge of such misuse. Lamarck was the worst offender in the matter of changing Linnaean names. In some instances his act was probably motivated by his seeming antipathy to tautonymic names, in cases where the author of a post-Linnaean genus had adopted, for his generic name, the name of a Linnaean species. To mention but a few, compare *Hippopus hippopus* (Linné) with *Hippopus maculatus* Lamarck, *Pectunculus pectunculus* (Linné), changed to *Pectunculus pectiniformis* Lamarck, *Malleus malleus* (Linné), changed to *Malleus vulgaris* Lamarck, *Dolium dolium* (Linné), changed to *Dolium maculatum* Lamarck, *Harpa harpa* (Linné), changed to *Harpa ventricosa* Lamarck. For some species his changes seem based on a desire to avoid even *virtual* tautonymy. Witness *Scalaria scalaris* (Linné), which became *Scalaria pretiosa* Lamarck, and many others. His other changes, in which a tautonymic name was not involved, were made for unknown reasons, but I strongly suspect that they were based on an unreasoning chauvinism. He wrote in an era in which the French natural and physical scientists led the world. Beginning with the Encyclopedists Diderot and d'Alembert, earlier in the eighteenth century, and followed by Buffon, Daubenton, Bruguière, Olivier, Cuvier, Lamarck, and Latreille, France, in Lamarck's

day, had attained preëminence not only in philosophy but in the sciences. Was it not a natural temptation to Lamarck, in producing another monumental work, and writing in the effulgence lent by his predecessors and contemporaries, to arrogate to himself the right to invent, rather than to copy the names proposed by a man who had not then attained the stature that he now has? In Lamarck's world Linnaeus was considered as one of a group of competent naturalists along with Gmelin, Martini, Chemnitz, Müller, and other foreign writers. Indeed, it seems that Lamarck regarded Gmelin as the paramount authority rather than Linnaeus. There is not a single reference to the "Systema naturae" of Linnaeus in the original edition of the "Histoire naturelle," as Lamarck referred to the Linnaean names only as "Lin. Gmel." One would say that he did not own a copy of Linnaeus' own work, and it need hardly be pointed out that Gmelin was often a dangerous guide to follow. If Lamarck's motive was not a patriotic one, to use a word more dignified and less opprobrious than "chauvinistic," then we must believe that his unwillingness to adopt the names of his predecessors, where no excuse of tautonymy was involved, was based on a feeling of self-importance, as distinct from a natural jealousy for the scientific honor of his country. This is a less admirable reason, to say the least, and one that I prefer not to consider. In any case, the constant suppression of valid prior names was a very human failing, and I do not intend, by referring to it, to depreciate Lamarck's greatness as a naturalist or the value of his work. In his day no Rule of Priority had been laid down for zoologists, although the need for such a rule was already apparent in the works of some of his contemporaries. Indeed, Deshayes and Milne Edwards, in the footnotes, did not hesitate to criticize Lamarck for his disregard of the older names, very emphatically saying, in several instances, that science could never progress if such a course were adopted.

2. The second edition of the "Histoire naturelle," edited by Deshayes and Milne Edwards, on page 8 of the "Avertissement" to the first volume, states the manner in which the collaborators divided the work:

"The Introduction, the Radiolaria, the echinoderms, and the mollusks have been done by M. Deshayes; the apathetic animals ["animaux apathiques"], except those mentioned above, the arachnids, the Crustacea and the annelids, by M. Milne Edwards." I do not think that this division has been appreciated by many writers, as, in the volumes covering the Mollusca, the footnotes use both the pronouns "we" and "I." As Milne Edwards did not collaborate in these particular footnotes, the use of the plural pronoun was apparently merely an employment of the editorial "we." This poses a problem in translation, in order to make it certain that the opinions expressed are those of Deshayes alone. Therefore, in the present paper and all future parts of the work, I shall refer to Deshayes and Milne Edwards in citing the "Histoire naturelle" itself, but quotations from the footnotes on Mollusca will be credited to Deshayes and the singular pronoun used even where this involves, technically, an incorrect translation.

3. Students citing references to figures used by Gmelin, Röding, Dillwyn, and Lamarck should note that these authors erroneously attributed the fourth volume of the Martini-Chemnitz work to Martini. Only the first three volumes were written by Martini. This same error was carried into the second edition of Lamarck's work by Deshayes.

4. Dillwyn's "Descriptive catalogue of Recent shells" (1817) has been frequently referred to by the present writer. This is an extremely elaborate work of over 1000 pages in two volumes, consecutively paged, which is described by its author, on the post-title page, as an "attempt to elucidate the species of shells described in Gmelin's edition of the *Systema naturae*, and to pave the way for a better arrangement." Even 50 years after the appearance of the twelfth edition of the "Systema" and 26 years after the publication of Gmelin's work, none of the good genera erected since Linnaeus were considered, all species described being included in the original Linnaean genera, although Dillwyn referred to several of the authors of these new genera in his synonymies and listed the synonyms under the new generic names. It is today a useful work in only two particulars: the synonymies are extremely full, and it is

the medium that first validated many of the Solander names which had not been validated by Humphrey in the "Portland Catalogue." (See Dodge, 1956, p. 157.) Great care must be taken, however, in using Dillwyn's synonyms, as errors are found which are not corrected in his "Addenda and corrigenda" at the end of his second volume (pp. 1091-1092). Moreover, the work contains few critical comments on the synonyms listed and little discussion of taxonomic questions. The work is, in the last analysis, a collection of synonymic and locality data. As to locality, Dillwyn apparently reported every mention available to him, without troubling to sift them or comment on those that were known to be erroneous even in 1817.

A contemporary criticism of the work can be found in Turton's "Conchological dictionary" (1819, pp. xii-xv). Turton, in his notes on conchological writers, there went into great detail in his strictures on the "Descriptive catalogue," saying that it offered nothing more than a collation of different authorities.

5. In the discussion of *Strombus succinctus* (Dodge, 1956, p. 278) the writer stated that in the twelfth edition of the "Systema" (p. 1212, no. 509) the name of that species was printed "ccinctus," the first two letters "su" having apparently been omitted through a printer's error, and that either "accinctus" or "succinctus" could have been chosen by readers. I added that the correction had been made by Linnaeus himself, who had written "succinctus" opposite the abbreviated name in his interleaved copy of the twelfth edition. I was unfortunately not aware of a list of "errata" on the last page of volume 3 of the "Systema" (*Regnum lapidum*), in which this item appeared: "Tom. 1. p. 1212. accinctus—lege succinctus." My mistake was caused by the fact that in the copy of the twelfth edition used by me a previous owner had written the letters "su" at the beginning of the name, an addition which obliterated the letter "a" which, according to Linnaeus' "errata" had been originally used, as I have since confirmed by examining another copy of the work. What therefore appeared to have been a printer's error was in fact a deliberate change of name by Linnaeus, although with little or no change in meaning.

CLASS GASTROPODA

MUREX LINNAEUS

Murex haustellum

1758, *Systema naturae*, ed. 10, p. 746, no. 493.

1767, *Systema naturae*, ed. 12, p. 1213, no. 518.

LOCALITY: "In O. Asiae" (1758, 1767).

"M. testa ovata tuberculata, cauda elongata subulata recta muricata."

The above description, which was the same in the tenth and twelfth editions of the "Systema," is scarcely sufficient to define the species, although it is probably clear enough to distinguish *haustellum* from the other long-beaked murices, *tribulus*, *cornutus*, and *brandaris*, which immediately follow it. This distinction is expressed by the lack of any mention of spines except the "prickles" on the siphonal canal, and the word "tuberculata," although *brandaris* is somewhat more tuberculate. The species is here redescribed:

Whorls convex, suture deep; three heavy varices on body whorl and spire with three strong ribs in interspaces; spiral sculpture of close-set brown cords crossing ribs and varices, making the ribs nodulose; siphonal canal open, straight, slender, and occupying approximately two-thirds of the length of the entire shell and bearing two to five extremely short but sharp spines or "prickles." No spines on rest of the shell except for a few such "prickles" at posterior end of body whorl on the left side of each varix; aperture an almost perfect oval, with an erect, flaring margin free from the body whorl except at the posterior end of the parietal wall.

The wide range of *haustellum*, from the Red Sea to the Philippines, is correctly but very broadly covered by the locality "In O. Asiae." The specific name was derived from Rumphius.

The synonymy is generally correct, although the figure from Argenville is uncharacteristic in everything but shape (1742, pl. 19, fig. B). Argenville, in his text, called the species "the Woodcock" because of the resemblance to the long bill of that bird. The figures from Buonanni (pl. 268), Rumphius (pl. 26, fig. F), Gualtieri (pl. 30, fig. E), Klein (pl. 4, fig. 81), and Seba (pl. 78, figs. 5–6) are all good and recognizable figures of *haustellum*. An excellent figure from Lister (pl. 903)

was added by a manuscript note in Linnaeus' revised twelfth edition. It is not surprising that, in spite of the brief description, the presence of this accurate synonymy led to the immediate identification of the species.

A properly marked specimen is found in the Linnaean collection in London which is therefore accepted as Linnaeus' type.

The description in the "Museum Ulricae" supplies most of the deficiencies in the "Systema" diagnosis and unquestionably describes the *haustellum* of all authors. The phrases "transversim striata," "interdum etiam spinis rarissimis brevis," referring to the occasional "prickles" on the body whorl above mentioned, "Apertura . . . margine prominens," and "Spirae anfractus convexi, costati et nodosi" are particularly instructive. A specimen properly labeled *Murex haustellum* is found in the Uppsala collection.

I refer the species to the subgenus *Brontes* Montfort, 1810, *non* Fabricius, 1801, of which it is the type, by original designation. It is placed by some systematists in *Haustellum* Klein, 1753 (pre-Linnaean). Klein's name was revived by Schumacher (1817, p. 213) who called the Linnaean species *H. laeve*.¹ *Brontes* is distinguished from *Murex*, *sensu stricto*, principally by the absence of spines on the varices. It is identical with *Haustellaria* Swainson, 1840.

Murex haustellum is very well figured in Martini (1769–1777, vol. 3, pl. 115, fig. 1066). It is also figured by Sowerby (1820, 1825–[1834], vol. 2, pl. 224, fig. 1) and by Reeve (1843–1878, vol. 3, *Murex*, pl. 23, sp. 95).

*Murex tribulus*²

1758, *Systema naturae*, ed. 10, p. 746, no. 444.

1767, *Systema naturae*, ed. 12, p. 1214, no. 519.

¹ Schumacher's genus *Haustellum* is a badly conceived group, as it included, in addition to *haustellum* Linné, *Murex spirillus* Linné (p. 156, below), which Schumacher renamed *H. carinatum*. The latter resembles *haustellum* only in the abrupt constriction of its body whorl where it joins the anterior canal, and in its long and straight canal. It has been separated from the Muricidae and is now placed in *Tudicla* Röding, 1798, in the family Vasidae.

² The name *tribulus* was borrowed from Rumphius. It is the Latin name for the thorny plant *Tribulus terrestris*, the "puncture vine."

LOCALITY: "In O. Asiae" (1758); "in O. Asiae, Java" (1767).

"M. testa ovata spinis setaceis trifariis, cauda elongata subulata recta similiter spinosa . . . Nobilior varietas* spinis longissimus integris parallelis pectinata."

Of the several species in *Murex*, *sensu stricto*, which are known by the vernacular name "Venus Combs," only *M. tribulus* is described in the "Systema naturae." The description of that species is, however, so generalized, although entirely accurate, that it can be read as covering almost any of the group. If the description contains any suggestion of a restriction, it is in the word "integris" as applied to the spines. This word might be held to exclude almost all of the group except *tribulus*, and would certainly exclude *M. scolopax* Dillwyn and *M. tenuispina* Lamarck, both of which are shown in the synonymy. The spines of these species show a filled-in furrow, which indicates that they were at least partially open in an earlier stage of growth. I have not seen this condition in any of the series of the true *tribulus* examined.

The elaborate synonymy also covers several species and makes it obvious that Linnaeus considered all of them varieties of a single species. Hanley (1855, p. 280) analyzed the figures and assigned them as follows: To *tenuispina* Lamarck he attributed the figures from Buonanni (pl. 269), Argenville (1742, pl. 19, fig. A), Olearius (pl. 39, fig. 1), Seba (pl. 78, figs. 1-3), Rumphius (pl. 26, fig. 3), and Gualtieri (pl. 31, fig. B); for *ternispina* Lamarck, which I am treating as conspecific with *tribulus* Linné, Rumphius (pl. 26, fig. G), Colonna (pl. 60, fig. 6), and Petiver (pl. 101, fig. 16, added in a manuscript note in Linnaeus' copy of the twelfth edition). The remaining figures, Seba (pl. 78, fig. 4), Lister (pl. 902, fig. 22), and Gualtieri (pl. 31, fig. A), should, according to Hanley, also be attributed to *ternispina*, "though less characteristically."

It is difficult to quarrel with this or, indeed, any analysis of the figures. The variation in the size, number, and disposition of the spines in this group of shells is so great, even in a single species, that any opinion as to some of the figures must be tentative only. It is certain, however, that the synonymy con-

tained undoubted figures of *tenuispina* and *tribulus* (*ternispina* Lamarck), and I would add to Hanley's list the fact that the figures from Rumphius (fig. G), Gualtieri (fig. A), and Seba (fig. 4) should be referred to *M. scolopax* Dillwyn. As to *ternispina*, although that name has been widely used as denoting a good species, and museums contain many specimens so labeled, I suggest that it cannot be distinguished from the *tribulus* of authors. Lamarck's original description (1822b, p. 158) said that its anterior spines were three in number, two being long and one "minore," and that the posterior recurved spines were shorter. Tryon (1879-1888, vol. 2, p. 78), on the other hand, said: "Its spines are not so stout, and the upper and middle series on the body whorl are not much larger than the others, as in *tribulus*." Although he tentatively listed it as a good species, he qualified this by saying: "It is by no means readily distinguishable from that species [*tribulus*]," and later, "Its claims to specific rank are allowed with considerable hesitation." It should be noted that Rumphius used the name *tribulus* for his figure G, cited by Linnaeus, which Hanley identified as showing *ternispina*. Hanley avoided a definite solution of this question by saying that while "one almost hesitates" to unite the two species, "one avoids, however, by so doing, the difficulty of pronouncing what species was the *ternispina* of Lamarck." This is, if anything, a stronger expression of doubt than that of Tryon. In summary, I consider the synonymy as covering *tribulus* Linné, *scolopax* Dillwyn, and *tenuispina* Lamarck.¹

The first post-Linnaean figures of the Venus Combs are found in Martini (1769-1777, vol. 3, pp. 363-368, pl. 113, figs. 1052-1056). Figure 1052 was undoubtedly meant for *M. scolopax* Dillwyn, although it lacks some of the features of that species. Figures 1053-1054 were probably meant for *tribulus*,

¹ Linnaeus' asterisks after certain of his cited figures are meant to refer to the "Nobilior varietas" of the sub-description. This is confusing in two respects. First, the variety referred to is probably two varieties, as it is described both as "spinis longissimus" and "integris," thus including both *tenuispina* and *tribulus*, and the two descriptive words are mutually exclusive for these species. Second, the starred figures include both Rumphius figures and both Gualtieri figures, but each pair shows *tribulus* as well as *tenuispina*.

although they also have defects. Figure 1055 is to me unrecognizable. Figure 1056 suggests the species later called *rarispinga* by Lamarck and was probably modeled on a specimen of that shell. All five figures were referred to the *Murex tribulus* of the "Systema" and the "Museum Ulricae." In the eleventh volume of Chemnitz (p. 101, pl. 189, figs. 1819–1820) a species called "*Murex tribulus maximus*" was described and figured. Not only is the name suggestive of *M. scolopax*, a much larger shell than *tribulus*, but the figures are incontestably *scolopax*. Chemnitz supplied no references and mentioned only the English and French vernacular names for the shell, "Great thorny Woodcock" and "La grande Becasse épineuse." His next species in that volume (p. 103, pl. 189, fig. 1821, and pl. 190, fig. 1822) was called "*Murex tribulus duplicatus*. The double spined thorny Woodcock." His specific name was probably derived from Rumphius' "Dubbelde Spinnekop," Klein's "Tribulus rostratus duplex," and Knorr's "Dubbelde getakte Spinnekop," which were all names given to shells in which each of the three longitudinal rows of spines on the anterior canal is "doubled" by a series, often incomplete, of short, intercalary spines, as in *M. tenuispina* Lamarck. The Rumphius and Knorr figures thus named were later cited by Lamarck for his *tenuispina*, and the two Chemnitz figures in question unequivocally show that species. This identification of the words "duplex" and "duplicatus" as used by the early writers is confirmed by Martini's division of his long list of references into two groups: "A. *Hystrix aculeis duplicatis*" and "B. *Hystrix simpliciter* in triplici serie aculeatis" (italics mine), although he unnecessarily confused the grouping by using the word "triplici" only for group "B," whereas all the Venus Comb shells have the spines arranged in three major longitudinal series, disposed on the varices of body whorl and spire, and continuing, to a greater or less degree, along the canal. Chemnitz, for his "tribulus duplicatus," cited most of the figures and descriptions placed by Martini in his group "B."¹

¹ Linnaeus' mixture of more than one species in his synonymy of *tribulus* is reflected in the following entry in the Portland Catalogue, no. 3366: "A fine specimen of a scarce variety of *Murex tribulus* Linnaei the *Venus's Comb*, or double spined Woodcock from China, rare."

Born's *Murex tribulus* (1780, p. 287, unfigured), which he referred to the *tribulus* of the twelfth edition, is divided into two groups: (a) "*Spinis simplicibus, alternis majoribus*," and (b) "*Spinis subaequalibus, duplicatis*," thus embracing those species which have the single rows of spines and those with a double or intercalary row. His synonyms for the two groups do not, however, follow this grouping, each synonymy containing figures of both groups. This is true not only of the synonyms taken from the "Systema," but those added by Born himself. While he attempted to separate Linnaeus' composite species into varieties, his was still composite.

Röding's *Murex tribulus* (1798, p. 145) was based on the Martini figures 1052–1054. None of these figures are entirely conclusive, but figure 1052 was probably meant for *M. scolopax* Dillwyn, figure 1053 was also *scolopax*, although it fails to show the brown ribs of that species, and figure 1054 may have been meant for *tribulus*.

Dillwyn (1817, pp. 681–682) contributed to the separation of the species included in Linnaeus' synonymy only by erecting the species *Murex scolopax*, which had been figured in some of Linnaeus' references. It was described as having "the three rows of spines thicker, and their interstices marked with reddish slightly elevated ribs, and obsolete transverse striae," and being "larger and stronger" than *tribulus*, a graphic description of the principal distinguishing characters of the shell, although he omitted a reference to the partial "doubling" of the three rows of spines. Dillwyn's diagnosis of *tribulus* was not so satisfactory. The description was identical with that of *scolopax* except for the substitution of the words "with . . . cancellated striae" for the expression "with . . . darker transverse ribs" for *scolopax*. He cited for it not only the fairly accurate Martini figures (1053–1054) but also *tribulus* Born, which was probably *tenuispina* Lamarck, and Martini's figures 1055–1056, one of which is unrecognizable and the other resembles *rarispinga* Lamarck, and is certainly not *tribulus*. He also listed a "Variety A," based on several figures, most of which show *tenuispina*, and a "Variety B. With crowded spines, and some as long as the

beak," citing for it figures that are certainly not the true *tribulus* and most of which are *tenuispina*. The latter is the only species of this group in which the longest spines even approach the length of the anterior canal. He nowhere mentioned the intercalary spines, with which the pre-Linnaean writers were so understandingly preoccupied, although these are seen in both *scolopax* and *tenuispina*, but which are either lacking in *tribulus* or represented by two or three extremely fine "prickles."

With Lamarck we find the first serious attempt to separate the species involved in Linnaeus' composite species, although his result was not entirely accurate. His first species was *M. crassispira*, a new name, for which he referred not only to *M. tribulus* Linné but the "*Murex tribulus maximus*" of Chemnitz. He failed to mention *M. scolopax*¹ by that name and did not refer to the double sets of spines. He also cited three of Martini's figures (1052-1054), one of which is *tribulus* and one *scolopax*. *Murex crassispira* is therefore a composite species, and the name is no longer used. I do not know what species Lamarck had before him, but he said that it was in his cabinet and was "fairly common in collections." His specimen was probably *scolopax*, as, in spite of his inclusion of *tribulus* in his synonymy, he used the vernacular name "grande-becasse épineuse" in his French description. Deshayes not only disagreed as to the identity of Lamarck's type but strongly criticized his unnecessary erection of *crassispira*. His remarks (1838-1845, vol. 9, pp. 564-565, footnote) are quoted almost in full: "It is quite certain that this species is the same as that named *Murex tribulus* by Linné. Lamarck himself recognized this in citing the Linnaean name as the beginning of the synonymy; it is thus necessary to restore to this species a name which it never should have lost. It is admitted that Linné referred to his species some figures of the following, *Murex tenuispina*; but this confusion, which is easily rectified, does not authorize a change in the name of the species." After a reference to the locality of the species, Deshayes continued: "We should note that

Lamarck confuses two quite distinct species in his synonymy, one the true *tribulus* of Linné, to which the name should be restored; the other the *Tribulus maximus* of Chemnitz out of which Dillwyn created *Murex scolopax*. This *Murex* had already been figured by Chemnitz [error for Martini] as a variety of *Tribulus*, pl. 113, f. 1052. In order to purify the synonymy of the *Murex crassispira* of Lamarck, it is necessary to suppress the figures which we have just mentioned." This language is an adequate restriction of Lamarck's composite description and synonymy of *crassispira* to *tribulus* Linné.

In my opinion, Lamarck also erred in erecting *M. ternispina* as a good species. He cited for it the "*Tribulus duplicatus*" of Chemnitz, which should be referred to his *M. tenuispina*, and those figures cited by Linnaeus that show shells with the spinose rows partially "doubled." *Murex ternispina* should also be considered a synonym (form) of *M. tribulus* Linné.

Lamarck's other species of the Venus Comb group, *tenuispina*, *rarispira*, and *brevispina*, are accurately described, and their specific separability is now established. The last was supplied with no references, but *tenuispina* was referred to many proper pre-Linnaean figures and to the "*Murex tribulus duplicatus*" of Chemnitz. *Murex rarispira* was referred only to Martini's figure 1056, which was the only adequate figure of the species in the literature up to Lamarck's day.

In 1845, Reeve (1843-1878, vol. 3, *Murex*, pl. 20, fig. 82), figured *tribulus*, and, as did most of his contemporaries, *ternispina* as well. He quoted Deshayes' comments on *crassispira*, however, with approval. He also erected a new species, *m. nigrospinosus* (*tom. cit.*, pl. 20, sp. 79). This latter species cannot be specifically separated from *tribulus*. It seems to be merely a color form in which the spines, and in most specimens only their tips, become dark brown.

The writer is not entirely clear as to the views of Hanley (1855, pp. 279-280) on this complex. The only categorical statement that emerges from his involved locutions and his peculiar punctuation is that he could not distinguish Lamarck's *crassispina* from his *ternispina*. Hanley's remarks on this question are here quoted, in order that the reader may

¹ Lamarck, even as late as 1822, seems to have been ignorant of Dillwyn's work.

have the opportunity of solving the puzzle for himself: "Under this name [*Murex tribulus*] our author included, not alone in the 'Museum Ulricae,' but likewise in both editions of the 'Systema,' both the *Murex tenuispina* of Lamarck (Reeve's Conch. Icon. Mur. fig. 85) and his *M. ternispina* (as figured by Sowerby, Conch. Ill. f. 110, and by Reeve). The latter species I cannot distinguish in the 'Animaux sans Vertèbres' from *crassispina*, and must trust therefore to the accuracy of the two writers just mentioned. In the 'Conchologica Iconica,' where both are defined, the *crassispina* may be easily distinguished from being devoid of the intermediate set of differently-disposed short spines upon its tail, but this shell, which corresponds best to Lamarck's description, is not imaged forth in his synonyms, which appear, on the contrary, to represent the *ternispina* of our English conchologists, and were possibly only quoted in default of more correct delineations being known to him. I am thus prolix, because the shell confused by Linnaeus with *tenuispina* is generally understood to be *crassispina*, which it certainly is of the Lamarckian synonymy, not so, if our English authors have rightly comprehended the species, of his description." In interpreting these comments one must realize that Hanley's acceptance of either *crassispina* or *ternispina* as a good species does not conform to the present writer's views.

Hanley, however, made a twofold contribution to our understanding of this group of species. He was the first to mention the intercalary spines in *M. tenuispina* since Linnaeus' phrase in the "Museum Ulricae," "inaequales, alternis minoribus." I have construed this phrase to refer to the intercalary series of short spines rather than to a difference in the length of the spines in the principal series, which is not particularly evident in *tribulus*, but more strikingly developed in *tenuispina*. Second, he reported his discovery, in the Linnaean collection in London, of the marked type of Linnaeus' *tribulus*, which Hanley, however, called *ternispina*. The photograph of the type in the microfilm of the collection is certainly the variety *ternispina*.

The treatment of *M. tribulus* in the "Museum Ulricae" also covers a composite spe-

cies. Only four figures were cited: Rumphius' figure G is probably *scolopax*, is drawn on a reduced scale, as compared with his figure 3 of *tenuispina*, and shows the intercalary spines, but these are coarser than the spines of the latter; Argenville's figure, which is clearly *tenuispina*; and both Gualtieri figures, which respectively show *scolopax* and *tenuispina*.¹ The added subdescription contains phraseology applying to both. "Spinae . . . inequales alternis minoribus" applies more closely to *tenuispina* or *scolopax* than to *tribulus*, as do the words "Spinae . . . fissae." On the other hand, Linnaeus here recognized the lack of fissured spines in *tribulus*, as he did in the "Systema," by the words "Nobilis tantum hac testam Spinarum longitudo, aequalitas, integritas." The collection at Uppsala contains specimens of the true *tribulus* and of *tenuispina*, both labeled *tribulus*. I have already, in these papers, pointed out the reasons for treating these labels as lacking authority.

Murex tribulus is the type species of *Murex* Linné, as now restricted, by subsequent designation, Montfort, 1810, as *Murex pecten*. Synonyms of *Murex*, *sensu stricto*, are: *Aranea* Perry, 1810, type species *A. gracilis* Perry, by monotypy, a shell which equals *M. tenuispina* Lamarck; *Tubicauda* Jousseaume, 1880, type species *M. brevispina* Lamarck, by monotypy; and *Acupurpura* "Bayle" Jousseaume, 1880, type species *M. tenuispina* Lamarck, by monotypy.

Synonyms of *M. tribulus* are: *M. ternispina* and *crassispina* Lamarck; *M. nigrospinosus* Reeve; and *M. pecten* Montfort.

It is figured by Reeve (1843-1878, vol. 3, *Murex*, pl. 20, sp. 82, an unsatisfactory figure), by Kiener (1834-1850, vol. 7, pl. 8, fig. 1, pl. 9, fig. 1) as *M. ternispina* Lamarck, and by Tryon (1879-1888, vol. 2, pl. 9, figs. 107, 109).

The best figures of *M. scolopax* are the

¹ On the Gualtieri plate 31 the upper row consists of four figures. Three of them, lettered A, all show *scolopax*. The remaining figure is unlettered and unnumbered, but is, I think, meant for *tenuispina*. In his pertinent text on the facing page he refers to both figures A and B, and the latter is referred to Rumphius' plate 26, figure 3, which is *tenuispina*. His two descriptions are inconclusive, but it seems reasonably certain that the figure called "B" by Linnaeus was, in fact, this unlettered figure of *tenuispina*.

original Chemnitz figures noted above (1780–1795, vol. 11, pl. 189, figs. 1819–1820).

Murex tenuispina is also well figured by Chemnitz (*tom. cit.*, pl. 198, fig. 1821, and pl. 190, fig. 1822), by Tryon (*tom. cit.*, pl. 10, fig. 113), by Maxwell Smith (1953, pl. 1, fig. 10, as *M. triremis* Perry, 1811), and by Perry (pl. 45, fig. 3) as *Aranea triremis*.

The striking number, slenderness, and disposition of the spines in *tenuispina* are simple to reproduce in figures, while the variability of the spines of *tribulus* in these respects makes it difficult to select individual figures to cite for it.

It is curious that the "Tableau encyclopédique" contains no figures of any of the species of this group.

Murex cornutus

1758, *Systema naturae*, ed. 10, p. 746, no. 445.

1767, *Systema naturae*, ed. 12, p. 1214, no. 520.

LOCALITY: Not given in 1758; "in O. Africano" (1767).

"*M. testa subrotunda spinis subulatis obliquis cincta, cauda elongata subulata recta spinis sparsis.*"

The description of *cornutus* was identical in the two editions except for the use of "arcuatis" in the tenth and "obliquis" in the twelfth. Inasmuch as the spines of this species are extremely curved and less noticeably oblique, the change was not for the better, unless Linnaeus used the word "obliquis" to point out that the spines on the body whorl are not set one above the other but are slightly off-centered. The word might have been used with more significance, however, of the spines on the beak of the shell, where the two rows of spines are really oblique, that is to say, the rows themselves slant downward from the horizontal. This latter feature was well expressed in the description in the "Museum Ulricae," as is pointed out below. With this exception, the description is probably sufficient to identify the species. At least it serves to distinguish the species from the other long-beaked species with which it is associated in the "Systema," *haustellum*, *tribulus*, and *brandaris*. It may be significant that the "prickles" on the beak of *haustellum* were designated merely as "muricata" and not spines. This may have been designed to distinguish that shell from

cornutus, the beak of which is described as having "spinis sparsis."

Some of the figures in the synonymy are badly chosen, are badly drawn, and show two different species. The figures from Colonna (pl. 60, fig. 3, *fide* Hanley; not seen), Rumphius (pl. 20, fig. 5), Buonanni (pl. 283), Gualtieri (pl. 30, figs. D,D.) and one of the Seba figures (pl. 78, fig. 7) may be referred to *cornutus*, the Seba figure being particularly good. The figure from Petiver (pl. 68, fig. 12) clearly shows the next species, *M. brandaris*, and was also cited for that species by Linnaeus. The reference to "Kirch. Mus. t. 901, f. 21" refers to the "Museum Kircherianum" of Buonanni, 1709, and was undoubtedly a *lapsus calami*, intended for the same numbered plate and figure in Lister which is a good figure of *cornutus*. Another Seba figure (pl. 78, fig. 8) was generally cited for *cornutus* by the early writers, but is much more like *brandaris*. The latter species has the general shape of *cornutus*, but is readily distinguished by its smaller size, its lack of the long, curved spines of *cornutus*, and its short anterior canal. The third Seba figure (fig. 9), although also often cited for *cornutus*, was probably based on *brandaris*, as the rows of spines on the beak are not set obliquely. It is a doubtful figure.

The only remaining figure is that from Adanson (1757, pl. 8, fig. 20), which Adanson called "le Bolin." The history of this figure discloses a strange conclusion on the part of the early conchologists. Although it resembles *brandaris*, the next species, far more than it does *cornutus*, Linnaeus cited it for *cornutus*, and in this he was followed by most of the later writers. It is difficult to believe that Deshayes, Dillwyn, and others who did so, had examined the figure, and it is felt that they must have blindly followed Linnaeus' citation. In part 3 of the present series of papers (Dodge, 1955, p. 53) I emphasized two facts concerning the Adanson species: first, that the figures on his plates were the work of a Mlle. Reboul and were in many cases so uncharacteristic that the problems of identity that have arisen in connection with the Adanson species have usually been caused by the vagueness or inaccuracy of the figures; second, that Fischer-Piette and his collaborators (1942, pp. 108–110) had located and ex-

amined what I have called the "retained" collection of Adanson's duplicate shells, and that these rediscovered specimens settled many of the problems of identity. "Le Bolin" is a case in point. Although the figure in Adanson's work strongly resembled *Murex brandaris*, the specimens found by Fischer-Piette and his co-authors and bearing the notation "2380. Bolin Sgl." on the shells themselves were specimens of *Murex cornutus* var. *tumulosus* Sowerby, 1841 (1841a, pl. 189, fig. 71). The details of the finding are discussed on page 223 of the Fischer-Piette paper (Fischer-Piette *et al.*, 1942). In the face of the only evidence available to the early writers, the figure in Adanson which so resembled *brandaris*, the citation of that figure for *cornutus* appears more like clairvoyance than good reasoning. No specimen resembling the figure was found by Fischer-Piette and his co-authors.

The description of *cornutus* in the "Museum Ulricae" is more detailed and more graphically descriptive than that in the "Systema," and it seems probable that the early identification of the species was largely based on it, although the early followers of Linnaeus were probably familiar with the shell which was called *cornutus* by Colonna and described by many of the pre-Linnaean writers under various vernacular names. Davila, to cite but one, called it the "Great Club of Hercules," and very accurately described it as "white, with somewhat granulated spiral striae, six longitudinal, slightly flattened ribs bearing two spiral rows of large spines, the upper stronger and the other less so, with two rows of small spines on the beak, and with a flattened spire, the inner lip outwardly salient."

The "Museum Ulricae" description contains the following illuminating phrases: "Spinae conicae, validae, laterae fissae, dorsum versus flexae, serie duplici dispositae cingunt ventrem," "Cauda longa, sulcata, armata spinis rectis, obliquo situ positae," and "Labro exteriori ad spinas fisso." With this phraseology alone it is not difficult to identify the species with the *cornutus* of all authors. The only misleading part of the description is the concluding paragraph, distinguishing the species from "the following species." The following species in the "Museum Ulricae" is *trunculus*, which is so remote

from *cornutus* in appearance that it would be unnecessary to distinguish them. However, the "following species" in the "Systema" was *brandaris*, a shell the features of which are sufficiently like those of *cornutus* to justify an explanation. Linnaeus did not describe *brandaris* in the "Museum," and his use of the phrase "Differt a sequenti, cui simillimus" apparently indicates that, in a moment of forgetfulness, he was thinking of the order in the "Systema."

The synonymy in the "Museum" includes only the acceptable figures of *cornutus* from Rumphius and Gualtieri, but, either by an error of Linnaeus or the printer, the Rumphius figure is designated as figure "S" instead of "5" as it correctly read in the tenth edition of the "Systema."

Whatever may be the defects in the "Systema" description, or however we may judge the composite synonymy, *Murex cornutus* was immediately identified, and there has never been a question as to its identity. It has acquired no synonyms. On this point and in reference again to the situation in Adanson's collection, Sowerby's *tumulosus*, which was considered by Fischer-Piette and his co-authors (1942, p. 223) and by Dautzenberg (1910a, p. 62; 1913, p. 36; and 1921, p. 125) to be a mere variety of *cornutus* Linné, may have a specific validity of its own. Sowerby was emphatic in treating it as a good species, saying (1841b, p. 144): "It differs from *M. cornutus*, in the thickness of the varices, which are excavated behind. The sutures of the spines [*sic*] are also excavated." Dollfus (1911, p. 29, pl. 1, fig. 23) also treated it as a good species. Based on Sowerby's figure (1841a, pl. 189, fig. 71) it is a little difficult to associate it specifically with *cornutus*. Tryon (1879-1888, vol. 2, p. 98) suggested that it might be a hybrid of *cornutus* and *brandaris*.

Reeve (1843-1878, vol. 3, *Murex*, pl. 18, sp. 71) described and figured for *cornutus* the form having the long curved spines. For *tumulosus*, which he listed as a good species, he described and figured the shell with the shorter and almost straight spines (*tom. cit.*, pl. 23, sp. 94) and said: "I quite agree with Mr. Sowerby in his estimation of this unique and valuable species; a hybrid, as it were, between the murices *cornutus* and *brandaris*."

I am of the same opinion. In addition to the striking difference in the spines, *tumulosus* is constantly smaller, and its varices are far coarser and more salient than those of *cornutus*. Kiener (1834–1850, vol. 7, *Murex*, p. 14, pl. 2, fig. 1) took the opposite view, saying: "The shell named *tumulosus* by Mr. Sowerby (Conch. Illus., fig. 71) is only a variety of this; it appears to differ only in the thickness of its varices."

The earliest figure of *cornutus* is that of Martini (1769–1777, vol. 3, pl. 114, fig. 1057). The drawing is somewhat stylized but accurately shows the distinguishing features of the species, especially the unequally curved spines. Schubert and Wagner's figures (1829, pl. 231, figs. 4068–4069) are somewhat more realistic. It is also well figured by Reeve (1843–1878, vol. 3, *Murex*, pl. 18, sp. 71); Sowerby (1847–1887, vol. 4, *Murex*, pl. 397, fig. 116*), and Tryon (*tom. cit.*, pl. 21, figs. 196–198).

Linnaeus apparently did not own a specimen of these species, as it does not appear on either of his lists of owned shells, and it is not represented in his collection in London. A specimen, properly labeled, is found in the Uppsala collection.

Murex brandaris

1758, *Systema naturae*, ed. 10, p. 747, no. 446.

1767, *Systema naturae*, ed. 12, p. 1214, no. 521.

LOCALITY: "In M. Mediterraneo" (1758, 1767).

"M. testa subovata spinis recta cincta, cauda mediocre subulata recta spinisque oblique circumdata . . . Variat a ventre triplici cingulo spinarum subulatarum. β duplici cingulo spinarum subulatarum. γ duplici cingulo spinarum conicarum, nivea."

The above description from the twelfth edition shows only one change from that in the tenth. The word "elongata," referring to the anterior canal, is omitted, and "mediocre" substituted therefore. It is entirely satisfactory to define the species.

The main description apparently describes Linnaeus' typical variety with two rows of straight spines, although this seems to be covered by his variety " β ." The variety " γ " is the white form with two rows of conical spines. The variety with three rows of subulate spines is described but not designated by a letter. The punctuation of the

subdescription listing the varieties is puzzling.

The synonymy is entirely correct, and the figures allotted to the several varieties are for the most part correctly chosen for those varieties.

The figure from Rumphius (pl. 26, fig. 4) and that from Gualtieri (pl. 30, fig. F), while correctly showing *brandaris*, are badly drawn, and it is difficult to attribute them to the varieties designated by Linnaeus, " γ " for Rumphius and " β " for Gualtieri. The Petiver figure (pl. 68, fig. 12) is the typical form with two rows of fissured, subulate spines. This figure was also erroneously cited for the preceding species, *M. cornutus*. For the typical species, which we may call variety " α ," Linnaeus cited the figure from Rondelet (1554–1555, pt. 2, p. 64), Regenfuss' figure (pl. 6, fig. 67), the Ginanni figure (pl. 8, figs. 61–62, not seen), and the Petiver figure above noted; for variety " β ," one of the figures from Buonanni (pl. 282); for variety " γ ," the other Buonanni figure (pl. 281).

Nobre (1931, p. 113) lists a *brandaris* "var. *nivea* Linn.," which takes its varietal name from the Linnaean description of variety " γ ," as did Bucquoy, Dautzenberg and Dollfus (1882–1898, p. 18). Linnaeus' variety with three rows of spines, although not the typical form, is frequently found. It was first given a more extended description by Chemnitz in 1788 (1780–1795, vol. 10, pp. 276–278) with the name "*Murex brandaris* Linnaei, triplici cingulo spirarum [*sic*] subulatarum cinctus," and figured by him (pl. 164, fig. 1571). Frauenfeld (1869, p. 888) named it *Rhinocantha trifariaspinosa*.¹ This specific name was emended to *trispinosa* by Bucquoy, Dautzenberg, and Dollfus (*loc. cit.*). An occasional specimen bearing four rows of spines on the body whorl is found. This was first described and figured by Favanne (1784, p. 227, pl. 4, fig. 1115) from a specimen in the collection of the Prince de Conti.² It was called "var. *quadrispinosa*" by Dautzenberg (1904, p. 287). In the same

¹ *Rhinocantha* is of H. and A. Adams, 1853, and is an exact synonym of the earlier *Bolinus* Pusch, 1837.

² Favanne's "Catalogue raisonné" is a rare work. The reference was taken from Chemnitz (1780–1795, vol. 10, pp. 277–278). Copies of the work are in the Academy of Natural Sciences of Philadelphia and the United States National Museum.

paper Dautzenberg also listed as varieties *robusta*, nov. var., *coronata* Risso, 1826, *mutica* Monterosato,¹ and *diplacantha*, nov. var. The collection of the American Museum of Natural History contains two specimens of *trispinosa* (A.M.N.H. No. 47197) and one specimen of *quadrispinosa* (A.M.N.H. No. 48187).

There has been little confusion in the identification of this common Mediterranean species, although Deshayes (1838–1845, vol. 9, pp. 562–563) cited the Adanson figure of "le Bolin" (pl. 8, fig. 20) for both *Murex cornutus* and *Murex brandaris*. As the two species are readily distinguishable, this double citation casts at least a scintilla of doubt on Deshayes' conception of the two species, unless it was a mere slip of the pen. The citation of the same figure for two different species was a common occurrence in the "Systema," as Linnaeus, owing to the paucity of good figures available to him, frequently was forced to choose "approximations," which he sometimes cited twice. This can hardly be said of the year 1843, in which Deshayes was apparently guilty of the same fault.

Murex brandaris is generally placed today in the genus *Bolinus* Pusch, 1837, of which it is the type species. *Aranea cinerea* Perry, 1811; and *Haustellum clavatum* Schumacher, 1817, are its only synonyms.

The species was one of the shells from which the Romans made the dye called Tyrian purple.

It is figured in Reeve (1843–1878, vol. 3, *Murex*, pl. 23, sp. 96), in Tryon (1879–1888, vol. 2, pl. 21, figs. 193–195), and in Nobre (1931, pl. 18, figs. 1–2, apertural and dorsal aspects).

The type of *brandaris* Linné is in the Linnaean collection in London, represented by a specimen marked by Linnaeus. It was not described in the "Museum Ulricae," and is not represented in the collection at Uppsala.

Murex trunculus

1758, *Systema naturae*, ed. 10, p. 747, no. 447.

1767, *Systema naturae*, ed. 12, p. 1215, no. 522.

LOCALITY: "In M. Mediterraneo, Jamaica" (1758, 1767).

¹ Dautzenberg did not give the date of *mutica*, and I have not been able to locate the name in Monterosato's works.

"M. testa ovata nodosa antierius [*sic*] spinis cincta, cauda brevior truncata perforata."

In the tenth edition of the "Systema" the word "nodosa" was not used, the sculpture being described as "spinis anterioribus majoribus cincta." The word "perforata" was added in the twelfth edition. As thus amended, the description gives us an accurate picture of the well-known Mediterranean *trunculus* when Linnaeus' habitual error in reversing the meaning of "anterior" and "posterior" is corrected. The phrase "brevior truncata perforata" clearly distinguishes the species from the four preceding long-beaked and imperforate species, although *M. brandaris* has an almost closed, slit-like umbilicus.

The synonymy is accurate with two exceptions: The figure cited from Argenville (1742, pl. 19, fig. G) is certainly not *trunculus* but some extremely spinous species which I am unable to identify. Martini (1769–1777, vol. 3, p. 369) surmised that this figure might represent Adanson's "le Sirat" (1757, p. 125, pl. 8, fig. 19), but that species, based on the figure of the specimen found by Fischer-Piette and his co-authors (1942, pl. 6, fig. 8), is quite different, showing a single row of shoulder spines. The latter is *Murex senegalensis* Gmelin, 1791. Linnaeus, in his "revised" copy of the twelfth edition of the "Systema," placed a manuscript note opposite the reference to Argenville, which, according to Hanley (1855, p. 282), is undecipherable. The second exception is that one of the Buonanni figures (pl. 277) was given a locality, the Red Sea, in Buonanni's text, which makes his conception of the species a shade doubtful, as *trunculus* has not been reported from that locality by later writers.

This is the commonest large *Murex* of southern Europe, being found throughout the Mediterranean as well as on the Atlantic coast from France to Senegal and the Canaries. Adanson, however, did not report it from Senegal. *Murex turbinatus* Lamarck, 1822, and *M. beckii* Philippi, 1851, both from the west coast of Africa, are very closely related species, if not, indeed, identical with *trunculus*. The present species is extremely variable in the development of the spines, which are sometimes low and nodulous and sometimes true spines of varying sharpness and prominence. It also varies appreciably in

the height of the spire. It is generally a colorful species, showing alternating bands of a rich brown and a pale yellow, there being two brown bands on the body whorl, which are visible in the aperture, and one on the spire. The Jamaica locality given by Linnaeus was not followed by his successors. It was probably based on specimens of *Murex pomum* Gmelin, 1791, a species in the same subgenus and closely related.

No difficulty was found in identifying this well-known species, and it has acquired no synonyms, unless *turbinatus* and *beckii* are identical with it, which, from the original descriptions of those shells, I am inclined to doubt. I have not seen specimens of either. *Murex trunculus* is now generally placed in the subgenus *Phyllonotus* Swainson, 1833, of which the type species is *M. imperialis* Swainson (*M. pomum* Gmelin), by subsequent designation, Gray, 1847.¹

The *Murex trunculus* of all authors is marked for the species in the Linnaean collection in London. The description in the "Museum Ulricae" is unquestionably descriptive of the same species and adds numerous confirmatory details. Two specimens of the *trunculus* of authors are present in the Uppsala collection and are properly labeled.

The earliest post-Linnaean figures are those of Martini (1769-1777, vol. 3, pl. 109, figs. 1018-1020) and are satisfactory, although they are all dorsal views of the shell. The species is also figured by Reeve (1843-1878, vol. 3, *Murex*, pl. 5, sp. 22), Sowerby (1843-1887, vol. 4, pl. 399, figs. 186-187), Bucquoy, Dautzenberg, and Dollfus (1882-1888, pl. 1, figs. 3-4), and Nobre (1931, pl. 18, figs. 3-4). Reeve's figures are somewhat more ornate than is typical of this species. Poli's figure (1826, posthumous vol. by delle Chiaje, vol. 3, pl. 49, fig. 7) is fairly characteristic.

¹ Grant and Gale (1931, p. 729) place it in *Chicoreus* Montfort, 1810, which they treat as a good genus, but erect a new subgenus, *Murithais*, for the reception of *trunculus* and a fossil species, *wilkesanus*, from the lower middle Miocene of California, designating *trunculus* as the subgenotype. Under their arrangement *Phyllonotus* Swainson is also treated as a subgenus of *Chicoreus* Montfort.

As *Purpura trunculus* Röding (1798, p. 139) it is the type species of Röding's *Purpura*, by subsequent designation, Winckworth, 1945. Röding's genus is the exact equivalent of *Murex* Linné, *sensu stricto*.

Murex ramosus

1758, *Systema naturae*, ed. 10, p. 747, no. 448.

1767, *Systema naturae*, ed. 12, p. 1215, no. 523.

LOCALITY: "In Sinu Persico, Jamaica" (1758, 1767).

"*M. testa trifariam frondosa, spira contigua, cauda truncata.*"

The description is identical in the tenth and twelfth editions. The few details given apply to the *ramosus* of authors, as they also apply to any of the several murices with three frondose varices and a short anterior canal. The description is too short and incomplete to be tied to any one of them, and it seems inescapable that Linnaeus conceived of them as mere forms of a single species. I cannot guess what he meant by the words "spira contigua." If they have the common meaning of "contiguous," they are redundant, as they could be applied to the shell of any gastropod. If they mean that the *whorls* of the spire are not separated, or "partially unwound," they would still apply to any of the *Murex* species. The same expression was used by Linnaeus for the species *M. saxatilis*, and I am unable to differentiate these two shells from the rest on any possible interpretation of the words.

The synonymy also comports a composite species. It is necessary to analyze the several figures at some length:

The figure from Colonna's "Aquatilium" (pl. 60, fig. 3) was not seen by the writer, and Hanley, who also discussed this synonymy (1855, pp. 282-283), does not mention it.

Buonanni's plate 276 was, I believe, based on a specimen of *M. palma-rosae* Lamarck, 1822. His plate 275 is less clear.

Rumphius' figure (pl. 26, fig. A) seems to represent Lamarck's *Murex inflatus*, 1822, as does one of the Gualtieri figures (pl. 38, fig. A). Lamarck's *inflatus* is now recognized as being a synonym of *ramosus* Linné, as the slight differences between it and the "typical" *ramosus* are considered as having no specific or subspecific value. Lamarck credited his *inflatus* to "*Murex ramosus*. Lin. Gmel."

One of the three Argenville figures (1742, pl. 19, fig. E) is *M. axicornis* Lamarck, 1822, as is also Rumphius' other figure (pl. 26, fig. 1).

Argenville's figure H on the same plate is unquestionably *M. adustus* Lamarck, 1822,

and his third figure (fig. C) is just as clearly *M. brevifrons* Lamarck, 1822, the latter being identical with Lamarck's *M. calcitrapa*.

The figure from Regenfuss (pl. 1, fig. 6, error for pl. 7) is a fairly accurate figure of *M. brevifrons* Lamarck.

The remaining figures in the synonymy are all of shells with three frondose varices, but it is difficult to fix their identity categorically. The hodge-podge of figures noted above, however, sufficiently establishes that Linnaeus was dealing with a composite species.

The description of *M. ramosus* in the "Museum Ulricae," although considerably more detailed, is equally ineffective for the restriction of the species. It lists three lettered varieties, two of which are described in a way that definitely points away from the *ramosus* of authors. Variety " α , Angulis membranaceis planis" is an equivocal phrase. Hanley (1855, p. 282) suggested, with a query, that it might refer to *M. pomum* Gmelin. The varices of that species are, it is true, membranous on the side facing the outer lip, but no more so than the varices of several other murices. Moreover, they are in no sense "planis" but are rounded and salient. *Murex pomum* is not shown sufficiently clearly to be recognized in any of the figures cited by Linnaeus either in the "Systema" or the "Museum Ulricae." The second variety is described as " β , Angulis brevissimis undulatus." I cannot guess what Linnaeus meant by the word "brevissimis" as applied to any of the species involved in this complex, in all of which the varices extend the entire length of the shell. The word "undulatus" might refer to the sculpture on the varices. It cannot refer to the varices themselves. It is important to note that the word "frondosis" is omitted in the descriptions of both of the above varieties, and it may be assumed that Linnaeus was therefore referring to shells which were not covered by his synonymy. The third variety, " γ , Angulis frondosis," does apply to the *ramosus* of authors but covers equally the other frondose species shown in his cited figures. The use of the word "frondosis," moreover, emphasizes the absence of that word in the descriptions of the other two varieties.

The remainder of the description in the "Museum" is likewise confusing. It begins with the phrase "Testa nigra," which could

cover only *M. adustus* of all the species in Linnaeus' synonymy, unless he included the brown bands and spine tips of *M. brevifrons* under this ill-chosen word. The words "Suturæ tres, frondosæ, dedalææ, longitudinales" are curiously used. "Suturæ" obviously refers to the varices, a very misleading meaning of the word. The word "dedalææ" is unintelligible to the writer, unless Linnaeus coined a word meaning "labyrinthine," referring to the tortuous sculpture of the varices and their spines, Daedalus being the mythological Greek architect who is said to have designed the Cretan labyrinth. "Aperitura . . . intus dentata" is a very loose way of describing the spines on the margin of the lip, which are in no sense "inside" the aperture.

At the end of the subdescription he re-described the varieties " β " and " γ ," saying of the first: "superficie magis rugosa suturis brevissimis undulatis; colore albo maculato luteo," again using the odd word "brevissimis." Of variety " γ " he said: "Suturis frondosis; colore rubicundo testaceo aut pallido," the latter phrase covering more than one species. Thus the "Museum Ulricae" is of no assistance in unraveling this complex of species.¹ Hanley (*loc. cit.*) was so impressed with the vagueness of the description and the discordance of the synonymy in both works that he felt that "the species not being adequately defined, the name should either be consigned to oblivion, or, if retained, should be applied to *inflatus* as the *ramosus* of Rumphius, and of Linnaeus 'in part.'"

It is hardly necessary to adopt this clumsy style of citation suggested by Hanley, as Lamarck in 1822 (1822b, pp. 161-163) by implication, if not actually, restricted the name *ramosus* to his *M. inflatus* by including it in the synonymy of the latter, and gave specific names to the several other shells included in Linnaeus' synonymy, *M. palma-rosæ*, *axicornis*, *adustus*, *brevifrons*, and *calcitrapa*, all of which are recognized as good species today, with the exception of *calcitrapa* which, I

¹ The synonymy in the "Museum Ulricae" included only the Rumphius figures of *M. inflatus* and *axicornis*, the Gualtieri figure of *inflatus*, and the Argenville figures of *inflatus*, *axicornis*, and *brevifrons*. Although the figures of *inflatus* (*ramosus* auct.) predominate, the synonymy is almost as heterogeneous as that in the "Systema."

think, is generally conceded to be the same as *brevifrons*. Up to Lamarck's day all descriptions of *ramosus* followed Linnaeus' broad interpretation of the species and even increased the confusion. Gmelin, in addition to his principal variety, which itself included more than one species in its synonymy, added six lettered varieties, his whole treatment including 10 to 12 species. Dillwyn (1817, pp. 686-687) also made no attempt to isolate the *ramosus* of authors. Both writers supplied localities ranging from the Persian Gulf and Madagascar to China and western Atlantic waters, the last-named locality being probably based on specimens of *brevifrons* Lamarck.

Deshayes (1838-1845, vol. 9, p. 570, footnote) commented thus on Lamarck's action and on the description in the "Museum Ulricae": "The synonymy which Linnaeus supplied for his *Murex ramosus* must without doubt be reformed. Nevertheless the specific name must be retained, as Lamarck well realized, since he included it in his synonymy [of *inflatus*]; but he was wrong to change the name without reason. . . . If we confine ourselves to the synonymy in the twelfth edition of the 'Systema,' it would be necessary to abandon the species, as we have done in several other cases, for this synonymy comprises four or five species; but in the 'Museum Ulricae' the synonymy is correct, the description exact, and it is only necessary to suppress the varieties in order to establish the species. Gmelin, Dillwyn, and the majority of authors adopted the species as Linnaeus described it in the twelfth edition of the 'Systema,' and thought to complete it by adding many citations in the synonymy and several varieties. . . . Lamarck, in his reform, returned to the Linnean type, and in this we think he should be followed." The above quotation is to some extent sophistry, and I take issue with Deshayes in his comments on the description in the "Museum Ulricae." Both that description and its synonymy, as pointed out above, comports a composite species.

Since Lamarck the specific name *ramosus* has been restored and used by virtually all conchological writers for the large and extremely frondose Indo-Pacific shell illustrated by Martini (1769-1777, vol. 3, pl. 102, fig. 980, pl. 103, fig. 981), in figures that were

cited by Lamarck for his *inflatus*. It is not a perfect restriction, as it was not made by Lamarck in apt language, but under the circumstances the use of the specific name chosen by Linnaeus is at least sound for very practical reasons.

The species is now included in the subgenus *Chicoreus* Montfort, 1810, the type species of which is *C. ramosus* Montfort, by monotypy. According to Clench and Farfante, however (1945, p. 28), Montfort's *ramosus* is not *ramosus* Linné, but *brevifrons* Lamarck.¹ Thiele (1931, p. 290) apparently accepts the common identity of *ramosus* Montfort and *ramosus* Linné, as he makes the latter the type of *Chicoreus*.

In addition to being *M. inflatus* Lamarck, the present species is *Purpura incarnata* Röding, 1798, and *M. frondosus* Mörch, 1852. It is not *M. ramosus* Mörch, 1852, which is *M. adustus* Lamarck.

Complete confirmation of Linnaeus' belief that all the species figured in the synonymy were forms of a single species is provided by the presence in the Linnaean collection in London of specimens of *M. adustus* Lamarck and *M. pomum* Gmelin, marked for *ramosus* in Linnaeus' handwriting.

The Uppsala collection contains a specimen of the *ramosus* of authors labeled with the Linnaean specific name.

The species is figured in Reeve (1843-1878, vol. 3, *Murex*, pl. 1, sp. 3), in Sowerby (1847-1887, vol. 4, pl. 387, fig. 69), and in Tryon (1879-1888, vol. 2, pl. 1, fig. 1). Neither *ramosus* nor any of the species associated with it in Linnaeus' synonymy are figured in the "Tableau encyclopédique," or appear in the "Liste."

Murex scorpio

1758, *Systema naturae*, ed. 10, p. 747, no. 449.

1767, *Systema naturae*, ed. 12, p. 1215, no. 524.

LOCALITY: "In O. Asiatico" (1758, 1767).

"M. testa quadrifariam frondosa, spira capitata, cauda truncata."

The description is identical in the tenth

¹ Clench and Farfante (*loc. cit.* in text) call attention to the fact that they are unable to determine the exact publication date of Montfort's work other than the year 1810. The genus *Triplex* Perry appeared in June, 1810, covering this group of species, and may prove to be the earlier name.

and twelfth editions. Partly because this is the only one of the Linnaean murices that is described as having four frondose varices, and partly because of the generally good synonymy, particularly the excellent Seba figures (pl. 77, figs. 13–16), the species was readily identified as the *scorpio* of authors. The word "capitata" as applied to the spire is highly descriptive of the enlarged, bulbous spire, which is often as large as the body whorl.

Linnaeus did not own a specimen of *scorpio*, as the name does not appear on either of the lists of his owned species, and therefore no type is present in the Linnaean collection in London. The graphic description in the "Museum Ulricae" is entirely confirmatory of the accepted identification, especially the following: "Anfractus contexti membranis intercurrentibus, remoti, ut quasi capitata adpareat" and "Anguli s. suturae varicosae 4 per testam excurrentes, singuli frondibus crispatis uti *M. saxatilis*, quorum frondes labii exterioris extus dilatati." Linnaeus associated this species too closely, however, with the preceding species *ramosus* and the next species *saxatilis*, to the extent of treating all three species as possible varieties of a single species, as he said of *scorpio*: "Varietas forte praecedentis," and of *saxatilis*, "Varietas forte praecedentium duarum." This comparison was written in the "Museum Ulricae" sometime before 1764. It is not made in the tenth edition of the "Systema," and in any case Linnaeus apparently changed his mind before the publication of the twelfth edition in 1767, as there is no hint of it in that work. *Murex saxatilis* might justly be compared with *ramosus*, although its varices are more numerous, but any association with *scorpio* is difficult to understand. The distinctive appearance of the present species, with its remarkably produced T-shaped labial digitations, the sutural strangulation of the body whorl, and its offset and swollen spire, instantly distinguishes it from its neighbors in the "Systema." The only species with which it could be seriously confused is *Murex rota* Mawe, 1823.¹ The juxtaposition of the

figures of the two species in Maxwell Smith (1953, pl. 5, figs. 6, 16), however, graphically distinguishes them.

Murex scorpio is now placed in the subgenus *Homalocantha* Mörch, 1852, of which it is the subgenotype, by monotypy.

It is figured in Reeve (1843–1878, vol. 3, *Murex*, pl. 25, sp. 106) and in Kiener (1834–1850, *Murex*, pl. 9, fig. 9).

A specimen is present in the Uppsala collection, properly labeled.

Murex saxatilis

1758, *Systema naturae*, ed. 10, p. 747, no. 450.

1767, *Systema naturae*, ed. 12, p. 1215, no. 525.

LOCALITY: "In O. Asiatico" (1758, 1767).

"M. testa quinquefariam frondosa, spira conigua, cauda abbreviata."

Murex saxatilis is an extremely debatable species. Not only is the description too brief, but it does not point exclusively to a single species, and the synonymy covers at least two. The discussion revolves around the question as to whether the *saxatilis* of Lamarck and later writers is, in fact, the *saxatilis* described in the "Systema."

The Linnaean shell is stated to have five frondose varices. Division "β" of Linnaeus' so-called "subgeneric" groups in *Murex* covering all the species with frondose varices in the words "Frondosi suturis crispato-frondescensibus" includes only four species, of which the varices are described, respectively, as "trifariam," "quadrifariam," "quinquefariam," and "multifariam." Much of the confusion experienced by the successors of Linnaeus in this group stemmed from the difficulty of determining the number of varices from the available figures. As all the sculpture of a shell cannot be shown in a figure drawn from only one angle, it is not certain whether any of the figures, either those cited by Linnaeus or those of his followers, conform to the phrase "quinquefariam frondosa." I suggest, however, that none of the models of the shells figured in Linnaeus' synonymy had five varices. If so, it is apparent that he chose figures which were mere ap-

¹ The date of *M. rota* is generally given as Sowerby, 1841, but Mawe's use of the name has 18 years' clear priority. Sowerby himself cited the species as "*M.*

rota—?," indicating that he was ignorant of the author of the name (1841a, *Murex*, p. 5, no. 73, pl. 199, fig. 119). Mawe lists it on page 131, and figures it on plate 26, figure 3.

proximations to the shell he was describing, owing to the lack of good drawings in the works at his disposal.

Two of the Seba figures (pl. 77, figs. 5–6) and one of the Regenfuss figures (pl. 1, fig. 6) resemble *Murex endivia* Lamarck, 1822, which has six varices, far more closely than any other species, and all three were later cited by Lamarck for his *endivia*. The Rumphius figure (pl. 26, fig. 2) may have been based on *endivia*, although it was cited by Lamarck for *saxatilis* (1822b, p. 167) which is described as having six varices, but which, if the frondose outer lip is counted, has seven or even eight. Lamarck's reason for allocating some of these figures to *endivia* and some to *saxatilis* is one of the very equivocal aspects of this problem.¹ In any event *saxatilis* Lamarck, as described and figured, cannot be identified with *saxatilis* Linné. The second Rumphius figure (pl. 26, fig. C) may have been based on a specimen of *endivia*, although both of Rumphius' drawings are equivocal. The remaining Seba figure (pl. 77, fig. 4) much resembles *Murex ramosus* Linné (*M. inflatus* Lamarck) and was cited for that species by Lamarck. The Argenville figure (1742, pl. 19, fig. F) is also clearly *endivia*.² The other Regenfuss figure (pl. 9, fig. 26), an apertural view, shows six visible varices, which means that the model must have had eight or even more, unless the figure was carelessly drawn. This number is even too great for the *saxatilis* of Lamarck, who nevertheless cited it in the synonymy of *saxatilis*. I have gone into detail as to the figures of both Linnaeus and Lamarck not only to emphasize the lack of harmony in Linnaeus' synonymy but to show that Lamarck had attempted, although not entirely successfully, to separate the species Linnaeus had combined. In this group of frondose shells much more accurate and detailed figures than the crude drawings of the pre-Linnaean iconographers are necessary in order to iso-

late the species. I am unable to identify the *saxatilis* of Linnaeus from this hodge-podge of figures supporting an inadequate description and suggest that it be considered a *species dubia*. The *saxatilis* of Lamarck and authors, which is labeled *saxatilis* in most of our collections today, is certainly not the shell Linnaeus described. Based on the preponderance of figures of *endivia* in Linnaeus' synonymy, a criterion that Hanley often incorrectly used, *saxatilis* could be identified with that species, but this would be repugnant to the phrase "quinquefarium frondosa" in the description.

Martini (1769–1777, vol. 3, pp. 328–331, pls. 107–108, figs. 1004–1012) listed a species which he called "Brandaris duplex vel variegatus vel fasciatus" and referred it to the *saxatilis* of both editions of the "Systema" and of the "Museum Ulricae." He also referred to Rumphius' figure (pl. 26, fig. 2), which both Linnaeus and Lamarck cited for *saxatilis* but which seems to the present writer more like *endivia*, the Argenville figure (1757, pl. 16, fig. K), which Lamarck used for *endivia*, and the Regenfuss figure (pl. 1, fig. 6), which Linnaeus cited for *saxatilis* and Lamarck for *endivia*. Most of Martini's nine figures cannot be categorically identified, but all seem to possess more than five varices. His next species (pl. 108, figs. 1013–1014) was called "Ericus duplex." These figures also appear to have more than five. They might have been based on *saxatilis* Lamarck but drawn by a careless artist.

Gmelin (1791, p. 3529) copied the Linnaean description, but was apparently also deceived by the existence of the several species of this group of shells which have a resemblance to one another at first glance. He supplied a synonymy of 30 figures, covering three varieties, and said that the species had "varietate multiplici." In addition to Linnaeus' locality "O. Asiatico," he added the Mediterranean.

Dillwyn (1817, pp. 689–690) referred *M. saxatilis* to the "Systema" species, paraphrased Linnaeus' description in English, and mentioned the "five foliated varices," but described a variety "with six foliated varices" for which he referred to Gmelin's *Murex diaphanus* (1791, p. 3529), a species that immediately followed *saxatilis* in Gmel-

¹ Mörch (1852, p. 95) went so far as to include *endivia* as a synonym of *saxatilis* Linné.

² Lamarck did not cite this Argenville figure, but for his *endivia* he cited another figure from the same plate of Argenville, as that plate is numbered in the 1757 edition (1757, pl. 16, fig. K), which is almost equally good as showing *endivia*, except that the black-tipped fronds of that shell are not so realistically rendered.

in's work. I am not certain what *diaphanus* was, but the evidence points to Lamarck's *endivia*. It is described as "sexfariam frondosa, frondibus apice nigris," and Gmelin cited for it a single figure (Argenville, 1757, pl. 16, fig. F; pl. 19 in the 1742 edition) which had been cited for *saxatilis* by Linnaeus, and which more nearly resembles *endivia* than any other species. However, as said above, it is a dorsal view which shows only three varices, and it seems improbable that the shell possessed three more. Dillwyn added: "Argenville has described his t. 16. f. F, which is the *M. diaphanus* of Gmelin, with six foliated varices, but there is not any appearance of more than five in the figure. . . ." The "five" mentioned by Dillwyn was the product of his imagination.

Lamarck was the first to describe *saxatilis* with six varices, with the exception of Dillwyn's "variety." He did not refer to the *saxatilis* of Linnaeus, but to that of Gmelin. He apparently believed that he was describing Linnaeus' shell but that the latter had mistaken the number of varices. Lamarck's *saxatilis* and *endivia* have been discussed above in connection with the analysis of Linnaeus' synonymy. It seems incredible, however, that Linnaeus, if he had Lamarck's shell before him, could have described it as having five varices, as that shell has in fact seven and sometimes eight varices, in spite of Lamarck's limitation of the number to six.

Deshayes (1838-1845, vol. 9, pp. 582-583, footnote) summed up for the first time what I consider to be the correct view of this complex. His comments are quoted in full: "It is the case with the *Murex saxatilis* of Linné, as with so many other species of that great naturalist, that the imperfections of the synonymy and the brevity of the description do not permit one to apply the name to one species rather than to another. Linné listed his *Murex saxatilis* for the first time in the tenth edition of the *Systema*. He cited five figures from three authors; each of these figures represents a different species. In the *Museum Ulricaë* the synonymy is reduced to three figures which cover three distinct species. Unfortunately the description in that work is entirely inadequate, Linné being preoccupied with the idea that this species could be a variety of the two preceding species, *Murex ra-*

mosus and *scorpio*.¹ Nevertheless Linné retained his species in the twelfth edition of the *Systema*, and added the citation of three other species of Seba. Gmelin, Dillwyn, Schröter added to the confusion, in seeking to complete the synonymy, already so defective. Lamarck attempted to regenerate the Linnaean species by limiting it. He chose among the 10 or 12 mentioned, that which seemed to him the best known and included them in his work, reducing the entire synonymy to three references. We ask ourselves: why did Lamarck choose this species rather than another? He was guided solely by chance, and this choice was unfortunate, because Linné had said: *Testa quinquefariam frondosa*. Now, the Lamarckian species always has seven or eight varices, while there are others with five, out of which he could have more correctly chosen. The species of Linnaeus, which, like the present, are absolutely uncertain, being a long continued cause of errors and discussions, we propose to eliminate from our catalogues."

The writer is in entire accord with Deshayes' conclusions, particularly as to his summing up of the diagnosis in the "Museum Ulricaë," although he does not agree that the figures in Linnaeus' synonymy all showed different species.

Our museums contain many specimens of a species from west Africa labeled *Murex saxatilis*, and several writers have reported it from that locality. Paul Fischer (1876, p. 236), in a paper on new species from west Africa, described a *Murex hoplites*, giving it eight varices. Sowerby (1847-1887, vol. 4, p. 33), in commenting on *saxatilis*, said that its early whorls have only slightly developed fronds, "and we think that *M. hoplites* Fischer is probably described from a specimen of this species, in which the later varices are not formed. This opinion is founded upon the observations of the younger portion of a mature *saxatilis*." In 1880 Tyron (1879-1888, vol. 2, pp. 101-102) cited *saxatilis* as of Lamarck and correctly gave it six to eight varices. He

¹ It seems impossible that Linnaeus could have confused *saxatilis* with *scorpio* and, indeed, there are no repetitions in the two synonymies. He might well have considered his shell a variety of *ramosus*, as the same figure from Rumphius is cited for both. However, *ramosus* is described with three varices and *saxatilis* with six (see p. 92 above).

located it in the Indian Ocean and the west coast of Africa. He reported a "fine series from the Gabon coast, some of which have all the richness of color and size of the Indian Ocean specimens." He commented on Fischer's species as follows: "Dr. Fischer has described *M. hoplites* (fig. 226) from the West African coast, distinguishing it by possessing 8 varices instead of six and by its smaller size. The specimens [of *saxatilis*] before me have seven to eight varices and some of them correspond well with the figure of *M. hoplites*. A starved condition of the animal is shown by the multiplication of varices or rest periods; such is *M. hoplites*. I cannot doubt its identity with *M. saxatilis*."

Fischer-Piette and his co-authors (1942, pp. 224-226) commented on this question, but their remarks are not conclusive. Adanson (1757, p. 131, pl. 9, fig. 22) described and figured a shell which he called "le Cofar." His description gives the height of the shell as 216 mm., while his figure is much reduced in size, being only 37 mm. This great difference, which may have represented a planned reduction to fit the plate, convinced the authors of the Fischer-Piette paper that two species were involved, and they mentioned that in a later catalogue, found with Adanson's "retained" collection (Dodge, 1955, p. 53), Adanson had adequately distinguished them, although he called both "le Cofar," reporting both from the island of Gorée. Fischer-Piette and his co-authors found in the retained collection seven specimens of the smaller shell. These may have been the models for the Adanson figure, and they were identified by Fischer-Piette and his co-authors as *Murex angularis* Lamarck, variety *lyratus* A. Adams (*in* Sowerby). No specimens of the larger shell were found. These authors continue: "But there is only a single species in Senegal which approaches the considerable height indicated by Adanson (21 cm. 6 mm.): It is the *Murex hoplites* P. Fischer (1876, Jour. Conchyl., vol. 24, p. 236, pl. 8, fig. 3). Tryon reported having seen specimens from Gabon which were as large as the Indian Ocean *saxatilis*." They therefore identified Adanson's "le Cofar" with "*Murex angularis* Lamk., et var. *lyratus* Sow., + *Murex hoplites* Fischer."

This is the most recent answer to the reports of *saxatilis* Lamarck from west Africa. Fischer-Piette and his co-authors apparently reject the presence of *saxatilis* in west Africa, but their examination of the Adanson collection is inconclusive, as the "larger species" was not there present. They admit, however, that *hoplites* is found in that region. I am impressed with the similarity of Fischer's figure and description of *hoplites* (*op. cit.*, pl. 8, fig. 3) to *saxatilis* Lamarck, and also with the fact that the few specimens seen by me labeled *saxatilis* Lamarck from the Gambier River and Gambia show no detectable differences from the considerable series of *saxatilis* from the Indo-Pacific examined by me. This was the opinion of Tryon, and I tentatively accept a west African locality for *saxatilis* until a larger series of *hoplites* from that area can be examined.

As to the *saxatilis* of Linnaeus, Hanley (1855, pp. 283-284), after criticizing Linnaeus' brief description and defective synonymy, decided that no identification could be arrived at by a study of the diagnosis either in the "Systema" or the "Museum Ulricaе," and added: "In short, the *M. saxatilis* was practically undefined, and, as Deshayes suggests, should be dropped as a Linnaean species; otherwise the claims of *endivia* must be preferred to those of the larger shell."

The name *saxatilis* does not appear on either of Linnaeus' lists of owned species. It follows that he must have described it from a borrowed specimen or one seen in the collection of a contemporary, and the condition of the synonymy strongly suggests that he chose his references later, without a specimen before him.

The species is described in the "Museum Ulricaе," but an examination of the Uppsala collection is unrewarding, as there has been an obvious misplacement of specimens. The specimen there labeled *saxatilis* is a specimen of *Murex pyrum* Gmelin. No specimen of the *saxatilis* of Lamarck and authors is present, nor any shell which can be said to correspond to the diagnosis of *saxatilis* Linné.

The *saxatilis* of Lamarck and authors is retained in *Murex* and placed in the subgenus *Phyllonotus* Swainson, 1840.

It is figured by Reeve (1843-1878, vol. 3,

Murex, pl. 2, sp. 8), Sowerby (1847–1887, vol. 4, *Murex*, pl. 398, fig. 177),¹ and Maxwell Smith (1953, pl. 2, fig. 3).

Murex erinaceus

1758, *Systema naturae*, ed. 10, p. 748, no. 451.

1767, *Systema naturae*, ed. 12, p. 1216, no 526.

LOCALITY: "In M. Mediterraneo" (1758, 1767).

"M. testa multifariam subfrondoso-spinosa, spirae anfractibus retuso-coronatis, cauda abbreviata."

Both the description and the synonymy of this species, which were identical in the tenth and twelfth editions of the "Systema," have been criticized, particularly by Deshayes (1838–1845, vol. 9, pp. 591–592, footnote), as being insufficient to define the species. It is true that the description is brief and omits several striking features of the *erinaceus* of authors. It is suggested that its position in the "Systema," immediately following and completing the group containing *ramosus*, *scorpio*, and *saxatilis* which are, respectively, described as "trifariam frondosa," "quadri-fariam frondosa," and "quinquefariam frondosa," is justified and explained by its own description as "multifariam subfrondoso-spinosa," although its varices differ in their prominence and degree of frondosity. This was probably covered by Linnaeus by the use of "subfrondoso." It is also separated from the succeeding several species by the interposition of a new "subgeneric" heading "Varicosi: suturis rotundatis torosis crassisque," which covers the species with non-frondose varices, as its varices are neither torose nor rounded but are compressed laterally into sharp, irregular edges. Deshayes' criticism of the sole figure in the synonymy (Gualtieri, pl. 49, fig. H) is not justified. While the figure is somewhat crude, it cannot be read as anything but *erinaceus*. The Mediterranean locality assisted in the identification. In brief, the early recognition of the species was based on a description which, although short, contains no equivocal details, the significant position of the species in the murices of Linnaeus, a recognizable figure, and a correct locality.

¹ In Sowerby's "Explanation" of plate 398 *saxatilis* is designated as "*Saxatilis*, sp. 150, Linn. Young, *M. hoplitus* [sic], Fischer, Jour. Conch.—Eastern Seas. (Hopl.) W. Africa."

It seems strange that, for a European species so well known in Linnaeus' day, he could have found only this one figure to cite. In the third volume of Seba, for instance, whose work Linnaeus often cited in the twelfth edition, there are three fairly characteristic figures of this species (pl. 49, figs. 71–73), and Knorr (pt. 4, pl. 23, fig. 3) also figures the shell satisfactorily.

Whatever may be said of Linnaeus' diagnosis, *erinaceus* was almost immediately recognized. As early as 1777 Martini (1769–1777, pp. 345–346) described a species under the name of "*Purpura scalata*" and his figures (*tom. cit.*, pl. 110, figs. 1026–1028) are recognizable figures of the *erinaceus* of authors. While he did not use the *erinaceus* of Linnaeus in his list of references, which were all pre-Linnaean, he referred in a footnote to the twelfth-edition *erinaceus* and to the Gualtieri figure cited by Linnaeus. His figures, however, leave no doubt as to what "*Purpura scalata*" represented. Born's figures (1780, p. 294, pl. 11, figs. 3–4) are also excellent. Martini was the first writer to mention the heavy spiral sculpture of the species, which was the most important feature omitted in the "Systema," describing them as "costis transversis valde prominentibus." Chemnitz did not list *erinaceus* in any of his volumes under its own or any other name, apparently considering that the description and figures of Martini were adequate. It is curious, however, that he did not validate Martini's "*Purpura scalata*" by specifically referring it to the *erinaceus* of Linnaeus, as he did in several other cases of species which had been too vaguely referred to a Linnaean shell by his predecessor Martini, particularly as he must have been familiar with the works of Born and Gmelin, who had clearly recognized *erinaceus*, at least when he published his eleventh volume of the "Conchylien-Cabinet" (1795).

Gmelin's description (1791, p. 3530), which was merely a copy of that of Linnaeus, was assisted by the addition to Linnaeus' synonymy of the good Born figures, although he cited them with a query. This is not understood, as these figures were the best of the early representations of the shell. Donovan in 1799 (1799–1803, vol. 1, pl. 35 and pertinent

text) correctly described the species as being found on the south and west coasts of England, and his figures are sufficiently characteristic.

In spite of these correct identifications the species was later confused with others. Lamarck included the shell in his "Liste" (1816). In his first description (1822b, p. 172) he referred not only to *M. erinaceus* "Lin. Gmel." but to *M. decussatus* Gmelin (1791, p. 3527). The latter is a peculiarly conceived species. Gmelin cited for it not only the good Martini figures (1026–1028) which show *erinaceus*, but a pair of figures from Chemnitz' tenth volume (pl. 161, figs. 1540–1541) which are as crudely drawn as any in the entire work and are undecipherable. It seems to the present writer that his citation was an error of transcription for the adjacent pair of figures (1538–1539) on plate 161, which have some resemblance to *erinaceus* as they show frondose varices and a much expanded labial flange. I am unable to identify them.¹ Gmelin's other references were Adanson's "Jatou" (1757, pl. 9, fig. 21) and Knorr (pt. 4, pl. 23, fig. 3). The latter figure, as said above, is a good one of *erinaceus* and was cited for that species by Lamarck. Adanson's "Jatou," as figured, does resemble not *erinaceus* but rather one of the triplate murices. However, Fischer-Piette and co-authors (1942, pp. 223–224) found in Adanson's "retained" collection (Dodge, 1955, p. 53) seven specimens of "*Tritonalia (Jatova) decussata* Gmelin" which were authoritatively documented by Adanson as "2389, Jatou," and a young specimen of the same labeled "Jatou, 2387, eadem junior." Unfortunately Fischer-Piette and his co-authors figured in their paper only the ju-

venile specimen. Gmelin's *decussatus*, although badly presented by its author, is a distinct species. It was described by Bucquoy, Dautzenberg, and Dollfus (1882–1898, vol. 1, p. 21) as a variety of *erinaceus*. Thiele (1931, p. 299) treats it as a good species, and its specific rank is now generally accepted.

Dillwyn (1817, pp. 690–691), in his synonymy, also confused *erinaceus* with another of Gmelin's species, *Murex cichoreum* (1791, p. 3530). This species is described by Gmelin as "*ochroleuca transversim striata multifariam frondosa . . . frondibus minus prominentibus minusque crispis*," language that can hardly apply to *erinaceus*, and the single figure cited by him (Argenville, 1757, pl. 16, fig. K; 1742, pl. 19, fig. K) resembles *Murex endivia* Lamarck and was in fact later cited by Lamarck for that species.

The range of *erinaceus* was the subject of discussion by the early conchologists. While Linnaeus located it only in the Mediterranean, later writers extended its range much farther north. Lamarck (*loc. cit.*) gave it as "The seas of Europe; common in the English Channel." Deshayes' (1838–1845, vol. 9, p. 591–592, footnote to *erinaceus*) text is here quoted in full, as it is the first considered discussion of the relationship of the Mediterranean and Atlantic forms: "The *Murex erinaceus* is an interesting species, cited extensively, sometimes as a Recent shell and sometimes as a fossil, and concerning which it is necessary to make certain observations. Established by Linnaeus in the twelfth edition [*sic*] of the 'Systema,' the descriptive language is very brief and insufficient and the only synonym, consisting of a mediocre figure from Gualtieri, does not contribute much to the identification of the species. . . . It is certain that the characters noted sufficiently apply to a species which is found in various parts of the Mediterranean; but in addition to this species there is another related species [*une autre qui l'avosine*] which has been considered to be *erinaceus*; finally, there is found in the Ocean, and even up to the northern seas, an intermediate form between these two Mediterranean species; almost all authors have considered this species from our side of the Channel as a variety of *erinaceus*. We admit that it is not easy to solve this difficulty even in the presence of a large series of

¹ The Chemnitz figures (1538–1539) are dorsal and apertural views of a plainly triplate shell. Chemnitz called them (vol. 10, p. 250) "*Murex purpura alata*" and located the species on the northwest coast of America, a locality borrowed from Martyn ("Tom. 2, fig. 66") which he cited. That region furnishes several species of triplate murices, but one in particular, *Murex erinaceoides* Valenciennes, 1832, might be referred to these figures, as the name itself may have some significance. The characters that distinguish it from *erinaceus* were clearly stated by Valenciennes (1832, p. 302). Chemnitz' locality, "northwest coast of America," would cover *erinaceoides*, the northern range of which is given as San Diego, California, for "America" to Valenciennes meant the entire extent of both American continents.

individuals from various localities. According to the information furnished to us by M. Bouchard Chantreaux, in his interesting *Catalogue des Mollusques du Boulonnais*, the animal of *erinaceus* from the Ocean has the greatest resemblance to that from the Mediterranean in the features of form and color. The question would be definitely answered if M. Chantreaux had also had the opportunity of seeing the animal from the Mediterranean as well. Nevertheless, we are convinced that *erinaceus* of the Mediterranean is the same species as that of the Ocean."

I cannot make any guess as to what the "other" Mediterranean species mentioned by Deshayes really was, as it is now accepted that the shells from any locality in European waters are conspecific, the slight variations being purely ecological, as is the case with many other species found in the Mediterranean Sea and in adjacent Atlantic waters. This species ranges from Norway along the European coast as far as southern Spain, Madeira, and the Azores, and throughout the Mediterranean. It has not been reported from the west African coast. Nobre (1931, p. 115, pl. 21, figs. 3-6) described and figured two "varieties" in addition to his "typical" species, which he cited as *Ocenebra erinaceus*. His varieties were *tarentina* Lamarck, 1822, a smaller and less varicose form, and *cingulifera* Lamarck, 1822, also a smaller form of a darker color and with lighter spots at the crossing of the spiral cords and the varices.

Bucquoy, Dautzenberg, and Dollfus (1882-1898, vol. 1, p. 21, atlas, pl. 2, fig. 1) retained the species in *Murex* but included it in the subgenus "*Ocenebra* Leach mscr. (Gray) 1847," and gave it, as varieties, both *M. tarentinus* and *cinguliferus* Lamarck, which were later adopted by Nobre, and *M. decussatus* Gmelin, which is a distinct species.¹

With the exception of Lamarck's two species *tarentinus* and *cinguliferus*, *erinaceus* has acquired no synonyms. Lamarck's *M. torosus* (1822b, p. 175), to which Lamarck gave the vernacular name of "faux-cabestan," was considered by Tryon (1879-1888, vol. 2, p.

116, pl. 36, fig. 404), "with some doubt," as a monstrous variety of *erinaceus*. This species shows only vestiges of varices, and these are almost hidden under the two spiral rows of almost contiguous nodes, one at the shoulder and the second just below, the two rows being, in effect, two articulated, cord-like members with the space between them "profunde cavis" in the words of Lamarck. It is a Mediterranean shell. I question its affinity with *erinaceus* Linné even as a monstrosity, although Maxwell Smith (1953, no. 178, pl. 11, figs. 5, 14) made it a subspecies.

Since the separation of *erinaceus* from *Murex* it has been assigned both to *Tritonalia* Fleming, 1828, and *Ocenebra* (Leach) Gray, 1847, but is here placed in the latter genus, a placement which is today adopted by the great majority of writers.² The emendation "*Ocenebra*," which has been frequently used, is unjustified. *Murex erinaceus* is the type species of *Ocenebra* Gray, by original designation.

The type of Linnaeus' *erinaceus* is present in the Linnaean collection in London, duly marked for the species in Linnaeus' handwriting. It was not described in the "Museum Ulricae."

The search for characteristic figures of *erinaceus* is handicapped by the fact that many figures examined showed the immature shell, the foliation of the varices being either

² Fleming used the name *Tritonalia* for certain muricid species in his text but did not cite a type. Dall (1908, p. 313) selected one of these species, *erinaceus*, as the type species of *Tritonalia* but overlooked the fact that in Fleming's Index it was stated that *Tritonalia* was a substitute name for *Triton*, Montfort 1810, a name that was already preoccupied by *Triton* Laurenti, 1768, for a group of reptiles. The type species of *Triton* Montfort had been selected by Montfort himself as *Murex tritonis* Linné, a species in Cymatiidae, and *Tritonalia*, as a substituted name, must take the same type. Writers who realized this began to use *Charonia* Gistel, 1848, as the first valid genus for *tritonis* after Montfort's unavailable *Triton*. Dall's designation of *erinaceus*, a muricid, as type species of *Tritonalia* was a use of *Tritonalia* in an entirely different sense from that in which Fleming used it. The result has been that most writers have not only continued to use *Charonia* for *tritonis* but have allowed *Tritonalia* to lapse. This unofficial determination could be validated by petitioning the Commission on Zoological Nomenclature to suppress *Tritonalia* officially because of the confusion brought about by the situation outlined above. See also Winckworth (1934, pp. 9-15) as to *Ocenebra* versus *Tritonalia*.

¹ Either *tarentinus* or *cinguliferus* may have been the "other" Mediterranean species mentioned by Deshayes, above, as conspecific with *erinaceus*. I very much doubt that Deshayes was referring to Gmelin's *decussatus*.

lacking or only partially developed. Other figures, while recognizable as the adult shell, are extremely crude. The best figures are those of Reeve (1843–1878, vol. 3, *Murex*, pl. 3, sp. 11) and Tryon (1879–1888, vol. 2, pl. 36, figs. 400–404). Tryon's figure 400 appears to be a copy of that in Reeve, and his figure 404 shows *torosus* Lamarck, which Tryon tentatively suggested as a monstrosity of *erinaeus*. The figures in the "Tableau Encyclopédique" (pl. 421, figs. 1a, b, c) are not good.

Murex rana

1758, *Systema naturae*, ed. 10, p. 748, no. 451.

1767, *Systema naturae*, ed. 12, p. 1216, no. 527.

LOCALITY: "In O. Asiatico" (1758, 1767).

1758: "M. testa suturis subvaricosis oppositis compressis scabra, cingulis muricatis, apertura edentula ovata . . . Bubo. β Rubeta. γ ."

1767: "M. testa varicibus oppositis compressis scabra, cingulis muricatis, subedentula ovata . . . Varietas suturis spinis aliquot elongatis e Tranquebar."

The identification of this species, which was provided with a description that is too vague to point clearly to any one species and with an extremely discordant synonymy, must be based almost entirely on the presence of an authenticated holotype in the Linnaean collection in London. This is a specimen of the shell later called *Ranella albivaricosa* by Reeve in 1844.

If Linnaeus' varieties *bubo* and *rubeta*, which are discussed under *Murex lampas* (p. 103, below) as Linnaeus moved them to the latter species in the twelfth edition, are omitted, the following changes from the tenth-edition description were made in the twelfth: The words "suturis subvaricosis" were changed to "varicibus," and "subedentula" was substituted for "edentula." The subdescription was added in the twelfth. These changes were for the better, especially the change in the detail as to the varices, as it involved an improper use of the word "suture." Even with these alterations, however, the description is insufficient for one to identify the species among the several *Bursa* represented in Linnaeus' synonymy.

Hanley (1855, p. 285) is the only writer who has critically analyzed the entire synonymy, and his conclusions are here repeated for what they are worth. It should be pointed

out that Linnaeus undoubtedly appreciated the fact that his models showed varied characters, but it is suggested that he either believed that they were all variations of a single species, or that he felt himself forced to cite those figures that seemed to him to come closest to his type.

The figures from Buonanni (pl. 182), Petiver (pl. 100, fig. 12), and Regenfuss (pl. 6, fig. 64) were held by Hanley to be unrecognizable, as "so little attention was paid to the minuter details by the older engravers that it is scarcely possible to decide what shell the cited figures . . . were designed for." The Rumphius figure (pl. 24, fig. G), which was called "Rana" by Rumphius, "seems more like *albivaricosa*." One of Argenville's figures (1742, pl. 12, fig. R) he characterized as being *bufonia* Gmelin. The other (pl. 12, fig. P) "reminds one of *granifera* [Lamarck, 1816]." Of the eight figures from Seba (pl. 60, figs. 16–20) figure 19 was *spinosa* [Lamarck, 1816; *echinata* Link, 1807]. Figures 15–16 and 17–18 seemed to him "possibly" to show *albivaricosa*. Figures 14 and 20, like Argenville's figure R, appeared to be *bufonia* ("or some very close ally of it").

Thus, according to Hanley's analysis, two figures clearly showed *albivaricosa*, four others "possibly" showed that shell, three showed *bufonia* or a close ally, one is possibly *granifera*, one is clearly *echinata*, and three were unidentifiable. All four species represented are good species. It is suggested that we may certainly attribute figure 19 from Seba (*echinata*) to Linnaeus' spinose variety from Tranquebar mentioned in his subdescription. Hanley did not explicitly choose any one of these species as the representative of *rana*, but was at pains to point out that a specimen of *albivaricosa* and one of *spinosa* (*echinata*) are both marked for *rana* in the Linnaean collection. The identity of *rana* is thus conclusively proved, as the specimen of *albivaricosa* must be considered as Linnaeus' holotype. The presence of a specimen of *spinosa*, also marked for *rana*, does not militate against this conclusion, as it is obvious that Linnaeus believed it to be a mere variety of *rana* and so described it.

Reverting to Linnaeus' synonymy, I have examined all the figures and, while I do not agree with all the details of Hanley's analysis,

it is certain that the synonymy covers several different species, and I feel that its gross disharmony and the fact that the majority are not unequivocally identifiable justify us in disregarding it as a factor in identification, in spite of the fact that two and possibly four more figures show the shell to which Linnaeus gave the name *rana*.¹ In the Foreword to part 1 of the present series of papers I discussed the factors to be considered in the identification of the Linnaean names and the relative weight to be given to each. I pointed out that the presence of a specimen in the collection, identified in Linnaeus' own hand, was to me the most cogent factor. The present case is one of the few in which neither the description nor the synonymy is a useful aid, or is at least a most equivocal aid, and in which the identification rests almost solely on the finding of the undoubted holotype, aided here by a correct although too comprehensive locality.

Both Reeve, in the "Conchologica iconica"² (1843-1878, vol. 2, *Ranella*, pl. 1, sp. 2), and Hanley (1855, p. 284) accepted *albivaricosa* as the representative of *rana* over one hundred years ago. I agree that the name should be thrown into the synonymy of *rana*. Boog-Watson (1886, p. 327) was emphatic on this point.

Up to the time of Reeve and Hanley, conchologists held extremely varied and often erroneous views on *M. rana* and its allies. Born used one of the Argenville figures (fig. P). Schröter, Gmelin, and others, while omitting the Argenville figures, which probably show, respectively, *bufonia* Gmelin and *granifera* Lamarck, added, as did Born, further figures

for *rana* and its supposed varieties, many of which show additional distinct species. Dillwyn somewhat clarified the description and to some extent improved the synonymy, by not only omitting the Argenville figures but also the unrecognizable figure from Buonanni and the Seba figures 14 and 20 which seem to show *bufonia*, and retaining the good Rumphius figure and Seba's figures 13, 15-16, and 17-18, all of which, with some degree of accuracy, may be said to show, or suggest, *albivaricosa*. Unfortunately he retained the Petiver and Gualtieri figures, which I agree with Hanley are not identifiable. Lamarck (1816, "Liste") abandoned the specific name *rana* and listed a new name, *Ranella crumena*, using *Murex rana* "Lin. Gmel." as a synonym in 1822. He separately listed *spinosa* (*echinata*), *bufonia*, and *granifera* in the "Liste" as good species in *Ranella*, and to this extent his treatment of this group of related species was a vast improvement over that of his predecessors. In his first description of *cumena* (1822b, p. 151) he used language much more characteristic of *rana* than Linnaeus' own description of the species, particularly mentioning the color of the aperture as "aurantio-rubra," a color that is seen in most fresh specimens of *rana* (*albivaricosa*). In his synonymy of *crumena*, however, he cited the unrecognizable figures from Buonanni, Gualtieri, and Petiver, although he included the good Rumphius figure and those of the Seba figures which show *albivaricosa*. Linnaeus' spinose species from Tranquebar was described as Lamarck's *spinosa*, the describer apparently being unaware of Link's earlier name *Gyrineum echinatum* (1807, p. 123), for which Link cited as references "*M. rana*. L. G. p. 3531" and two figures from Chemnitz (1780-1795, p. 110, pl. 133, figs. 1274-1275) which are as characteristic of the spinose shell as any that were published prior to the advent of photography. Lamarck also appeared ignorant of Perry's earlier name, *Biplex spinosa* (1811, pl. 5, fig. 6), as well as that of Schumacher (1817, p. 252), *Bufonaria spinosa*. Schumacher's *B. spinosa* was referred to *Murex rana* Linné, var. β , "as described in the Museum Ulricae" (see p. 100, below), and to the good Chemnitz figures cited by Link.³

¹ Dr. J. P. E. Morrison (personal communication, 1955) considers that after the two Argenville figures have been expunged the majority of those remaining may be recognized as *rana*. I do not entirely share Dr. Morrison's confidence in the majority of the other figures, although several of them have features resembling *rana*. This complex of species exhibits so many variations of sculpture and, indeed, so much variation within a given species, that more detailed and accurate figures than those of the early iconographers are necessary to distinguish any of its members with accuracy.

² Reeve also described *albivaricosa* in the volume of the Proceedings of the Zoological Society of London for 1844 (1844a, p. 136). His text covering plate 1 in the "Conchologica iconica" is dated "July, 1844." The first paper was not read until August, 1844, yet each publication quotes the other.

³ The species *echinata* had already been described by

Deshayes (1838–1845, vol. 9, p. 544), in adopting Lamarck's separation of *crumena*, *spinosa*, *bufonia*, and *granifera* as good species, continued to include *rana* in the synonymy of *crumena*, and added a footnote saying that Linnaeus' twelfth-edition synonymy was "almost entirely" correct once the figures from Argenville were eliminated. As said above, I cannot go that far. In giving "Lin. Syst. Nat. 10, p. 748" as the first synonym of *crumena* Deshayes added the words "exclus. variet." To the reference to the twelfth edition he added "exclus. plur. synonym," and to the reference to Gmelin, "exclus. varietatibus." If *crumena* was in fact *rana* Linné (*albi-varicosa* Reeve), an identity that I feel should be rejected,¹ these were helpful limitations so far as they go. Deshayes, however, complicated the synonymy still further by including virtually every figure, good or bad, which had been used by his predecessors, and this makes one suspect that he might have felt a mental reservation as to the identity of *crumena* with *rana*.²

Röding (1798, p. 129) as *Bursa bufonia*, but that name was preoccupied by *Murex bufonius* Gmelin.

Schumacher, in describing *Bufonaria*, included two very different species: *B. spinosa*, which was later designated as the type species of *Bufonaria* by Jousseaume (1881, p. 174), and *B. pes-leonis* which he referred to *Murex scrobiculatus* (sic) Linné, and which Jousseaume (*op. cit.*, p. 175) placed in his new genus *Tutufa* as *Tutufa scrobiculatus* Linné. Dall, on the other hand (1904, p. 119), selected *M. scrobiculatus* Linné as the type species of *Bufonaria* Schumacher. E. A. Smith (1914, p. 229) said of the latter designation: "... but since Jousseaume had already chosen the type and given the name *Tutufa* to *M. lampas* auct. *Bursa* (*Tutufa*) *rubeta* Röding, which certainly belongs to the same group as *M. scrobiculatus*, I think it would have been better if Dr. Dall had used that subgeneric name instead of *Bufonaria*, already disposed of by Jousseaume." Smith committed one error in the above comment: It was *lampas* Linné, not *lampas* auct., which Jousseaume placed in *Tutufa*. (See discussion of these two species under *M. lampas* Linné, pp. 103–106, below.)

¹ It might be suggested that Lamarck considered that *crumena* was a form of *rana* represented by one of the figures cited by Linnaeus. It is difficult for the present writer, however, to allocate *crumena* to any of these figures. Even if a specimen of *crumena* had been the model for one of them, Lamarck properly separated it from that complex. It is a good species in its own right and clearly distinguishable from the undoubted type of *rana* in the Linnaean collection.

² One item in Deshayes' synonymy should be noted. He included *Ranella elegans* Kiener (1843–1850, vol. 7, p. 4, pl. 3, fig. 1), which is not *crumena* Lamarck. The

Murex rana was described in the "Museum Ulricaë." There the tenth-edition description is copied, followed by short descriptions of two "varieties." The first, "tuberculis plurimis exasperata," possibly refers to the spinose shell from Tranquebar (*spinosa*) noted in the "Systema." The second, "Lateribus anfractum exeuntibus in spinas canaliculatas," may refer to the typical *rana*, although I have seen no specimen in which more than a single spine at the posterior end of the lip could be called canaliculate. The synonymy consists of the Rumphius, Gualtieri, and Argenville figures cited in the "Systema," only one of which shows the true *rana*. There follows an elaborate subdescription which is of little assistance in the identification. The two shells labeled *Murex rana* in the Uppsala collection are, first, a specimen of the *crumena* of authors, and, second, the *subgranosa* of Sowerby (1841c, p. 52). The latter species, of which a considerable series was examined by the present writer, is readily distinguishable from *rana*. It seldom reaches the size of *rana*. The spiral striae on both body whorl and spire are closely and finely beaded, whereas the beading of *rana* is much sparser and coarser. This difference was constant in all specimens seen. Fully adult individuals of *subgranosa* show considerable orange stain on the anterior part of the columella and the edge of the outer lip, which is lacking in *rana*. The presence of these two species, both of which are distinct from *rana*, makes it obvious either that Linnaeus had a different conception of *rana* in 1764 than he had in the "Systema" or that a mixture of specimens or labels has taken place.

error stemmed from a mistake of Broderip. Broderip (1825, p. 199, suppl. pl. 11, fig. 2) described and figured a shell which he called "*Ranella crumena* L." and a second (new) species, *Ranella foliata* (*loc. cit.*, fig. 1). His *crumena*, not being the *crumena* of Lamarck, was a homonym, and takes the next available name, *N. crumenoides* Valenciennes, 1832. It is this shell that is *elegans* Kiener (not *elegans* Sowerby, 1835, nor Anton, 1839) and *cavitensis* Beck MS. in Reeve, 1844. Kiener's *elegans* does not therefore belong in the synonymy of *crumena* Lamarck. The *crumena* of Sowerby, 1841, and Reeve, 1844, are likewise misnamed, and are both equal to *crumenoides* Valenciennes.

Broderip's second species, *foliata*, is *crumena* Lamarck, and must be thrown into the synonymy of the latter.

Murex rana belongs in the genus *Bursa* Röding, 1798. While the present writer advocates the restoration of the Linnaean specific name and the placing of Reeve's name *albivaricosa* in its synonymy, for reasons consistently advanced in this series of papers, it is probable that the rule of convenience, which seems to be gaining undue strength with the present generation of zoologists, in cases where a later name has become "established" in the literature, will prove the governing factor rather than the Rule of Priority.¹

The early figures of the species are so unilluminating that it may be said that the first unmistakable representation of it is the figure in Reeve (1843-1878, vol. 2, *Ranella*, pl. 1, fig. 2) as *R. albivaricosa*.

Murex gyrinus

1758, *Systema naturae*, ed. 10, p. 748, no. 453.

1767, *Systema naturae*, ed. 12, p. 1216, no. 528.

LOCALITY: "In M. Mediterraneo" (1758, 1767).

"M. testa varicibus oppositis continuatis, punctis tuberculosis fasciata, apertura edentula orbiculari . . . Testa magnitudine nucis coryli, quiescens apice adscendente, undique punctis eminentibus fasciata; Suturæ laterales continuatae, obtusae; color albus fasciis solitariis in singulo anfractu, sed in infimo binis, per duos ordines punctorum dilatatis."

The description in the tenth edition of the "Systema" was identical with that in the twelfth, above, except in two particulars: As in the preceding species the description of the varices was changed for the better, "suturis varicosis" of the tenth becoming "varicibus" in the twelfth. "Binis" and "dilatatis" were written "binae" and "dilatatae."

Although this species has undergone many changes in both its generic and specific names, there has not, since earliest post-Linnaean times, been any question as to its identification. In spite of Linnaeus' erroneous locality, *gyrinus* being a Pacific shell, and in spite of the paucity of the synonymy, the main description and subdescription give an exact and detailed picture of the *gyrinus* of all authors. If any criticism may be made of the description it is that the phrase "apertura edentula" is somewhat misleading. The outer lip is crenulate, or finely dentate, by the termi-

ni of the transverse threads of the exterior, and these continue as short white ridges on the inner side of the lip. The word "edentula" was omitted in Gmelin's description, and Lamarck (1822b, p. 154, as *Ranella ranina*) improved the description by saying merely "labro margine dentato," although recent descriptions usually mention the ridges or lirae of the aperture.

No references were supplied in the tenth edition. In the twelfth three figures from Seba were cited (pl. 60, figs. 25-27). These are adequate representations of *gyrinus*. Linnaeus omitted to cite a Gualtieri figure (pl. 49, fig. E) which is almost equally characteristic. This is strange, as Gualtieri, with Rumphius, were most often cited in the "Systema." In the interleaved copy of the twelfth edition belonging to Linnaeus he added a figure from Petiver (pl. 102, fig. 14) by a manuscript note, which is also a clear figure of the species.

Chemnitz (1780-1795, vol. 4, pp. 78-80) graphically described *gyrinus*, as "Buccinum bufonia compressa," this being the first instance I have found of a reference to the peculiarly compressed shape of the shell. Chemnitz referred the shell to the *gyrinus* of the "Systema" and supplied 11 figures (*tom. cit.*, pl. 127, figs. 1224-1227, pl. 128, figs. 1229-1235), only three of which (pl. 128, figs. 1233-1235) are entirely satisfactory. The remainder somewhat resemble its congener *natator* Röding, 1798, both in the fineness of the tubercles and the chocolate-brown color of the transverse bands.

Link (1807, p. 123) included the species in his new genus *Gyrineum*, but under the name *G. verrucosum*, for which he cited the figures used for *gyrinus* by Linnaeus and the two best of the above-mentioned Chemnitz figures. He also listed *G. natator* without referring it to the *natator* of Röding, but citing for it the Chemnitz figures 1229 and 1230, which I have mentioned as resembling *natator*. The latter is a good species. Gmelin had used all 11 of the Chemnitz figures for *gyrinus* Linné.

Dillwyn (1817, p. 693) retained *gyrinus* in *Murex* and in his comprehensive synonymy confused at least five species, including the true *gyrinus* Linné. Lamarck (1822b, p. 154) assigned it to his genus *Ranella*, 1816, and changed the specific name to *ranina*, although

¹ The most recent identification of *albivaricosa* Reeve with *rana* Linné is that of Bayer (1932, p. 224).

admitting its identity with *gyrinus* Linné. Of the several Chemnitz figures he cited the three best (figs. 1233–1235).¹ Deshayes (1838–1845, vol. 9, p. 549, footnote), as usual, criticized Lamarck's suppression of the Linnaean name, saying: "... Lamarck was wrong to list it under a new name and we propose to restore to it the specific appellation which Linnaeus first gave to it." The name *ranina* has been used only sparingly since that time.

Murex gyrinus was placed in the genus *Bursa* Röding, 1798, for many years after the Röding names came to the attention of conchologists. Recent writers are beginning to assign it to the genus *Argobuccinum* (Klein) Herrmannsen, 1846,² and in the subgenus *Gyrineum* Link, 1807. It has been also used by some authors in the genus *Gyrineum* Link, 1807, *Apollon* Montfort, 1810, *Ranella* Lamarck, 1816, *Gyrina* Schumacher, 1817, *Gyrinea* Mörch, 1877, and *Apollo* Fischer, 1883, these names being used either generically or subgenerically.

A specimen of the *gyrina* of all authors is found in the Linnaean collection in London. It was once marked with numerals which are now so nearly obliterated as to be undecipherable, and it cannot even be stated that they were in the hand of Linnaeus. While we know that Linnaeus owned a specimen of the shell, as the name appears on his lists of owned species, and while no other specimen in his collection conforms to the description of *gyrinus*

and to the Seba figures cited in the "Systema," the absence of an unequivocal documentation renders it unacceptable as Linnaeus' type specimen, except on a "probable" basis. It was not described in the "Museum Ulricae."

The species is figured by Reeve (1843–1878, vol. 2, *Ranella*, pl. 8, sp. 49), Sowerby (1852, pl. 17, fig. 393, as *Ranella ranina*), and Maxwell Smith (1948, pl. 6, fig. 7, as *Gyrineum gyrinum*).

THE CYMATIIDAE IN *Murex* LINNÉ

Linnaeus described 10 species in his *Murex* which now belong in the family Cymatiidae as at present constituted (*lampas*, *olearium*, *femorale*, *cutaceus*, *lutorium*, *pileare*, *pyrum*, *rubecula*, *anus*, and *tritonis*).³ Although these species are not listed consecutively in the twelfth edition of the "Systema," this note is here inserted as the next species is the first of the group.

The names mentioned have had an involved history, both generically and specifically. The family was formerly composed of only two genera—*Ranella* Lamarck and *Triton* Montfort of the older authors. *Cymatium* Röding, 1798, has replaced *Ranella* Lamarck, 1816. The old genus *Triton*, after the elimination of certain species of *Epidromis* and their transfer to genera in Buccinidae and Muricidae, has been drastically broken up. Under the Thiele classification the Cymatiidae are divided into four genera—*Cymatium* Röding, *Distortrix* Link, 1807, *Charonia* Gistel, 1848, and *Argobuccinum* (Klein) Herrmannsen, 1846. These in turn, under Bayer's interpretation of Thiele's arrangement, are subdivided into 19 subgeneric and sectional groups. In the following discussions of the Linnaean Cymatiidae, I follow Bayer's generic and subgeneric arrangement except in a few particulars, although I disregard the sections. Moreover, I do not fully accept all his specific synonyms, and point out (footnote 2, this page) that he erroneously attributed *Argobuccinum* to Bruguière.

The diagnoses of several of the species of the family in *Murex* Linné were the subject

¹ Lamarck (*loc. cit.* in text) suggested that Linnaeus used the name *gyrinus* because of its fancied resemblance to "the aquatic insect Gyrin." This refers to the members of the genus *Gyrina* Linné, 1767, in Insecta, Coleoptera. The species included in that genus are oval "water-bugs" which do not resemble the Linnaean mollusk in any particular. Linnaeus, with somewhat more reason, might have had in mind the resemblance of the shell to a tadpole (Latin, *gyrinus*; Greek, γυρινος).

² Thiele, Bayer, and a few other writers have attributed *Argobuccinum* to "(Klein) Bruguière, 1792." This is incorrect, as Bruguière used the name only in his article "Conchology" in the second part of his volume 1 of the "Histoire naturelle des vers," which discussed several of the pre-Linnaean classifications, among them that of Klein. None of the Klein names were there accepted as valid, nor did he adopt them as his own. The earliest valid use of *Argobuccinum* has been considered to date from Mörch, 1852, in the Yoldi Catalogue, but Herrmannsen had used it validly in 1846, six years earlier.

³ If *Murex gyrinus* should be held to belong properly to *Argobuccinum* rather than to *Bursa*, it would fall in the family Cymatiidae, which would increase the number of the Linnaean murices in the latter family to 11.

of widely varying interpretations during the first three-quarters of a century after Linnaeus, and serious questions of identification are still raised. This has been partly due to the brevity of the descriptions and the fact that important diagnostic characters were omitted by Linnaeus, but primarily to the gross disharmony of the cited figures. Certain figures do not conform in any respect to the scant details of the description, and in one instance the same figure was cited for two of the species. While the drawings in the pre-Linnaean iconographies are, for the most part, admittedly crude and uninformative, most of those that Linnaeus chose, or was forced to use because of the lack of good figures, were particularly uncharacteristic and generalized. In the case of three of the 10 species Linnaeus did not possess a specimen, and in four of them he did not supply any locality. The details of these confusing diagnoses are discussed below under the respective species. In brief, there have been more divergence of opinion and more debatable conclusions reached as to the identity of the Linnaean Cymatiidae than in almost any group in the mollusk portion of the "Systema." The conclusions arrived at in the following pages are, in the case of at least half of the 10 species, admittedly susceptible of argument. I do not find sufficient evidence either in the Linnaean diagnoses, the Linnaean collection, or the comments of his successors, to be convinced that my conclusions are unanswerable.

Murex lampas

1758, *Systema naturae*, ed. 10, p. 748, no. 454.

1767, *Systema naturae*, ed. 12, p. 1216, no. 529.

LOCALITY: "In M. Mediterraneo" (1758, 1767).

"M. testa varicibus suboppositis, gibbosa tuberculis longitudinaliter tuberculis, apertura edentula . . . Testa viva epidermide vestita, ut in proximis. Bubo β . Rubeta γ ."

As in the two preceding species, *rana* and *gyrinus*, the tenth-edition description used the phrase "suturis varicosis," for "varicibus." The subdescription was added in the twelfth. Note also that, as mentioned under *M. rana*, the "varieties" *bubo* and *rubeta* were moved from *rana* in the tenth to *lampas* in the twelfth.

Murex lampas and the two names associ-

ated with it by Linnaeus, *bubo* and *rubeta*, have presented more difficulties in identification than any of the other *Bursa*, *Charonia*, or *Cymatium* species in the "Systema." The earlier conchological writers after Linnaeus treated these names in various ways, often synonymizing one or the other of them with *M. rana*, *olearium*, *lutorium*, or *reticularis* Linné. The first critical revision of the group was made by E. A. Smith in 1914 (pp. 226-231). He weighed all the evidence offered by the description, the synonymy, and the treatment by the earlier writers and clarified the nomenclature in a paper that the present writer believes should settle the identification of the Linnaean names and truly reflects Linnaeus' conception at the time the twelfth edition was published. It is here followed.

Linnaeus supplied only two synonyms for his principal species, *lampas*—Rondelet (1554-1555, pt. 2, p. 81) and Gualtieri (pl. 50, fig. D). The first is unquestionably the well-known Mediterranean shell later called *Triton nodiferum* by Lamarck (1822b, p. 179). The second is a crude figure, but Smith concluded, with some reason, that "it may represent a form (immature) of *Triton lampas* of authors," not of Linnaeus, an Indo-Pacific shell of wide range and of several forms. Inasmuch as Linnaeus' locality was the Mediterranean and the Rondelet figure has all the characters of *nodiferum*, except that it is shown as sinistral, it seems obvious that the name *lampas* should be confined to that shell. Smith very properly suggested the retention of the Linnaean specific name, saying: "To transpose the name *T. lampas* applied to a well-known shell, to another species equally well-known by a commonly received name, does not seem advisable, still it must be done if we abide by the evidence before us." The present writer emphatically agrees with this conclusion and could only wish that Smith had stated it more strongly. It is interesting to note that Lamarck established his *nodiferum* without any reference to Linnaeus' earlier name.

For Linnaeus' two varieties, *bubo* and *rubeta*, he cited two figures from Rumphius (pl. 28, fig. C for *bubo*, and fig. D for *rubeta*). Both represent, with more or less clarity, forms of the *Triton lampas* of Lamarck (*tom. cit.*, p. 180) and other authors, but certainly

do not show *lampas* Linné. These figures do not show sufficient divergence in characters to justify specific or even subspecific separability, and this immediately raises the question as to what name should be borne by *lampas* auct. In choosing a name, we find that Röding (1798, p. 125) had already given the name *Tritonium opis* to the Mediterranean shell, which disposes of the possible use of *nodiferum* in any case. The Australian *Triton australe* Lamarck seems to be identical with *nodiferum* and was also called by an older name, *Septa rubicunda* Perry, 1811. Gmelin followed Linnaeus in using the two varietal names *bubo* and *rubeta* and referred to two pairs of figures from Chemnitz (1780–1795, vol. 4, pl. 129, figs. 1238–1239, for *bubo*, and pl. 128, figs. 1236–1237, for *rubeta*). These names were adopted by Röding (1798, p. 128), but in a specific sense.¹ It is certain what shell Röding called by the name *rubeta*, as he based it on the second pair of Chemnitz figures (1236 and 1237), which show the red-mouthed form. Smith selected that form as typical and therefore chose the name *rubeta* for the *lampas* of authors. This choice between *bubo* and *rubeta* was arbitrary and based solely on Röding's choice of figures and Smith's selection of the typical form. In a case like this, however, Smith was the first reviser and was therefore in a position to decide between them.²

The species *rubeta* belongs in the genus *Bursa* Röding, 1798, subgenus *Tutufa* Jousseaume, 1881, and should be cited as of Röding who first used *rubeta* as a specific name. Its synonyms are *Tritonium tuberosum* Röd-

ing,³ *Tritonium bufo* Röding, *Lampas hians* Schumacher, *Triton lampas* Lamarck and many authors, and *Tutufa lampas* and *caledonensis* Jousseaume.

Smith distinguished four forms of *rubeta* to which he gave form names: (1) The typical red-mouthed form described by Lamarck and figured in the "Tableau encyclopédique (pl. 420, figs. 3a, b); (2) *lissistoma* Smith, as figured by Reeve (1843–1878, vol. 2, *Ranella*, pl. 10, sp. 30b); (3) *gigantea*, as figured by Reeve (*tom. cit.*, pl. 9, fig. 30a) and by Chemnitz (*tom. cit.*, pl. 129, fig. 1238), although the latter figure was queried by Smith; (4) *tenuigranosa* Smith. All these forms are minutely described in Smith's paper and figured on his plate 4. The form *tenuigranosa* may be, according to its author, only a finely sculptured form of *gigantea*. A good figure of the typical form is given by Maxwell Smith (1948, pl. 10, fig. 11) as *Bursa* (*Bufo* *naria*) *bubo rubeta* Linné. The species, in all of its forms, is confined to the Indo-Pacific.

The contrast in size between these several forms would seem to preclude the idea, at first sight, that they are conspecific, as they range in height from the typical form, $4\frac{1}{2}$ inches, to *gigantea*, 14 inches. However, in a large series Smith was able to find intermediate measurements which seemed to connect them.

Smith's conception of *lampas* auct. has not been universally accepted, although the majority of conchologists agree with him. Hedley (1916, pp. 41–42), while he followed Smith as to the common identity of *Triton nodiferum* Lamarck with Linnaeus' *lampas*, added that he believed that Smith's form *gigantea* was in fact the *bubo* of the "Systema." He based this partly on the fact that the

¹ Röding wrote *bufo* instead of *bubo*. This change in spelling was first suggested by Chemnitz (*tom. cit.* in text, p. 86) who considered the spelling *bubo* as a printer's error ("Ich habe immer geglaubt *Bubo* sey ein Druckfehler, und soll ohnstreitig *Bufo* heissen.").

² Vanatta (1914, p. 80), in commenting on Smith's conclusions, disagreed with the latter's selection of *rubeta*. He said, basing his argument on the tenth edition of the "Systema": "The second species was named by Linnaeus *Murex rana* var. *rubeta*. Also of Gmelin; *T. rubeta* Bolt. *T. tuberosum* Bolt. is a synonym, and has page priority over *rubeta* if the names were to date from Bolt. Adam and Leloup (1938, p. 151) used the name *bubo* without comment, listing the *lampas* of authors as "*Bursa* (*Ranella*) *bubo* (Linné, 1758) (= *Triton lampas* auct.)" and cite as a synonym "*Bursa* (*Tutufa*) *rubeta* (Bolten) Smith."

³ For *Tritonium tuberosum* Röding used the same figures from Chemnitz on which he founded his *T. rubeta* (figs. 1236–1237). *Tritonium rubeta* is listed one page later than *tuberosum* in the Bolten Catalogue and to this extent Vanatta's objection (see footnote, 2, this page) is sound on the basis of page priority. However, as first reviser, Smith could select any of the Röding names in *Tritonium*. The point which Vanatta disregarded is that Röding used *rubeta* as a specific name, whereas his predecessors used it, and *bubo*, only in a varietal sense. Smith's use of *rubeta* was merely to emphasize Röding's validation of an earlier name. Vanatta selected *tuberosum* "if the names were to date from Bolt. Unfortunately they do not."

Rumphius figure (pl. 28, fig. C) cited by Linnaeus for *bubo* was characterized by Rumphius as having "the inside white like porcelain" and as being the larger of the two shells described by the latter, as also appears from his plate 28. Hedley said (*op. cit.*, p. 41): "The two Linnaean names concerned in this matter, *bubo* and *rubeta*, depend on the figures of Rumphius. From the uncharacteristic dorsal view presented by the Dutch engravers either figure might refer to any of the *rubeta* group. But Rumphius says that his *Buccinea tuberosa* (the name given to the shell figured in figure C) has 'the inside white like porcelain' and this, supported by its large size, seems to fix *Murex rana* var. *bubo* Linn. definitely as *Bursa rubeta*, var. *gigantea*." Hedley thus adopted the view that *Bursa bubo* Linné should be established as a good species. I say above that Rumphius' two dorsally presented figures are not sufficiently detailed to point to two distinct shells, but after reading Rumphius' description of *bubo* and examining the figures as to size I am strongly tempted to abandon the conclusion that nothing may be gained by a reference to Rumphius and to agree with Hedley's modification of Smith's conclusions. I therefore tentatively suggest that both of Linnaeus' varieties be considered as good species.

Murex lampas Linné (*Triton nodiferum* Lamarck) belongs in the genus *Charonia* Gistel, 1848. In addition to Lamarck's name, *Murex nereis* Dillwyn (1817, p. 728) has been indirectly associated with *lampas* Linné. Dillwyn cited for *nereis* the shell called *Murex tritonium australe* by Chemnitz (1780-1795, vol. 11, pl. 194, figs. 1867-1868), which somewhat resembles *lampas* Linné, and a further figure from Chemnitz (*op. cit.*, vol. 4, pl. 136, fig. 1284) which resembles it even more closely, called "*Buccinum Tritonis ventricosius valde nodosum*." The latter was cited for *Triton nodiferum* (*lampas* Linné) by Deshayes who limited its application by referring to it as "*Murex nereis*, Pars. Dillw." Deshayes used Chemnitz' *Murex tritonium australe* as *Triton australe*, citing for it both the Chemnitz figures and "*Murex nereis altera pars*, Dillw." Deshayes said in a footnote (1838-1845, vol. 9, p. 624): "Dillwyn confused this species [*nodiferum*] with the following [*Triton aus-*

trale Lamarck] under the name *Murex nereis*. It is easy to distinguish them today as they are found in all collections. These species should receive their own names and those of Lamarck should be retained."¹ The figure of *australe* in Reeve (1843-1878, vol. 2, *Triton*, pl. 4, 5, sp. 12a, b) is called *Triton australis*. I have not seen a specimen, but the available figures strongly suggest that it is distinct from *lampas* Linné.

Charonia lampas Linné is figured by Reeve (*tom. cit.*, pl. 3, sp. 9); by Kiener (1834-1850, vol. 7, pl. 1, fig. 1), both as *Triton nodiferum*; and by Maxwell Smith (1948, pl. 7, fig. 10) as *Charonia nodifera*.

Murex lampas was described in the "Museum Ulricae" without any mention of the varieties *bubo* and *rubeta*, as at the date of publication of that work, 1764, these names had not yet been transferred from *M. rana* to *lampas*. The only figure in the synonymy, however, was the Gualtieri figure (pl. 50, fig. D) which I have mentioned above as more resembling a form of the *lampas* of authors. The additions to the original description, moreover, are equivocal. The phrases "Testa, oblonga, rubra" might apply either to *lampas* Linné or to the *lampas* of authors. "Apertura alba" might also apply to either, as *lampas* Linné has a white aperture, while the aperture of only the typical *lampas* of authors is red. "Intus non striata" describes neither, although the aperture of *lampas* Linné and some forms of *lampas* of authors shows only faint striae. "Labia extus dentata" is equivocal. The outer lip of both is crenulate by the terminations of the transverse sculpture, but "dentata" is, at best, an ill-chosen word. Note that Linnaeus described *lampas* as "apertura edentula," while Lamarck did not mention the outer lip of his *nodiferum*. The most puzzling part of the description is the phrase "Mur. Lotorio affinis et similis." The latter species is so distinct in appearance that Linnaeus' comparison of the two casts the gravest suspicion on what he had before him

¹ Deshayes did not follow his usual practice of suggesting that the Linnaean name should be restored to *nodiferum*. It is apparent that neither Lamarck nor Deshayes suspected that *nodiferum* was in fact *lampas* Linné, and neither cited any of Linnaeus' figures for that species.

in this description. The decidedly long and twisted anterior canal of *lutorium* is perhaps the most striking difference between the two species. The specimen now marked for *lampas* in the Queen's collection at Uppsala is indeed a specimen of *lutorium*, which either indicates a mixture of labels at some time, or, if the labeling is correct, shows that Linnaeus had completely changed his conception of *lampas* after the publication of the tenth edition. The return to the original description in the twelfth edition is, as in the several other similar cases, one of the unsolvable mysteries that face the students of the Linnaean species.

Murex olearium

1758. *Systema naturae*, ed. 10, p. 748, no. 455.

1767. *Systema naturae*, ed. 12, p. 1216, no. 530.

LOCALITY: "In Europa australi, M. Mediterraneo" (1758); "in Europa australi, M. Mediterraneo, Africano" (1767).

"M. testa varicibus subalternis numeroso-tuberculata, dorso postice mutico striato, apertura edentula."

There were no changes in the description between the tenth and twelfth editions, but it should be stated at the outset of this discussion that the evidence seems conclusive that under this name Linnaeus was describing two quite distinct shells. The tenth-edition *olearium* was the shell later called *Ranella gigantea* by Lamarck, while the twelfth edition refers to Born's *Murex costatus*. The great difficulty experienced by the early followers of Linnaeus undoubtedly stemmed from the inharmonious synonymy.

In the tenth edition the synonymy consisted of four figures. The figure from Colonna (pl. 53, not seen) was, according to Deshayes (1838-1845, vol. 9, p. 540, footnote), clearly referable to *Murex tritonis* Linné. The Rondelet figure (1558, p. 88) was probably meant for *gigantea*, and the figures from Rumphius (pl. 49, fig. I) and Gualtieri (pl. 50, fig. A) are both characteristic of that species. Thus three out of the four figures may be referred to *gigantea*.

In the twelfth edition the same figures were repeated, although the one from Rumphius was erroneously cited as figure H, instead of I. Four new references were added, none of them being referable to *gigantea*. The two Seba figures (pl. 51, error for pl. 57, figs. 29,

31) were later stricken from the synonymy by a manuscript note in Linnaeus' copy of the twelfth edition. They were later cited by Lamarck for his *Triton succinctum* (1822b, p. 181). The three Lister figures, cited as plate 932, figures 27 and 31-32, also involve errors of transcription. For figure 27 the proper plate number was stated, but figures 31 and 32 belong, respectively, to plates 936 and 937 of Lister. The latter two figures are undoubtedly copies of the Buonanni plates, also cited by Linnaeus (pls. 105 and 289). Plate 105 apparently shows *Murex pileare* Linné. Plate 289 is a good figure of Born's *Murex costatus* (1780, p. 297). Two of the Lister figures (figs. 27 and 31) were also cited by Lamarck for his *succinctum*. All three of the Lister figures were later expunged from the synonymy by Linnaeus, and a single figure (Lister, pl. 935, fig. 30) was substituted. This latter figure resembles *gigantea* in some respects but shows no nodose revolving ribs but rather a deeply fenestrated cancellate sculpture, and might have represented Lister's attempt to show *M. argus* Born. The figure from Adanson (pl. 8, fig. 12), which Adanson called "le Vojet," is certainly not *gigantea* but much resembles some of the figures cited by Lamarck for *T. succinctum*. Fischer-Piette and his co-authors (1942, p. 215) found in Adanson's "retained" collection three specimens of a shell, two of which were accompanied by a label inscribed "Vojet 37. G. Goré," indicating that they had been collected on the island of Gorée off the coast of Senegal. These they identified as *Cymatium costatum* Born, 1780, of which they gave an excellent photographic figure (pl. 6, fig. 1), stating that none of the specimens found was the model of their figure. I have already called attention (Dodge, 1955, p. 53) to the fact that Adanson's own figures, which were not drawn by him, are not always accurate. In this case the salient revolving ribs of *costatum* are not sufficiently emphasized in Adanson's figure.

Thus, after Linnaeus' suppression of the Seba and Lister figures and the implicit suppression of the Buonanni figures as well, as the latter were the models for two of the Lister figures, we are left with only the Adanson figure, which is *M. costatus* Born, and the substituted Lister figure 30, which I cannot identify. It should not be forgotten that both

Seba figures and one of the Lister figures (fig. 27), all of which were suppressed, show *succinctum* Lamarck. Inasmuch as I feel that we are justified in uniting *T. succinctum* with *M. costatus*, and that Linnaeus wrongfully suppressed one and possibly both of the Seba figures and one of those from Lister, I conclude that the majority of the originally cited twelfth-edition figures showed *costatus* Born and that that species should be accepted as the shell Linnaeus there described. While it cannot be explained why Linnaeus should have retained the original description and name after such a drastic change in his concept of the species, the above theory has been adopted by some later authors, as appears below.

The description of *olearium* is not entirely satisfactory for either concept but may with reservations be taken to describe *Ranella gigantea*. By another later manuscript note Linnaeus substituted the words "illinc tuberculata," as applying to the aperture for the original word "edentula." This is a helpful correction. It is possible, as Hanley (1855, p. 287) believed, that the specimen originally described by Linnaeus was "either immature or imperfect at the mouth," although the specimen marked for *M. olearium* in the Linnaean collection in London is a fully matured specimen of *Ranella gigantea* Lamarck.

Before the complications introduced by Lamarck are taken up, certain of the descriptions and figures of the intervening writers should be noted:

Born's *olearium* (1780, p. 298) is also supported by a discordant synonymy. After citing the Buonanni plate 289, which had been cited by Linnaeus and which shows a tumid shell with its body whorl encircled by flat, strap-like ribs, which may be *costatus*, he cited Gualtieri's figure A, which shows *gigantea* Lamarck; a Chemnitz figure (1780-1795, vol. 4, pl. 127, fig. 1223) which may be *costatus* or a bad figure of Born's *M. argus*; and two of Linnaeus' Lister figures (pl. 936, fig. 31, and pl. 937, fig. 32, both plate numbers corrected), which respectively show *pileare* Linné and *costatus* Born. Thus three species were included. Born may have been attempting to portray *olearium* Linné but was confused by Linnaeus' synonymy.

The synonymy of Born's *M. costatus* is also

discordant, consisting of the Seba figure 31, cited by Linnaeus and showing *pileare*, and a pair of Chemnitz figures (*tom. cit.*, pl. 131, figs. 1252-1253) which may be accepted as showing *M. costatus* (*Cymatium costatum*). All three of these figures were cited by Lamarck for his *Triton succinctum*.

Born's *reticularis* was supported by a good figure of the *olearium* of the tenth edition (*gigantea* Lamarck), and is further discussed under *M. reticularis* Linné (p. 125 below).

Four "species" of Chemnitz should be noted. In 1780 (*tom. cit.*, pp. 80-82, pl. 128, fig. 1228) he described and figured "Das gitterförmige Kinkhorn. Buccinum reticulatum tuberculatum . . . varicibus oppositis." Among his references we find citations of *M. reticularis* Linné of the tenth and twelfth editions, which I am treating as an unidentifiable name, and the Gualtieri and Rondelet figures cited by Linnaeus for *olearium*, which are *gigantea*, together with the Colonna figure which was suppressed by Linnaeus and Linnaeus' substituted Lister figure which I would not venture to identify. Chemnitz' own figure is a highly stylized drawing which is, however, recognizable as *gigantea*.

In the same volume (pp. 89-95, pl. 130, figs. 1242-1243, and 1246-1249) Chemnitz described "Das knotige braungefleckte Kinkhorn. Der Delkuchen mit Rosinen. Der knotige Rosenmund." His six figures are all uncontested drawings of *Murex pileare* Linné, while his references are a mixture of figures of *pileare* and either the *olearium* of the tenth or twelfth editions of the "Systema." His Latin description describes *pileare*, while his German vernacular names point only to *gigantea*, with the exception of the word "Rosenmund," which describes the aperture of *pileare*. It is curious that Chemnitz could have confused these two species, but, as is noted under *Murex pileare* (p. 116, below), his conception of that species was equally vague. The name *pileare* is not mentioned either in his text or references for the above "species." Chemnitz further confuses the issue in the following excerpt from his remarks (p. 93): "Probably our Delkuchen, which is shown in figures 1242 and 1243, is Linnaeus' *Murex olearium*. Edit. 12. no. 530., particularly because a hint is given by the Buonanni figure 105 and Rumphius pl. 49

(with which Linnaeus. Edit. 10. no. 455, where the same citation from Rumphius is given, must be compared). Probably it is his *lotorium* no. 513." None of this quotation is understood. Buonanni's plate 105 shows *pileare* Linné, while the Rumphius figure (pl. 49, fig. 1) is the *olearium* of the tenth edition (*R. gigantea*). Moreover, *lotorium* Linné is easily distinguishable from both.

Again in volume 4, Chemnitz (p. 96) described "*Buccinum costato tuberculatum, fasciatum ventricosum*." In its synonymy we find Lister's figure (pl. 932, fig. 27) which was expunged from the synonymy of *olearium* by Linnaeus but was used by Lamarck for *T. succinctum*. Chemnitz' own figures (pl. 131, figs. 1252-1253) were also cited by Lamarck for *succinctum* and may have been drawn from a specimen of that species.

In 1795 (vol. 11, pp. 115-117) Chemnitz described a shell which he called "*Murex pileare* Linnaei," and referred to the *pileare* of the "Systema." His figures, however (pl. 191, figs. 1837-1838), cannot be tied to *pileare* Linné. They were cited by Lamarck for *T. succinctum*, and in this he was followed by Deshayes.

Gmelin's treatment of the name *olearium* (1791, p. 3532) adds nothing to our knowledge of the species. He copied Linnaeus' description, and his restricted synonymy included figures of both the *olearium* of the tenth edition and of *succinctum* Lamarck.

The *olearium* of Dillwyn (1817, p. 695) is certainly not *Ranella gigantea*, as he described it as having its "back on the hind part unarmed and striated," and it is assumed that he meant by "unarmed" that it lacked tubercles. His synonymy is confused, but his first reference is to the *olearium* of the twelfth edition. His doubts as to this species are reflected in the following excerpt from his subdescription: "Linnaeus' description of this species is short, and his references extremely discordant, so that it is almost impossible to ascertain his meaning. In the opinion of Schröter and Schreibers, *M. olearium*, *M. Lotorium* and *M. Pileare* all belong to the same species, and for the former they have referred to the above mentioned figures of Martini [figs. 1242-1243, which almost certainly show *M. pileare* Linné]; but Born considered *M. argus* to be the Linnaean *M. olearium*. . .

The larger of Martini's figures is four inches long, and an inch and a half broad, and the transverse ribs are represented much finer and more granulated than in *M. Lotorium*." One might read Dillwyn's diagnosis and comments as indicating that he favored *pileare* as the representative of *olearium*.

With this long but necessary discussion of the confused conception of the immediate followers of Linnaeus as to this species, we come to the theories of Lamarck and Deshayes. Lamarck did not cite *olearium* under that name, but his *Ranella gigantea*, as diagnosed in 1822 (1822b, p. 150), is clearly referable to the *olearium* of the tenth edition, including his citation of Chemnitz' "*Buccinum reticulatum*" (vol. 4, p. 80, pl. 128, fig. 1228). His first reference, however, is to *Murex reticularis* "Lin. Gmel. p. 3535." Gmelin's *reticularis*, based on his description and the majority of his figures, is identical with the *reticularis* of Linnaeus, a name which I cannot identify, but which cannot be referred to *gigantea*. It is discussed below (p. 125). This presents an identification suggested for the first time by Lamarck, if we except Chemnitz' doubtful and confused diagnosis of "*Buccinum reticulatum*," which was referred to *reticularis* Linné as well as to several figures of *gigantea*. Lamarck's *Triton succinctum*, 1816, is described (1822b, p. 181) as a good species, but its synonymy, with one exception (the doubtful Chemnitz figs. 1252 and 1253), is referable to the *olearium* of the twelfth edition. I do not know how definitely the distinction between the two concepts of *olearium* was actually appreciated by Lamarck, but I must conclude that *Ranella gigantea* is the *olearium* of the tenth edition and that *Triton succinctum*, for which the earlier name of *Murex costatus* Born (*Cymatium costatum*) must be used, is the *olearium* of the twelfth edition.

These conclusions were in part adopted by Deshayes (1838-1845, vol. 9, footnotes to pp. 540 and 628) and discussed in considerable detail. These footnotes should be studied. As to *gigantea* he said: "This *Murex olearium* is exactly the same species as that to which Lamarck here gives the name *Ranella gigantea*." As to *Murex reticularis* Linné he had this to say: "Like many others, this species is variable, and it is one of these varieties which

had retained, even in the adult stage, the characters of the young shell, which Linnaeus made into another species, under the name of *Murex reticularis*." After analyzing the synonymy of *reticularis* and giving suggestions as to its purification, he continued: "Lamarck, unfortunately, has not followed this simple and natural step; he ignored the *Murex olearium*, took for the type [of *gigantea*] the *Murex reticularis*, and in place of adopting this name, he needlessly substituted another name for it. Thus we have a species with three names, for which we propose that one which is applicable, *Murex reticularis*. It is not necessary to adopt the entire synonymy which Linnaeus supplied for *Murex olearium* in the twelfth edition of the 'Systema,' because Linnaeus, between the tenth and twelfth editions of his work, had modified his opinion of *Murex olearium*: for, in the tenth edition, the species called *Ranella gigantea* by Lamarck dominated [the synonymy] under that name, while, in the twelfth edition, it is the *Triton succinctum* of the same author; thus, in the note concerning the *Triton succinctum* [Deshayes, p. 628] our observations apply exclusively to the *Murex olearium* of the twelfth edition." While I entirely agree with Deshayes' opinion as to the common identity of the tenth-edition *olearium* and *R. gigantea*, and with his conclusion that *T. succinctum* is the *olearium* of the twelfth, I cannot follow him in his views on *M. reticularis*, a species which I am unable to refer to either, or, as is suggested below, even to identify.

It is generally conceded today that Lamarck's *gigantea* is the "*olearium*" of Linnaeus, but in the references to the latter species in recent literature the distinction between the shells described in the two editions is seldom recognized. Tryon (1879-1888, vol. 3, p. 42) did not, in his text, specifically identify *gigantea* with either of Linnaeus' versions of *olearium*, but in his index to that volume listed it as being equal to the *olearium* of the tenth edition. He called the *olearium* of the twelfth (p. 11) "the *olearium* of authors, not of Born or Gmelin," without referring to *T. succinctum* Lamarck, although he placed *Triton costatus* (Born) in its synonymy, along with *Murex parthenopus* von Salis, 1793, another good synonym. He did say that

"*olearium*" was so well established "that it seems preferable to retain it."

Bucquoy, Dautzenberg, and Dollfus (1882-1898, vol. 1, p. 28) did not identify *gigantea* with either *olearium*, at least under that name. They accepted *gigantea* as the valid name for the Mediterranean shell, placing in its synonymy *Murex reticularis* Born, *non* Linné, *Gyrina maculata* Schumacher ("on the authority of Lamarck [error for Deshayes] and Petit"), and *Ranella olearium* Deshayes, *non* Linné (1830-1832, vol. 3, p. 877).¹

Although I recognize the prevalence of the modern view that the avoidance of "confusion in the nomenclature" is more to be desired than a strict adherence to the Rule of Priority, I feel that in the present case it is irrational to continue to insist that Lamarck's *Ranella gigantea* is incontestably the *olearium* of at least the tenth edition, and, at the same time, to suppress the older Linnaean name in its favor. As to the *olearium* of the twelfth edition I am prepared to admit that there is probably sufficient ambiguity in the Linnaean diagnosis to justify us in disregarding it, although I believe that Linnaeus was there describing the shell later called *Murex costatus* by Born and *Triton succinctum* by Lamarck. The name *costatus* should therefore be retained for the well-known shell so labeled in our collections.

Murex olearium Linné, 1758, belongs in the genus *Argobuccinum* (Klein) Herrmannsen, 1846, and in the subgenus *Gyrina* Schumacher, 1817. As *Ranella gigantea*, it is the type species of *Ranella* Lamarck, 1816, by subsequent designation, Children, 1823, and of *Gyrina* Schumacher, by monotypy, as *Gyrina maculata*.

It is figured in the "Tableau encyclopédique" (pl. 413, fig. 1), by Reeve (1843-1878, vol. 2, *Ranella*, pl. 1, sp. 3), by Tryon (1879-1888, vol. 3, pl. 24, fig. 69), and by Bucquoy, Dautzenberg, and Dollfus (1882-1898, vol. 1, atlas, pl. 3, fig. 1).

Murex costatus Born (*Triton succinctum* Lamarck) belongs in the genus *Cymatium* Röding, 1798, subgenus *Cabestana* Röding, and

¹ This reference of these writers is erroneous. Deshayes, in listing *gigantea* at the place cited, did not synonymize it with *olearium* but with *reticularis* Linné, and did not list any *olearium*.

section *Monoplex* Perry, 1811 (*Simpulum* [Klein] Mörch, 1852).

Synonyms of the *olearium* of the tenth edition, in addition to *R. gigantea*, are: *Ranella ranina* Blainville, 1825; *Gyrina maculata* Schumacher, 1817; and *Murex parthenopus* von Salis, 1793, *vide* Deshayes.¹

Murex femorale

1758, *Systema naturae*, ed. 10, p. 749, no. 456.

1767, *Systema naturae*, ed. 12, p. 1217, no. 531.

LOCALITY: "In O. Asiatico" (1758, 1767).

"M. testa varicibus decussatis trigona rugosa, antice [*sic*] nodulosa, apertura edentula: antice [*sic*] transversa."

The description of *M. femorale* is identical in the tenth and twelfth editions of the "*Systema*," except that here, as for the four preceding species and several of those succeeding, now placed in the genera *Bursa* or *Cymatium*, Linnaeus changed the words "suturis varicosis" to "varicibus," a more scientifically accurate expression. The description of this very distinctively shaped shell could have been much more graphically worded. Nevertheless, when Linnaeus' habitual error in reversing the meanings of "postice" and "antice" is corrected, it may be said to point exclusively to the *femorale* of all authors, as the combination of "trigona rugosa," "postice nodulosa," and "postice transversa" is not found in any other species in Linnaeus' *Murex*. The last of these phrases is possibly too broad, as, practically speaking, the last two whorls of the spire show a pronounced deviation to the left from the horizontal, while the remaining whorls of the spire are deflected somewhat to the right. The phrase "spira distorta" would have been more graphically descriptive.

The triangular shape of the shell, both of the vertical face of the apertural side and of the periphery of the shell when viewed in section, is its most striking feature, and the feature that most impressed itself on both the pre-Linnaean and the early post-Linnaean

writers. Lister used the word "triangulare," as did Grew, Petiver, and Davila. Buonanni called the species *Murex triangularis*, and Martini "Pyrum triangulari subalatum."

The synonymy is only partially correct. The figures from Grew (pl. 11, error for 10, figs. 7-8), Lister (pl. 941), Buonanni (pl. 290), Gualtieri (pl. 50, fig. C), and Seba (pl. 63, figs. 7-8) are all recognizable as *femorale* and have been frequently cited for it. The remaining figures (Rumphius, pl. 26, fig. B; Argenville, 1742, pl. 13, fig. B; and Regenfuss, pl. 2, fig. 21) seem to have been meant for *M. lotorium* Linné. Indeed, Linnaeus cited the Rumphius figure again in the synonymy of *lotorium*, although with a query. In Linnaeus' manuscript revision he had apparently discovered that his synonymy covered two species, as he placed the figure "2" before the name *femorale* and struck out the three discordant references.² The most accurate figure in the synonymy of *femorale* is that from Buonanni, which Linnaeus designated as "bene" by a manuscript note. In the reference to Grew, the figures referred to are the seventh and eighth figures, by position, on the plate. None of the figures are numbered.

Linnaeus' Asiatic locality is incorrect, as *femorale* is a western Atlantic species, found in southeastern Florida and the West Indies. It is described in Sloane's "Natural history of Jamaica" (1707, 1725, vol. 2, p. 250) and Petiver (1708, vol. 2, p. 190) called it "*Buccinum* Jamaic. triangulare." As the first of these works, at least, was in Linnaeus' library and is repeatedly referred to in the "*Systema*," it is surprising that he did not suspect that his Asiatic locality was incorrect.

Murex femorale belongs in the typical subgenus of *Cymatium* Röding, 1798, of which it is the type species, by subsequent designation, Dall, 1904. The earlier writers placed it either in *Tritonium* Link, 1807, not Müller, 1776, or in *Triton* Montfort, 1810, and it was generally retained in the latter genus until the Röding names came again to the attention of conchologists early in the present century.

¹ Deshayes (*tom. cit.*, p. 630, footnote) said that *M. parthenopus* is "the veritable *olearium*," by which I assume that he meant the *olearium* of the tenth edition. The present writer has not seen any specimens so labeled but, based on the descriptions and figures examined, *parthenopus* seems to have been a synonym of *Cymatium costatum* (Born) rather than of *Ranella gigantea*.

² As is pointed out in the comments on *M. lotorium*, the next species but one in the "*Systema*," Linnaeus, having cited another Argenville figure (1742, pl. 13, fig. M) changed it by a manuscript note to figure B, an undoubted representation of *lotorium*, and one that had been already been cited for *femorale*.

I know of no specific synonyms of *M. femorale* except *Lotorium lotor* Montfort, 1810. It was apparently confused with *M. lotorium* Linné by the editors of the "Tableau encyclopédique," where the figure of *femorale* (pl. 415, fig. 2) is referred to as "Triton lotorium. T. femorale Lamk.," while the next species (pl. 415, fig. 3) is correctly called "Triton distortum. T. lotorium Lamk.," *distortum* being Lamarck's once-used name for *lotorium*.

The eastern Pacific analogue of *femorale*, *Cymatium tigrinum* (Broderip, 1833) from the Panamic province, has been confused with the western Atlantic shell by some collectors. It is a less triangular species, more compact, and has a more expanded lip and a larger aperture. Its specific name is derived from the large brown spots on both sides of the aperture.

The type of the present species is found in the Linnaean collection in London. It conforms with the description in the "Systema" and with all the figures cited by Linnaeus and not excluded by his manuscript note above referred to.

The description of *femorale* in the "Museum Ulricae" entirely confirms the identification and adds the useful details "postice [sic] angustata," "Color ruber," and "cauda levissime adscendens." Two specimens of the *femorale* of all authors are properly labeled in the Uppsala collection.

Cymatium femorale is figured in Reeve (1843-1878, vol. 2, *Triton*, pl. 7, sp. 22) and in Kiener (1834-1850, vol. 7, *Triton*, pl. 10, figs. 1, dorsal and apertural views). The figure in the "Tableau encyclopédique" (pl. 415, fig. 2) was, as said above, confused with *Triton lotorium* in the catalogue of the plates that was published to accompany the "Tableau," and that must not be confused with the "Liste" of 1816.

Murex cutaceus

1767, *Systema naturae*, ed. 12, p. 1217, no. 532.

LOCALITY: Not given.

"M. testa varice solitaria, nodis angulata subrugosa, apertura dentata, columella perforata . . . Testa alba, magnitudine n. Juglandis. Venter sutura unica labro opposita, dorso levissime striata et tribus nodis antice [sic] angulata. Labrum intus scrobiculato-caniculatum et subdentatum. Cauda productiuscula. Columella in medio perforata. Venter subtus rugis striatis notatus."

This species, which appeared for the first time in the twelfth edition of the "Systema," is provided with a reasonably clear and detailed description which, however, contains some questionable language. The use of the expression "Venter sutura unica labro oppositae" indicates that Linnaeus used the word "sutura" to mean "varix," as he did in many of the tenth-edition descriptions in *Murex*, where the unfortunate phrase "suturis varicosis" was corrected to "varicibus" in the twelfth (see the species *Murex gyrinus* through *M. pyrum*). In the phrase "varice solitaria," however, the correct word was used. Furthermore, in both phrases Linnaeus indicates that he conceived of the shell as having only one varix, that opposite the lip, whereas the thickened and expanded lip is also a varix. The "tribus nodis" are seen only on the apertural face of the shell, there being only two nodes on the dorsal face, between the varices.¹ Again Linnaeus has confused the words "antice" and "postice." Possibly all of these defects were due to carelessness, although we know that Linnaeus owned a specimen of *cutaceus*, but they detract from the evidential value of the description.

The Linnaean name was, however, immediately recognized by all writers, and its identity has not been questioned. It is strange that he did not supply a locality for the shell, as it is a common Mediterranean species and its source should have been known to him. In addition to the Mediterranean it is found from the English Channel islands to the Cape Verde Islands, and along the coasts of France, Spain, and Portugal.

The synonymy consists of a single figure (Seba, pl. 49, fig. 72), which is characteristic of the species and was designated by Linnaeus as "bene." Figures 71 and 73 on the

¹ Since the above was written the writer has examined a large series of *cutaneus* in several life stages with greater care and determined that the number of nodes is not a constant character. There may be two to four nodes on both the apertural and dorsal face of the body whorl between the varices, although the number on each face is not necessarily the same. In juvenile shells there are sometimes as many as five nodes on the dorsum of the body whorl, and in such cases these may be counted on the spire of the adult shell. It is apparent that Linnaeus described the species from a single specimen or at least from only a few. There seems to be no constant difference in the number of nodes in shells from different localities.

same plate of Seba, which Linnaeus apparently overlooked, show the species in even better detail. A further figure (Lister, pl. 942) was added to the synonymy by a manuscript note in Linnaeus' interleaved copy of the twelfth edition.

The first post-Linnaean figures of *cutaceus* are found in Martini (1769–1777, vol. 3, p. 408, pl. 118, figs. 1087–1088). They do not, however, show the sculpture of the aperture and lip, and the prominent dorsal nodes. Martini called the species "*Dolium nodosum contabulatum*," a name much more descriptive than were his figures, and referred to the *Murex cutaceus* of the "Systema."

The species is now generally placed either in the genus *Cymatium* Röding, 1798, subgenus *Cabestana* Röding, or in *Cabestana*, using the latter as a good genus. It is the type species of *Cabestana*, by subsequent designation, Dall, 1904.¹ The genus *Triton* has largely been abandoned, by American writers at least, as the proper receptacle for *cutaceus*, as well as for the other species now included in *Cymatium*. The name is still used, however, by some continental conchologists and was employed as late as Bucquoy, Dautzenberg, and Dollfus (1882–1898) and Nobre (1938–1940). *Cabestana* is equal to *Aquillus* Montfort, 1810, *Monoplex* Perry, 1811, and *Simpulium* (Klein) Mörch, 1852, and probably to *Neptunella* (Gray) H. and A. Adams, 1858, and *Turritriton* and *Tritoniscus* Dall, 1904. Thiele (1931, p. 282) treats all of these names as sections of the subgenus *Cabestana*, on what basis he does not state. The present writer adopts the view that *Cabestana* should be considered generically distinct from *Cymatium*. Grant and Gale (1931, p. 732) give reasons for the separation which seem unanswerable: "*Cabestana* is so much like *Cymatium* that it may be and often has been considered a subgenus of *Cymatium*. However, the latter is much larger, bears very

large prominent varices with high shoulders, a very elongate, expanded, trigonal aperture, and a narrow, curving anterior canal." These authors say (*loc. cit.*) of Dall's *Turritriton*: "*Turritriton*, on the other hand, is hardly of sectional value."² *Murex cutaceus* is also the type of *Aquillus* Montfort, by original designation.

Both Bucquoy, Dautzenberg, and Dollfus (1882–1898, vol. 1, p. 32) and Bayer (*loc. cit.*) cite as varieties of *cutaceus*: *curta* Bucquoy, Dautzenberg, and Dollfus, and *danieli* Locard, 1886.

The only synonyms of *cutaceus* are *Ranella tuberculata* and *Murex succinctum* Risso,³ 1826 (not *M. succinctus* Linné, 1771, "*Man-tissa*," nor *Triton succinctum* Lamarck, 1816).

A properly documented specimen of *Cabestana cutacea* is present in the Linnaean collection in London. The species was not described in the "Museum Ulricae."

It is well figured in the "Tableau encyclopédique" (pl. 414, figs. 2a, b), and by Reeve (1843–1878, vol. 2, *Triton*, pl. 11, sp. 39).

Murex lotorium

1758, *Systema naturae*, ed. 10, p. 749, no. 457.
1767, *Systema naturae*, ed. 12, p. 1217, no. 533.

LOCALITY: Not given in either edition.

"M. testa varicibus decussatis angulata, nodis longitudinaliter tuberculosis, cauda flexuosa, apertura dentata."

The *lotorium* of authors, which is today almost universally considered to be the *lotorium* of Linnaeus, is a peculiarly distorted shell much resembling *Cymatium femorale* (Linné), at least when viewed from its apertural side. In the words of Argenville, in the text applying to his figure (1742, p. 270): "Everything about the figure is irregular." In order to compare it to the other species with which it has been confused or identified in the past it is here redescribed:

It possesses two opposite varices, one forming the outer lip and the other adjacent to the parietal wall. These varices carry a series of heavy white ridges which are the extensions of the heavy white cords which encircle

¹ Winckworth (1945, p. 130) commented as follows on Dall's designation: "The species *C. helclarum* Röding should have been selected, since that species bears the vernacular name 'Kabestan,' i.e. capstan. It is perhaps fortunate that this was overlooked, as *Cabestana* has been used for the *Murex cutaceus* group from H. and A. Adams, 1853." That is the earliest use of *Cabestana* since Röding that I have been able to find. The Adams brothers used it as a good genus.

² Bayer (1933, p. 43) places this species in *Cabestana* but uses that name as a subgenus of *Cymatium*.

³ Risso's *Ranella tuberculata*, cited above, was figured by him (1826, p. 202, fig. 11). The figure clearly shows the *cutaceus* of Linnaeus.

the exterior of the shell, the interspaces being dark brown. The dorsum shows three extremely prominent, transversely compressed nodes, which, theoretically, involve the upper six of the spiral cords, the upper two being the most produced and the remainder decreasing so rapidly that the shell is markedly constricted at this point. It may be reasonable to designate the entire arrangement as a series of three axial ribs which flatten out and become obsolete as they approach the constricted area of the dorsum. The word "ribs" is used advisedly, as it is involved in the confusion which has attended the identification of this species, as appears below. The lower portion of the body whorl and the anterior canal are twisted to the left in almost a complete half-turn and carry a further series of spiral cords of varying width. At the base the whorl is again raised, below the constriction, into a pronounced ridge, the summit of which is the heaviest of the lower series of cords. Viewed dorsally, the canal is twisted first to the right and then to the left. The aperture is porcelaneous white and shows seven heavy white ridges which correspond to the interspaces of the exterior cords. The lip, at the stage of growth just before the varix is completed, is strongly everted and carries a series of scallops which become obtusely pointed in the mature varix. These Linnaeus described as "teeth." The columella is white, concave in its upper portion, and smooth except that the exterior cords are visible and slightly raised under the columellar callus in the growth stage preceding the complete deposition of the callus. A pair of large, irregular brown blotches are seen at the posterior end of the parietal area. The spire is produced, turreted, and angulate, and carries on each whorl the vestige of an earlier varix as well as vestiges of the three dorsal nodes.

Much ink was expended by the conchologists of the eighteenth and the first half of the nineteenth centuries, in debating what the *lutorium* of Linnaeus really was, and in confusing it at times with *Murex lampas*, *olearium*, *pileare*, or *pyrum* Linné. The confusion was due to the equivocal character of Linnaeus' description and his published synonymy.

The description has been generally condemned as being entirely useless as an aid to identification. It is identical in the tenth and

twelfth editions of the "Systema," except for Linnaeus' substitution of the word "varicibus" for the unfortunate phrase "suturis varicosis" of the tenth edition. The following details, which have been advanced to prove that Linnaeus' shell was not the *lutorium* of authors, should be noted: The phrase "nodis longitudinalibus tuberculosus" is at first glance meaningless, but undoubtedly refers to the fact that the most prominent portion of the dorsal nodes are developed on two (or more) of the spiral cords, and here "longitudinal" may be said to mean "lengthened out" across the axis of the shell, rather than the ordinary meaning of "axial." "Apertura dentata" is merely another instance of Linnaeus' misuse of the word "dentata" to cover crenulations, scallops, ridges, and other irregularities of the lip edge in addition to true "teeth." If by the word Linnaeus meant the white ridges in the aperture, the misuse is still more glaringly apparent. The word "decussatis" was badly chosen and is the only detail of the description which is difficult to explain away, whether Linnaeus meant it to apply to the varices alone or to the entire shell. I suggest that Linnaeus should have placed a comma after the word, thus making it apply to the varices, although it is difficult to describe them as decussate. The rest of the shell carries no decussate sculpture, as the only axial features are the three rapidly decreasing bulges on the dorsum, to which I have suggested that the word "ribs" might apply. Other than this last detail, "decussatis," the description, although it omits many of the peculiar characteristics of the shell, may certainly be said to apply to the *lutorium* of all modern authors, so far as it goes. It must be realized that most of the descriptions of the *Cymatium* species in *Murex* Linné are confusing because of the similarity of many of their details and the omission of many important diagnostic characters. No locality was supplied for this species.

The synonymy in the tenth edition consisted of a single figure from Argenville (1742, pl. 13, fig. M), with the addition, in the twelfth, of a Rumphius figure (pl. 26, fig. B). The first is a recognizable figure of *Cymatium pileare*. The second, in my opinion, is *Cymatium lutorium*. The fact that one figure was

clearly not *lotorium* and that both were cited by Linnaeus with a query caused several of the early writers either to dismiss the whole synonymy as useless or to accept the figure from Argenville as authoritative, as it was Linnaeus' original figure. Those who disregarded the synonymy attempted to refer *lotorium* Linné to his *Murex olearium*, *pileare*, or *pyrum*, always by most devious means. What these writers disregarded, or did not know, was that Linnaeus, in his interleaved copy of the twelfth edition, not only substituted Argenville's figure B on plate 13 for figure M, but deleted the question mark after both references. Figure B is a completely characteristic figure of *lotorium*, so that as corrected the entire synonymy shows *lotorium* and leaves no doubt in my mind that that was the species he was describing, as we are given a description with but a single equivocal word, "decussatis," and a perfect synonymy.¹

The manuscript notes making the above corrections were, of course, never published, and therefore technically we are left with the twelfth-edition diagnosis as the basis of identification. The early commentators were consequently right in confusing this species with others or even in suggesting other identifications, but the manuscript corrections do at least show us what Linnaeus meant and entirely justify the attribution of the name *lotorium* to Linnaeus, 1758. Even if a reasonable argument could be made in favor of any of the species which the early writers suggested, the use of such a substitute would mean the suppression of a name which has been in use for almost two hundred years,

¹ It should be also noted that both figures in the synonymy of *lotorium*, in their proper (corrected) form, were cited by Linnaeus in both editions for *Murex femorale*, which immediately preceded it in the tenth edition, and that both were deleted from the synonymy of *femorale* by a further manuscript note by Linnaeus. Possibly he discovered, after the publication of the twelfth edition, that he had combined two distinct species in *femorale* and therefore made the double correction. On the other hand, it is equally possible that the listing of the two incorrect figures in *femorale* as well as the erroneous reference in *lotorium* was a printer's error which was not detected by him until too late. *Cymatium aquatile* Reeve has been identified by some systematists with *lotorium* Linné. This identification is fully discussed under *Murex pileare*, the next species.

with the exception of the suggestions of the early dissenters.

A history of the early but long-continued debate on this species, with a presentation of all the arguments, weak or strong, that were advanced, would take up unnecessary space and is of only academic interest. It is sufficient to say that Chemnitz (1780–1795, vol. 4, p. 93), Schröter (1783–1786, vol. 1, p. 490, no figure), Gmelin (1791, p. 3333), Röding (1798, p. 129), Link (1807, p. 122), and Dillwyn (1817, p. 698) all confounded *lotorium* with other species both in their descriptions and in their synonymies.

Hanley (1855, p. 288) was apparently the last of the dissenters. After stating all the facts regarding Linnaeus' corrections he still denied the modern identity of *lotorium* Linné, saying: "In the last published edition of the 'Systema,' a figure in Rumphius, generally considered meant for *Triton lotorium*, was doubtfully cited, hence the *accepted though illogical conclusion* of the identity of that shell with the Linnaean species" (*italics mine*). His suggestions as to the correct identity of the species are contained in three sentences which are even less clearly expressed than was usual in his book. They are here quoted as the best illustration of the state of mind of those writers who attempted to refer *lotorium* to other Linnaean *Cymatium* species: "The *M. lotorium* was next described in the 'Museum Ulricae,' where it was described as a large red *Triton* with 'subter costas singulas tuberculorum series 5 longitudinales.' Now, in whatever sense we may understand this passage, it suits not the *T. lotorium* of authors; if, however, the 'subter' should have been a mere misprint for 'inter'—and, as the 'costas' here signify varices, it would be sheer nonsense to talk of tubercles beneath them: moreover, in the antithetical description of a shell (*lampas*) declared to be like it in the opposite page of the same publication, 'nodi tres—inter costas' are specified—in that case the entire account would suit the *T. pyrum*, and, strange to relate, the account of *M. lampas* would apply fairly enough to the traditional *Tr. lotorium*, which has three, not five, knobs between each varix.

"Had I been alone in this opinion I should scarcely have ventured to positively assert the identity of the Lamarckian *T. pyrum*

with the *M. lotorium* of Linnaeus (as first intelligibly defined), but a recent perusal (long after these pages had been penned) of Mörch's critical sale-catalogue of Count Yoldi's collection proves that another has arrived at a similar conclusion by an independent path of inquiry.¹

The words "similar conclusion" cannot be solved by me by a re-reading of Hanley's discussion of the description in the "Museum Ulricae." The entire quotation is reproduced exactly as punctuated and is a monument of confusion. It is useless to criticize any particular phrase. However, I suggest that the transformation of "inter" into "subtus" is hardly a conceivable printer's error. Moreover "the Lamarckian *pyrum*" is a name which he had not mentioned in his first paragraph.

Lamarck (1822b, p. 182) placed the species in *Triton* Montfort, 1810, and supplied the first clear and completely unequivocal description of *lotorium*, a description so accurate that there is no doubt of the species on which it was based. With one exception his synonymy is unimpeachable. His reference to "Lin. Gmel. p. 3533" was apparently used without an examination of Gmelin's synonymy. Gmelin listed two varieties of *lotorium*. The synonymy of his principal variety is a mixture of *lotorium* and *pileare*. The synonymy of his variety " β " shows figures that seem to resemble Linnaeus' *olearium*, and others that are more like his *pyrum*. In spite of this minor defect we may say that Lamarck first established the true identity of *lotorium*.²

¹ Mörch was one of the few eighteenth century writers who used any of the Röding names, and also one of the few naturalists of his day to identify *lotorium* Linné correctly. He listed it (1852, p. 109) as "*lotorium* L. (non autt.)" and placed it in "*Cymatium* Bolt." I do not, however, agree with his synonymy. He made it equal to *P. pilosa* Martyn and "*T. pyrum* Lam. non L." *Triton pyrum* Lamarck is the same as *Murex pyrum* Linné and is not *lotorium* Linné. Hanley, in the above quotation, spoke of Mörch as having arrived at a similar conclusion as he (Hanley) did as to the identification of *lotorium*, but "by an independent path of inquiry." This is not understood, as in the Yoldi Catalogue, the work mentioned by Hanley, Mörch added no comments to his listing of *lotorium*.

² The figure referred to by Lamarck from the "Tableau encyclopédique" (pl. 415, fig. 3) is entitled *Triton distortum*, as that was the name given to the species in the "Liste" of 1816. Figure 2 on the same plate shows

Lamarck cited the popular name for the species, "le rhinoceros," which is peculiarly apt for the shell. He may have copied this from Röding's *Tritonium rhinoceros*, although Röding referred the species so named to *Murex pyrum* Gmelin rather than to *lotorium*.

Schubert and Wagner's description of *lotorium* is mentioned only because they supplied the best figure of the species which has yet appeared (1829, p. 136, pl. 231, fig. 4071). It shows the dorsal aspect of the shell.

Reeve in 1844 (1843-1878, vol. 2, *Triton*, pl. 6, sp. 19a, b) accurately described and figured *lotorium*, and also erected a new species (*tom. cit.*, pl. 19, fig. 20) from a specimen in the collection of Cuming, which is closely related. He gave it the name *T. grandimaculatus*. He had already (or simultaneously) described the shell in the Proceedings of the Zoological Society for 1844 (p. 113) and his comments in that paper are repeated in the "Conchologica iconica": "This shell appears at first sight to be nothing more than a casual variety of the *Triton lotorium*; it will be found, however, upon examination, to differ

femorale, but is listed in the explanation of plates of the "Tableau" as "*Triton lotorium*. *T. femorale*. Lamk. vii. p. 183," a page of Lamarck's volume 7 that contains *femorale* but not *lotorium*. I am unable to establish the date of the explanation of the plates (not the "Liste"), but it must have been after Lamarck's volume 7, 1822, as it continually quotes the latter. This might raise a suspicion that Lamarck, as late as 1822, was confused as to the relationship of *femorale* and *lotorium*. However, it is certain that the explanation of plates was edited, not by Lamarck, but by one of the other Encyclopedists, probably Bory de Saint Vincent. A paragraph is inserted at the head of page 134 of the explanation of plates which throws light on this problem. It reads: "In order not to set up a double use by the repetition of an illustration for which all that can be said is covered in alphabetical order in various parts of the dictionaries which chiefly make up the Encyclopedia, the systematic distribution of which, established by our illustrious predecessor Bruguière, was considerably modified by M. de Lamarck, whose method we adopt, we will, from this point on, limit ourselves . . . to indicating the objects figured in the remaining plates to those which, in Bruguière's day, were called 'Vers.' . . . We have added to the names here represented a reference to the works of M. de Lamarck or to the *Systema Naturae* of Gmelin in order that the reader may have the opportunity to refer to these two great works, which are available to everyone, for details which cannot be revealed by a simple figure." The above quotation has been repunctuated, as the punctuation of the original is grossly incorrect because of its improper use of semicolons.

materially. The large tuberculated lumps of the *Triton lotorium* are here represented by a regular series of small rounded knobs, which impart a kind of cancellated sculpture to the earlier whorls which is very characteristic; the lower part of the shell is not distorted and the varices, especially at the back, are vividly painted with large distinct brown blotches." The name *grandimaculatus* is considered by some to be based on the two brown blotches on the upper parietal wall, but that feature is also found in *lotorium*, although the blotches are there not usually so brilliantly colored.¹

Murex lotorium is now placed in the genus *Cymatium* Röding, 1798, and should be included in the typical subgenus along with the type species, *C. femorale*. I have been unable to find any synonym of the specific name other than the *Triton distortum* of the "Liste," although Adam and Leloup (1938, p. 147) list *Cymatium rhinoceros* Röding, 1798, which is, however, referred to *Murex pyrum* Gmelin, 1791, and not to *lotorium*.

Bayer (1933, p. 48) also makes *lotorium* Linné, which he placed in the principal subgenus of *Cymatium* Röding, equal to *rhinoceros* Röding. The latter species, as said above, is referred only to *Murex pyrum* Gmelin and not to *lotorium* Gmelin, and in all of Gmelin's elaborate synonymy for his five "varieties" of *pyrum*, I cannot find a single figure that can honestly be referred to *lotorium*. The principal variety is probably the *pyrum* of authors. Variety "β" is certainly based on *gutturium* Röding. The single figure for variety "γ" is unrecognizable. Variety "δ" appears to be *tuberosum* Lamarck. Variety "ε" was referred only to "Mart. Concholog. 2. t. 56," which I assume to mean Thomas Martyn's "Universal conchologist." That plate of Martyn, in the copy used by the present writer, shows an obvious *Fusus* close to *F. colus*, but darker in color and with still darker and very strong nodes. It has no similarity to *lotorium*.² While *rhinoceros* is a more

graphic name for *lotorium* than for *pyrum* auct., I assume that Bayer was in error in using it as a synonym of the former, although the original error, which was probably an error of judgment, lay with Röding. Bayer also made *grandimaculatum* Reeve a synonym of *lotorium*.

Adam and Leloup give *Septa triangularis* Perry, 1811, as a synonym, basing their identification on Perry's plate 14, figure 6. Their reference to this figure must have been a *lapsus calami*, as, though badly drawn, it is clearly recognizable as *C. femorale*. Perry's description also points unmistakably to that species.

In addition to the figures cited above, figures are found in Kiener (1834–1850, vol. 7, *Triton*, pl. 9, fig. 1, dorsal and apertural views), and in Maxwell Smith (1948, p. 5, pl. 14, as *Cymatium grandimaculatum pyrum* Linné). The most recent figure is the excellent drawing by Kaicher (1956a, pl. 2, fig. 10). The photographic figure in Rogers (1941, pl. opp. p. 49, fig. 2) is the best that has appeared.

Murex pileare

1758, *Systema naturae*, ed. 10, p. 749, no. 458.
1767, *Systema naturae*, ed. 12, p. 1217, no. 534.

LOCALITY: "In M. Mediterraneo" (1758, 1767).
"M. testa varicibus decussatis, subnodosorugosa, apertura dentata, cauda subadscendente."

The description of this species is the same in the tenth and twelfth editions of the "Systema," except for the change from "suturis varicosis" in the tenth to "varicibus" in the twelfth.

Many of the species in *Murex* Linné which are today assigned to the genera *Bursa* or *Cymatium* are difficult to separate from certain of their congeners, not only because the

¹ Although the shell characters of *grandimaculatum* clearly distinguish it from *lotorium*, Tryon (1879–1888, vol. 3, p. 19) believed the two shells to be conspecific, saying, in his comments on *lotorium*: "*T. grandimaculatum* Reeve belongs here; the distinctive characters are individual only." Tryon supplied two figures (pl. 10, figs. 78–79), of which figure 79 seems to be *grandimaculatum*.

² As the copies of Martyn's volumes of plates now in

libraries vary widely in the number of plates included, in the presence or absence of numbers, and in the manner of numbering, it is unwise to place too much reliance on citations of any of his plates. To state but two possibilities, Gmelin may have seen a discarded plate or an advance plate of which the number was later changed. However, Deshayes (1838–1845, vol. 9, p. 467), in listing his *Fusus toreuma*, gave it the vernacular name "Fuséau de Martyns" and cited for it the same plate of Martyn, saying that it "has a great similarity to that to which M. Kiener gave the name *Nicobaricus*." This is some evidence that both he and Gmelin were citing a definitive Martyn plate, which makes Gmelin's citation all the more puzzling.

descriptions are inadequate, but because of the fact that both the descriptions and the synonymies of some of them cover more than one species, which are distinguished by slight sculptural differences. Moreover the individual species themselves are often so variable in sculpture and color pattern that the range of these variations cannot be adequately pointed out in these short descriptions. This is most strikingly illustrated by *pileare*.

A special problem is presented by *pileare*. That name has long been applied to the Indo-Pacific *pileare* and to a western Atlantic analogue which is barely, if at all, distinguishable from it. Most collections contain specimens of the western form labeled *Cymatium pileare*, and that name has been almost universally used for it until very recently.

The synonymy of *pileare* in the tenth edition of the "Systema" consisted of a single figure from Gualtieri (pl. 49, fig. G). It conforms in a general way to Linnaeus' description of *pileare* and was probably meant for it. It is a poor drawing, as it shows too small a ratio between breadth and length, is too heavily sculptured, and its spire is too produced. In the twelfth edition four figures from Seba were added (pl. 57, figs. 23, 24, 29, 31). The first two correspond roughly to the Gualtieri figure. Figures 29 and 31, on the other hand, seem to show *C. costatum* (Born, 1780), a species which, as noted above (p. 106), I have identified with the *Murex olearium* of the twelfth edition, not the tenth-edition *olearium*, which is *Ranella gigantea* Lamarck, 1816. *Cymatium costatum* is readily distinguished from *pileare* by its more tumid shape, but principally by the strength of its revolving ribs. It was called *Triton succinctum* by Lamarck, 1816.¹

In the Linnaean collection in London the species marked for *pileare* is a specimen of the *pileare* of all authors. Hanley (1855, p. 290) identified the marked specimen as *Triton corrugatum* Lamarck, 1816. He said, however, "It is not expedient to create confusion by altering the established nomenclature," on the grounds that "it was impossible, without ac-

tual examination of the type, to have deduced this fact from a definition which was not merely inadequate but misleading." While there was no occasion for speaking of a change in the nomenclature, as Hanley's identification was clearly an unexplainable error, his reason for suggesting the retention of *pileare* was pure sophistry. In any event Hanley's identification with *corrugatum* Lamarck has not been followed, nor can I find any reference to it in later literature. No voice except that of Hanley has been raised against the traditional identification of the *pileare* of authors with *pileare* Linné.

An examination of a considerable series of both the Indo-Pacific and western Atlantic shell makes it exceedingly difficult for me to separate them even subspecifically. Such slight differences as appear are not impressive. In general, the Indo-Pacific form frequently has less dominant spiral sculpture than the western form, and I have not seen a specimen in which it becomes so defined and strap-like as is occasionally seen in western specimens. The brilliant red color of the aperture of the eastern shell appears, from the series examined, to be somewhat paler in the western form, even in fresh specimens. The soft, hairy periostracum, which is present in shells from both faunal regions, seems to be heavier in the Antillean specimens.² The shells from each region, however, are very variable in all these and in other respects. Given variations recur in both the eastern and western shells, and I suggest that a complete chain of intermediates will be found if a sufficient series is studied and compared.

In 1845 d'Orbigny (p. 249) described a species collected in Cuba, Guadeloupe, St. Lucia, and St. Thomas to which he gave the name *Triton martinianum*, which he introduced as a new name for the western Atlantic *pileare* Lamarck, *non* Linné. In other words he assumed that Lamarck's name referred to a different species and had been preoccupied by Linnaeus. His description reads as follows:

² While the species *pileare* is called by the vernacular name "the hairy Triton," its specific name is not derived from "*pilus*," "a hair," or "*pilosus*," "hairy." It was apparently coined by Linnaeus from the Latin "*pileatus*," "wearing the *pileus*," a felt cap worn at Roman feasts, and by freed slaves to indicate their manumission.

¹ Lamarck did not refer to Born's *costatum* in his synonymy of *succinctum*, but cited for the latter the same Seba figures (figs. 29 and 31) which Linnaeus used for *pileare*, one of which had been cited by Born for his *Murex costatus*.

"Triton testa fusiformi turrita, transverse costata, striis longitudinalibus, albo et rufo variegata; anfractibus convexis distortis, postice nodiferis; canali adscendente; apertura sanguinea, albo rugosa." This description is clear and accurate and contains nothing pointing solely to the *pileare* of the Antilles. In his comments, d'Orbigny distinguished his species from "*pileare*": "This species, very distinct from *pileare* by the yellowish red mouth and in not [being] marked with alternate spots of white, may have given rise to the error on the part of Lamarck. As Linnaeus said that the Mediterranean is the home of *Murex pileare*, it is evident that it should be united with the species we have described in our 'Moluscos de las Canarias'; but then Lamarck was deceived in applying the name only to the species of the Antilles, while he used *T. succinctum* for the true *pileare* of Linnaeus. It results from this error that the name *pileare* should be restored to the *T. succinctum* of Lamarck, and the *T. pileare* of the same author should receive a new name. We propose to name it *T. martinianum*. This *Triton* is found throughout the Antilles."

I do not know whether d'Orbigny, a Frenchman, wrote the above comments in Spanish, or whether de la Sagra or an editor translated d'Orbigny's French into Spanish, but they are not only confused and almost unintelligible but reveal a misconception of Lamarck's treatment of the names *pileare* and *succinctum*.

First, I cannot admit that *pileare* Lamarck is a different species from *pileare* Linné. Of the 16 figures cited by Lamarck, at least 14 show Linnaeus' *pileare*. Lamarck's Latin description gives an accurate picture of that species, and in his French description he emphasized the "vivid color of the aperture" and the teeth and ridges of the inner face of the outer lip. Lamarck's location, "seas of the Antilles" cannot be used as an argument against the common identity of his *pileare* and that of Linnaeus. We are not sure of the actual source of Lamarck's type, but an American locality is certainly not inaccurate for *pileare*.

Second, I am convinced that Lamarck's *Triton succinctum* was not "the true *pileare*," as d'Orbigny would have us believe. I suggest that I have demonstrated above (p. 108) that

succinctum was a new name for the *Murex olearium* of the twelfth edition of the "Systema," rather than a new name for *pileare*.

Third, d'Orbigny said that *martinianum* was distinguished from *pileare* by two features, the color of the aperture and the spots of white on the body whorl. These features are both found in all specimens of *pileare* Linné, from both localities.

In the last analysis, it seems to be obvious that d'Orbigny's errors stemmed from a single cause, his preoccupation with the theory that the true *pileare* was represented by *succinctum* Lamarck and not by *pileare* Lamarck.

The question of whether the western Atlantic *pileare* should be given specific or sub-specific rank is, of course, important. The present writer's feeling is that it should not. If, however, we are forced after further research to give a new name to the western Atlantic shell, I would regret to see the choice fall on *martinianum* d'Orbigny, as that name was based on what I consider a gross misconception, and because d'Orbigny's comments on his species are so confusedly presented.

Triton aquatile Reeve, 1844 (1843-1878, vol. 2, *Triton*, pl. 7, sp. 24), is a form of this complex confined to the Indo-Pacific. It is close to *pileare* and it is sometimes difficult to distinguish the two. In general, its longitudinal ribs are somewhat coarser and more sinuous than those of *pileare*, its tubercles are more prominent, and its spire less produced. Küster and Kobelt (1878, p. 162) treated it (as *aquatilis*) as a good species. Their figures (*tom. cit.*, pl. 42, figs. 7-8) do not show these differences. The confusion of these writers is evident in the localities they gave: "In the Philippines. My specimen is from the West Indies." Tryon (1879-1888, vol. 3, p. 12), in his remarks on *Triton pilearis* [*sic*], said: "Kobelt distinguishes *T. martinianus* (= *veliei* Calkins, fig. 36) *T. aquatile* Reeve (fig. 34) and *T. intermedia* Pease (fig. 35) as varieties. But I cannot so regard them as I find no characters by which to separate them." Tryon was not quite accurate as to Küster and Kobelt's opinion of *aquatile*, as the latter gave it specific rank. I am inclined to agree with their view, and most recent systematists are of the same opinion.

In the collection of the United States Na-

tional Museum *C. pileare* and *C. aquatile* are treated as good species, but *aquatile* is considered as being equal to *C. lotorium* Linné. This identification is based on the single figure from Argenville (1742, pl. 13, fig. M) which Linnaeus cited for *lotorium* in the tenth edition of the "Systema," and of which Hanley (1855, p. 288) very properly said, "I suppose [it] to be *aquatilis* or *pileare*," and the additional figure from Rumphius (pl. 26, fig. B) in the twelfth edition. Linnaeus' disposal of these two figures, however, seems to dispose of any association of *lotorium* with *aquatile*. In the tenth edition the Argenville figure M was followed by a question mark, as well it might be. It was clearly meant for *pileare* or *aquatile*, and does not show *lotorium*. In the twelfth edition this figure was again cited for *lotorium*, still with a query, but Linnaeus added a second figure (Rumphius, pl. 26, fig. B), also with a query, which shows a quite different species, the distorted *lotorium* of Linnaeus. We thus have, in the twelfth edition, a synonymy of two figures, each queried, which show different species, a situation which would permit a reviser to select either as the representative of *lotorium*. Linnaeus' concept of *lotorium* was, however, clarified after the publication of the twelfth edition. By manuscript notes in his interleaved copy of that edition, he deleted the question mark after the Rumphius figure (*lotorium*), and for the Argenville figure of *pileare* (or *aquatile*), figure M, he substituted figure B on the same plate, which is, in the words of Hanley, "a beautiful and characteristic engraving of the *Triton lotorium*." Thus Linnaeus' final conception of the species *lotorium* was that it was the peculiarly distorted, orange-colored shell which has always been known under that name, as both of the figures which he finally adopted as illustrative showed that shell, and both were left unqueried. It is realized that, from a technical point of view, these unpublished manuscript notes lack authority. But they do show what Linnaeus meant by *lotorium*, and I therefore suggest that any identification of *lotorium* with *aquatile* is highly artificial and too untrue to be adopted. It should be noted that both of the figures finally adopted for *lotorium* had already been cited by Linnaeus in the published synonymy of *Murex femorale* (p. 110, above). This is but another indication that Linnaeus' original

conception of both *femorale* and *lotorium* was most confused.

It would be impracticable and unnecessary to mention in detail the many diverse descriptions and synonymies and the many erroneous identifications of *pileare* which have been examined by the writer. My tentative conclusions on this extremely controversial species are summed up as follows:

A. The *pileare* of all authors is represented by forms in the Indo-Pacific and western Atlantic which I am unable to separate either specifically or subspecifically, but which further research may prove to be distinct taxonomic units.

B. The description and comments of d'Orbigny for his *Triton martinianum* are based on error, which makes it unwise to use his name for the western Atlantic form of *pileare*, even if the selection of a new name should become necessary.

Murex pileare Linné belongs in the genus *Cymatium* Röding, 1798, and in the subgenus *Lampusia* Schumacher, 1817, of which it is the subgenotype, by subsequent designation, Herrmannsen and Gray, 1847.¹

It is figured in the "Tableau encyclopédique" (pl. 415, figs. 4a, b). These are poor figures, as the spiral sculpture is so marked, close-set, and sinuous that the figures suggest *Triton corrugatum* Lamarck, 1816. It is also figured by Kiener (1834-1850, vol. 7, *Triton*, pl. 7, fig. 1, dorsal and apertural views); by Reeve (1843-1878, vol. 2, *Triton*, pl. 7, sp. 23); by Thiele (1831, p. 282, fig. 301a); by Maxwell Smith (1953, pl. 2, fig. 10); and by Abbott (1954, pl. 9, fig. L), as *Cymatium martinianum* d'Orbigny.

It is impossible to state in all cases whether the above cited figures were of the Indo-Pacific or western Atlantic form, the only information being that given by the author's stated locality. Kiener located his *pileare* in the Indo-Pacific, the Mediterranean, and the Antilles. Reeve gave only the Philippines. The figure in Maxwell Smith is referred to a shell from the Indo-Pacific and the western Atlantic. Abbott's figure is of the western Atlantic shell, as his work covers only American species.

¹ Schumacher described *Lampusia* in two sections, the first typified by *M. pileare* Linné, and the second by *M. tritonis* Linné. No type was selected.

Murex pileare was not described in the "Museum Ulricae."

Triton veliei Calkins, 1878, is given as a synonym of *martinianum* d'Orbigny, by those workers who accept the latter name as a new name for the western Atlantic form. (See Abbott, 1954, p. 195, and Bayer, 1933, p. 47.) Bayer, however, treated *martinianum* only as a variety of *pileare* Linné, along with *aquatile* Reeve and *vestitum* Hinds, 1844.

Murex pyrum

1758, *Systema naturae*, ed. 10, p. 749, no. 462.

1767, *Systema naturae*, ed. 12, p. 1218, no. 535.

LOCALITY: Not given in either edition.

"M. testa varicosa ovata, transversim sulcata nodosa, cauda longiore flexuosa subulata . . . Testa alba, longitudinaliter striata, angulata, transversim sulcata. Cauda longitudine testae. Faux labro interiore explanato."

In the case of *Murex lotorium*, the *lotorium* of authors is conceded to be the shell described by Linnaeus, although for many years after the publication of the twelfth edition of the "Systema naturae" and even as late as the work of Hanley (1855) the Linnaean species was confused by many conchologists with other species, and the early treatments are almost impossible to reconcile. In the case of *Murex pyrum* the situation is precisely the opposite. The shell now called *pyrum* is, I am convinced, not the species described by Linnaeus, although the long-continued attribution of the *pyrum* of authors to *pyrum* Linné makes it inadvisable, from a practical point of view, to suggest any change in the nomenclature.

The only changes made in the main description of *pyrum* in the twelfth edition were the substitution of "varicibus" for "suturis varicosis," an incorrect and unrealistic term, and the addition of the word "subulata" as applied to the anterior canal. The entire subdescription was added in the twelfth.

It is impossible to identify the *pyrum* of the tenth edition with any one species. With the addition of the subdescription in the twelfth the identification appears less difficult. Certain details may be said to exclude the shell which has been traditionally referred to *pyrum* Linné: "Testa alba" does not conform to the distinctive orange-yellow color of the *pyrum* of authors, nor does the

phrase "longitudinaliter striata." The canal of *pyrum* auct. is not subulate but truncate, nor is it "longitudine testae," if the reference is to the entire shell exclusive of the canal, although it is about equal in length to the body whorl. The phrase "Faux labro interiore explanato" is not understood. Linnaeus used the word "explanato" for many species to indicate that the aperture was wide and patulous, which is no more true of the *pyrum* of authors than of the other *Cymatium* species in *Murex* Linné. The crowded and wrinkled striations of the columella of the *pyrum* of authors is not mentioned, nor is the nodular sculpture of the inner face of the lip, yet these features were habitually noted by Linnaeus when they were present. The interpretation of the descriptions of this group of shells in the "Systema" is complicated not only by the omission of many important diagnostic characters of the shells but by the unfortunate similarity of the language used for *lotorium*, *pileare*, and *pyrum*.

No locality was supplied for *Murex pyrum*.

The synonymy was identical in both editions except for the suppression in the twelfth of one of the Regenfuss figures (pl. 6, fig. 60). The significance of this suppression is discussed below. The Rumphius figure (pl. 26, fig. E), which was cited with a query in both editions, is an extremely poor figure but may possibly be based on the *pyrum* of authors. Hanley did not attempt to identify it. The figure from Argenville (1742, pl. 13, fig. O) is too crude to be identified with certainty but was said by Hanley (1855, p. 290), and possibly correctly, to show *Triton sarcostoma* Reeve, 1844. The retained Regenfuss figure (pl. 5, fig. 50) was identified by Hanley (*loc. cit.*) with *Triton clavator* Lamarck, 1822, in which I entirely concur. Lamarck himself cited it for *clavator*. The first use of the name *clavator* for this species was by Chemnitz (1780-1795, vol. 11, p. 110, pl. 190, figs. 1825-1826). Chemnitz' description points surely to Lamarck's shell, although his figures do not sufficiently emphasize the length of the canal, which is, however, subulate as specified in Linnaeus' description of *pyrum*. Lamarck's name is not, however, the earliest name for the species. Röding (1798, p. 145) listed a *Tudicla gutturnium* which was the *clavator* of Chemnitz and Lamarck and has

24 years' priority over the latter. The species is herein referred to as *gutturium*.¹

The Regenfuss figure suppressed by Linnaeus is equivocal. It somewhat resembles the *pyrum* of authors, but its canal is much too abbreviated for that species. It also has a remote resemblance to *Murex cutaceus* Linné (p. 111, above). The suppression of this figure in the twelfth edition and the retention of Regenfuss' good figure of *gutturium* are to me the strongest pieces of evidence in favor of identifying *pyrum* Linné with Röding's species. The only figure in the synonymy that can be said to resemble the *pyrum* of authors is the figure from Gualtieri (pl. 37, fig. F). It is the clearest figure cited by Linnaeus and it is this fact which, I suggest, led to the general acceptance of that species as the representative of *pyrum* Linné.

All the figures in Linnaeus' synonymy have a gross resemblance to one another, except the figure of *gutturium*, which most fully conforms to the description. It is impossible to disregard the phrases "Testa alba," "longitudinaliter striata," and "cauda longitudine testae," all of which apply to *gutturium* and not to the *pyrum* of authors.

Hanley (*loc. cit.*) was emphatic in his acceptance of this interpretation, saying: "For, on the principle of rejecting as illustrative all such engravings as do not harmonize with the described features, that figure (Reg. f. 50) which represents the long-tailed white *Triton* can alone be retained, and hence the *T. clavator* (as exhibited by Reeve) must be regarded as the veritable representative of the Linnean *Murex*." Although Hanley's categorical statement as to the principle of selecting a single figure is too broad as a general rule of identification, I am willing to agree with him

in this instance that Linnaeus was describing *gutturium* rather than any other species covered by the synonymy. While the tenth-edition diagnosis, with its equivocal description and its discordant synonymy, was inadequate to fix the species, I feel that the additional phrases in the twelfth and Linnaeus' considered choice between the two Regenfuss figures constitute the most cogent evidence we have as to the Linnaean species. In an age in which the exotic shells were still imperfectly known, and the available figures of most species were few and crudely drawn, we are forced to base our tentative identifications on the language of the descriptions, particularly when we are aided by a conforming figure deliberately chosen. The description was the only part of the diagnosis entirely under the control of Linnaeus. In the synonymy he took what was available to him, and his localities, where these were stated, were often hearsay. We do not, I admit, know that he ever possessed a specimen of his *pyrum*, as the name does not appear on either of his lists of owned species, and no specimen so marked, and none which answers to his description, is found in his collection. In these circumstances, and in the absence of an unequivocal diagnosis, any identification must be purely tentative. Although I feel convinced that he was describing *gutturium*, an element of doubt does exist. Therefore, while I suggest that *pyrum* Linné be considered a *species dubia*, which would necessitate the finding of a new name for the *pyrum* of authors, it is realized that the name is so firmly entrenched in the literature that any change in the nomenclature would be inadvisable.²

We are not assisted by the "Museum Ulricae," as the species was not there described. A specimen, identified by Odhner (1953, p. 15) as *Cymatium pyrum*, is present in the Queen's collection in Uppsala. It is, however, labeled *Murex lotorium*. An examination of the microfilm of the collection fully confirms Odhner's identification. I have already called

¹ Röding's shell (now *Cymatium gutturnium*) may be the same as *Monoplex formosus* Perry (1811, pl. 3, fig. 5) and probably the same as both *Ranularia labiata* and *longirostra* Schumacher (1817, pp. 253-254). For *labiata*, which Schumacher designated as having alternate varices, he referred to two Martini figures (1769-1777, vol. 3, pl. 112, figs. 1048-1049) which may be reasonably taken for *gutturium* and are certainly not the *pyrum* of authors. For *longirostra*, stated to have a single varix, he referred to the pair of Chemnitz figures of *Murex clavator* cited in my text. I believe that the two pairs of figures show the same species, *gutturium* Röding, and that Schumacher was under the impression that the lip varix in his second species was not a true varix.

² In the most recent critical treatment of the Cymatidae, Bayer (1933, p. 48) accepts the *pyrum* of authors as the representative of *pyrum* Linné, and gives as only synonym *Triton lotorium* Mörch, 1852. Mörch's incorrect treatment of *lotorium*, which he made equal to "*T. pyrum* Lam. non L." is referred to above under *M. lotorium* (p. 115).

attention, in previous papers of the present series, not only to the questionable accuracy of the labels in the Queen's collection, but to the many demonstrable instances of physical misplacements of specimens or labels which have occurred in the almost two centuries since the collection was arranged by Linnaeus.

The *pyrum* of authors was included in the genus *Triton* Montfort, 1810, by the great majority of nineteenth century conchologists, and at times in *Tritonium* Link, 1807. The Adams brothers (1858, vol. 1, p. 103) used it in *Tritonium*, subgenus *Gutturnium* Mörch, 1852. It is now placed in *Cymatium* Röding, 1798, and variously included in the subgenera *Lotorium* Montfort, 1810, *Gutturnium* Mörch, 1852, or *Ranularia* Schumacher, 1817.¹

In addition to the figures cited above, figures of the *pyrum* of authors are given by Reeve (1843-1878, vol. 2, *Triton*, pl. 10, sp. 33) and by Kiener (1834-1850, vol. 7, *Triton*, pl. 11, fig. 1). The most recent figure is the accurate drawing by Kaicher (1956a, pl. 3, fig. 1).

Cymatium gutturnium Röding is figured by Reeve (*tom. cit.*, pl. 3, sp. 7), by Tryon (1879-1888, vol. 3, pl. 11, fig. 86), and by Maxwell Smith (1848, pl. 3, fig. 7).

Murex rubecula

1758, *Systema naturae*, ed. 10, p. 749, no. 459.

1767, *Systema naturae*, ed. 12, p. 1218, no. 536.

LOCALITY: Not given in either edition.

¹ *Ranularia* Schumacher is used by some systematists as a good genus. Thiele (1931, p. 283) makes it a subgenus and divides it into two sections, *Ranularia*, *sensu stricto*, and *Gutturnium* Mörch. *Triton clavator* Lamarck is given as the type species of the first. Thus he either disregards the earlier specific name *gutturnium* Röding or believes it to be distinct from *clavator*. He also cites *Tritonocauda* Dall, 1904, as a name that cannot be distinguished from *Ranularia*, *sensu stricto*, and apparently gives as its type (?) *Murex caudatus* Gmelin. The latter species was described by Gmelin (1791, p. 3535) in language which in many respects suggests Röding's *gutturnium*, except for the phrase "anfractibus canaliculatis." The figures Gmelin cited (Martini, 1769-1777, vol. 3, pl. 112, figs. 1045-1047) plainly show this canaliculation and an anterior canal much shorter than that in *gutturnium*. Although *caudatus* has been accepted by some workers as being equal to *clavator* and *gutturnium*, I find it difficult to do so, and therefore would treat it only tentatively as the earliest valid name for what I conceive to have been the *pyrum* of Linnaeus.

"M. testa varicibus decussatis, obtusa rugis nodosis, ventre aequali, aperture dentata."

The description in the twelfth edition of the "Systema," which is identical with that in the tenth except for Linnaeus' felicitous substitution of "varicibus" for "suturis varicosis," offers little assistance in the identification of this unusual and strikingly colored species, except that it seems to point to a member of the genus *Cymatium* Röding, 1798, which is already suggested by its position in the "Systema" immediately following *M. femorale*, *cutaceus*, *lotorium*, *pileare*, and *pyrum*. Indeed, except for color and color pattern, which are not mentioned in the description, *rubecula* strongly resembles a young *pileare*. Most authors have described the species as having a tubercle on the dorsum of the shell at the posterior end. This is not a constant feature, however, and when present it is laterally compressed and extends over three or more of the spiral cords, resembling an abbreviated varix. One of the Chemnitz figures noted below shows this feature. Reeve's figures (1843-1878, vol. 2, *Triton*, pl. 9, figs. 29a, b, c, d) do not show it.

The synonymy is somewhat more helpful. The figure from Gualtieri (pl. 49, fig. I) and the figures from Seba (pl. 49, figs. 1-5) may be said to resemble *rubecula* more than any other *Cymatium* species.² The Argenville figure (1742, pl. 12, fig. K) is fairly accurate in its contour, although the spiral sculpture is not shown except as lines of color. The reddish bands of *rubecula*, each of which typically covers several of the spiral cords, appear in this figure as narrow stripes either covering a single cord or lying in the interspaces. This is, however, a known variation. Argenville, in his description (*op. cit.*, p. 269), speaks of the "golden [aurores] striations interrupted by large white tubercles." The use of the word "aurores" suggests that Argenville based his description either on a worn specimen, as the red color of *rubecula* becomes yellow with bleaching, or on one of the known color forms, in which the color is reddish brown or

² It should be noted that Lamarck (1822b, p. 188) added a further Seba figure (fig. 6) from the same plate, which is even less characteristic than figures 1 to 5 chosen by Linnaeus, and that Deshayes (1838-1845, vol. 9, p. 640) cited the added figure only.

even yellow.¹ In the last analysis it is suggested that the early identification of *rubecula* Linné was based on the specific name itself, by those who had seen the typical red form.

A form of *rubecula* has been several times reported from the western Atlantic. It was first described by Mörch (1877, p. 29) from St. Thomas (Virgin Islands), as "*Triton rubecula* L. *occidentale*." It is still a rare shell. The holotype is in the Academy of Natural Sciences of Philadelphia (no. 36874), and specimens have been reported from Matanzas, Cuba, and from Florida. It is considered by Abbott (personal communication, 1955) to be a good subspecies "or possibly a separate species." This is another of the comparatively long list of species, forms of which are found in widely separated faunal regions and raise questions of the creation, distribution, and migration of species which have not been satisfactorily settled.

Murex rubecula is now placed in the genus *Cymatium* Röding, 1798, of which *Lotorium* Montfort, 1810, *Septa* Perry, 1810,² *Currus* Lesson, 1842, *Luterium* Herrmannsen, 1847, and *Nyctilochus* Gistel, 1848, are synonyms, in whole or in part. Some systematists have assigned *rubecula* to *Lampusia* Schumacher, 1817,³ and that genus is now generally used as the proper subgenus to contain the species. H. and A. Adams and Tryon placed it in *Simpulum* (Klein) Mörch, 1852. Lamarck (1822b, p. 188) included it in *Triton* Montfort, 1810, and this genus was used for many years by the majority of conchologists. Couturier (1907, p. 146) placed it in *Eutriron* Dautzenberg, 1907 (error for *Eutrironium* Cossmann, 1904), and the subgenus *Lam-*

pusia Schumacher. Schepman (1909, p. 111) revived for *rubecula* the almost forgotten *Aquillus* Montfort, 1810, also using *Lampusia* as its subgenus.⁴

Davila (1767, p. 146) was the first post-Linnaean writer to describe *rubecula*, for which, however, he did not use the name *rubecula* or refer to the "Systema." Born in his 1780 work (p. 300) referred it to the *rubecula* of Linnaeus. No figure was supplied. The first post-Linnaean figures were published by Chemnitz in 1780 (1780-1795, vol. 4, pp. 104-105, pl. 132, figs. 1259-1267). These figures show, although in a somewhat stylized manner, many of the variations in the distribution and depth of color of the bands mentioned above. Although Chemnitz' long polynomial did not contain the word *rubecula*, he referred his species to the *rubecula* of the "Systema" and the "Museum Ulricae."

Link (1807, p. 122) placed the species in *Tritonium*, as he did with many of the species later included for many years in *Triton* Montfort, 1810, and noted that it had many forms ("viele Abänderungen"). Dillwyn (1817, p. 702) described it accurately. He cited the above figures from Chemnitz, but added an extremely discordant figure to his synonymy, citing as a variety "brown with white bands" the *Murex varicosus* of Chemnitz (vol. 10, p. 256, pl. 162, figs. 1546-1547), although he did so with a query. This is a quite distinct species, which was later called *Fusus varicosus* by Kiener (1834-1850, vol. 6, p. 41, pl. 10, fig. 2). Chemnitz' *varicosus* was also cited in Gmelin's synonymy of *M. rubecula* (1791, p. 3535). Dillwyn reemphasized his query in his lengthy subdescription, saying: "I have now before me a reddish brown variety with white bands, but I rather doubt whether it is the same as the *M. varicosus* of Chemnitz." Dillwyn's variety may have been the color form of *rubecula* shown in Chemnitz (1780-1795, vol. 4, figs. 1762, 1763).

Other than Perry's *Septa scarlatina* the only specific synonyms of *rubecula* are the several names listed for this species by Röding in his *Tritonium*, in addition to *rubecula* it-

¹ Gualtieri's description of his figure I on plate 49 uses the phrase "ex flavo fusco et albido fasciatum." Seba, for his figures, used the expressions "flavi et albi coloris," "saturate aurantii," and later "rubore corallino pictum." Davila spoke of "des couleurs, qui sont très-vives et très-variées." It is obvious that the varied color pattern of the shell was known to Linnaeus' predecessors and contemporaries.

² *M. rubecula* is the type species of *Septa* Perry [1810 (1810-1811), pl. 2, sp. 2, and unnumbered text p. 5], by monotypy, as *Septa scarlatina*.

³ *Lampusia* Schumacher (1817, p. 250) was erected with two sections, the first, "α," typified by *M. pileare* Linné, and the second, "β," by *M. tritonis* Linné. *Lampusia pileare* was selected as the type species of the genus by both Herrmannsen and Gray in 1847.

⁴ *Aquillus* Montfort appears to be a junior synonym of *Cabestana* Röding, 1798, which covers a different group of the Cymatiidae (see discussion of *Murex cutaceus*, p. 111, above).

self: *T. limbatum*, *hepaticum*, and *flaveola*.

The early followers of Linnaeus reported widely different localities for this species. Linnaeus was apparently ignorant of its locality. Chemnitz (1780–1795, vol. 4, p. 106) said that it was found "in both Indies as well as on the African coast." Gmelin also gave a very comprehensive locality: "Ad Indiae, americae australis littora." This is the first unequivocal reference to its presence in the Western Hemisphere, as Chemnitz' "both Indies" might have meant what Linnaeus, in another place (see *Venus castrensis*, Dodge, 1952, p. 102, footnote) called "In O. utriusque Indiae," meaning "Hither and Farther India," or the Indian Peninsula and the Malay Peninsula and the East Indian islands. It is barely possible that Gmelin had seen or heard of a specimen of Mörch's *occidentale*. Forskål reported it from "the Red Sea," and Ulysses from the "Bay of Naples."

The holotype of *rubecula* is found in the Linnaean collection in London, correctly marked in Linnaeus' handwriting. It was described in the "Museum Ulricaе" in a much improved form. The words "Color nitens ex rubro et flava, fusco et luteo aut luteo et alba" correct Linnaeus' original omission of a reference to color in the 1758 description and show that he was familiar with the variation in color, although he repeated the original description in 1767.

The species is figured by Reeve (1843–1879, vol. 2, *Triton*, pl. 9, sp. 29a, b, c, d) and by Tryon (1879–1888, vol. 3, pl. 7, fig. 40). A characteristic recent photographic figure is that from Maxwell Smith (1948, pl. 2, fig. 1).

Murex scrobilator¹

1758, *Systema naturae*, ed. 10, p. 749, no. 460.

1767, *Systema naturae*, ed. 12, p. 1218, no. 537.

LOCALITY: "In M. Mediterraneo" (1758, 1767).

¹ Linnaeus used the spelling "*scrobilator*" in both the tenth and twelfth editions of the "*Systema*." Schröter (1783–1786, vol. 1, p. 499) changed it to "*scrobiculator*." Chemnitz, in 1788 (1780–1795, vol. 10, p. 262) resumed the spelling "*scrobilator*" in his text, but in the "Namen Register" prepared by Schröter for inclusion in Chemnitz' tenth volume the name appears as "*scrobiculator*." Gmelin (1791, p. 35) used Schröter's amended form, either because of the word "scrobiculatis" in the text of the Linnaean description or because he was influenced by Schröter's use of the name, although Gmelin cited Chemnitz' figures and undoubtedly knew that the latter used the original spelling in his text. The amended spelling has been almost universally used since Schröter.

"M. testa varicibus scrobiculatis suboppositis, laevigata, apertura dentata."

The description of this species is identical in the tenth and twelfth editions of the "*Systema*," except for Linnaeus' habitual change from "suturis varicosis" to "varicibus" noted in the descriptions of many of the preceding varicose species. The language of the description has apparently been considered as adequate to identify the species with the *Bursa scrobiculator* of authors. It is, however, a very short and inadequate description.

It was pictorially defined in the tenth edition only by a characteristic figure from Gualtieri (pl. 49, fig. B). The additional references in the twelfth were not felicitous choices. The two Seba figures (pl. 60, figs. 13, 15) and the figure from Petiver (pl. 100, fig. 12) show what is apparently *Bursa rana* (Linné) and all three had already been cited by Linnaeus for that species (p. 98, above). The Lister figures (pl. 939, figs. 34, 39) must have been an error of transcription, as they are not *scrobiculator*, and an adequate figure of that shell is found on another plate of Lister (pl. 943, fig. 39) which seems obviously to be the figure intended.² The Petiver reference was stricken out by Linnaeus in a manuscript note in his interleaved copy of the twelfth edition.

The figure from Adanson (1857, pl. 8, fig. 13) has been frequently discussed. It has been often cited for *scrobiculator* and indeed somewhat resembles it. In the examination of Adanson's "retained" collection (see Dodge, 1955, p. 53) by Fischer-Piette and his co-authors (1942, p. 216) it is reported that Adanson's shell, which he had called "le Jabik," was, in fact, a smooth individual of *Ranella pustulosa* Reeve, 1844.³

² Hanley (1855, p. 291) detected this error and corrected it. Wilkins (1953, p. 20), in his admirable account of the Sloane collection in the British Museum (Natural History), also used the right plate and figure.

³ The comments of Fischer-Piette and his co-authors are quoted in full: "All three specimens found are *Ranella pustulosa* Reeve. They are not pustulous, at least on the body whorl which is smooth, and from this point of view their general appearance more resembles *Ranella scrobiculator*. But, where the latter species shows about 15 indentations or folds on the inner face of the lip, here there are only nine as in *pustulosa*. . . . We consider the three specimens to be a smooth variety of *pustulosa*, for which we retain the name 'Jabik.' " It should be noted that Adanson's description of "Jabik"

The present species is now placed in the genus *Bursa* Röding, 1798. Conchologists have differed in assigning it to its proper subgenus, many using *Lampas* Schumacher, 1817. Dall (1904, p. 119) selected it as the type species of *Bufonaria* Schumacher, but Jousseaume (1881, p. 174) had already chosen *B. spinosa* Schumacher as its type. (See p. 100, above, in discussion of *Murex rana*.) The opinion of Thiele (1931, p. 284), who placed it in the subgenus *Ranella* Lamarck, 1816, is here followed. Thiele also assigned it to his new section *Bufonariella*, 1931, a sectional placement that has been adopted by several other writers.

The Linnaean locality, the Mediterranean Sea, is correct.

In spite of the insufficiency of the description and the discordance of the synonymy the species was immediately recognized by Linnaeus' followers and the identification with the *Bursa scobiculator* of all writers is confirmed by the presence of a specimen in the Linnaean collection in London, duly documented by Linnaeus. It was not described in the "Museum Ulricae."

Schumacher's *Bufonaria pes-leonis* (1817, p. 252) is a synonym.

The species is figured by Reeve (1843-1878, vol. 2, *Triton*, pl. 8, sp. 28a, b, dorsal and apertural views), Kiener (1834-1850, vol. 7, *Ranella*, pl. 10, fig. 1, dorsal and apertural views), and Tryon (1879-1888, vol. 3, *Ranella*, pl. 20, figs. 19-20). For a figure of *Ranella pustulosa* Reeve, see Platt (1949, pl. 73, fig. 7).

Murex reticularis

1758, *Systema naturae*, ed. 10, p. 749, no. 461.

1767, *Systema naturae*, ed. 12, p. 1218, no. 538.

LOCALITY: Not given (1758); "in Carolina" (1767).

"M. testa varicibus suboppositis reticulata, maculis tuberculatis, columella subedentula, cauda adscendente."

This name has been the subject of very diverse opinions ever since its proposal by Linnaeus, and at least three widely different species have been suggested, with some

recognized this difference in nodosity (p. 121): "The first whorl is sometimes smooth and sometimes encrusted with three rows of little nodes substantially equal in size."

emphasis, by writers. It has been referred to *Ranella gigantea* Lamarck (the *M. olearium* of the tenth edition of the "Systema"), to *Ranella tuberculata* Broderip, and to some member of the genus *Distorsio* Röding.

The description in the "Systema" has details which might apply to any of these species. The words "varicibus suboppositis" describe both *Ranella gigantea* and *tuberculata* although *gigantea* is eliminated by the word "reticulata." Any *Distorsio* species is, on the other hand, eliminated by "varicibus suboppositis" and "maculis," but included by "reticulata."

The synonymy, consisting of three figures, shows three species. The figure from Buonanni (pl. 193) is of a shell with which I am not familiar. It has the general shape of *gigantea* and has two opposed varices, but the low but strongly nodose revolving ribs of that species are replaced by a deeply fenestrated, cancellated sculpture devoid of nodes. The Gualtieri figure (pl. 49, fig. M) was said by Hanley (1855, p. 291) to represent *Ranella tuberculata*, and I am inclined to accept this identification of the figure. The Rumphius figure (pl. 29, fig. N) is unmistakably *Phos senticosus* (Linné) and was later deleted by a manuscript note by Linnaeus.

Thus it may be said that the diagnosis is more applicable to *tuberculata* than to either of the other species to which it has been referred, as the description contains nothing repugnant to that shell and the only figure in the synonymy which cannot be eliminated shows *tuberculata*. This would be, however, an identification resting on a very unscientific basis.

The locality, "Carolina," added in the twelfth edition, would exclude both *gigantea* and *tuberculata*, but may be accepted for a *Distorsio* species. *Distorsio clathrata* (Lamarck, 1816) is found from North Carolina to the Florida Keys and the West Indies. *Distorsio mcgintyi* Emerson and Puffer, 1953 (new name for *D. floridana* Olssen and McGinty, 1951), occurs off the east coast of Florida but has not yet been reported from as far north as the Carolinas.

If the *reticularis* of the "Systema" is, in fact, the *tuberculata* of Broderip, the diagnosis in the "Museum Ulricae" assuredly covers a different species. After copying his "Systema"

description, Linnaeus cited only two of the figures in that work, the Gualtieri figure (?*tuberculata*) and the Rumphius figure (*P. senticosus*). It is in the subdescription that it becomes apparent that a *Distorsio* species was being described. The phrases "Rugis elevatis decussatis," "Labium exterius patens, tenue," and "Labium interius longitudinale, membranaceus, patens, reticulatum" fairly apply to several species of *Distorsio*, and the final words, "Affinis sequenti," confirm that identification, as the following species is, as it was in the twelfth edition, *Murex anus*.

Two specimens of *Distorsio cancellinus* (Lamarck, 1803) are present in the Queen's collection in Uppsala labeled *Murex reticularis*.

No specimen marked *M. reticularis* is found in the Linnaean collection in London, although a fully adult specimen of *Ranella gigantea* is present, marked for *Murex olearium*. A specimen of *Distorsio cancellinus* is also in the collection, accompanied by a printed label, supplied by Hanley himself, reading *Murex reticularis*. No marking is visible on the photograph of this shell in the microfilm of the collection, and Hanley did not say whether or not it was marked in any way by Linnaeus.

The chronological order of treatments of this name by some of the more important conchological writers is here noted:

The first identification was by Linnaeus' pupil Murray, in his "Fundamenta testaceologicae," 1771. Murray's figure for *M. reticularis* (p. 143, pl. 2, fig. 18) appears to be *R. tuberculata*, although Deshayes (1838-1845, vol. 9, p. 548) queried whether it might not have been meant for *R. granifera* Lamarck, 1816.

Born (1780, p. 300, pl. 11, fig. 5) described *M. reticularis* Linné, but his figure is unquestionably *Ranella gigantea*.

Children (1823, p. 49, pl. 5, fig. 181) also identified *reticularis* with *gigantea* in his text, and his figure shows the typical Mediterranean *gigantea*.

Lamarck (1822b, p. 150) gave *reticularis* as the first synonym of his *R. gigantea*. Deshayes (*tom. cit.*, p. 340), in a footnote under *R. gigantea*, treated *reticularis* as a variety of that species saying: "Like many others, this species [*olearium* Linné] is variable, and it is out of one of these varieties, which has re-

tained its juvenile characters into the adult stage, that Linné erected another species, under the name of *Murex reticularis*." Deshayes must have based his theory that Linnaeus' *reticularis* was an immature shell on some hint in its description, which I have been unable to find.

Hanley (*loc. cit.*) discussed *Murex reticularis* as a good species which was not, however, represented in the Linnaean collection in London. He referred to the discordance of the three synonyms, treating the Buonanni figure as an inaccurate figure of *gigantea* and mentioning that Gmelin, Dillwyn, and others had accepted *gigantea* as the representative of *reticularis*, apparently solely because of the Buonanni figure. From the entire synonymy, he chose the Rumphius figure to represent the species intended and said that it showed *Ranella tuberculata* Broderip (1832, p. 179). He admitted that both the figure of Gualtieri and that of Rumphius might be said to conform, in part at least, to the description of *reticularis*, but that the words "columella subdentula" were "far more suited" to *tuberculata* than to *gigantea*. He thus arrived at the same conclusion as that of Murray 84 years earlier.

Bucquoy, Dautzenberg, and Dollfus (1882-1898, vol. 1, p. 28), in their discussion of *Ranella gigantea*, synonymized that species with *Murex reticularis* Born, not *reticularis* Linné, and said of the latter: "Some authors have attempted to restore to the species the name *reticularis* Linné. But it is impossible for us to agree. According to Deshayes (in Lamk., Anim., s. vert. 2nd. Ed. IX. p. 540) Linné based his *Murex reticularis* on a young individual of our species. Now, Hanley states that the type in the Linnaean collection is a specimen of *Ranella tuberculata* Broderip,¹ while the Mediterranean species is found labeled *Murex olearium*. It is hardly possible to adopt the latter name, for it would apply to *Triton succinctum*. In our opinion Lamarck was right in solving this complicated question by creating a new name."

Since Hanley, the name *reticularis*, as a good species or as a name equal to *gigantea* or

¹ These writers are in error. Hanley did not say that the type of *reticularis* was in the collection. He merely based his identification on the figure of *tuberculata* in Gualtieri. There was no type present.

tuberculata, has dropped out of the literature, and few writers have even referred to it. The same is true of any association of the name with the genus *Distorsio*. Whether or not we treat the "Museum Ulricae" description as connoting a different species from that in the "Systema," and even though the evidence pointing to *R. tuberculata* as the representative of the "Systema" species seems to have some weight, *Murex reticularis* is a doubtful species. I am convinced that the *reticularis* of the "Museum Ulricae" was a *Distorsio*, and that Linnaeus, for some reason which it is now impossible to explain, gave it the same name which he had given to an entirely different species in the "Systema." I do not know what the "Systema" species was. It is difficult to accept either of the identifications suggested by the early writers, and the recent literature does not contain any more reasonable suggestions. I do not believe that an identification should be founded on such a scanty description as that of *reticularis*, supported by a synonymy that shows three different species, in figures that do not show any of them with satisfactory accuracy. My views are expressed by Reeve in his discussion of *Ranella gigantea* (1843-1878, vol. 2, *Ranella*, pl. 1, sp. 3): "There is so much confusion among the synonymies which Linnaeus has quoted at different times for the illustration of his *Murex reticularis*, that I have not ventured to refer to it. It is cited by some authors for this species, some for *Triton cancellinus*, others for the *Triton olearium*, than which there are scarcely three shells belonging to this immediate group of more opposite character."

Figures of *Ranella gigantea* are cited under *M. olearium* (p. 106, above). Broderip's *R. tuberculata* is well figured by Kiener (1834-1850, vol. 7, *Ranella*, pl. 12, fig. 2). I have used the familiar name *tuberculata*, although there seems to be an earlier name for the species, *Murex crassus* Dillwyn (1817, p. 692), a name borrowed by Dillwyn from Humphrey's "Museum Calonnianum." The species belongs in the typical subgenus of *Bursa* Röding, 1798. Thiele (1931, p. 285) places it in the section *Marsupina* Dall, 1904.

Murex anus

1758, *Systema naturae*, ed. 10, p. 750, no. 463.
1767, *Systema naturae*, ed. 12, p. 1218, no. 539.

LOCALITY: "In O. Asiatico" (1758, 1767).

"M. testa varice labisque dilatato-membranaceis, gibbosa reticulato-tuberculata, apertura sinuosa, cauda erecta."

The description in the twelfth edition of the "Systema" is identical with that in the tenth except that the word "varice" has been substituted for "suturis," a wise change from the point of view of scientific accuracy. This description, which points out the most obvious features of this distinctive species, is adequate to define it, and the identification has not been questioned. The synonymy consists of 10 figures, nine of which are unquestionably based on *M. anus* and need not be discussed in detail. One of the Petiver figures (pl. 99, fig. 10) is very badly drawn, but apparently Linnaeus recognized it for *anus*.

This species was well known to the predecessors of Linnaeus, under various names, as early as Buonanni, 1684. The French naturalists called it by the appropriate name "Grimace." It was named "Auris pilosa" by Seba, and the English equivalent, "Hairy Ear," by Petiver. I cannot find that the specific name *anus* was used prior to Linnaeus.

It is an Indo-Pacific species. The only writers who erred in stating its locality were Martini, who placed it in the Mediterranean, and Dillwyn, who quoted Martini to that effect.

It is now placed in the typical subgenus of *Distorsio* Röding 1798, and is the type species, by subsequent designation, Pilsbry, 1922. *Distortrix* Link, 1807, *Persona* Montfort, 1810, and *Distorta* Perry, 1811, are exact synonyms, having the same type; *Distorsio* Link by subsequent designation, Dall, 1904; *Persona* Montfort, by original designation; and *Distorta* Perry, by subsequent designation, Emerson and Puffer, 1953. It has been placed in *Triton* Montfort, 1910, by many writers, notably Lamarck and his successors.

While *Murex anus* cannot be confused with any other species in the *Murex* of Linnaeus, it resembles in many particulars its later congeners *Distorsio cancellinus*¹ (Lamarck, 1803),

¹ *Distorsio cancellinus* is properly cited as of Lamarck (1803, p. 225), who placed it in *Murex*. In his 1822 work he changed the name to *Triton clathratum* (1822, p. 576), but was careful to say: "This is the very remarkable fossil analogue of our *Triton clathratum* . . . which is a quite distinct species living in the southern ocean and

an Eocene fossil from Grignon, France; *Triton constricta* Broderip, 1833, from the eastern Pacific; and *Triton clathratum* Lamarck, 1822, from subtropical western Atlantic waters.¹

The only synonyms of *Distorsio anus* are *Cassis vera* Martini, 1773, *Distorta rotunda* Perry, 1811, and *Distorta rugosa* Schumacher, 1817.

The first figures of the species were those of Martini (1769–1777, vol. 2, pl. 41, figs. 403–404). While these are somewhat stylized, both in shape and coloration, they are clearly recognizable as *M. anus*. The species is well figured in Reeve (1842, pl. 244, fig. 2; 1843–1878, vol. 2, *Triton*, pl. 12, sp. 44). The figures in the "Tableau encyclopédique" (pl. 413, figs. 3a, b) are characteristic and are among the best in that work. It is hardly surprising that figures of this unique species should be so uniformly good.

It was described in the "Museum Ulricae" with instructive added details, and two specimens of the *Distorsio anus* of all authors are present, properly labeled, in the collection at Uppsala.

Murex ricinus

1758, *Systema naturae*, ed. 10, p. 750, no. 464.

1767, *Systema naturae*, ed. 12, p. 1219, no. 540.

LOCALITY: "In O. Asiatico" (1758, 1767).

"M. testa ecaudata obovata, spinis subulatis, apertura dentata, labro dentato . . . Faux violacea."

The only change in the description of *ricinus* in the twelfth edition was the addition of the subdescription "Faux violacea." The

which I have mentioned under its genus, p. 186, no. 22." His application of the same name to the fossil and the Recent species was undoubtedly the cause of some of the confusion in this group in the minds of those who failed to read Lamarck's French description above translated. The name *Murex cancellinus* was also used for the fossil species by de Roissy in 1805 (Montfort and de Roissy, 1801–1805, vol. 6, p. 56), who repeated Lamarck's original 1803 description. The species is frequently cited as of de Roissy.

¹ Lamarck's *clathratum*, the Recent species, should not be confused with *Triton clathratum* Sowerby, 1833, nor *Boreotrophon clathratus* (Linné, 1767) a boreal species occurring on both sides of the Atlantic, nor *Trophon scalariformis* Gould, 1838, which probably should be called a subspecies of the latter, and which Johnson (1934, p. 117) said was the "*Triton clathrata* of authors." The subspecies is confined to the western side of the Atlantic, from Labrador to Massachusetts Bay.

language of the main description is correct in every detail, although it could be improved by a more detailed description of the character and disposition of the teeth and the shape of the aperture, which are peculiar and diagnostic features. Linnaeus made a partial clarification by a manuscript note in his copy of the twelfth edition, adding the word "utrinque" before "dentata" in the description of the aperture.

Two of the three references correctly show the *ricinus* of authors. The Gualtieri figure (pl. 28, fig. N) is an extremely characteristic picture of the species. Rumphius' figure (pl. 24, fig. E) is somewhat less accurate but is recognizable. The three Seba figures added in the twelfth edition (pl. 60, figs. 37, 39, 42) were the cause of some confusion among later writers. They are certainly not meant for *ricinus* and were probably based on *Ricinula horrida* Lamarck, 1822. Deshayes (1838–1845, vol. 10, p. 49, footnote) indirectly commented on these figures, saying: "Linnaeus said that sometimes the aperture is violet [the 'sometimes' is taken from the description in the 'Museum Ulricae'], which makes us suspect that, among his specimens of *Murex ricinus*, some individuals of *Ricinula horrida* Lamarck had been introduced. This confusion, which had no importance so far as Linnaeus is concerned, became more significant for his successors, who, under the Linnaean name, have combined the synonymies of the two species." The present writer has not seen a specimen of *ricinus* showing a hint of color in the aperture, save for the yellow spots of the form *arachnoides*, which is discussed below. Hanley (1855, pp. 292–293) also remarked that Linnaeus added the words "faux violacea" because he had mistakenly included *Ricinula horrida* in his conception of *ricinus*, and that the Seba figures were added for that reason. It seems incomprehensible that Linnaeus should have confused these two species. Hanley added that the Seba figures did not show *horrida*. I am inclined to disagree.

The locality, "in Asiatico," is correct.

The specific name *ricinus* has been retained by almost all writers, although Lamarck, in 1816, changed it to *arachnoides*²

² We cannot be sure that Lamarck changed Linnaeus' name deliberately, as he did not refer to the *ricinus* of Linnaeus or Gmelin in his synonymy, although he cited

and placed it in his new genus *Ricinula*, and this name was used by many of his successors, notably by Kiener (1834–1850, vol. 8, pl. 1, fig. 3), and as late as 1884 by P. Fischer in his "Manuel" (1880–1887, p. 646, pl. 6, fig. 9). However, in common with the majority of species in *Murex* Linné, *ricinus* has been used in several different genera: *Ricinula* Lamarck, 1816; *Purpura* Bruguière, 1789; *Pentadactylus* (Klein) Mörch, 1852; *Sistrum* Montfort, 1810; *Ricinella* Schumacher, 1817; and *Drupa* Röding, 1798. It is now generally included in the typical subgenus of *Drupa* Röding, as *Drupa* (*Drupa*) *ricina*. The type species, as today accepted, is *D. morum* Röding 1798,¹ by subsequent designation, Suter, 1913.²

for *arachnoides* the Rumphius figure and one of the Seba figures (fig. 39) cited by Linnaeus (Lamarck, 1822b, p. 232). Deshayes (*loc. cit.*, in text, above) called attention to the fact that *arachnoides* was in fact *ricinus* Linné. The name *arachnoides* may, however, be preserved for the form of *ricinus* which shows, at least in fresh specimens, a number of orange-yellow spots on the columella and the inner face of the lip, these parts in the typical *ricinus* being completely white. While Lamarck did not mention the spots of color in either his Latin or French descriptions of *arachnoides*, I am advised by Dr. E. Binder of the Muséum d'Histoire Naturelle of Geneva (personal communication, 1956), where a large proportion of Lamarck's types are assembled, that the type of *arachnoides* is indeed the form having the orange-yellow blotches around the aperture and is accompanied by other specimens (paratypes?) of the same color form. Linnaeus' reference to the Rumphius figure for *M. ricinus* (pl. 24, fig. E) quotes Rumphius' name of "Os luteum" for this species. The name was probably based on the yellow apertural spots in this form.

¹ *Drupa morum* Röding is *Ricinula horrida* Lamarck, 1816, and 1822, and probably *Murex neritoideus* Gmelin, 1791, species 43 (not *M. neritoideus* Gmelin, species 169, nor *Turbo neritoideus* Linné, 1758), and *Ricinella violacea* Schumacher, 1817. Gmelin's conception of this name, as is shown by his double use of it and the figures he cited for each use, was peculiarly confused. For instance, figures showing *Murex ricinus* Linné (Martini, 1769–1777, vol. 3, pl. 102, figs. 976–977) were cited by Gmelin for his first use of *neritoideus*. In suggesting the above synonymy, I note that the same figures (Martini, *tom. cit.*, pl. 101, figs. 972–973) were cited by all four of the above authors, Gmelin, Röding, Schumacher, and Lamarck, for their respective names.

² Winckworth (1945, p. 139), after stating the type species of *Drupa* Röding as above given, mentioned another earlier designation (Cossmann, 1903): "It might be said that Cossmann had selected a type for *Drupa* in the words '*Ricinula* Lamarck, 1812 (= *Pentadactylus* Klein, 1753, = *Canrena* Link, 1807, = *Drupa* Bolten, 1798, = *Ricinella* Schumacher, 1817) . . . Type

As is noted below under *Murex hystrix* (p. 133), the next species but two in the "Systema," that name must be assigned merely to the young shell of *M. ricinus*, and represents one of the few instances in which Linnaeus described two growth stages of the same shell under different specific names, a fault more often committed by Gmelin.

The description of *ricinus* in the "Museum Ulricaë" cited the recognizable figures from Rumphius and Gualtieri, omitted the incorrect Seba figures, and mentioned the color of the aperture as "saepius flava, rarius violacea." Even this modified expression is incorrect as to the violet color and indicates that the specimens described in the Queen's collection contained, as Deshayes and Hanley surmised, individuals of some violet-mouthed species, probably *horrida* Lamarck. This confusion in Linnaeus' mind persisted in the twelfth edition, where he specifically said: "Faux violacea." The added details in the "Museum Ulricaë" point clearly to *ricinus*, particularly the words "Spinis nigris . . . ad labium majoribus" and "spira brevissima." The latter phrase might, however, refer to *horrida*, as well as the words "dentes labii quasi duplicati."

The specimen or specimens on which the "Museum Ulricaë" description was based have apparently been lost. No specimen of *ricinus* is present in the collection at Uppsala, and the shell now labeled *Murex ricinus* and shown on the microfilm of the collection as photograph number 319 is apparently a specimen of *Murex melanomathos* Gmelin, 1791, and was so identified by Odhner in his recent examination of the collection. This is a quite distinct species, as it is a true *Murex* having black, spinous varices, particularly those nearest the outer lip, and a produced anterior canal.

Murex ricinus is well figured by Martini (1769–1777, vol. 3, pl. 102, figs. 976–977). Although a faint violet color shows in the

Murex ricinus Linné,' but I interpret this as meaning that these names are synonyms, but not necessarily exact synonyms with the same species as type. In any case, *D. morum* R. and *M. ricinus* auct. are species so closely related that they could not be put in different sections of the same genus." Winckworth might well have added that Cossmann's designation was invalid, as the name *ricinus* was not included in the original list of *Drupa* by Röding (see Article 30, 2, α of the Code).

aperture of figure 976, it is probable that Martini was not influenced by the "Faux violacea" of the "Systema," as he referred both figures, as well as the two following (figs. 978-979), to *Nerita nodosa* Linné, 1758 (*Murex neritoideus* Linné, 1767). The latter pair of figures apparently show *Drupa digitata* (Lamarck, 1816), and Lamarck (1822b, p. 252) cited them for the latter species.

Drupa ricinus is also figured by Reeve (1843-1878, vol. 3, *Ricinula*, pl. 1, sp. 5), Kiener (1834-1850, vol. 8, *Purpura*, pl. 1, figs. 3, 3a, as *P. arachnoides* Lamarck), and Tryon (1879-1888, vol. 2, *Ricinula*, pl. 56, fig. 200, pl. 57, figs. 204, 206, 212). The figures of Reeve and Kiener show the orange-yellow spots on either side of the aperture mentioned above. The most recent colored figure is that from Hirase (1954, pl. 110, fig. 11).

Murex nodus

1758, *Systema naturae*, ed. 10, p. 750, no. 467.

1767, *Systema naturae*, ed. 12, p. 1219, no. 541.

LOCALITY: Not given in either edition.

"M. testa ecaudata obovata, spinis conicis, labro dentato, columella laevi colorata . . . Faux incarnata."

The subdescription, "Faux incarnata," was added in the twelfth edition. No synonymy or locality was supplied in either edition.

The species was said by Hanley (1855, p. 293) to be unidentifiable, and indeed the absence of any evidence except a brief and uninformative description would make any identification extremely conjectural.

Born's *M. nodus* (1780, p. 303), unfigured, appears to have been *Thais pica* Blainville. The description suggests that species, and three of his five cited figures show *pica*. The others are unidentifiable.

Purpura hippocastanum Lamarck (1822b, p. 238), which is not the *hippocastanum* of Linnaeus (see p. 137, below), has been suggested as being equal to *M. nodus*. If we could exclude such of Lamarck's references to his *hippocastanum* as are in conflict with the language of his description, and those important phrases of his description, particularly "sulcis squamosis cincta," which would certainly have been mentioned by Linnaeus in the description of *nodus* if they had been present, the suggestion might have some merit.

Both Schröter (1783-1786, vol. 1, p. 503)

and Gmelin (1791, p. 3537) cited for *nodus* a figure from Knorr (pt. 6, pl. 24, fig. 7) which is clearly the *Purpura hystrix* of Lamarck and authors, not Linné (see p. 134, below). Each of these authors, however, qualified the citation by a question mark. Lamarck's *hystrix* conforms fairly well with the description of *nodus*, but no part of its aperture is "incarnata." Dillwyn (1817, p. 705) listed *nodus*, supplying a main description which was a mere paraphrase of that of Linnaeus, but he had apparently seen the shell that he conceived to be Linnaeus' *nodus*, as he gave "Jamaica" as its locality and added a long subdescription containing additional details. In his synonymy he cited three figures from Martini (1769-1777, pl. 100, figs. 956-958) which are almost certainly meant for *Thais pica* (Blainville 1832).

Mörch (1852, p. 88) believed that *nodus* was *Purpura deltoidea* Lamarck, 1822. This species has a white aperture, although its columella is often stained with brown or pink, and is provided with black bands between its three rows of nodes which decrease markedly in size posteriorly, and cannot be described as "spinis conicis," as the description of *nodus* requires. The description of *nodus* in the "Museum Ulricae" is even more unlike that of *deltoidea*, as the spines are there described as "spinis multiplici serie flavis aut nigris . . . conicis," although the words "spinis . . . conicis" are limited by "obtusiusculis." The columella, in the "Museum Ulricae" description, is said to be "incarnata," whereas in the "Systema" it was the "throat" which was so described, and the aperture is "alba." The shell labeled *Murex nodus* in the Uppsala collection is a large specimen of the *hystrix* of authors with worn spines, and, with the usual reservations as to the authenticity of the labels in that collection, this seems to be the only shred of available evidence that Linnaeus was describing the *hystrix* of authors in either work.

What might be considered the most cogent piece of evidence for identification is the fact that a specimen of a form of *Purpura haemastoma* (Linné) in the Linnaean collection in London bears the number 541, the serial number of *M. nodus* in the twelfth edition of the "Systema." Although I have repeated several times in the present series of papers that the presence of a "marked" specimen in

Linnaeus' collection is the strongest evidence of identification, I am tempted in this case to limit this theory drastically. In the first place, Linnaeus' *Buccinum haemastoma* is represented by another specimen in the collection, which is properly marked. Second, Linnaeus, who was undoubtedly describing the European form in his description of *haemastoma*, there emphasized certain details which are repugnant to the description of *nodus*: "testa submuricata," "labro intus striato," "cincta duplici fascia nodosa," and "testa ovata." Some of these features, at least, would have been mentioned by Linnaeus for *nodus* if they had been present. Moreover, the color of the aperture of *haemastoma*, which is a brilliant orange sometimes seen on the columella and the inner face of the outer lip, and sometimes covering the entire aperture, does not conform to the limited scope of the "incarnata" of *nodus*. Most important there may be a serious question as to the authenticity of the numbering on the shell in the collection. It may have been an error on the part of Linnaeus, as another specimen was marked for *haemastoma*, or an error on the part of a later custodian or examiner of the cabinet. Errors of this sort are noted in a few other species in the collection. Hanley did not say that the numerals were in the handwriting of Linnaeus, but only that they were "legible." They are not shown on the microfilm of the collection.

It is important to note that Linnaeus did not possess a specimen of *nodus* when he first described it, as the name is not checked on his tenth-edition list of owned species. Based on the fact that the description harmonizes so imperfectly with the description of *haemastoma*, and on the great possibility of an error in the numbering of the marked specimen, I am unwilling to accept that specimen as the type species of *nodus* with any more confidence than the shells suggested by Schröter, Gmelin, and Mörch. I am forced to agree that *Murex nodus* is unidentifiable.

Murex neritoideus

1758, *Systema naturae*, ed. 10, p. 777, no. 628 (*Nerita nodosa*).

1767, *Systema naturae*, ed. 12, p. 1219, no. 542 (*Murex neritoideus*).

¹ LOCALITY: Not given in either edition.

"N. testa nodosa pluribus ordinibus solida, lab-

ro angulato Affinis Murici Nodo tota structura, sed postice lacuna destituta, qua neglecta ruere genera" (1758).

"M. testa ecaudata nodosa plurimis ordinibus, labro angulato, columella planiuscula Structura Neritae; habitus Muricis. Apertura non effusa est, verum uti Neritae integra, sed habitus hujus generis" (1767).

Although the description of this twice-named species differs in several particulars in the tenth and twelfth editions, Linnaeus made it clear that the two referred to the same species by giving the tenth-edition reference as his first reference in the twelfth. In the first description he assumed that the species was properly placed in *Nerita*, although he compared its form with that of a *Murex*. The choice of *Murex nodus* ("affinis Murici nodo") as a comparison was unfortunate for later writers, as *nodus* has not been satisfactorily identified. By the time he prepared the twelfth edition, while he realized that the species was closer to *Murex* than to *Nerita*, he still retained the comparison with *Nerita* so far as concerns its form ("structura Neritae"), but added that in other respects it had the appearance of a *Murex* ("habitus Muricis"), although he dropped the specific comparison with *nodus*.

While the twelfth-edition description is the more accurate of the two, as applied to the shell now recognized as that which Linnaeus described, the earlier name *nodosa* must have priority, with *neritoideus* being thrown into its synonymy. It belongs in the typical subgenus *Thais* Röding, 1798. Thiele used the name *neritoidea*, a practice adopted by the majority of systematists until comparatively recent times. The type species of *Thais* was designated by Stewart in 1926¹ as *T. lena* Röding (= *Nerita nodosa* Linné, and *Murex fucus* Gmelin, 1791).²

The synonymy of *nodosa*, which is identical in both editions, consists of a collection of six

¹ Stewart (1926, p. 386, footnote 262) thoroughly discussed the available evidence supporting this type designation and referred to the other ineffective designations.

² Gmelin's name *fucus* may have been a misprint for *fuscus*, and the latter name has been used for the species. The two words are not far apart in meaning. *Fucus* is a genus of algae typified by certain olive-brown seaweeds. The Latin "fuscus" means "dark-colored," and was ordinarily used by the early naturalists to mean "brown." The dark brown epidermis of the present species, which is only slightly persistent, would make either word applicable.

very bad figures, only one of which possesses a single identifiable detail, and none of which can I refer to the typical *nodosa*. The consensus has identified them as follows: Buonanni's figure on plate 173, and the figures from Lister (pl. 804, fig. 13), from Klein (pl. 1, fig. 30), and from Gualtieri (pl. 66, figs. B, B) are said to show *Drupa morum* Röding, 1798 (*Ricinula horrida* Lamarck, 1816, and *Murex neritoideus* Gmelin, 1791, p. 3537, not *neritoideus* Linné, nor *neritoideus* Gmelin, p. 3559, a double use of this name, which is a *Coralliophila*). Buonanni's plate 174, while a vague figure in most respects, does show two black spots on the columella which probably justify us in referring it to *nodosa*. The Klein and Lister figures probably were meant for *morum* Röding. The Gualtieri figures are said by some to be meant for the non-nodose variety of *T. nodosa*, named *ascensionis* by Quoy and Gaimard, 1832, and it does resemble that shell, although the black spots on the columella, which are present in both the typical species and the variety, are not shown.¹ They constitute the most important diagnostic character of this species.

The range of *nodosa* is restricted. It is plentiful in the Cape Verde Islands, although it has not been reported from the near-by African coast. Specimens are found in collections labeled "Corisco," West Africa. This locality is in Spanish Guinea, some distance south and east of the Cape Verde Islands and the Atlantic bulge of Africa. Adanson does not include it in his "Histoire naturelle du Sénégal" and Fischer-Piette and his co-authors (1942) did not find it in Adanson's "retained" collection (Dodge, 1955, p. 53). The variety *ascensionis* has been reported only from Ascension Island, an Atlantic island still farther south than the latitude of the African locality Corisco. This is a peculiar dispersal of a species and a variety.

Linnaeus himself did not realize the importance of priority of name, as the specimen of the present species in the Linnaean collection in London is marked for *neritoideus* rather than for *nodosa*. The identification of the species was further confirmed by Linnaeus, by the substitution of a good Lister

figure (pl. 990, fig. 50) for the Lister figure originally cited, in a manuscript note in his interleaved copy of the twelfth edition, and by a further note reading "labium interius punctis 2 maculatum." The substituted Lister figure shows the columellar spots.

The early post-Linnean figures of this species are not satisfactory. Martini (1769–1777, vol. 3, p. 270, pl. 100, figs. 959–962) described a "*Murex moega*," which he did not refer to any species in the "Systema," but for which he cited one of the Buonanni figures (pl. 174, *nodosa*) and the Gualtieri figures (pl. 66, B, B) which Linnaeus had cited for *nodosa*, the latter figures being unidentifiable. The black spots on the columella of the Buonanni figure constitute strong evidence that Martini had before him a specimen of *nodosa*, and his description contains the words "muricata" and "ad columellam binis vel tribus maculis nigris notata." His locality was "probably Guinea." The figures supplied by Martini are not good. One pair (figs. 959–960) are conventionalized drawings of the nodose shell deprived of its epidermis, but show the two spots of the columella and the angulated lip. The second pair (figs. 961–962) are crude but recognizable drawings of the non-nodose *ascensionis*, showing a heavy, dark epidermis and three columellar spots. As Martini was probably not familiar with Linnaeus' annotated copy of the "Systema," it is not strange that he failed to identify either of the forms he pictured with the Linnean species.

On page 280 of the same volume (pl. 101, figs. 972–973) Martini described "*Murex, Morum globosum labro aculeato*." This he referred to the *nodosa* of the tenth and the *neritoideus* of the twelfth editions, but was apparently impressed by the majority of the figures in Linnaeus' synonymy, as his figures are acceptable drawings of *T. morum* Röding, and cannot be taken for the present species. He also supplied for his species four further figures (pl. 102, figs. 976–979), two of which are *Drupa ricinus* Linné, and the others probably *Drupa digitata* (Lamarck, 1816).

Chemnitz did not refer to the Linnaean species. His "*Murex neritoideus*" (1780–1795, vol. 10, p. 280, pl. 165, figs. 1577–1578) is shown by his figures to have been *Coralliophila neritoidea* (Lamarck, 1816). Lamarck

¹ Quoy and Gaimard's *ascensionis* is probably the same as *Thais meretricula* Röding.

referred to these figures for his *Pyrula neritoidea*.

Born (1780, p. 303), for his *Murex neritoides*, used several of the figures cited by Linnaeus, and, whether or not he had seen Linnaeus' annotated copy, cited the Lister figure there noted, which showed the columellar spots. He supplied no figure of his own.

Lamarck (1822b, p. 240) did not recognize the Linnaean authorship of his *Purpura neritoides*, saying, in his French description: "Characterized by . . . its flat, broad columella with two black spots. . . . The *M. neritoides* of Linné includes both this species and our *ricinula horrida*." Deshayes (1838-1845, vol. 10, p. 70, footnote) comments on Lamarck's treatment as follows: "It is certain that the *Murex neritoides* of Linné is the same species as this. The short description which Linné gave can apply only to the *Purpura neritoides* of Lamarck. That which prevented Lamarck from uniting them was, without doubt, the citation by Linné in his synonymy of figures which represent two species: one, the *Ricinula horrida* Lamk., the other, *Purpura neritoides*; and as Linné said in his description: *Columella planiuscula*, this character can only apply to *neritoides*, since *horrida* has a plaited and toothed columella."

Blainville (1832, p. 224) used for the species the name *Purpura fucus* (Gmelin).¹

Since Deshayes no question has been seriously raised as to the identification of the species, or that it should bear the Linnaean name, although, as said above, the earliest name, *nodosa*, has not been used.

Neither *nodosa* nor the variety *ascensionis* is figured in the "Tableau encyclopédique." The best figures of *nodosa* are found in

Kiener (1834-1850, vol. 8 *Purpura*, pl. 22, fig. 62, dorsal and apertural views), and in Reeve (1843-1878, vol. 3, *Purpura*, pl. 3, sp. 12).

Thais ascensionis is figured in Kiener (*tom. cit.*, fig. 63, dorsal and apertural views), and in Reeve (*tom. cit.*, sp. 11).

The species is not described in the "Museum Ulricae" under either *Nerita* or *Murex*.

Murex hystrix

1758, *Systema naturae*, ed. 10, p. 750, no. 468.

1767, *Systema naturae*, ed. 12, p. 1219, no. 543.

LOCALITY: Not given in either edition.

"M. testa ecaudata subovata, apinis acutis apertura edentula repanda."

As noted above (p. 129), Linnaeus' *hystrix* was based on the immature shell of his *Murex ricinus*. Although the young shell, even in very early stages, shows one or two of the three columellar ridges of the adult, it lacks the prominent teeth on the lip of the fully grown shell. This is reflected in the description of *hystrix* by the words "apertura edentula." The color of the aperture is white in all life stages of the typical species,² although Linnaeus' description of *ricinus* used the phrase "faux violacea," possibly because he had confused that species with *Drupa morum* Röding, 1798 (*Ricinula horrida* Lamarck, 1816) or *Drupa rubusidaeus* Röding, 1798 (*Drupa hystrix* of Lamarck and authors), both of which have violet apertures. The two latter species are so distinct from *ricinus* in size and sculpture that it would seem that Linnaeus could not have confused them. However, a specimen of the white-mouthed *ricinus*, marked with the proper number, is found in Linnaeus' collection in London, where the other two species are not present.

The synonymy of *hystrix*, comprising only two figures, is completely erroneous. The figure from Argenville (1742, pl. 17, fig. A), cited in both editions of the "Systema," is only a dorsal view and might have been based on either *ricinus* or *horrida*. The difficulty in accepting it for *hystrix*, however, is that its great development of spines suggests a fully mature rather than a juvenile shell. Hanley (1855, p. 294) characterized this figure as

² The form *arachnoides* Lamarck, 1816 (referred to on p. 128, above), shows a few orange-yellow spots on the columella and lip.

¹ Blainville distinguished very clearly the two species *nodosa (neritoidea)* and *ascensionis*, and identified his *Purpura fucus*, to which he gave the vernacular name "P. à deux taches," with the former. He said: "M. de Lamarck has confused under this name two quite distinct species, which, in our opinion, do not belong to the same section; one, figured by Martini under the numbers 959 and 960, the other, under the numbers 961 and 962, and which MM. Quoy and Gaimard have properly distinguished by the name of P. de l'Ascension." Blainville included *nodosa* in his "section" "Les P. semi-Ricinules," and *ascensionis* in the "section" "Les P. hémostomes," and called attention to the fact that the latter species has at least three spots on its columella, *nodosa* having only two.

"indisputably meant for *Ric. arachnoides*." I cannot be so certain. The Seba figure (pl. 60, fig. 38) resembles, according to Hanley (p. 295), both *M. ricinus* and *mancinella* Linné. These two species are not unlike when viewed dorsally, and I agree with Hanley that the Seba figure might have been based on either. *Murex ricinus* is apt to have the longer spines, but this feature is extremely variable.

The name *hystrix* means "a porcupine" and could have been applied to more than one of Linnaeus' spinose species in this group. Why he selected *hystrix* to bear it is not apparent, particularly as the spines of the young *ricinus* are less pronounced than those of the adult shell or of *mancinella* or *hippocastanum* Linné.

This species must not be confused with *Purpura hystrix* Lamarck (1822b, p. 247) which, although referred by Lamarck to "*Murex hystrix*. Lin. Gmel.," is a distinct and misnamed species. It should take the earlier name *Drupa rubusidaea* Röding, 1798. *Purpura spathulifera* Blainville, 1832, is a synonym. Deshayes (1838-1845, vol. 10, p. 85) cited for *hystrix* Lamarck the Linnaean *hystrix* of the tenth edition of the "Systema," and there has been a certain amount of confusion even up to recent years, although the specific separability of *hystrix* Linné and *hystrix* Lamarck is now established.

Murex hystrix was described in the "Museum Ulricae" with a single reference, the questionable Argenville figure discussed above. The only helpful detail in the added description is the phrase "intus laevis, alba," which immediately distinguishes the species from the *hystrix* of Lamarck. The specimen labeled for *hystrix* in the collection at Uppsala is shown on the microfilm of the collection as a dorsal view of a large spinose *Drupa*, over 7 cm. in height by the gauge at the top of the photograph. This is much too large for even the adult *ricinus* and indicates that Linnaeus was still possibly confusing that shell with *horrida*.

No specimen of the juvenile shell of *ricinus* is present in the Linnaean collection in London, marked or unmarked, and I have been able to find no figure of it in the literature. An early characteristic figure of the *hystrix* of Lamarck and later authors is found in Regenfuss (pl. 3, fig. 32).

Murex mancinella

1758, Systema naturae, ed. 10, p. 751, no. 469.

1767, Systema naturae, ed. 12, p. 1219, no. 544.

LOCALITY: Not given in either edition.

"*M. testa ecaudata ovata, spinis obsoletis, apertura edentula, columella transversim striata.*"

It is not difficult to understand why this description, which is identical in the tenth and twelfth editions, should have hampered the identification of the species. Its meager details are insufficient for the isolation of any one species in the group of spinose *Thais*, a group in which the members have so many characters describable in the same words. Moreover, two of its details do not conform to the species that has been for so long accepted as the representative of the Linnaean species, the *mancinella* of authors. The phrase "columella transversim striata" does not describe the columella of that shell, which is smooth except for a more or less conspicuous anal ridge, which is hardly a part of the columella, and except for the longitudinal furrow or depression which is seen in the mid-parietal area of several species of *Purpura* and less conspicuously in the basal end of the parietal area in certain species of *Thais*, including the *mancinella* of authors. The phrase "spinis obsoletis" does not conform to the sharp and prominent spines seen in that shell. If it be attempted to explain this phrase by saying that Linnaeus was describing a worn specimen of *mancinella* auct., reference may be made to the Linnaean collection in London which contains a specimen of that shell which probably had been placed there by Linnaeus, although it is not documented as a type, and shows spines which are certainly not "obsolete."

The synonymy, consisting of only two figures, is discordant. Apparently good figures of the specimen before him were not found in the literature available to Linnaeus, and he was forced to the expedient of choosing those that seemed to him the nearest approximation to his specimen. The figure from Rumphius (pl. 24, fig. 5) the only figure cited in the tenth edition, is not recognizable. It shows a shell which has a smooth columella and more or less prominent spines which I cannot refer either to the Linnaean description or to the *mancinella* of authors. Its spire is too produced for that species, but it has four rows of

spines on the body whorl, as in *mancinella* auct., and Rumphius called it "Geelmonden" (saffron-mouth) which also conforms. In the last analysis, the figure is distinguishable from that shell by its higher spire and its unlined aperture. The Argenville figure (1742, pl. 20, fig. H) is even less informative. It is a dorsal view of a thickly spinose shell showing six rows on the body whorl and which is more evenly ovate than *mancinella* of authors. It might have been meant for *Drupa uva* Röding, 1798 (*Ricinula morus* Lamarck, 1822), and could conceivably be said to resemble either a bunch of grapes or a mulberry, in explanation of these names. It also suggests the dorsal view of a young *Thais patula* (Linné) and it is significant that it was also cited for that species by Linnaeus (*Buccinum patulum*, 1758, p. 739).

In the "Museum Ulricae" the "Systema" description was, as usual, first copied, the single figure from Rumphius was cited, and the following details were added: The word "flavescens" describes the exterior color, and "Fauce lutea, transversim striata" adds two further diagnostic details of the *mancinella* of our museums. The phrase "transversim substriata," which from the context refers to the exterior of the shell, describes the fine spiral lines of its body whorl. Based on this subdescription alone, which in the "Museum Ulricae" is the most significant part of the diagnosis, the present writer is forced to agree with those authors who contend that here Linnaeus was describing the *mancinella* of authors, a specimen of which is labeled for *Murex mancinella* in the collection at Uppsala.

In commenting on the diagnoses and the synonymies in the two Linnaean works, Hanley (1855, pp. 295–296) concluded that species described in them were not the same. He said: "Hence there is no definition in the 'Systema,' for such a term can scarcely be applied to a description of barely two lines elucidated by two discordant synonyms. Naturalists, consequently, have sought in the 'Museum Ulricae' for the obscure species of the earlier publication, and have bestowed the name of *Purpura mancinella* upon a shell (Kiener, Purp. f. 46) which so fairly corresponds with the details of that work that we may reasonably accept of the traditional

identification. It must not, however, be confounded with the species of the 'Systema,' as its columella is perfectly smooth." Hanley's comments on the specimens in the Linnaean collection in London are discussed below.

The Linnaean collection contains three specimens that are pertinent to this discussion. These are all contained in one tray. One is the *Thais mancinella* of authors. It bears no documentation of any kind. The other two are specimens of *Drupa cornus* Röding, 1798 (*Purpura elata* Blainville, 1832, and *Ricinula spectrum* Reeve, 1846). These were reported by Hanley, who used the name *spectrum* Reeve, as being "marked" by Linnaeus for *Murex mancinella*. This species is much smaller than our *mancinella*, has a higher spire, and lacks the spines of that species. Its only resemblance to it lies in its yellow aperture. It should be noted that one of the figures cited by Linnaeus for *M. mancinella* (Rumphius) is not unlike *cornus* in shape and also has a yellow mouth according to Rumphius' description. The possibility exists, of course, that Linnaeus may have considered these three specimens as forms of a single species, although the existence of the undocumented specimen in the same tray with the documented specimens of *cornus* is not evidence that Linnaeus so placed them. Hanley apparently gave insufficient weight to the inscription, in Linnaeus' handwriting, on the specimens of *cornus*, as he merely said: "It is probable that an immature example of the *Ricinula spectrum* of Reeve was the original of this species [*M. mancinella* Linné]." (Italics mine.) At least he did not say that the two marked specimens should be accepted as the syntypes of the Linnaean species.

The only critical discussion of these specimens and of the identity of *M. mancinella* Linné since the above comments by Hanley was made by E. A. Smith in 1913 (pp. 287–289). After reviewing Linnaeus' descriptions and the synonymies and describing the above-mentioned specimens in the London collection, he concluded that the *mancinella* of the "Systema" was a *species dubia*, and supplied new names for the species found by Hanley in the London collection, *Thais gemmulata* Lamarck, 1816, for the *mancinella* of authors and *Drupa cornus* Röding for *spectrum* Reeve.

Smith's conclusions have not been generally adopted, and the name *mancinella*, usually attributed to Lamarck, is continued in use on museum labels. Hedley (1908, p. 457), however, had already adopted the name *gemmulata* Lamarck for the *mancinella* of authors.

I agree with Smith's renaming of the two species represented in the Linnaean collection, as both substituted names are earlier and validly proposed. The systematists who follow the current practice of retaining well-known names whenever possible must, in the present case, base their opinion on the presence in the collection of a single undocumented specimen of the *mancinella* of Lamarck and authors and thus retain the name *mancinella*, selecting that specimen out of the syntypic lot as the lectotype of *M. mancinella* Linné. This is not only a violation of the Rule of Priority, but is the choice of a type unsupported by any evidence whatever, except its possible adventitious presence in the tray, and is a disregard of specimens that Linnaeus himself documented as type.

I do not agree, however, with Smith's treatment of *mancinella* Linné as a *species dubia*, in the face of the situation in the collection, and see no reason for denying to the specimens of *Drupa cornus* Röding their status as syntypes. I am not much concerned with the defects of Linnaeus' description in the "Systema." It is only one of many poor descriptions, which have been explained and purified by the finding of the type. Nor am I disturbed by the applicability of the description in the "Museum Ulricae" to the "*mancinella* of authors." It may well be that Linnaeus had changed his concept of the species when he wrote that work. But he not only resumed his original concept in the twelfth edition, but confirmed it by the documentation of the type in his collection. There are other instances of this double change in Linnaeus' works.

The species *gemmulata* Lamarck, by which ever specific name it is to be called, belongs in the genus *Thais* Röding, 1798, and is generally placed in the subgenus *Mancinella* Link, 1807, of which it is the subgenotype, by absolute tautonymy, as *T. (M.) mancinella*. Iredale (1915c, p. 472) also designated *mancinella* as type species.¹ Röding's *cornus*, which I am treating as equal to *M. mancinella*

Linné, belongs in the genus *Drupa* Röding, 1798, and I suggest the restoration of the Linnaean specific name, as *Drupa mancinella*.

Drupa cornus Röding [*Drupa mancinella* (Linné)] is figured by Reeve (1843-1878, vol. 3, *Ricinula*, pl. 3, sp. 19) as *R. spectrum*, and by Maxwell Smith (1953, pl. 20, fig. 3) as *Sistrum ochrostoma spectrum* Reeve.

The *mancinella* of authors is figured by Reeve (*tom. cit.*, *Purpura*, pl. 1, sp. 2), Kiener (1834-1850, vol. 8, pl. 16, fig. 46), Tryon (1879-1888, vol. 2, pl. 47, figs. 59, 61), and Adam and Lepoup (1938, pl. 7, fig. 6).²

¹ *Thalessa* H. and A. Adams, 1853, is treated by Clench (1947, no. 23, p. 83) as a synonym of *Mancinella* Link, although others have distinguished *Thalessa* as a group to contain the *Thais hippocastanum* of authors. I am inclined to separate *Mancinella* and *Thalessa*. The aperture in *Mancinella* is closely lirate, whereas in *Thalessa* this is smooth and decorated with broad bands of brown. Moreover, in *Thalessa*, the inner aspect of the lip is provided with a series of pearly nodules, which are lacking in *Mancinella*.

² Since writing the above, and because the "markings" reported by Hanley on the three specimens in the tray referred to are not visible on the reproductions in the microfilm of the Linnaean collection, I requested the Secretary of the Linnaean Society in London to examine again the numbers on the specimens and report on them. His report is as follows: The three specimens are fastened to a tablet (probably by Hanley himself) and show, reading from left to right:

On specimen 1, Linnaeus has written the number 54(?), the last digit not being clear, but probably being 4, 7, or 9. 544 is the number of *M. mancinella* in the twelfth edition of the "Systema." 547 is the number of *M. melongena*, and 549 the number of *M. babylonius*, both in the twelfth edition. As the two latter must obviously be excluded, the evidence is almost incontestable that 544 (*M. mancinella*) is what Linnaeus wrote. The specimen bears the faint traces of another number, either 567 or 767. These numbers apply, respectively, to *M. trapezium* and *Patella unguis* in the twelfth edition, and must be taken as an attempt by Linnaeus to obliterate an obvious error of transcription or a *lapsus calami*.

On specimen 2 (center) Linnaeus has clearly written 544 (*mancinella*).

On specimen 3 there is no trace of any writing whatever. This specimen is the *M. mancinella* of authors, the first two specimens being individuals of *cornus* Röding.

Hanley, as said above, reported that the specimens 1 and 2 were *cornus* Röding (*spectrum* Reeve), but were marked for *mancinella*. As the marked numbers on both of these specimens now are found to be 544, one number being clear and the other almost certainly 544, it seems unanswerable that Linnaeus' *mancinella* was *cornus* Röding and not the *mancinella* of authors. This is confirmed inferentially, if confirmation is necessary, by the fact that the undoubted specimen of the *mancinella* of authors in the same tray was left unmarked. Indeed we

Murex hippocastanum

1758, *Systema naturae*, ed. 10, p. 751, no. 471.

1767, *Systema naturae*, ed. 12, p. 1219, no. 545.

LOCALITY: "In O. Asiae ad Bandam" (1758, 1767).

"M. testa ecaudata ovata striata quadrifariam subspinoso, apertura transversim striata."

The same situation as to identification is presented here as was encountered in the case of the preceding species, *M. mancinella*, as both the description and the synonymy are equivocal and, standing alone, are insufficient for the purpose of a categorical identification. However, Linnaeus' type, a specimen of the shell later called *Pyrula galeodes* by Lamarck (1822), is found in the Linnaean collection in London inscribed with the serial number of *M. hippocastanum* in Linnaeus' hand.

Referring first to the synonymy, we find it extremely discordant, as at least three species are probably pictured. A figure from Rumphius was cited in the tenth edition of the "Systema" and in the "Museum Ulricae" as plate 24, figure C. This figure has been much discussed, but, to this writer, it might be taken for almost any of the spinose *Drupa* species. Possibly it most closely resembles the *D. hystrix* of authors, not Linné. In the twelfth edition this reference was changed to plate 24, figure 4. The latter figure clearly represents *galeodes*. Hanley (1855, p. 296) suggested that the change may have been merely an error of transcription, using as his argument that the Rumphius name, "Pimpeltjes e Banda," which was cited in the twelfth edition, was attached by Rumphius to figure C. One might as reasonably say that Linnaeus' error was in transposing the name, rather than the figure. In any event, figure 4 was Linnaeus' final choice and is a good and unmistakable figure, whereas C is most equivocal.¹ The Gualtieri figure (pl. 31, fig. F) also shows *galeodes* and is, if anything, a better drawing. The figure from Argenville (1742, pl. 17, fig. L) which was cited in both

editions, although with a query in the twelfth, shows neither *galeodes* nor the *hippocastanum* of authors, and most resembles *Purpura pica* Blainville, 1832.² The Klein figure (pl. 7, fig. 112) is apparently a copy of Rumphius' figure C (?*hystrix*). The figure from Regenfuss reads "t. 3, f. 32" in the tenth edition and "t. 13, f. 32" in the twelfth. That on plate 3 shows a globose shell with numerous irregularly disposed, short spines and a purplish aperture, which may have been intended for *D. morum* Röding. The twelfth-edition citation of plate 13 is an obvious error as Regenfuss' work contains only 12 plates. Thus we find, in the same synonymy, two good figures of *galeodes*, one of *pica*, and three figures that are neither and that I would hesitate to identify. It should not be forgotten that the Argenville figure (*pica*) was queried in the final edition of the "Systema," which leaves only the two figures of *galeodes* as really authoritative. On the basis of choosing that species which is represented in the majority of the figures, therefore, a "yardstick" often employed by Hanley but which is scarcely a scientific approach to the problem, we could say that Linnaeus' *hippocastanum* is pictorially defined as being *galeodes*.

The description, which is identical in both editions of the "Systema," reflects the shell characters of *galeodes* save in one particular. The phrase "apertura transversim striata" hardly describes the short ridges on the inner face of the outer lip of *galeodes*, and this fact has been treated by most writers as the greatest stumbling block to an identification with that shell. Even Hanley (*loc. cit.*), who discovered the documented type in the collection, said after discussing the diagnosis: "Be that as it may, *galeodes* suits not the 'apertura

cannot be sure that Linnaeus originally placed it in that tray. The evidence, therefore, seems to the present writer to be conclusive that Linnaeus' type was *cornus* Röding.

¹ Lamarck later used for *P. galeodes* an even better figure from Rumphius (pl. 23, fig. D).

² *Purpura pica* has only two rows of prominent and broad spines on the upper part of the body whorl, those on the upper row being the largest, with two much smaller rows near the base. The *hippocastanum* of authors possesses four evenly spaced rows on the body whorl, decreasing gradually in size anteriorly, with two incomplete rows of small nodules below them. The most spinose form of *galeodes* shows four rows of open spines on the body whorl, the uppermost row being placed at the sutural border of the sloping shoulder and resembling the spines of *Melongena corona* Gmelin. The number and disposition of spines in *galeodes* are, however, extremely variable, some individuals having only the shoulder row and others having from one to three obsolescent or incomplete rows.

transversim striata' of the description; hence the name cannot be assigned to that *Pyrula*, although a specimen of it is marked, in the Linnaean cabinet, with the numerals indicative of that shell." As I have many times contended in this series of papers, while I rate the description above the synonymy as a factor in identification, it seems inescapable that the existence of a type in the collection, marked for the species in Linnaeus' hand, should not only outweigh both of these factors, but should be taken as an absolute determinant in the identification. As to the possibility that Linnaeus changed his conception of the species between the tenth and twelfth editions, Hanley said: "Our author, judging from his list, did not possess an example when he first constituted the species, and evidently altered his ideas when he published his final edition, for he there queries the cited figure of Argenville." It is not apparent to the present writer why the querying of a figure should indicate a change in his idea of the species.

Hanley very properly noted, however, that if Linnaeus had been describing the *hippocastanum* of authors he should not have cited the figures he did, as adequate pictures of that shell are found in books in his own library or available to him (Regenfuss, pl. 2, fig. 18; Gualtieri, pl. 43, fig. V; and Seba, pl. 52, fig. 67, pl. 60, fig. 12). I am not satisfied with all these figures, although some of them are characteristic of *hippocastanum* auct. and none is either *galeodes* or *pica*. Hanley did not, however, make any positive identification of the Linnean species.

The diagnosis in the "Museum Ulricae" is even more equivocal and may indicate that Linnaeus was there dealing with a different species. He cited three of the references of the tenth edition—Rumphius, figure C (*Drupa* sp.), Gualtieri, figure F (*galeodes*), and Argenville, figure L, without a query (*pica*). However, his added subdescription, while it contains discordant elements, seems to point rather to *pica* than to either *galeodes* or the *hippocastanum* of authors. The word "rudis" suggests *pica*, as does the phrase "albo nigroque varia." Although that phrase could conceivably apply to the *hippocastanum* of authors, it cannot be said of *galeodes*. "Spinae serie triplici" was said by Hanley to describe

pica, and with some reason if we omit the obsolescent anterior row of spines. The word "robustae," as applied to the spines, describes *pica* as well as *hippocastanum* auct., but not *galeodes*. "Apertura alba" is apt for *galeodes*, less so for *pica*, as the aperture of the latter has, in many specimens, a pinkish flush. "Intus saepius striata" clearly conforms to *pica*, but not to *hippocastanum* auct., as in the latter the aperture is broadly banded in brown and lacks striations, and hardly to *galeodes*, as noted above. In the last analysis we have, in the "Museum Ulricae," a synonymy which shows three species, including *galeodes*, and a subdescription which weighs rather heavily on *pica*, somewhat less on *hippocastanum* auct., and with only one phrase, 'apertura alba,' which best describes *galeodes*. Hanley summed up the diagnosis but did not make a categorical identification, saying: "Indeed, the whole description is so applicable to *pica*, especially the 'spinae, serie triplici' (for the canal belt cannot, without straining, be termed spinous) and the 'apertura edentula,' that Karsten has described that shell as the *hippocastanum* of Linnaeus."

In the face of the marked specimen of *galeodes* in the London collection I am inclined to dismiss the equivocal nature of the description and the discordant synonymy in the "Systema" as due largely to Linnaeus' own confusion in his choice of both language and references. As to the "Museum Ulricae" diagnosis, he may have suffered a change of concept as to the species when writing that catalogue, and reverted to *galeodes* when documenting his specimen. It is of possible significance, however, to note that the shell now labeled for *M. hippocastanum* in the Queen's collection in Uppsala is a specimen of *galeodes*. If we could be certain that no mixture of specimens or misplacements of labels had taken place, we could completely solve the puzzle of the "Museum Ulricae" diagnosis. The lack of authority, however, which taints the entire labeling of that collection, has already been pointed out in previous papers of this series. None of the specimens was supplied with a label by Linnaeus, and none bears any marking on the shell. I therefore conclude that *galeodes* Lamarck is the true representative of the *hippocastanum* of

the "Systema," and that the *hippocastanum* of the "Museum Ulricae" was probably a different species and may have been *pica* Blainville.

As in the case of the preceding species, *Murex mancinella*, the suppression of the later name in favor of that of Linnaeus and the allotting of a new name to the *hippocastanum* of authors will be dependent on the views of the individual worker as to whether the Rule of Priority should be strictly construed or the retention of an established name should be considered of paramount importance.

Little would be gained by detailing the descriptions and figures supplied in the many erroneous treatments of this disputed species.

It is sufficient to say that the literature contains many descriptions and figures of the *hippocastanum* of authors which are referred to the Linnean species, as well as many treatments which hold the species to be a *species dubia*. In virtually every list of *Melongena*, in which genus *galeodes* is now placed, that species is attributed to Lamarck with no reference to the "Systema" and with many erroneous figures.

While *galeodes* is almost universally placed in *Melongena* Schumacher, 1817,¹ the suggestion has been made to the writer by Dr. W. J. Clench that it would be better assigned to *Volema* Röding (1798, p. 57), where Röding placed it as *V. aromatica*, one of his several names referred to *M. hippocastanum* Gmelin. His *aromatica* is referred to a Martini figure (1769–1777, vol. 2, pl. 40, fig. 399) which is a recognizable figure of the less spinose form of *galeodes*. I here adopt that placement.

Volema galeodes is figured in the "Tableau encyclopédique" (pl. 432, fig. 4), in Kiener (1834–1850, vol. 6, *Pyrula*, pl. 5, figs. 2, dorsal and apertural views), and in Reeve (1843–1878, vol. 7, *Pyrula*, pl. 7, sp. 22).²

Synonyms of *V. galeodes* are: *Buccinum*

bezoar Born, 1780, *Murex hippocastanum* Born, 1780, and *Murex calcaratus* var. B Dillwyn, 1817.

The *hippocastanum* of authors belongs in the genus *Thais* Röding, 1798, and I am tentatively placing it in the subgenus *Thalessa* H. and A. Adams, 1858.

It is figured by Kiener (1834–1850, vol. 8, *Purpura*, pl. 12, fig. 33) as *P. hippocastanum*; by Reeve (1843–1878, vol. 3, *Purpura*, pl. 8, sp. 34a) as *P. hippocastanum*; and by Tryon (1879–1888, vol. 2, pl. 45, fig. 42) as *P. (Thalessa) hippocastanum*.

Synonyms of *hippocastanum* auct. are: *Purpura aculeata* Deshayes, 1844, and *Purpura (Thalessa) pseudocastanum* Dautzenberg 1929.³

Murex senticosus

1758, Systema naturae, ed. 10, p. 751, no. 474.

1767, Systema naturae, ed. 12, p. 1220, no. 546.

LOCALITY: Not given in either edition.

"M. testa ecaudata subturrita longitudinaliter costata, transversim cancellata, apertura striata . . . Columellae plica una alterave."

The description of this species in the tenth edition of the "Systema" did not include the word "ecaudata" and the subdescription was also added in the twelfth. It is not a good description. The word "subturrita" is too restrained to apply to the markedly turreted appearance of the species. The word "cancellata" is misused, as the sculpture of *senticosus* consists of strong, widely spaced, longitudinal ribs and a spiral series of much finer and very close-set threads which cross the ribs and interspaces, forming sharp nodes at the intersections. This is not a combination of sculptural features to which "cancellate," in its ordinary meaning, could apply.⁴ More-

¹ Thiele (1931, p. 320) used *Galeodes* Röding in place of *Melongena*. The latter name is, however, a homonym, as it had already been used by Olivier, 1791, for a genus of Arachnida.

² The "Tableau" figure is entitled *Pyrula hippocastanum* in the "Liste," 1816, but in the Explanation of Plates, published after the publication of Lamarck's seventh volume, the figure is designated as "*Pyrula hippocastanum*. *Pyrula galeodes* Lamk. vii, 145."

³ Dautzenberg said as to this name (1929, p. 427): "According to the researches of Hanley, which we have checked, it is impossible to accept the concept of the name *hippocastanum* L. which has been adopted by Kiener and the majority of modern writers, for it applies rather to *Purpura pica* Blainville, but in the face of such uncertainty it is preferable to strike the name from our nomenclature. We propose to replace the name *hippocastanum* Kiener et auct. (non Linné, nec Lamarck) by *pseudocastanum*." I am not entirely in accord with Dautzenberg's interpretation of Kiener's figures (pl. 12, figs. 33, 33). They are not good but seem closer to *hippocastanum* auct. than to *pica*.

⁴ The word "cancellatum" was also used for this species by Klein (1753, p. 44).

over, a much more descriptive phrase than "plica una alterave" could have been used for the plaits on the columella. The "-ve" attached to "altera" is an enclitic particle, a shortened form of "vel," so that the phrase might be translated: "one or more plaits on the columella." It is accurate, although not a happy expression. The columella of *senticosus* bears two folds. The lowest is the most prominent and is developed from the base of the shell rather than the columella proper. No locality was supplied.

The species is in strange company in the "Systema." In the tenth edition it is placed between *Murex scabriculus* (*Cancellaria cancellata*) and *Murex ficus* (*Ficus ficus*), and in the twelfth between *Murex hippocastanum* (*Volema galeodes*) and *Murex melongena* (*Melongena melongena*). The location in Linnaeus' work, which sometimes assists the identification, supplies, therefore, no hint of its identity. Indeed, Linnaeus himself was in doubt as to its proper place, as he wrote "Inter Buccina simile" in a manuscript note in his own copy of the twelfth edition.

All but two of the figures in the synonymy may be criticized. The badly drawn figure from Buonanni (pl. 35) somewhat resembles *senticosus*, but, as Buonanni said in his text (pt. 2, p. 177), it is a magnified picture of a minute shell from the Adriatic Sea not further identified. The Argenville figure (1742, pl. 12, fig. O) was criticized by Hanley (1855, p. 297) as being "much too large" for *senticosus*, as well as being "too short-spined." In the light of the inaccuracy of the conchological drawings of the era these seem trivial objections. In fact, the drawing is very little larger than the largest specimens of this species, and the ratio of height of body whorl to height of spire is not noticeably inaccurate. I consider it a good, and certainly identifiable, figure of the species. The sculpture is extremely well reproduced.

Two of the Seba figures (pl. 49, figs. 45-46) have, on the contrary, a spire that is much too short. The other (fig. 47) must be excluded, as being either an approximation or an error of transcription. Of the two Gualtieri figures (pl. 51, figs. G, I), figure G is shown twice. The first of these is a characteristic dorsal view readily recognizable as *senticosus*. The second is not sufficiently turreted. Figure I is

not good. Not only is it not sufficiently turreted, but the longitudinal ribs are too prominent. It may, however, have been based on a specimen of *senticosus*. By a manuscript note in his own copy of the twelfth edition Linnaeus added two new figures. One from Rumphius (pl. 29, fig. N) is badly drawn but vaguely resembles *senticosus*. The other (Lister, pl. 967) is also crude and, to me, unidentifiable.

In brief, the entire diagnosis, consisting of an equivocal description, a synonymy with only two acceptable figures, and a locality left blank, is so unsatisfactory that one is surprised that the species was identified so early, and by writers who had, in all probability, not seen Linnaeus' collection. The type is present in the Linnaean collection in London, duly marked in the handwriting of Linnaeus.

The first post-Linnaean use of the name *Murex senticosus* was that of Born (1778, p. 306) who, however, supplied no figure.

Chemnitz, in 1780 (1780-1795, vol. 4, p. 308, pl. 155, figs. 1466-1467) described it as "*Murex senticosus* Linnaei" and referred to the *senticosus* of the tenth and twelfth editions of the "Systema." His figures are accurate except that the color is too dark, although the brown band around the body whorl is faintly indicated. He also referred to the correct locality, the East Indies. These are the earliest post-Linnaean figures. A later pair of Chemnitz figures (*op. cit.*, vol. 11, pl. 193, figs. 1865-1866) is even more characteristic.

Bruguère (1789, vol. 1, pt. 1, p. 272) first advanced the view that the species belonged in *Buccinum*, and this opinion was followed by many writers up to and including Deshayes and Kiener. Röding (1798, p. 114) placed it in *Buccinum*; Link (1807, p. 124), in *Nassaria*; Montfort (1810, p. 11), in his new genus *Phos*, of which it is the type species by original designation.

Lamarck (1822b, p. 114) included *senticosus* in his *Cancellaria*, 1799, and listed a variety designated as "[b] var. *costis crebrioribus*," which he referred to the "*Buccinum lima*," of Chemnitz (*op. cit.*, vol. 11, pl. 188, figs. 1808-1809). These figures show a shell with more numerous and thinner axial ribs, justifying the word "crebrioribus," a flaring parietal flange, and a brown band on each

whorl of the spire in addition to that on the body whorl.¹ I cannot identify these figures except as a form of *senticosus* with which I am not familiar.

Deshayes, in the second edition of Lamarck's work (1838-1845, vol 9, p. 406), disagreed with Lamarck's choice of *Cancellaria* as the vehicle to contain *senticosus* and referred it to *Buccinum*, saying in a footnote: "Lamarck was apparently deceived as to the diagnostic features of this species; they belong, without doubt, to the genus *Buccinum* as Bruguière was the first to assert. Bruguière's opinion being forgotten, that of Lamarck prevailed with the majority of conchologists up to the time when, in the continuation of the Encyclopedia, we were convinced that this species was, indeed, a true Buccin. Since that time all conchologists have adopted this view." Deshayes was, of course, correct, to the extent of identifying this species as a member of what is known today as the family Buccinidae. He disregarded, however, Montfort's separation of *Phos* from the other *Buccinum* species. It is now almost universally cited as *Phos senticosus*.

I know of no specific synonyms of the species. *Rhinodomus* Swainson, 1840, is an exact synonym of *Phos* Montfort.

The present species was not described in the "Museum Ulricaë."

In addition to the good Chemnitz figures above mentioned, figures of the species may be found in Kiener (1834-1850, vol. 9, *Buccinum*, p. 26, pl. 9, fig. 31), Sowerby (1847-1887, vol. 3, *Phos*, pl. 221, figs. 8-11), and Maxwell Smith (1953, p. 58, fig. 795).

Murex melongena

1758, *Systema naturae*, ed. 10, p. 751, no. 472.

1767, *Systema naturae*, ed. 12, p. 1220, no. 547.

LOCALITY: "In America" (1758, 1767).

"M. testa ecaudata obovata glauca, anfractu subspinoso, spira prominula, apertura laevi . . . Variat cum et sine spinis."

The description is identical in the tenth

and twelfth editions of the "Systema." It is entirely accurate, although somewhat too brief to insure a ready identification. However, the correctness of the synonymy, in which no discordant figures are found, combined with the correct although too broad locality, defines the species both pictorially and geographically. The identification is confirmed by the presence of Linnaeus' marked type in his collection in London.² It is scarcely necessary to comment on the excellent synonymy.

Linnaeus, by a manuscript note in his interleaved copy of the twelfth edition, which was designed to be used for his proposed revision of that work, restricted the locality of the species to "Jamaica," which Clench and Turner (1956, p. 166) selected as the type locality. By a similar note Linnaeus added a further good figure (Lister, pl. 904) and the phrase "Rore gluco obducta" to the description.³

The species has been placed in several genera. The earliest name for the group is *Galeodes* Röding (1798, p. 53), of which *melongena* is the type species, by monotypy. This name, however, is unavailable as it is a homonym of *Galeodes* Olivier, 1791, in Arachnida. The present species was called *Buccinum melongena* in the Solander manuscripts (see Solander in Bibliography). Schumacher (1817, p. 212) erected for it the genus *Melongena*, of which it is also the type species, by monotypy, as *Melongena fasciata*. This is the earliest valid generic name for this species. Lamarck (1822b, p. 140) placed it in his *Pyrula*, 1799. Clench and Turner (1956, p. 165) explain that *Volema* Röding (1791, p. 57) is also unavailable, as it is a mixed genus. It was purified by Iredale (1917, p. 322) by a type selection.

² Clench and Turner (1956, p. 166) said: "It would certainly appear that Linné did not have a specimen of *Melongena melongena* at the time the original description was written." The "original" description is identical in the tenth and twelfth editions and conforms in all its details to the *melongena* of authors, and the specimen in the Linnaean collection in London is marked for *melongena* by Linnaeus. The present writer can find nothing to indicate that Linnaeus did not own a specimen in both 1767 and 1758.

³ Literally translated this phrase means, "Exuding or covered over with a glaucous liquid," but the applicability of the words is not understood. I have never seen it referred to by any later writer.

¹ The production of the parietal wall into a non-adherent flange or shield is seen in some species of the related buccinid genera *Cantharus* and *Solenosteira*, but I know of no species of *Phos*, in which *senticosus* is now placed, which exhibits this feature. In the latter genus the parietal wall and columella are much reduced in size.

Clench and Turner say: "Iredale pointed out that *Volema* Röding had priority over *Melongena*, but at the same time he designated *Volema paradisiaca* Röding as the type species. This was a fortunate choice, as *Volema paradisiaca* (= *Murex ficus* Gmelin) is certainly not congeneric with *Melongena* of the Western Atlantic and Eastern Pacific."

The only synonyms of the species are *Melongena fasciata* (Schumacher) mentioned above and *M. margaritana* Richards, 1943, a name given to a Pleistocene fossil from Isla Margarita, Venezuela, which appears to be merely a spineless immature individual of *M. melongena*. Dollfus (1888, p. 56) erected three subspecies (*denudata*, *multispinosa*, and *semispinosa*). These describe mere forms of *Melongena* and cannot even be considered as ecological varieties, as all three are occasionally found in a single colony. They have no taxonomic value.

Linnaeus' name was recognized very early. In 1773 Martini (1769–1777, vol. 2, p. 77) referred the spineless form to Linnaeus' *M. melongena*, calling it "*Murex melongena sine spinis*." His figures (pl. 39, fig. 393, and pl. 40, figs. 395–397) are recognizable as *melongena*. The spined form (*tom. cit.*, p. 74) is also referred to Linnaeus' *melongena* and the figures (pl. 39, figs. 389, 392, and pl. 40, fig. 394) are fair. The last figure is an excellent apertural view. Chemnitz in 1788 (1780–1795, vol. 10, p. 271) listed a "*Murex melongena* Linnaei" and for some reason supplied no references. His figure (*tom. cit.*, pl. 164, fig. 1568) is a dorsal view and a poor and much stylized drawing of what may be the many-spined form of the shell later called *Murex corona* by Gmelin, 1791. It bears some resemblance to the dorsum of the heavily spined form of *melongena*.

Gmelin's *melongena* is an elaborate affair which consists of a main species and six varieties, with figures for each. None of his varieties has any taxonomic value, and from the many figures cited it is apparent that he drastically subdivided the species on the basis of the spines alone, their presence or absence, their prominence, and the number of their rows. He accepted for his last variety the questionable Chemnitz figure (fig. 1568). Dillwyn (1817, p. 710) listed only one variety—"with spines obsolete"—thus accepting the

spined form as typical, and also accepted the Chemnitz figure, as did Lamarck (1822b, p. 140). With Lamarck all varieties were merged into a single species.

The range of *Melongena melongena* along the mainland of the American coast is from Tampico, Mexico, south and east to Dutch Guiana. In the West Indies it is found only in the waters of Cuba, the Isle of Pines, Hispaniola, Jamaica, and some of the islands off the South American coast.

The best of the early figures of the species are found in the "Tableau encyclopédique" (pl. 435, figs. 3a, b, c, d, e) which show a wide range of forms. The most accurate modern figures are the recent photographs in Clench and Turner (1956, pl. 98, figs. 1–2). Reeve's figure (1843–1878, vol. 4, *Pyrula*, pl. 6, fig. 18) shows the form with two rows of spines at the shoulder.

Murex melongena is described in the "Museum Ulricae," and two smooth and one spinose specimen are present in the collection at Uppsala, properly labeled.

Murex cariosus

1767, *Systema naturae*, ed. 12, p. 1220, no. 548.

LOCALITY: "In Aquaeductu ad Sevilam" (1767).

"M. testa ecaudata subplicata ovata acuminata apice carioso Testa magnitudine Fabae, ovata, oblonga, acuminata, cinerea, subdiaphana, longitudinaliter sulcata, sed obsoletius. Apex cariosus. Basis emarginata."

This species appeared for the first time in the twelfth edition of the "Systema" and was not supplied with any synonymy. The only information given, outside of the description, was the name of "Cl. Alströmer"¹ who appears to have been the collector of Linnaeus' specimens. We are therefore forced to rely on the description, except for the possible type in the Linnaean collection in London, to which reference is made below.

The shell now universally recognized as the *cariosus* of Linnaeus belongs in the genus *Melanopsis* Férussac, 1807.

The description contains two confusing details, the confusion resulting from the

¹ Baron C. Alströmer was one of Linnaeus' patrons, and his son Clas was a pupil of Linnaeus who sent many plant seeds and shells to his teacher, taken on his travels in Spain, Italy, France, and England.

fact that Linnaeus was describing only one form of this variable species, although the specimens found in his collection do not conform to the particular variety described. The species is extremely variable in respect to the number and prominence of its longitudinal ribs. Linnaeus described it as "subplicata," but individuals vary from deeply plicate to almost smooth forms and from shells with from 14 to 17 plications to those in which the plications are much more distant. The subdescription is more descriptive of the sculpture, saying "longitudinaliter sulcata, sed obsoletius." The specimens in the collection are, on the other hand, of the more deeply sulcate form. The description also used the words "carioso" and "acuminata" without further explanation, although, viewed in the sense in which most readers read them, they are mutually exclusive. In fact, the specific name *cariosus* is much too graphic for this species. Although the difference between the Spanish and Levantine forms in the resistance of the spire to wear is the same as in its congener *M. praemorsa* Linné (see Dodge, 1956, p. 208), the wear, when present, is much less extensive than in the Spanish *praemorsa*. Many specimens from Spain are seen which show no signs of wear, which is not true of the Spanish *praemorsa*, and the Levantine shells are sharply acuminate even in adult specimens.

The position of *cariosus* in the "Systema" is peculiar. It is the first species in Linnaeus' "subgeneric" group characterized as "Caudigeri: cauda subulata clausa recta elongata, testa inermi." This group contains species widely differentiated in respect to the length and shape of the anterior canal, as it includes not only *M. colus*, *M. spirillus*, and the long-tailed *Busycon* species, but species in which the canal is only slightly or not at all produced, such as *M. cariosus* and *M. scriptus*. In any event, the canal of *cariosus* cannot be called "subulata" or "clausa" as the subgeneric heading provides. This mixture of species must have been the result of gross carelessness or the omission of a further "subgeneric" group which Linnaeus had projected but lost sight of.

The color of the species varies from a pale straw-yellow to much darker brown shades. One form has two spiral bands of

brown on the body whorl and one on the spire. This latter color form is represented in the Linnaean collection.

Olivier (1801-1807, vol. 2, p. 294, pl. 31, fig. 3) described and figured a shell from his travels in the Levant which he called *Melania costata*. His figure is undoubtedly the present species and has been consistently cited for it. The species had already been described once and possibly twice, and possibly figured once. Gmelin (1791, p. 3541) merely copied Linnaeus' main description, paraphrased the subdescription, and gave no references. He added to the subdescription: "An vere distincta integra hujus generis et hujus tribus species?" This suspicion of Gmelin's that *cariosus* did not belong in *Murex* may have originated with him or may have been suggested by a manuscript note in Linnaeus' copy of the twelfth edition, which reads: "An potius Buccinum, affine B. praerosa, sed majus et plicatum." However, there is no indication in the diagnosis that Gmelin was familiar with this species. In 1795 Chemnitz (1780-1795, vol. 11, p. 285) described a "Buccina maroccana." He gave no locality other than that suggested by his specific name. His six figures (pl. 210, figs. 2078-2083) show three different species, two of which are remote from *cariosus*. The third pair (figs. 2082-2083) very closely resemble the more prominently but distantly ribbed form of *cariosus*, with brown banding. There is no wear of the apex. Chemnitz' two latter figures are mentioned because they have been frequently cited for *cariosus* under the name "*Murex maroccana* Chemnitz." I am inclined to agree that it is a synonym.

In 1814 (p. 54) Férussac, in listing the species, retained Olivier's name *Melania costata*, but in 1823 (p. 157) he transferred it to his genus *Melanopsis*, which he had erected in 1807, and changed the specific name to *costellata*. In neither work did he associate the species with Linnaeus' *Murex cariosus*.

Dillwyn (1817, p. 712) listed *cariosus*, but it is apparent that he had not seen a specimen, as he began his subdescription with the words, "Linnaeus has described this species to be. . . ." He supplied no references, and said: "No other author has noticed it." He apparently overlooked Gmelin's listing of the

species, and did not realize that the names of Olivier and Férussac were synonyms.

Lamarck (1822a, p. 168) called it *Melanopsis costata*, passing over Férussac's change of the specific name. He gave as references only Olivier's "Voyage" and the figure of *costata* in the "Tableau encyclopédique" (pl. 458, fig. 7). The latter is a reasonably good figure of *cariosus*. Deshayes (1838-1945, vol. 9, pp. 489, 494) listed both *costata* and *cariosa* as good species, citing for *costata* the reference to Olivier, Chemnitz' figures 2082-2083 of "Buccina maroccana," and a reference to "Férus. Syst. Conch. p. 71," a work I cannot find in any list. For *cariosa* he cited *cariosa* of Linnaeus, Gmelin, and Dillwyn and both the *costata* and *costellata* of Férussac. His separation of the two species *cariosa* and *costata* is not to be taken seriously, however, as he cited Chemnitz' "Buccina maroccana" for both. He did, however, deplore the suppression of the Linnean specific name by Férussac and, impliedly, by Lamarck, as he said in a footnote to his "*cariosa*" (p. 494): "We have been wrong in following the example of M. Férussac and in not giving to this species its Linnean name. We do so today, being more than ever convinced that the only means of improving the nomenclature is to establish it, for all species, by the restoration of the earliest name which they received." He followed this with a lengthy redescription of *cariosa*, which, however, did not take account of the variability of the species. His is the first recognition of the fact that *costata* and *costellata* are synonyms of *cariosus* Linné.

Hanley (1855, p. 298) agreed with Deshayes' conclusion and referred for confirmation to the "specimens" of *Melanopsis costellata* in the Linnean collection in London.¹ One of these specimens is figured by him (*op. cit.*, pl. 2, fig. 6). This figure conforms generally to the description of *cariosus* in the "Systema," and shows a heavily ribbed form of the species. In as much, however, as it represents what I consider to be a form of the

species not described by Linnaeus, as his *cariosus* was said to be "subplicata" and "sulcata obsoletius," and Hanley did not report that any of the specimens were marked in any way, their acceptance as types is seriously impugned.

Reeve (1843-1878, vol. 12, *Melanopsis*, pl. 2, sp. 4a to h) was the first to figure several variations of *M. cariosa*, and his figures should be examined. In his synonymy he included not only the *costata* and *costellata* of Férussac, but Chemnitz' "Buccina maroccana," without specifying which of Chemnitz' discordant figures on plate 210 he relied upon. He also referred to the *Melanopsis jordanica* of Roth (1839, p. 25, pl. 2, figs. 12-13), a shell collected by Roth in "The Orient," which, in this case, meant the Middle East. He did not give a precise locality for his species, but in his general discussion of the genus he mentioned both Spain and the Levantine countries of Syria, Turkey, and "Asia Minor." Based on his figures, his shell seems to be unquestionably *M. cariosa*.

It is not necessary to comment on the appearances of the species in the literature since Reeve, as it has an uneventful nomenclatural history, and the *M. cariosa* of all authors is universally accepted as the shell Linnaeus described.

Thiele (1931, p. 192) separates it from the typical group of *Melanopsis*, by placing it in the section *Canthidomus* Swainson, 1840, while leaving *M. praemorsa* Linné in the typical section. This seems to the present writer to be a case of splitting to a degree unjustified, at least by the shell characters of the two species.

To summarize the synonyms of the present species, it is equal to *Melania costata* Olivier, 1801-1807, *Melanopsis costellata* Férussac, 1823, "Buccina maroccana" Chemnitz, 1795, and *Melanopsis jordanica* Roth, 1839.

The best figures of the species are noted above: Reeve (*loc. cit.*) and Roth (*loc. cit.*). The two Chemnitz figures (pl. 210, figs. 2082-2083) can hardly be bettered by any of the recent drawings of the shell.

It was not described in the "Museum Ulricaë."

Murex babylonius

1758, *Systema naturae*, ed. 10, p. 753, no. 479.
1767, *Systema naturae*, ed. 12, p. 1220, no. 549.

¹ I have not been able to isolate the photograph of Hanley's specimens on the microfilm of the Linnean collection. They are probably on one of the several photographs of undocumented and unlabeled shells which are so unclear, and in which so many of the shells are lying on one another, that it is impossible to identify most of them.

LOCALITY: "In O. Asiae" (1758); "In Asia" (1767).

"M. testa turrita cingulis acutis maculatis recto-caudata, labro fisso."

The words "cingulis acutis maculatis" were added in the twelfth edition of the "Systema." Without this addition the species could not have been identified from the description alone, as the scant details could apply to several pleurotomid species. Even in the final description "cingulis acutis" is incorrect, as the spiral carinae of the shell are rounded rather than acute.

All of the figures in the synonymy, as corrected, however (Lister, pl. 917, fig. 11; Rumphius, pl. 29, fig. L; Gualtieri, pl. 51, figs. NN; Argenville, 1742, pl. 12, fig. M; Regenfuss, pl. 1, fig. 9; and Seba, pl. 79, figs. laterales), are recognizable as *babylonius*. The Knorr figure is particularly good, and that from Petiver, although crudely represented, is unmistakable. The citation of the plate from Gualtieri was an error for plate 52, and was corrected by Linnaeus by a manuscript note in his copy of the twelfth edition.¹ The Seba reference was the only one added in the twelfth edition. The locality, "In Asiae," is correct but much too broad.

The specific name was borrowed from several of Linnaeus' predecessors (Petiver, Rumphius, Klein, Lesser, Argenville, and Seba), and it was called "le Tour de Babel" by the early French naturalists.

The earliest post-Linnaean figure of the species was by Chemnitz, who, however, called it *Turris babylonica*, although he referred it to the *Murex babylonius* of the "Systema naturae" and the "Museum Ulricaе." His figures (1780-1795, vol. 4, p. 166, pl. 143, figs. 1331-1332) cannot be referred to anything but this species, although the wide concavity of the shell at the suture is barely perceptible in the drawings, the sculpture being shown as a series of closely packed, heavy spiral cords of approximately the same size throughout. Moreover, the labial sinus, as drawn, is too pointed.

Gmelin (1791, p. 3541) seriously complicated the identification by dividing the

¹ This reference read "t. 5" in the tenth edition but was changed to "52" in the "Museum Ulricaе," and to "51" in the twelfth.

species into six "varieties," involving at least two identifiable species and three questionable ones, each with its own synonymy. These synonymies are here analyzed:

For his principal variety he copied the Linnaean description, referred to the diagnosis of *babylonius* in the "Museum Ulricaе," and cited all six of Linnaeus' references and, in addition, the Chemnitz figures noted above.

For variety "β" he cited only Chemnitz' vignette 39, figure C (*tom. cit.*, p. 143), which is a vague and crude drawing of a short ovate shell with a shallow pleurotomid sinus, a very short anterior canal, and what are apparently triangular and everted spines at the shoulder. Chemnitz (*tom. cit.*, p. 176) called it *Turris babylonica coronata* and said that he possessed a Recent specimen and that it was found fossil in the Grignon, France, beds.² Chemnitz also said of this species: "Its home is probably the East Indies." I am not able to identify it, although it somewhat resembles *Clavatula echinata* Lamarck, 1816.

Gmelin's variety "γ" is referred to another figure, B, in Chemnitz' vignette 39, which he called *Turris nivea* (p. 174). This same figure was used by Dillwyn (1817, p. 715) for his variety of *Murex tornatus* "with remote transverse ribs," and is further discussed under the next species, *Murex javanus* Linné. It does not, however, show either *javanus* or *tornatus*, and I am not able to speak with any certainty of its identification. Deshayes (1830-1832, vol. 3, p. 793) cited it for *Pleurotoma virgo*, as did Lamarck (1822b, p. 94), a shell that is figured in the "Tableau encyclopédique" (pl. 439, fig. 2), and perhaps this identification may be tentatively accepted.

Gmelin's variety "δ" was clearly *M. javanus* Linné. He cited four references. One, from the "Museum Gottwald," was not seen. The other three (Buonanni, pl. 46; Knorr, pt. 6, pl. 27, fig. 3; and Chemnitz, *tom. cit.*, pl. 143, figs. 1334-1335) are definitely *javanus*, the Chemnitz figures, which the latter had

² The present writer is unable to tie this drawing to any of Lamarck's fossil *Pleurotoma* from Grignon (1822b, pp. 96-102) although the description of the latter's *P. asperulata* (p. 97), a fossil from the environs of Bordeaux, might be tentatively referred to Chemnitz' equivocal figure.

called *Turris babylonia spuria*, being particularly good figures of *javanus*. They were not cited by Gmelin for *javanus*, but were later cited by Dillwyn for that species.

For variety "ε" Gmelin cited only a further pair of figures from Chemnitz (vol. 4, pl. 145, figs. 1345–1346) which show an extremely fusiform shell which lacks the pleurotomid sinus. It greatly resembles *Murex colus* Linné (*Fusus colus*) but shows more of the brown color seen in that species or is shown with a brown epidermis. It may well have been based on a specimen of *colus* in which the brown tinge was deeper than in the typical shell and covered more of its area.

For his final variety "ζ" he cited still another pair of Chemnitz figures (vol. 10, pl. 162, figs. 1550–1551) which do not remotely resemble *babylonius*. They show a pleurotomid with a very short anterior canal, and what appears to be an uplifted scalloped or roundly dentate flange just above the suture of the last three whorls. They bear a slight resemblance to figure C of Chemnitz' vignette 39, which Gmelin cited for his variety "β."

It is obvious from the above analysis that Gmelin fell again into his frequent error of uniting with a distinctive and well-known species a number of species which resemble it only superficially or, in this case, not at all.

Röding (1798, p. 123) used the spelling *babylonica* for the species, placing it in *Turris* and citing *Murex babylonica* [sic] Gmelin, without specifying any of Gmelin's varieties, and the good Chemnitz figures 1331–1332.

In 1801 Lamarck (p. 84) also used the amended spelling, and put the species in his *Pleurotoma*, 1799, in which earlier work it was the "illustrative" species of the genus.

Perry (1811) described and figured the species twice, first as *Murex babylonicus* (pl. 2, fig. 5) and later as *Pleurotoma babylonica* (pl. 32, fig. 5). The first figure shows a white shell with the typical dark brown spots and the second a shell heavily tinged with a lighter brown, the darker spots being on the white carinae. This latter figure resembles the Chemnitz figures 1345–1346, which Gmelin had cited for his variety "ε." This might be the form which Reeve called *spectabilis* (1843–1878, vol. 1, *Pleurotoma*, pl. 1, sp. 6a, b).

Link (1807, p. 119) placed *babylonica* in

Pleurotome, which he properly credited to Lamarck but misspelled.

Dillwyn (1817, p. 714) was the first important writer after Gmelin to use the Linnaean spelling *babylonius*. His main description was a literal translation of that of Linnaeus, and his added subdescription is characteristic except for the confusing statement: "Shell sometimes three inches long . . . but is generally smaller." He must have been describing small or immature specimens, as the great majority of adult shells average in excess of 3 inches in height. His synonymy is largely correct.¹

Lamarck, in the "Histoire naturelle" (1822b, p. 94), continued the use of *Pleurotoma* for this species and also adopted the Linnaean spelling *babylonia*. His synonymy followed that of Linnaeus fairly closely, using five of the latter's references, omitting only that of Regenfuss, and added four more (Petiver, pl. 4, fig. 7; Argenville, 1780 [Favanne], pl. 33, fig. D, with a query; Knorr, pt. 4, pl. 13, fig. 2; and "Tableau encyclopédique," pl. 439, figs. 1a, b), all of which are acceptable figures of the *babylonius* of all authors. With Lamarck, any confusion as to the complete specific separability of the true *babylonius* from its suggested "varieties" came to an end. It is a species with remarkably constant characters, its only noticeable variation being in the number and size of its blackish brown spots and in the amount of brown in its color pattern.

The species is now placed in the typical subgenus of *Turris*, but there has been a difference of opinion among recent commentators as to whether *Turris* should be attributed to Müller, 1766, or Röding, 1798. Winckworth (1945, p. 145), Dall (1919, p. 314), and Grant and Gale (1931, p. 503) use *Turris* Röding, and in this they have been followed by most authors. On the other

¹ Dillwyn, incidentally, gives us his interpretation of what the debatable Chemnitz figure (vignette 39, fig. C) really was. Under *Murex clavatus* (*Clavatula coronata* Lamarck, 1801) he cites *Turris babylonica coronata* Chemnitz as a synonym, as figured in the above vignette and figure C. He also interprets Chemnitz' figures 1550–1551 which Gmelin cited alone for his variety "ζ" of *babylonius*, by citing it as showing a "Variety?". With curled laminae at the sutures," as *Murex taxus* Chemnitz. Both these interpretations seem extremely persuasive.

hand, Hedley (1919, p. 214) and Thiele (1931, p. 360) cite *babylonia* as the type species of *Turris* Müller, 1766. Hedley's original attribution of the genus to Müller was predicated on the use of the name in the "Deliciae naturae selectae" of Philipp Ludwig Stadius Müller, 1766, not Otto Friedrich Müller. Thiele, however, by what must have been a *lapsus calami*, used O. F. Müller as its author.¹ In any event, this difference of opinion between the protagonists of Müller and Röding has only a historical interest, as Müller used the name *Turris babylonica* merely as a polynomial specific name. *Turris* Röding is not *Turris* Montfort (1810, p. 559) which was based on *Vexillum vulpecula* (Linné).

In addition to the name *babylonica* of Chemnitz, Röding, Lamarck, 1816, and the pre-Linnaean writers, *Buccinum costatum* Martyn, 1789, and *Pleurotoma venusta* Reeve, 1843, are probably synonyms.

The holotype of *Murex babylonius* is present in the Linnaean collection in London, properly documented.

The species was described in the "Museum Ulricae" with the tenth-edition description

and a synonymy consisting of the three best figures cited in the "Systema" (Rumphius, Gualtieri, and Argenville). The added details in the subdescription included the use of the inaccurate phrase "angulis acutis," later used in the twelfth edition of the "Systema," and adding "quorum qui medius est major et acutior." It is helpful, however, in saying "Color albus maculis nigris," and in describing the labial sinus as "Margo exterior versus basin [*sic*] sinu singulari, profundo, transverso excisus," and "Rostrum baseos rectum, intus parum flexuosum," all of which cover the characters of the *babylonia* of all authors. Two specimens of that shell are present in the collection at Uppsala labeled for *Murex babylonius*.

The species is adequately figured in Reeve (1843-1878, vol. 1, *Pleurotoma*, pl. 1, sp. 5), in Kiener (1834-1850, vol. 5, *Pleurotoma*, pl. 1, fig. 1), and in Thiele (1931, p. 361, fig. 440).

Murex javanus

1767, *Systema naturae*, ed. 10, p. 1221, no. 550.

LOCALITY: "In Java" (1767).

"M. testa turrita cingulis nodosis immaculatis, labro sinu separato . . . Simillimus M. babylonico, sed albus immaculatus. Anfractus substriati, cincti carina vel tuberculis nodosi vel angulati. Labrum fissum versus basin, sed sinu latiusculo, magis obtuso. Cauda longior aut brevior variat."

This species, which appeared first in the twelfth edition of the "Systema," was supplied with a description which, in spite of its length, is peculiarly misleading. The mention of the labial sinus indicates a pleurotomid. The phrase "cincta carina vel tuberculis nodosi vel angulati" immediately suggests that two species had been confused by Linnaeus and was the cause of the difficulties encountered in the interpretation of the description by several of his successors, who believed that his diagnosis covered two forms of a single species which we now know as *javanus* and *tornatus*, respectively.² Further, while the

¹ P. L. S. Müller's work with the above title is a rare and little-known work which is not mentioned in the catalogues of the American Museum of Natural History library, or the Library of Congress. The library of the British Museum (Natural History) refers to two editions of the work, 1766 and 1777. The entry in the last-named catalogue reads as follows:

"Knorr (G.W.). [Deliciae Naturae selectae; oder, auserlesnes Naturalien-Cabinet, welches aus den drey Reichen der Natur zeigt was von . . . Liebhabern aufbehalten und gesammelt zu werden. Ehemals herausgegeben von G. W. Knorr . . . fortgesetzt von diesen Erben, beschrieben von P. L. S. Müller, und in das Französische übersetzt von M. V. de la Blaquière]. 2 Thl. Germ. u. Fr.

wanting fol. Nürnberg, 1766, 1777."

Iredale (1922, pp. 78-79) has given a full account of the Knorr-Müller work, in which he pointed out: "Throughout the work no systematic treatment appears, and though Müller writes of genera, he was not using the word in our sense." The work apparently contains a series of figures, with vernacular names, and in some cases the Latin equivalents added by Müller. Iredale reports that the present species appears as "*Turris babylonica* R[umphius]," and adds "It is obvious that Müller is simply quoting the Rumphius Latin name, and that none of these names has any validity in our modern nomenclatural usage." Grant and Gale (*loc. cit.* in text), who cite Müller's use of *Turris* in the synonymy of *Turris* Röding, say that it was used "after Rumphius, in a specific sense only."

² The above opinion that Linnaeus' description covered both the nodose species (*javanus* Linné) and a smooth species (*tornatus* Dillwyn) is based on my interpretation of the words "cincti carina vel tuberculis nodosi vel angulati," which I translate as "encircled with a carina which is either provided with nodose tubercles or is angulate." The species *tornata* Dillwyn occurs in two forms, one in which all the whorls are

words "Labrum fissum" refer to the pleurotomid notch in the posterior portion of the outer lip as they did in the description of the preceding species *M. babylonius*, the words "versus basin" which immediately follow make the entire description of the sinus unintelligible. The sinus is further described as "sinu latiusculo, magis obtuso" in contradistinction to that of *babylonius*, with which it is compared, and this detail is virtually the only thing in the description that is unequivocally correct. Although we know what Linnaeus' type was, as a specimen of the nodose *javanus* of present-day conchologists is present in the Linnaean collection in London, properly marked, this collection was probably not available to the writers of the first three-quarters of a century after Linnaeus, who were forced to rely on an ambiguous descrip-

evenly rounded, with no discernible "keel," and the other with a shoulder which, at least on the body whorl and penultimate whorl, is slightly angulate and therefore may be said to constitute a carina. This latter form is the one shown in Chemnitz' figure 1336 which is discussed below. I suggest that Linnaeus had seen and was describing both the true (nodose) *javanus* and a specimen of the form of *tornatus* in which the shoulder, though carrying no nodes, was angulated or "keeled," and that he conceived both to be forms of a single species, although his holotype in the London collection is the true *javanus*.

The only argument against this interpretation is the fact that the words "nodosi" and "angulati" have the same case-endings, indicating that both adjectives modified the word "tuberculis." As against this we must remember that Linnaeus was a notoriously bad Latinist. In support of this latter interpretation I admit that there exists a form of *javanus* in which the nodes themselves are not roundly nodose, but, rather, short ridges obliquely produced on the carina and thus might be called "angulati." I assume that persons who consider that Linnaeus was describing only these two varieties of *javanus* are thinking of such individuals. To support this interpretation, however, its adherents would be forced to transpose the first "vel" to be read *after* "tuberculosis," so that the phrase would read "cincti carina tuberculis vel nodosi vel angulati," thus meaning that the tubercles were either truly nodose (rounded) or "angulati" (oblique and lengthened). It is unfortunate that Linnaeus supplied no synonymy, but on all the evidence of the description alone I am forced to conclude that he described two distinct species. It is certainly true that Chemnitz, Gmelin, Röding, de Roissy, Link, Kiener, Reeve, and others adopted a translation of this deceptive phrase at variance with mine, but Dillwyn and Deshayes disagreed, and their opinion is universally accepted today—that Linnaeus combined in his description two distinct species.

tion and were not assisted by a synonymy.

The first post-Linnaean use of the name *javanus* was by Born (1778, p. 309). He supplied no figures either in 1778 or in his later 1780 work. In 1780 Chemnitz (1780–1795, vol. 4, pp. 172–174, pl. 143, figs. 1336–1338) described and figured a "*Murex javanus* Linnaei" and referred it to the *javanus* of the twelfth edition of the "Systema." Although his description used the phrase "anfractibus subnodosis," his three figures show no nodosity. In two of them (figs. 1337, 1338) the whorls are smooth and evenly rounded. In the other (fig. 1336) the body whorl, and to a lesser degree the penultimate whorl, shows a slightly angulated shoulder. The figures are clearly *tornatus* Dillwyn, a species that occurs in both forms shown in these figures. Chemnitz was unwilling to base any separability on the presence or absence of nodes, as, after quoting from Linnaeus' description¹ and noting that the models of his figures, from Tranquebar, were smooth, he said that the species must differ in structure "according to the difference in locality [Wohnorte]." Chemnitz' preceding species (*tom. cit.*, p. 171, pl. 143, figs. 1334–1335), which he called "*Turris babylonia spuria*," was, however, unmistakably the *javanus* of Linnaeus. Not only was it described as "*Fusus striata*, anfractibus obtuse nodosis," but the two figures are without question the *javanus* described in the "Systema" and so known today. It should be noted that Chemnitz cited Born's use of, and description of, *Murex javanus* Linné. In Chemnitz' synonymy of this "*babylonia spuria*" he said: "Prof. Müller thinks that this is the *Murex lignaria* of Linnaeus." This is, of course, an entirely indefensible conclusion on the part of Müller, and was not specifically accepted by Chemnitz.

The nodose shell hereafter is referred to as *Murex javanus* Linné and the smooth shell as *Murex tornatus* Dillwyn, 1817. Dillwyn's separation of the two species is discussed below. The non-nodose shell with the subangular shoulder, figured by Chemnitz (fig. 1336), is a mere form of *tornatus*.

Gmelin's *javanus* (1791, p. 3541) was also a composite species. His main description was

¹ Chemnitz did not quote Linnaeus' words exactly, as he rendered them as "anfractus tuberculis nodos et angulatos."

a copy and his subdescription a close paraphrase of the "Systema" language, thus covering both *javanus* and *tornatus*. The synonymy was short, consisting of a figure from Lister (pl. 915, fig. 8) showing a smooth shell which might be taken for *tornatus* and the three Chemnitz figures of "*Murex javanus* Linnaei," which also show *tornatus*. In spite of this harmonious synonymy, it seems probable than Gmelin, too, believed the two shells to be varieties of a single species.

Gmelin also listed a *Murex turris* (p. 3543), which Dillwyn later cited as a synonym of *javanus* Linné. Its description, however, is equivocal. It uses the expression "anfractibus tuberculis coronatis cinguloque granulato cinctis," and this mention of both tubercles and granules, and the fact that the description mentions a color pattern quite different from that of *javanus* ("alba fascia anfractuum coloris inter vinosum et rufum intermedii"), make Dillwyn's reference to it unacceptable. Gmelin cited for it only a Buonanni figure (pl. 79) which may be taken only for some close relative of *babylonius*.

Röding's *Turris javanus* (1798, p. 124) was referred to Gmelin's *javanus* and to two of Chemnitz' figures (figs. 1337, 1338) of the smooth *tornatus*, which thus makes it impossible to say whether the specimen before him was the nodose or smooth species. His *T. tornatus* was based on *babylonius* Gmelin.

In 1805 de Roissy¹ (Montfort and de Roissy, 1801-1805, vol. 6, p. 72) listed *Pleurotome javana*, citing *M. javanus* Linné as a synonym, and several later writers used de Roissy as the author of *javana*.

Link (1807, p. 119) also placed *javanus*, which he cited, as was his custom, as "L. G. p. 3540" (error for p. 3541), in "*Pleurotome* Lam." This was probably a typographical error. He was describing *tornatus*, as he cited the Chemnitz figures of that species (figs. 1336-1338).

Dillwyn was the first to separate *tornatus* from *javanus* and, giving the former its specific name (1817, pp. 714-715), his description of the two species unmistakably and properly differentiate them. His two syn-

onymies are, for the most part, correct. He did not, however, specifically say that he believed *javanus* Linné to be a composite species or that he was separating it into its two elements, and there is no hint in his diagnoses that he even realized this, although his description of *javanus* includes only the details relating to the nodose shell, and although he selected Gmelin's "variety δ " of *M. babylonius*, which was undoubtedly *javanus* (see under *M. babylonius*, p. 145, above), as a synonym, and made no reference to *javanus* Gmelin.

For *M. tornatus* Dillwyn listed a variety "with remote transverse ribs," for which he cited four references: *Turris candida* of the "Museum Calonnianum" (p. 34); *Buccinum sinuatum* Martyn (pl. 94, right-hand fig.); figure B from Chemnitz' vignette 39 (*tom. cit.*, p. 143); *M. babylonius* Gmelin, "variety γ ." It is difficult to identify any of these references, particularly the Chemnitz vignette figure, which the latter called "*Turris nivea*. . .," as the figure shows no transverse ribs, unless Dillwyn meant the series of close spiral threads (? or incised lines) there shown. The "variety γ " of Gmelin's *babylonius* was also referred to the vignette figure, which is neither *javanus* nor *tornatus*. The only later identification of it was made by Lamarck (1822b, p. 94) who put it in the synonymy of his *Pleurotoma virgo*, and in this was followed by Deshayes (1830, 1832, vol. 3, p. 793). I am inclined to accept this association and also to suggest that all four of Dillwyn's variety "with remote transverse ribs" may be assigned to *virgo*, with the reservation that Dillwyn took a very broad view of the words "ribs" and "remote." *Pleurotoma virgo* was figured in the "Tableau encyclopédique" (pl. 439, fig. 2). The inclusion of Dillwyn's variety is the only defect in his synonymy of *tornatus*.

Lamarck (1822b, p. 96) placed *javanus* in his *Pleurotoma*, 1799, describing it as a nodose species, but changing the specific name to *nodifera*. It is possible that this change of name was based on a reason that was at least plausible, unlike many of Lamarck's other changes. He may have been impressed by the confusion of his predecessors as to the species and chose a name that was itself descriptive of the true *javanus*. He, however, queried its

¹ Volumes 1 to 4 inclusive of this work were written by Montfort, volumes 5 and 6 by de Roissy, the latter being dated 1805 (see Bibliography).

identity with Linnaeus' species, as he said in his synonymy, "An *murex javanus* ? Lin. Gmel. p. 3541," although he may have recognized the possibility that Gmelin's diagnosis was sufficiently different from that of Linnaeus to raise a doubt as to whether they referred to the same species. His only other reference was to the figure in the "Tableau encyclopédique" (pl. 439, fig. 3) which is an extremely poor figure of what may have been *javanus* Linné as restricted. The "Tableau" figure shows the nodes as short, oblique ridges rather than round tubercles. This is a form occasionally seen and may have given some comfort to those who take the position that the word "angulati" in the Linnaean description of *javanus* meant "slanting," thus making the entire phrase covering the sculpture include only forms of *javanus*. In the list of the "Tableau" plates, published after the appearance of Lamarck's volume 7, this figure is referred to as *Pleurotoma javana* "Lamk. vii. 96." Lamarck recognized the discordance of Gmelin's synonymy, saying in his French description: "The figures cited by Gmelin as synonyms of the *murex javanus* of Linné do not belong to my species, nor, probably, to that of Linné." Lamarck's specific name was long employed, although largely by the continental conchologists. It should be particularly noted that Lamarck did not list or refer to Dillwyn's *tornatus*, and I suspect that he was not familiar with Dillwyn's work, as I have found no reference to it in any of his writings.

Kiener (1834-1850, vol. 5, *Pleurotoma*, pl. 5, fig. 1) credited his *P. javana* to de Roissy, but his figures (apertural and dorsal views) show the smooth *tornatus*. Kiener then described and figured *Pleurotoma nodifera* (tom. cit., p. 22, pl. 12, fig. 1, dorsal and apertural views), and these excellent figures show the nodose *javanus*. He did not list *tornatus*.

Reeve (1843-1878, vol. 1, *Pleurotoma*, pl. 4, sp. 28) also described *P. javana* as of de Roissy, but included *M. javanus* Linné in his synonymy. His figure shows a shell with very constricted sutures and with a subsutural band on the spire with a row of nodules below and contiguous to it, and on the body whorl a further row of nodules at the shoulder. If this figure was based on *javanus*, it was of a form with which the present writer is unfamiliar.

On the same plate he supplied a good figure of *javanus* under the name of *P. nodifera* Lamarck.

Deshayes (1838-1845, vol. 9, pp. 353-354, footnote to *P. nodifera*) finally used categorical language to separate definitely the nodose and the smooth species. Because he was the first to supply a complete clarification of the subject, his words are here quoted in full: "It is very probable that this species [*nodifera*] is the *Murex javanus* of Linné, and not that to which M. de Roissy first, and M. Kiener later, have given the name; in fact, the *Murex javanus* of Linné is a *turreted shell* possessing a row of nodules, lacking spots on each whorl, the lip divided by a sinus; and Linné adds: *it is close to the Murex babylonius but it is without spots; the whorls are substriate and encircled either by a carina, or by a row of tubercles which are nodose or angular. The lip is cut into at the base, but this sinus is wider and more obtuse, the basal canal varies in length.* It is evident that this short description cannot apply to the shell called *Pleurotoma javana* by M. de Roissy and M. Kiener; it is probable that the error of these conchologists stemmed from the work of Gmelin; for the latter applied his description to the figures 1336, 1338 of Martini, which show an entirely smooth shell, the species which since then has been listed under the name of *Pleurotoma javana* by MM. de Roissy and Kiener. Dillwyn correctly reestablished the synonymy of this species, an example which M. Reeve did not follow in his *Conchologica Iconica*. It results from the preceding observations that: 1st. the *Pleurotoma nodifera* of Lamarck should become the *Pleurotoma javana*; 2nd. the *Pleurotoma javana* of de Roissy, Kiener and Reeve should take the name of *Pleurotoma tornata* which Dillwyn first gave to this species."

Two things should be noted in the above quotation. Deshayes adopted the same grammatical interpretation of the confusing phrase of Linnaeus as to the sculpture of the shell as is suggested in the present paper (p. 147, footnote, above), and he perpetuated Linnaeus' error in saying that the sinus was at the base of the shell. It is, however, the first clear and unequivocal restriction of the two species.

In spite of Deshayes solution of the

javanus problem the confusion noted in the works of his predecessors still continued, and until comparatively recent times Dillwyn's *tornata* has been often referred to *javanus* Linné.

Tryon (1879-1888, vol. 6, p. 237) commented not only on the improper use of *tornatus* for *javanus* but on the peculiar persistence of the use of the name *nodifera* Lamarck by some conchologists. In his listing of *tornatus*, which, with *javanus*, he placed in the genus *Surcula* H. and A. Adams, 1953,¹ he noted: "Generally known as *S. javana* Linn., but that author's description is of a ribbed [sic] shell, which this is not." The description of *S. javana*, his next species, is entirely characteristic, and he added: "This is perhaps better known as *S. nodifera* Lam., the *S. javanus* of authors (not Linn.) being the preceding species *S. tornata* Dillwyn." Tryon's figures for *tornata* (pl. 5, fig. 62, and pl. 6, fig. 8) are excellent. His figure for *javanus* (pl. 5, fig. 63) is less characteristic.

Since then the conclusions of Dillwyn and Deshayes have been almost universally adopted. Dall (1919, p. 315) said, after referring to the shell represented in the Chemnitz figures 1337 and 1338: "This shell is *Turris javana* Bolten, but not *Murex javanus* Linnaeus and Gmelin. It is the *Murex tornatus* of Dillwyn, 1817, but not of Bolten, 1798."²

Hedley (1922, p. 254) in listing *Turricula javana* Linné, included in its synonymy both *Pleurotoma nodifera* Lamarck and *Murex turris* Gmelin. As said above (p. 149), I am unwilling to say that the latter species can be united with *M. javanus* Linné, and, indeed, I cannot identify it.

Murex javanus Linné as restricted by Dillwyn and Deshayes is now generally placed in *Clavatula* Lamarck, 1801 (*Clavus* Montfort, 1810), subgenus *Turricula* Schumacher, 1817. *Turricula flammea* Schumacher is sometimes

given as a synonym but is quite distinct, as it belongs to the *tornatus* affinity rather than to *javanus*. It is possibly identical with Kiener's *Pleurotoma fulminata* (1834-1850, vol. 5, pl. 10, figs. 2, dorsal and apertural views). *Pleurotoma contorta* Perry, 1811, has also been cited as a synonym of the Linnaean species but, based on Perry's description and figure, seems also to be distinct. *Surcula coreanica* Adams and Reeve, 1848, was considered by Tryon (*loc. cit.*) to represent an immature specimen of *javana*, and *S. lurida* Adams and Reeve, 1848, was held, also according to Tryon, to be a "smaller, darker, banded variety." Tryon's figures for these two names (pl. 5, fig. 64, for *coreanica*, and pl. 5, fig. 65, for *lurida*) are not illuminating, and the present writer has seen no specimens so labeled nor any that could be referred to either Tryon's figure or to his brief descriptions.

In addition to the figures cited above, good figures of either *javana* or *tornata* are difficult to find. The figure in Crouch (1827, pl. 17, fig. 4) is characteristic and was probably adapted from the "Tableau" figure of *javana*, but improved. Grant and Gale (1931, pl. 25, figs. 9a, b) show excellent photographic figures of the apertural and dorsal faces of a Recent specimen of "*Turricula flammea* Schumacher" (*Tornata* Dillwyn). The Grant and Gale figures are of the form with a slightly angulated shoulder (the "angulati" of Linnaeus' description of *javanus*) rather than the rounded shoulder of the typical form.

The species *Murex javanus* was not described in the "Museum Ulricae."

Murex colus

1758, *Systema naturae*, ed. 10, p. 753, no. 480.

1767, *Systema naturae*, ed. 12, p. 1221, no. 551.

LOCALITY: "In utraque India" (1758, 1767).

"M. testa turrita subrecto-caudata striata nodosa carinata, labro crenulato . . . Testa cauda huic longissima. Variat ventre tereti et angulato."

The subdescription was added in the twelfth edition. As Linnaeus left it, it is adequate to fix the species, the only detail to be criticized being the phrase "Variat ventre tereti et angulato." Although *colus* varies somewhat in the prominence of the carinal nodes, even in unworn specimens, the shells with rounded whorls are not *colus* but are

¹ The name *Surcula* is now generally used as a subgenus of *Clavatula* Lamarck, 1801. Thiele (1931, p. 360) degrades it still further, making it a section of the subgenus *Turricula* (Schumacher, 1817) of *Clavatula*.

² Dall's mention of *Murex tornatus* Bolten should be explained. Röding's *Murex* (1798, p. 144) was composed of true murices and included no *Murex tornatum*. Dall's phrase "but not of Bolten, 1798" is misleading. Röding's *tornatum* is placed in his genus *Turris* and referred, as said above, to *M. babylonius* Gmelin.

referred to other species of *Fusus*.

The synonymy is poor. The figures from Rumphius (pl. 29, fig. F), Gualtieri (pl. 52, fig. L), and Argenville (1742, pl. 12, fig. B) are unmistakably characteristic of the species. The remaining figures are discordant. Klein's drawing (pl. 4, fig. 78), which appears to be a copy of a Lister figure (pl. 917, fig. 10) shows an entirely smooth species. It was, however, called *Murex colus* in Dillwyn's Index to Lister (p. 41). The Seba reference, added in the twelfth edition (pl. 19, fig. "centralis"), was an error for plate 79, as plate 19 is devoted to Crustacea. The central figure on the corrected plate shows *Murex longissimus* Gmelin, 1791. The Buonanni figure (pl. 360) is extremely crude and shows a sinistral shell with no nodes, but which might have been the artist's conception of *colus*. The figure from Regenfuss (pl. 12, fig. 62) is apparently the shell later described and figured by Chemnitz (1780-1795, vol. 4, p. 179, pl. 144, fig. 1340) as "*Fusus lineatus fuscus*. . .," which was later named *Murex ansatus* by Gmelin (p. 3556), who cited for it both the Regenfuss and Chemnitz figures. It is quite distinct from *M. colus*.

The first post-Linnaean use of the name *colus* was by Born (1780, p. 310). His description adequately covers the Linnaean species, although his synonymy is again mixed.

Chemnitz (*tom. cit.*, p. 180, pl. 144, fig. 1332) described *colus* under the name "*Fusus tabati*," which is suggestive of the shape and color of the anterior canal, although he referred the species to the *Murex colus* of the "*Systema naturae*" and the "*Museum Ulricaе*." *Fusus longissimus*,¹ which was later confused with *colus* by Dillwyn, was figured by Chemnitz in figures 1344 and 1339.

Gmelin (1791, p. 3543) provided for *colus* one of the most highly discordant synonymies in his work, and not only complicated the identification by his frequent practice of list-

ing lettered varieties, citing three in addition to his "typical" *colus*, but by including in their synonymies references to other species. For his typical *colus* he cited the best of Linnaeus' references (Rumphius, Gualtieri, and Argenville) but added the equivocal Lister figure (pl. 917, fig. 10) from which Klein's figure was copied, and which shows a completely smooth *Fusus*, and a further figure from Lister (pl. 918, fig. 11a) and one from Knorr (pt. 3, pl. 5, fig. 1), both of which are satisfactory.

His variety " β " was based on a single figure (Regenfuss, pl. 12, fig. 62) which had been cited by Linnaeus, although Gmelin placed a question mark after it. This figure showed the *Murex ansatus* of Gmelin.

His variety " γ " was *Fusus nicobaricus* Lamarck, 1822, a distinct species, for which he correctly cited the "*Murex colus nicobaricus variegatus*" of Chemnitz (vol. 10, p. 241, pl. 160, fig. 1523).

For variety " δ " he referred to another pair of Chemnitz figures (vol. 10, pl. 161, figs. 1536, 1537) which the latter had called "*Murex fenestratus*." These figures have not a single detail in common with *colus*. They show a slightly fusiform shell, about $1\frac{1}{2}$ inches in height, with a very short anterior canal, having seven or eight varices and two groups of heavy, white, spiral cords on the body whorl, and with the interspaces between the longitudinal and spiral sculpture deeply excavated. The name *Murex fenestratus* was adopted for the species by Lamarck, who said that it was in his collection and was "very rare and very precious."²

Thus none of Gmelin's varieties of *colus* are correctly cited.

Dillwyn (1817, pp. 716-717) divided the species even further, listing four "varieties"

¹ Gmelin's *longissimus* was correctly referred by him to Chemnitz' figure 1344 which seems to be identical with figure 1339, although Chemnitz gave different names to the two. Lamarck's *longissimus* (1822b, p. 122) was referred both to *longissimus* Gmelin and *candidus* Gmelin and to both of the above-named Chemnitz figures. Figure 1339 was the only reference for *candidus* Gmelin. Thus we find another instance of Gmelin's duplication of a species under two different names.

² *Murex fenestratus*, so named because of the pits between the crossings of the varices and the spiral cords, is a well-known but comparatively rare shell from the Indo-Pacific. In fresh specimens the varices, and particularly the lip varix, are elaborately foliate, suggesting the foliate sculpture of the western Atlantic *Murex florifer* Reeve, 1846, but in the majority of specimens in collections the shell is so worn that the foliation is either lacking or only vestiges of it remain. The Chemnitz figures cited by Gmelin do not show any foliation, but it is reproduced in a highly developed form by Sowerby (1847-1887, vol. 4, pl. 394, fig. 146) and by Tryon (1879-1888, vol. 2, pl. 25, fig. 228).

in addition to his "typical" *colus*. The first three cover, respectively: *M. longissimus* Gmelin, *M. nicobaricus* Lamarck, and *Murex ansatus* Gmelin. The fourth merely described a form of *colus* "with two tails," a monstrosity which is listed and figured by Chemnitz in his eleventh volume (p. 291, pl. 211, figs. 2088–2089).¹

In 1798 Röding changed the specific name to *tornata* and placed it in his new genus *Syrinx* (p. 121). Lamarck, 1801, again changed the name to *longicauda*, and this name was again used in the explanation of the plates of the "Tableau encyclopédique" ("Liste," 1816, pl. 423, fig. 2) as "*Fusus longicauda*. *F. colus* Lamk. vii, p. 123." He reverted to the Linnaean specific name in 1822, probably to prevent confusion with the several other long-tailed *Fusus*, and that name has been almost universally used since his day. Lamarck, in his 1822 description, added a detail that had been omitted by Linnaeus and all of his own predecessors: "lame columellaire saillante," referring to the parietal shield of the species which is slightly flaring and only partially adherent to the body whorl.

With Lamarck the confusion of *colus* Linné with the several other species that had been improperly synonymized with it came to an end. He properly separated and described these species and definitely restricted the name *colus* Linné to the shell we know today by that name. Several other generic names have been proposed to contain it: *Colus* Humphrey, 1797; *Syrinx* Röding, 1798; *Fusinus* Rafinesque, 1815; *Gracilipurpura* Jous-

seume, 1880; *Pseudofusus* Monterosato, 1884; and *Falsifusus* + *Fulgurofusus* Grabau, 1904; although only *Fusinus* Rafinesque enjoyed any appreciable currency. *Syrinx tornatus* Röding and *Fusus longicauda* Lamarck are synonyms of *colus*.

Fusus colus is figured in Reeve (1843–1878, vol. 4, *Fusus*, pl. 3, sp. 11) and Kiener (1834–1850, vol. 6, *Fusus*, pl. 4, fig. 1). The figure in the "Tableau encyclopédique" ("Liste," 1816, pl. 432, fig. 2) is acceptable, although the whorls are pictured as somewhat too oblique and the carinal nodes too little developed. The best photographic figure is found in Thiele (1931, p. 330, fig. 379).

The *Fusus colus* of all authors is found in the Linnaean collection in London, marked for *Murex colus*.

It is described in the "Museum Ulricae" in a much improved version over that in either edition of the "Systema," by the addition of these characteristic details: "Anfractus superiores (non vero inferiores) sulcati s. angulati longitudinalibus sulcis 15," "color albidus," "cauda longitudine saepe testa . . . rectum aut parum flexuosa," and "labrum . . . interius integerrimum, erectum, vix adnatum."

Murex morio

1758, *Systema naturae*, ed. 10, p. 753, no. 481.

1767, *Systema naturae*, ed. 12, p. 1221, no. 552.

LOCALITY: Not given in 1758; "in *M. Africano*" (1767).

"*M. testa patulo-caudata nigra fascia alba, spirae anfractibus subnodosis, columella rugosa.*"

This species is normally bluntly spinose or tuberculate at the shoulder of the body whorl, but occasionally, in adult individuals, this sculptural feature is much reduced in prominence or becomes obsolete. It is today agreed that the two forms are conspecific. Linnaeus' description, which is identical in the tenth and twelfth editions, was probably based on a smooth specimen, as no mention is made of any sculpture except the nodosity of the axial costae of the spire ("spirae anfractibus subnodosis"). The synonymy, however, shows both smooth and spinose or tuberculate shells, so that it is certain that Linnaeus knew that both forms existed. The same is true of the description and the synonymy of the related species *M. melongena* (p. 141, above). That the type was an adult shell is

¹ Dillwyn, in addition to the inclusion of unwarranted "varieties," made one error. For variety A, "Shell whitish," he referred not only to both *colus* and *longissimus* but to *Murex undatus* Gmelin (p. 3556) and to the figure cited by Gmelin for *undatus* (Chemnitz, 1780–1795, vol. 4, pl. 145, fig. 1343). This figure shows a long-tailed shell, even longer than *colus*, with very large, blunt nodes which, on the body whorl, are developed into coarse rounded folds. This is neither *colus* nor *longissimus*, but is the species called *Fusus incrassatus* by Lamarck ("Tableau," pl. 423, fig. 5). Dillwyn's error lay in the fact that he should have referred to *M. undulatus* Gmelin rather than to *M. undatus*, and was possibly an error of transcription. Gmelin's *undulatus* was referred only to a figure from Kammerer's "Cabinet Rudolstadt" which was not available to the present writer, but from Gmelin's description it was not *undatus*, and seems much closer to *longissimus*.

indicated by the fact that in the young shell the body whorl is also axially costate. Other than the omission of any mention of sculpture or lack of sculpture of the body whorl, the description has only one defect. The columella is said to be rugose, whereas it is smooth. It is true that the close spiral ridges which encircle the whole shell but are only faintly seen on the body whorl extend over part of the parietal area, but there they are so overlain with glaze that they are scarcely perceptible in most individuals. This hardly justifies the word "rugosa" as applied to the columella. The further addition in the "Museum Ulricae" of the phrase "labium . . . interiore latere rugosum" refers to these almost imperceptible ridges on the columella.

The synonymy is only partly accurate. The original 1758 figure cited from Buonanni (pl. 357, a spineless shell) and the figure from Regenfuss (pl. 11, fig. 61, showing nodes at the shoulder) are acceptable for *morio*. Seba's several figures from plate 88 ("f[ere] omnes") are all of bivalves. This had been corrected in the "Museum Ulricae" to plate 80, so that Linnaeus' misnumbered plate in the twelfth edition is unexplainable except on the ground of carelessness. The correct plate (80) contains 26 figures, all but a few of which are fair pictures of *morio*. Of Seba's other figures cited (pl. 52, figs. 5-6) figure 5 represents, according to Hanley, *Murex ternatanus* Gmelin (1791, p. 3554) for which it was cited by Gmelin. Figure 6 is, again according to Hanley, *Murex cochlidium* Linné, which is discussed below (p. 155). I am inclined to agree with Hanley as to this second figure. Additional excellent figures of *morio* in Seba (pl. 79, 3 figs.) were passed over by Linnaeus, although they were later cited for the species by Lamarck. A manuscript note in Linnaeus' interleaved copy of the twelfth edition adds Lister's plate 928 which shows a spinose form, further confirming that, at least at the time this note was written, Linnaeus was aware of both forms.

Lamarck, in the "Liste," 1816, erected the name *Fusus coronatus* for the form with shoulder spines or tubercles, listing it, however, as a good species.¹ In 1822 (1822b, p. 127) he retained this name, citing for it the

three figures from Seba's plate 79, which had been omitted by Linnaeus, and "almost all" ("fere omnes") of those on plate 80. For his *morio* he did not cite any of the figures cited by Linnaeus. Lamarck's conviction that *coronatus* was distinct from *morio* is thus expressed in his French description: "Alone among the writers who have spoken of this shell, I do not confound it with the preceding, *morio*, and I think I can list it as a good species. In fact it is always distinct: 1 because it is always shorter; 2 it is more inflated; 3 its whorls are very angular; 4 the body whorl especially is coronated by large tubercles; 5 finally the spire is more turreted."

Deshayes (1838-1845, vol. 9, p. 451) also listed both *morio* and *coronatus*, but took pains to deny their separability by the following footnote to the former: "When collections had a scanty number of specimens of a species there would occur what we have already pointed out several times in the works of Lamarck: two species would be erected for the extreme variations of the same shell. Today, when we can place a great number of intermediates between two species, naturalists can and should reunite what their predecessors had separated. This applies precisely to *Fusus morio* and *coronatus*. Eight or ten chosen individuals prove that these two species are but one, for which the name *morio* should be retained." From Deshayes onward *coronatus* was scarcely ever used as a good species.

Murex morio has been from time to time included in several different genera. Röding, 1798, placed it in his *Fusus*. Schumacher (1817, p. 216) included it in his new genus *Pugilina*,² of which it is the type species, by elimination,³ as *Pugilina fasciata*. Lamarck,

² Deshayes (1838-1845, vol. 9, p. 451, footnote) opposed the use of *Pugilina*, saying: "M. Schumacher, joining to this species the *Pyrula citrina* of Lamarck [*Pugilina laevis* Schumacher], has made of them a genus *Pugilina*, which should not be accepted in a sound nomenclature."

³ Schumacher listed only two species in his *Pugilina*: *laevis*, which equals *Volema paradisiaca* Röding (*Murex ficus* Gmelin) and *fasciata*, which is *Murex morio* Linné. These species are in no sense congeneric. Iredale (1917) purified Röding's *Volema* by designating *paradisiaca* as its type species, thus leaving *Pugilina fasciata* (*morio* Linné) as the sole species in *Pugilina*. Hence, the latter species may be said to be the type species, by elimination.

¹ This is not *Fusus coronatus* of Lamarck, 1803, a Paris Basin fossil.

as noted above, placed it in *Fusus*, and Reeve in *Pyrula* Lamarck, 1799, and the latter genus was used by several later writers. Tryon, 1881, Dautzenberg, 1921, and many other recent writers treated it as belonging in *Melongena* Schumacher, 1817, and the species is so labeled today in most unrevised collections. Dautzenberg had earlier (1910a, p. 204) placed it in *Semifusus* Agassiz, 1846, as did Thiele (1931, p. 320) who, however, attributed the name incorrectly to Swainson, 1840.¹ Odhner (1953, p. 16) also used *Semifusus*. *Pugilina* is the proper receptacle for the species.

I know of no specific synonym of *morio* other than the *coronatus* of Lamarck.

The range of the species is confined to two widely separated faunal regions. It is found, in the eastern Atlantic, on the African coast from Sierra Leone southward to the Belgian Congo and, in the western Atlantic, in the Lesser Antilles and along the South American coast from Dutch Guiana to Espirito Santo, Brazil. The above ranges are based on specimens examined by Clench and Turner (1956, p. 186). The species was also reported by Adanson (1757, p. 141, pl. 9, fig. 31) from the island of Gorée off the Senegal coast, and this reference was cited by Linnaeus in the twelfth edition of the "Systema." The latter locality is north of the most northerly African locality authoritatively reported by any writer since Adanson. Fischer-Piette and his co-authors found in Adanson's "retained" collection (see Dodge, 1955, p. 53) a single specimen of *morio* labeled "Purpura 31 Nivar de Sénégal," but did not figure the specimen on their own plates. It was apparently not the specimen figured by Adanson in his own work, but his 1757 figures were not the work of Adanson himself (Dodge, *loc. cit.*) and are in many cases extremely equivocal. Clench and Turner (1956, p. 185) select the island of Gorée as the type locality.

The specimen of the *morio* of all authors preserved in the Linnaean collection in London is not documented by any name or number on the shell itself or on the tray

containing it, but, alone of the shells in the cabinet, conforms to the Linnaean description. It is the tuberculate form of the species. It is impossible to say whether Linnaeus owned this specimen, and this fact casts the greatest doubt on its status as the type specimen, as it may have been added to the collection by another hand. A printed label is found in the tray reading *Murex morio*, but its typography indicates that it was cut from a copy of Hanley's "Ipsa Linnaei conchylia" or from proof sheets of that work, and was probably furnished by Hanley himself at the time of his examination of the collection in the years prior to 1855 (Dodge, 1955, p. 7, footnote).

The description of *morio* in the "Museum Ulricae" has already been referred to. The specimen now labeled *morio* in the Uppsala collection is the form with a tuberculate shoulder.

In addition to the figures mentioned above, figures of both the smooth and the spinose or tuberculate forms are found in the "Tableau encyclopédique" and mentioned in the "Explanation of plates" (pl. 430, fig. 3a as *Fusus morio*; fig. 3b as *F. coronatus* β ; fig. 4 as *F. morio*. *Varietas*. *F. coronatus* α). The species is also figured by Reeve (1843-1878, vol. 4, *Pyrula*, pl. 1, sp. 3, showing prominent shoulder nodes) and in the photographic plate of Clench and Turner (1956, pl. 109, figs. 1-2, dorsal and apertural views of a moderately spinose form). The Chemnitz figures (1780-1795, vol. 4, pl. 139, figs. 1300-1301) are the best of the early figures and are completely characteristic.

Murex cochlidium

1758, *Systema naturae*, ed. 10, p. 753, no. 482.

1767, *Systema naturae*, ed. 12, p. 1221, no. 553.

LOCALITY: Not given in either edition.

"M. testa patulo-caudata, spirae anfractibus supra planis."

In spite of the brevity of the above description and the lack of a locality for the species, the reference to the flat-topped whorls, combined with the position of the species in the "Systema" immediately following *M. morio*, probably accounted for the early identification of *cochlidium*. The flatness of the sub-sutural area induced Lamarck to use for it the vernacular name "Fuseau rampe," and in

¹ *Semifusus* Agassiz is a mere emendation of *Hemifusus* Swainson, 1840, and the latter spelling should be used. Clench and Turner (1956, p. 187) use *Hemifusus* as a subgenus of *Pugilina* Schumacher, but place *morio* in the typical subgenus.

his French description the words "... this ramp is divided lengthwise by a ridge which traverses it" suggest the vernacular name "le Cordelier" or "la Cordelière" given to the shell by the earlier French conchologists, which refers to the twisted girdle of cords worn by the Franciscan orders of monks and nuns who were popularly known by those names. The three cords seen in the shell apparently consisted of the rim of the body whorl below, the central ridge mentioned in Lamarck's description, and the lower boundary of the whorl above. This feature was specifically referred to by Favart d'Herbigny (1775, vol. 1, p. 340) but has not been mentioned by later writers except as a channel below the suture, bounded exteriorly by a low ridge (Sowerby) or as two grooves on the flat upper portion of the whorl (several writers).

The synonymy, consisting of only two figures (Argenville, 1742, fig. A, and Seba, pl. 37, figs. 27-28), is characteristic.

The description in the "Museum Ulricae" added the instructive phrases "transversim striata," "spirae longitudine ventris," by which is probably meant the body whorl exclusive of the long anterior canal, "apertura oblonga, pyriformis, pallida," "labium exterius undique integrum," and "columella integra." The synonymy cited the same figures used in the "Systema," and the Uppsala collection contains a specimen of the *cochlidium* of all authors on which is pasted the label "*cochlidium*."

A subadult specimen, showing the rounded longitudinal costae which become obsolete in the mature shell, is marked for *cochlidium* in the Linnaean collection in London. It is accompanied by a printed label in Gothic lettering, which was in all probability supplied by Hanley (see Dodge, 1955, p. 7). As the species is not checked on Linnaeus' lists of shells owned by him either in 1758 or 1767, it may be inferred that the specimen was added to the collection later. Hanley (1855, p. 301) said: "It is not unimportant to remark that the original description was not taken from that specimen, which Linnaeus did not possess when he published his tenth edition." Hanley apparently assumed that if this immature specimen had been in Linnaeus' possession when he wrote the description he would have referred to the folds on the

body whorl. This is too great an assumption to make, as the list of Linnaean descriptions in which important diagnostic details are omitted is a long one. However, we may be reasonably certain that Linnaeus did not own a specimen of *cochlidium*, and therefore the shell in the collection cannot be considered as the type.¹

The earliest good description and figure of *cochlidium* is found in Chemnitz (1780-1795, p. 274, pl. 164, fig. 1569). The figure is extremely characteristic of the adult shell and shows clearly the three spiral cords on the flattened portion of the whorls. Chemnitz very graphically distinguished it from *M. morio* (loc. cit.): "The spire-whorls of this shell are so step-like and so turreted one upon the other that Linné was persuaded to separate it completely from the species called *Murex morio*, with which it stands in close relationship in other respects, and to give this Spindel the name of *cochlidium* or spiral staircase."

Murex cochlidium is figured more recently by Reeve (1843-1878, vol. 4, *Pyrula*, pl. 1, sp. 2) and by Sowerby (1847-1887, vol. 4, pl. 420, fig. 27).

It is today included in the genus *Pugilina* Schumacher, 1817, and its strong shoulder nodes and constant thread-like spiral sculpture seem to justify its inclusion in the subgenus *Hemifusus* Swainson, 1840.

Murex spirillus

1767, *Systema naturae*, ed. 12, p. 1221, no. 554.

LOCALITY: "In Tranquebar" (1767).

"M. testa caudata, spirae mucronatae anfractibus supra convexis.... Simillimus M. canaliculato, sed anfractus sulco non distincti.

¹ There is a possibility, probably remote, that Linnaeus failed to check this species on his lists. This question has plagued the present writer in connection with many of the Linnaean species of mollusks. In cases in which a specimen marked by Linnaeus and conforming at least to the meager details of a description but not checked on his lists of owned species is found in the collection, I have considered it only as an ostensible or possible type. As this work progresses, however, I become less and less willing to accept such a specimen as even a possible type, and, as I am inclined to reject the possibility that Linnaeus could have inadvertently omitted a species from his lists, I have arrived at the conclusion that all such specimens were added to the collection by him at a later date and therefore are not the types on which the descriptions were based.

Corpus subtus ventricosum, supra convexum, spirae centro mucrone prominente obtuso; Anfractus supra margine acuto cincti. Cauda subcylindrica, nec versus aperturam ventris dilata, sed Columella ruga transversa a ventre distincta."

The above description, which appeared first in the twelfth edition of the "Systema naturae," enabled the early followers of Linnaeus to identify the species even in the absence of any synonymy, and Hanley (1855, p. 301) spoke of it as "the comparatively ample description." It does cover the necessary diagnostic features of the species sufficiently to define it but contains several confusing details. The words "mucronatae" and "obtusae" are distinctly antithetical. The word "centro" applied to the tip of the spire is redundant. The phrase "Corpus subtus ventricosum, supra convexum" is confusing. The whole description gives us, on close reading, a fair picture of the species, but Linnaeus' peculiar locutions must first be explained away.

The identification, however, is assisted in a roundabout way by the presence of a specimen of the *spirillus* of authors in the Linnaean collection in London on which one digit of the three-digit number is obliterated. Only the figures 55 remain. A trial substitution of the digits 1 to 9 before 55, leads us, with one exception, to genera far removed from *spirillus* (two pelecypods, a *Cypraea*, a *Buccinum*, a *Helix*, and a *Patella*). The exception is *Murex canaliculatus*, number 555, but that species must be disregarded, as it is already isolated by being represented by a properly documented specimen in the collection and by being expressly compared to *spirillus* in the description of the latter. In the choice of a digit to place after 55 we find at least nine, long-tailed species in *Murex*. These are all excluded because they exhibit other distinctive features foreign to *spirillus*. Accordingly, we may say that, while the species is identified by the specimen in the collection, practically speaking the equivocal documentation of the specimen prevents it from being considered as anything but the "ostensible" holotype.

The absence of any references in the "Systema" was due to the lack of figures of the species in the works available to Linnaeus. Fortunately he did not, in this case,

resort to the expedient of choosing other figures as "approximations."

The earliest post-Linnaean mention of this species was by Davila (1767, p. 202, no. 377). He did not use a Latin name, but his description of one of the "Tête de becasse" in his collection points very surely to *spirillus*. Martini (1769–1777, vol. 3, p. 381, pl. 115, fig. 1069) did not list it under the Linnaean name but called it "Haustellum acute marginatum." His figure is a highly stylized but recognizable figure of *spirillus*. The name *Haustellum* dates from Rumphius, 1705, was used by Klein, 1753, and was later validly used in a specific sense by Linnaeus (*Murex haustellum*) and in a generic sense by Bruguère, 1792, for the group containing the latter species. It is often employed today as a sectional name in the subgenus *Bolinus* Pusch, 1837. Martini was obviously impressed by the gross similarity of his shell to *M. haustellum*.

The species has undergone a series of changes in name, both generically and specifically. Born (1780, p. 312) and Schröter (1783–1786, vol. 1, pl. 3, fig. 4) left it in *Murex* and retained the name *spirillus*. Schröter's figure is characteristic. Röding erected the genus *Tudicla*¹ for this species

¹ "Tudicla" or "tudicula" is the Latin word for an instrument used for crushing olives, which the shape of the shell suggests. The former spelling is not found in the Latin dictionaries but represents, not only in decadent but in classical Latin, the fairly common practice of dropping the unaccented later "u" when it occurred between two consonants; thus "ridiculus" ("ridiculus"), "circlus" ("circulus"). Both are therefore acceptable Latin words, and Röding's use does not represent "an error of transcription, a *lapsus calami*, or a typographical error," so far as we can determine. Probably Röding's familiarity with the syncopated form was responsible for his name.

The spelling *Tudicula* is referred to because it has been used by some writers for an infrageneric group. Henry and Arthur Adams (1858, vol. 1, p. 151) used *Tudicla* for the species *spirillus*, following Röding and most of their predecessors, but in 1864 (p. 429) they erected a new subgenus for the species *T. spinosa*, which they called *Tudicula*, leaving the generic name *Tudicla* intact. *Tudicula* may have been used by the Adams as merely a coined word, as there is no evidence that they believed that Röding had made a mistake in Latin or that they realized that *Tudicula* was an acceptable Latin word. In any case, as authors of a new taxonomic unit, they could choose any name, whether coined or not or whether correct or not. Tryon (1879–1888, vol. 3, p. 144), having said that *spirillus* had been

(1798, p. 145), basing the species on the *spirillus* of Gmelin, which is identical with that of Linnaeus, and on Martini's figure 1069. He, however, changed the specific name as well, calling it *T. carinata*. Link (1807, p. 120) accepted Röding's *Tudicla* but restored the Linnaean specific name. Perry (1811, pl. 3, fig. 4, and text) placed it in his *Monoplex* and give it still another specific name, *M. capitata*. His figure is crude, but was obviously based on a specimen of *spirillus*.

Dillwyn (1817, p. 721) supplied an excellent and completely unequivocal description, comparing the species to *M. haustellum* in its general appearance and leaving it in its original Linnaean genus as he did with all species in his catalogue. Schumacher (1817, p. 213) resurrected the generic name *Hau-stellum* for *spirillus* but changed the specific name to *carinatum*. He included only one other species in his genus, *Murex haustellum*, under the name of *Hau-stellum laeve*.¹

Lamarck (1816, the "Liste") removed *spirillus* to his genus *Pyrula*, 1799, and the latter was used for the species by many of the later continental conchologists. The figures in the "Tableau encyclopédique" (pl. 437, figs. 4a, b) are entirely characteristic. Swainson (1820-1823, ser. 1, vol. 3, pl. 177) used still another genus, *Turbinellus* Lamarck, 1801.

The name *Tudicla* Röding is the earliest validly proposed name for the group and is

now well established in the nomenclature. *Tudicla spirillus*, as *T. carinata* Röding, is its type species, by subsequent designation, Fischer, 1884. *Tudicla* is now placed in the family Vasidae. The only specific synonyms of *spirillus* are *carinata* Röding and *capitata* Perry. *Tudicla*, however, has several synonyms: *Pyrella* Swainson, 1835, *Spirillus* F. Schlüter, 1838, *Pyrenella* Gray, 1857, *Pyropsis* Conrad, 1860, *Heteroterma* Gabb, 1869, and *Apiotropis* Meek, 1876. These names are on the authority of Thiele (1931, p. 342) who placed a question mark before the name *Heteroterma* Gabb.

In addition to the good figures in the "Tableau encyclopédique" cited above, Tryon's figure (1879-1888, vol. 3, pl. 58, fig. 409) is characteristic. An excellent photographic figure is found in Thiele (1931, fig. 408), and a characteristic black and white drawing is supplied by Maxwell Smith (1953, p. 64, sp. 870). Reeve's figures (1843-1878, vol. 4, *Pyrula*, pl. 9, sp. 29a, b) are less instructive.

Murex spirillus was not described in the "Museum Ulricae."

Murex canaliculatus

1758, *Systema naturae*, ed. 10, p. 753, no. 483.

1767, *Systema naturae*, ed. 12, p. 1222, no. 555.

LOCALITY: "Ad Canadam" (1758, 1767).

"M. testa patulo-caudata, spirae anfractibus supra canaliculo distinctis."

"Granum β . M. testa hemispherica glabra diaphana, cauda recta patula, vertice papillari. Syst. nat. 10. p. 752. n. 477 . . . Varietas β est pullus. Testa grano Secalis minor alba. Anfractus unicus, antice vix manifeste rugosus. Cauda recta, longitudine ipsius testae. Apertura obovata." Locality: "M. Mediterraneo" (1758); "ad Canadam" (1767).

This is the *Busycon canaliculatum* of all recent authors. The genus *Busycon* Röding, 1798, and its species have had a complicated nomenclatural history, and the list of specific and infraspecific names that have been attributed to it is impressive. As to the validity of many of these names, and the names, validity, and relationship of the supra-specific categories of the genus and the type species of each, there has been much disagreement, and it cannot be said that there is any unanimity of opinion today. In the discussion of *canaliculatus* and its two other Linnaean congeners, *M. aruanus* and *M.*

separated by the Adams brothers under the name *Tudicula*, was quoted by Cossmann (1901-1904, vol. 4, p. 70), who continued: "... this name is simply a rectification of *Tudicla*." In as much as both spellings were correct, their word "rectification" was unnecessary. The spelling *Tudicula* has been used by some later authors, notably by Thiele (1931, p. 342) who made it a section of *Tudicla* Röding.

In any case, there is no occasion to invoke the terms of Article 19 of the Code of Zoological Nomenclature.

¹ The combining of these two species was later discussed by Deshayes (1838-1845, vol. 9, p. 569, footnote to *M. haustellum*). After mentioning Schumacher's association of the two, he continued: "Doubtless there are certain similarities between the two species, and although we admit that they belong to the same genus, it seems to us, in the present state of the science, that both should be included in the genus *Murex*, as they do not exhibit characters sufficient to constitute a new genus." Deshayes was apparently unaware of the *Tudicla* of Röding and Link, and it is not difficult to disagree with his conclusion.

perversus, the present writer follows the views of Puffer and Emerson (1954, pp. 115–147). I do this not only in the interest of consistency, but because that paper reflects my views, is the first comprehensive catalogue of the genus that has appeared in nearly one hundred years, and explains and corrects many of the errors of previous workers.

Linnaeus' description, if for the moment the description of his variety " β " be omitted, is identical in the tenth and twelfth editions of the "Systema." It is brief but probably sufficient, in its mention of the principal diagnostic features of the species, to identify it with the *Busycon canaliculatum* of all authors. The identification is confirmed by the presence of a duly marked specimen in the Linnaean collection in London, which is therefore accepted as Linnaeus' type.

The synonymy is not only short for such a common species but poor. The Gualtieri figure (pl. 47, fig. A) is the only one that is accurate. The figure from Seba (pl. 68, fig. 22) shows a sinistral shell, which is either *B. contrarium* Conrad or *perversum* Linné, and was in fact later cited by Lamarck (1822b, p. 138) for the latter species. The figure from Ellis (1755, p. 85, pl. 33, fig. b) is too vague to be identified specifically, though it certainly shows a *Busycon*.¹

Murex canaliculatus is now placed in the subgenus *Busycotypus* Wenz, 1943, of *Busycon* Röding, 1798, and is the subgenotype, by original designation, the type of the typical subgenus being *Busycon carica* (Gmelin, 1791), by subsequent designation, B. Smith, 1938.

Synonyms of *Busycon* Röding are: *Fulgur* Montfort, 1810; "*Fulgus* Montfort," Desmarest in Chenu, 1758; *Busycum* "Bolt." Mörch, 1852; *Busicon* "Con[rad]" Emmons, 1858; *Sycopsis* Conrad, 1867; and *Echinofulgur* Olssen and Harbison, 1953.

¹ Ellis' figure was cited by Deshayes (1838–1845, vol. 9, p. 505) for *Pyrula carica* Gmelin, 1791. It shows a sinistral shell which, however, is neither *contrarium* nor *perversum*. It may have been based on *carica*, and can be taken for *canaliculatum* only by the exercise of considerable imagination. Ellis said in his text (p. 85), "Fig. b is a small whelk-shell or *Buccinum ampullatum* of Lister brought from Virginia." The locality would restrict it to either *carica* or *canaliculatum*. On the same plate of Ellis are figured a string of egg cases and a single case, which resemble the egg cases of *canaliculatum*.

The only synonym of *canaliculatus* is *Volema granulatum* Link, 1807, referred to two Martini figures (1769–1777, vol. 3, pl. 67, figs. 742–743), which were identified by Martini (*tom. cit.*, p. 29) as *M. canaliculatus* Linné. They are the most characteristic of the early figures of that species, except that they show a specimen (apertural and dorsal views) in which the shoulder nodes, which are such an obvious feature of the juvenile shell, have been retained in the adult shell pictured, in the form of thick, semicircular crenulations. I have not seen a mature shell in which these features were so prominent.

The type of Linnaeus' *M. canaliculatus* is found in the Linnaean collection in London, duly marked in the handwriting of Linnaeus. The description of the species in the "Museum Ulricae" is, as usual, considerably amplified, but it is apparent that his model was a young, or at least not a mature, shell. Witness the phrases "striis transversis," "anfractibus angulo tuberculoso," and "labium . . . transversim interne sulcatum." The specimen labeled *canaliculatus* in the Uppsala collection is the *canaliculatus* of all authors, but, contrary to the details of the description, it is an adult shell, 21 cm. in height, in which the shoulder tubercles have disappeared.

Linnaeus' variety "*Granum* β " in the twelfth edition is referred back to number 477 of the tenth edition, which lists *granum* as a good species, with a description identical with that in the twelfth, but with a subdescription using the phrase "An pullus majoris cujusdem Testae?" instead of "Varietas β est pullus." Between the two editions, therefore, Linnaeus' query, "Of what adult shell is this the young?" was answered by his flat statement that it was the juvenile *canaliculatus*. It is apparent from the subdescription in both editions that it was not only a young shell but a specimen of the fry. This is unquestionably shown by the words in the subdescription, "Testa grano Secalis minor, alba," and "Anfractus unicus," as well as by the "hemispherica glabra diaphana" and "vertici papillari" of the main description. I question, however, whether the *granum* of the tenth edition was the fry of the same species as the "*Granum* β " of the twelfth or that either can be identified today. The former is said to come from the Mediterra-

nean Sea, on the authority of Brander, who appears to have been a competent and careful collector and accurate in his localities. He was probably, as Hanley said (1855, p. 5), the Brander who was "the Consul at Algiers."¹ This locality would eliminate *B. canaliculatum* from consideration, or, indeed, any member of *Busycon*, a genus confined to the western Atlantic. The variety "*Granum* β " of the twelfth edition was given a location "in Canada," as was the principal species in both editions, and the common locality of both principal species and variety apparently gave rise to the belief in the minds of some workers that Linnaeus knew that the variety was the fry of *canaliculatus*. I feel certain, however, that Linnaeus could not have accurately identified what must have been almost a larval shell 'as large as a grain of wheat,' as the fry of any one species of *Busycon*. The varietal name should be expunged from our nomenclature. On the plate of Ellis' work mentioned above, a figure of a larval shell is supplied, which is said by Ellis to be the fry of the adult shell shown in figure B. As figure B is not clear enough to be identified except that it is certainly a species of *Busycon*, the problem is no nearer solution, and in any case, I am sure that no conchologist would venture specifically to identify the fry from a crude figure drawn in the middle of the eighteenth century.

Busycon canaliculatum is figured by Abbott (1954, pl. 23, fig. n, the adult shell) and by Maxwell Smith (1941, pl. 48, fig. 2, a juvenile specimen).

Schubert and Wagner (1829, vol. 12, p. 93, pl. 226, figs. 4010–4011) confused this species with *Pyrula spirata* Lamarck, 1816. This shell was renamed *Bulla pyrum* by Dillwyn in 1817, and the latter name, as *Busycon pyrum*, has been familiar to American conchologists of recent years. The Lamarckian name was, however, used by European writers, notably Reeve and Kiener. Although Schubert and Wagner's description and most of their synonymy may be applied to *canaliculatum*, the two figures they supplied clearly show *spirata* (*pyrum*). Kiener did not list *canaliculatum* as a good species, and apparently committed the same error as Schubert and Wagner did, as

¹ I have not been able to check the statement, nor the sources of Hanley's information.

his *spirata* (1834–1850, vol. 6, pl. 10, fig. 1, dorsal and apertural aspects) seem to show a juvenile specimen of *canaliculatum*, referred to by him as "form *canaliculata*." His figure 2 on the same plate, called *spirata* var., shows the typical *spirata*.

Murex aruanus

1758, *Systema naturae*, ed. 10, p. 753, no. 484.

1767, *Systema naturae*, ed. 12, p. 1222, no. 556.

LOCALITY: "Ad Novam Guineam" (1758); "ad Novam Guineam, Chinam" (1767).

"M. testa patulo-caudata, spira spinoso-coronata . . . Testa ponderosa rudis, saepe nigra s. subcaerulea."

The subdescription was added in the twelfth edition. It is questionable whether, from the tenth edition alone, the language could have been referred to any one species, particularly as the synonymy showed two species of two different genera. The Rumphius figure (pl. 28, fig. A) shows a shell later called *Fusus probosciferus* by Lamarck, which is *aruanus* Linné as restricted. Indeed, Rumphius called his shell *Buccinum aruanum*. The only material defect in the figure is that the apex is shown as pointed instead of as the produced and cylindrical apex of *aruanus*. The Gualtieri figure (pl. 47, fig. B) is a passable drawing of *Busycon carica* (Gmelin, 1791), a species much smaller than *aruanus* and readily distinguishable, although the two have certain features in common.

The added figure in the twelfth edition (Buonanni, pl. 101) also shows *aruanus*, so that, for what it is worth, the pictorial preponderance of evidence favors that species. The addition, in 1767, of the words "ponderosa rudis" in the subdescription is additional evidence that we are dealing with a composite species. Hanley reported (1855, p. 302) that Linnaeus added a figure from Lister (pl. 800) by a manuscript note in his copy of the twelfth edition. I have not had an opportunity of examining this copy, but Lister's plate 800 shows a figure of a *Cymbium* species. Hanley's reference was probably an error of transcription for plate 880, which is a fair drawing of *Busycon carica*.

Hanley (*loc. cit.*) makes another significant statement which underlines the fact that Linnaeus had confused *aruanus* and *carica*, and at the same time is to be taken as Hanley's belated attempt to act as first reviser of

the composite species, a revision already accomplished by Gmelin as noted below. Hanley said, after noting that the synonymy included both *Fusus proboscidiiferus* and *B. carica*: "the specific epithet is derived from the former, *but the latter alone agrees with the 'spinis coronata' of the diagnosis, and must consequently retain the Linnaean appellation*" (italics mine). He apparently overlooked the fact that both species are coronate, although the spines appear only on the spire of *aruanus*, whereas in *carica* the shoulder of the body whorl is spinose. The quoted words do not, therefore, apply to *carica* alone. He also said that the "spira brevis" and other details of the "Museum Ulricae" description of *aruanus* support the conclusion that Linnaeus was describing *carica* alone, and noted that the place name "Campegiæ" (Campeche) was added to the diagnosis by Linnaeus, in manuscript. As to the latter argument, the Gulf of Campeche is far from the normal range of *carica*, although that shell has been reported from Galveston, Texas, by Maury (1922, p. 86). Hanley's argument as to the "Museum Ulricae" has much more weight. In that work, after quoting the tenth-edition description and using the tenth-edition synonymy, the author supplied a sub-description which contains at least two details that suggest *carica* and could not be applied to *aruanus*, "Testa magna pugni crassitie" and "Spira brevis." The remainder of the description may be said to apply to either. The shell now labeled *aruanus* in the Uppsala collection is a specimen of *Busycon carica*.

On all the evidence it seems obvious that Linnaeus had confused the two species mentioned and that his *aruanus* must be considered a composite species.

Gmelin (1791, pp. 3545, 3546) listed *aruanus* and *carica* separately as good species, and in general his diagnoses are mutually exclusive. For *aruanus* he used the tenth-edition description and the unquestioned figures (Rumphius and Buonanni) of *aruanus*, and added a characteristic figure of that shell from Chemnitz (1780-1795, vol. 4, p. 143, vignette D). His subdescription uses the characteristic phrase "annulis cincta." Its only apparent defects are his locality "ad insulam Am, et novam Guineam," as to which

I feel sure that "Am" was a misprint for "Aru," the East Indian island from which the name was derived, and "spira mucronata" which I suggest was merely a misuse of the Latin word, a misuse of which Linnaeus himself was often guilty. The spire of *aruanus* is produced into a series of whorls of equal width, making up a long, narrow cylinder, whereas "mucronata," in its restricted and usual meaning, implies a sharp termination.

For *carica*, Gmelin supplied a description which is not entirely clear, but at least it does not suggest *aruanus* and may be taken for *carica*. His synonymy is somewhat less convincing. He cited the figure of *carica* which Linnaeus had used for *aruanus* (Gualtieri, pl. 47, fig. B), and a good figure of *carica* from Lister (pl. 880, fig. 3b). His three Martini figures (1769-1777, vol. 3, pl. 67, fig. 744, and pl. 69, figs. 756-757), however, more nearly resemble the dextral form of *Busycon perversum* than *B. carica*, but at least they show a *Busycon* and cannot be mistaken for *aruanus*. He also cited two figures from Knorr (pt. 1, pl. 30, fig. 4, error for fig. 1, and pt. 6, pl. 27, fig. 1) which also show dorsal views of what is probably *perversum*.

Gmelin's treatment of these two species, while not perfect, sufficiently separates them and makes him the first reviser of his composite species *aruanus*. The name *aruanus* must therefore be reserved for the exotic species which Lamarck renamed *Fusus proboscidiiferus* (1822b, p. 126).¹

Gmelin's revision and the establishment of *aruanus* as the earliest name are today accepted by virtually all systematists. Hedley (1901, p. 98) said: "... the proper course to adopt is to accept the first revision—in this case Gmelin's. If this is correct, we shall lose a

¹ It is not certain that Lamarck changed the name of *aruanus* deliberately. While he listed both *F. proboscidiiferus* and *Pyrula carica* separately, he did not refer to *aruanus* Linné in his synonymy of the former, except to say: "I have received this under the name of 'the trumpet of Aru,' but the description and synonymy of the *Murex aruanus* of Linné and Gmelin in no wise conforms to it. This *Fusus* is most remarkable in the upper part of the spire which resembles a straight trumpet, as if implanted and terminal." I sympathize with Lamarck's failure to find a description of this peculiar spire in either Linnaeus or Gmelin, but I do not consider this defect to be material.

familiar name in *proboscidiiferus*, but we shall gain in the undisputed possession of a still more familiar name of *carica*." Burnett Smith (1938, pp. 16–20) has published the most recent and complete discussion of the validity of Gmelin's purification of Linnaeus' composite species. This view is, however, not accepted by all. Deshayes (1838–1845, vol. 9, p. 449) took the position that Lamarck's *proboscidiiferus* was not the *aruanus* of Linnaeus, but the *aruanus* of Born and Dillwyn. He said in a footnote: "As Lamarck very well said, it is not to this species that the name of *Fusus aruanus* should belong; it is enough to read attentively the description of *Murex aruanus* Linné in the *Museum Ulricae*, in order to be convinced that this species is none other than the *Pyrula carica* of Lamarck, which should become *Pyrula aruana*. Dillwyn in modifying the defective synonymy of Linné, made of *Murex aruanus* another species which is equal to the present one. This species should then retain the name which Lamarck has given it." Deshayes' last sentence is not clearly worded, but it is evident that he felt that *aruanus* Linné was not even a composite species but referred entirely to *carica*. In any case the right of a first reviser to purify a species was, of course, not recognized by him, as that rule was not yet heard of.

Adam and Leloup (1938, p. 181) are also unwilling to accept the revision of Gmelin. They say that the *aruanus* of Gmelin and Röding (*Syrinx aruana* Röding, 1798, p. 121) is not the *aruanus* of Linnaeus, but is *Buccinum incisum* Martyn, 1786, and *Fusus proboscidiiferus* Lamarck and Thiele. Puffer and Emerson (1954, p. 127, under *B. carica*) treat *aruanus* Linné as a composite species (*aruanus* and *carica*), although the purpose of these authors was merely to catalogue the genus *Busycon* and did not involve the revisions of composite species.

The restricted *aruanus* Linné is now generally placed in the genus *Megalatractus* P. Fischer, 1884, which was used by Fischer as a subgenus of *Hemifusus* Swainson, 1840. Thiele (1931, p. 321) used it as a section of *Hemifusus* in the family Galeodidae (Melon-genidae).¹

¹ Pilsbry (1894b, p. 69) first advocated the elevation of *Megalatractus* to generic rank: "In conclusion it

The Linnean collection in London does not supply any further evidence for Linnaeus' conception of his species *aruanus*. He did not own a specimen of the shell, as the name does not appear on his lists of owned species. While the collection contains a specimen of *Busycon carica*, it is not documented in any way, which deprives it of evidential value. The name *aruanus* is written on a specimen of *Melongena vespertilio* Gmelin, but the handwriting of the name is not that of Linnaeus.

The earliest post-Linnaean figure of *aruanus* is found in Chemnitz (1780–1795, vol. 4, p. 143, vignette D), described by Chemnitz (*tom. cit.*, p. 190) as "Die seltene Aruanische Spindel. *Fusus aruanus rarissimus*," and referred to the tenth and twelfth editions of the "Systema" and to the "Museum Ulricae." The composite nature of the species in all three of the works referred to was not, apparently, perceived by Chemnitz. It is well figured in Reeve (1843–1878, vol. 4, *Fusus*, pl. 4, fig. 15); in Sowerby (1847–1887, vol. 4, pl. 421, figs. 34–36); and in Swainson (1834, pl. 19), the last showing the nuclear whorls intact.

The species shares with *Pleuroploca gigantea* Kiener the honor of being the largest gastropod shell. Hedley (1905, p. 98) reported a specimen of *aruanus* weighing 10 pounds, 12 ounces, and with a height of 22 $\frac{3}{4}$ inches, even with the loss of the nuclear whorls which are usually missing in adult specimens. C. W. Johnson (1906, p. 108) reported a specimen of *P. gigantea* from Florida 23 inches in height, and Simpson (1893, p. 51) recorded having seen specimens "two feet in length" on the Florida Keys.

Murex perversus

1758, *Systema naturae*, ed. 10, p. 753, no. 485.

should be stated that *Fusus proboscidiiferus* has been made the type of *Megalatractus*, a subgenus of *Hemifusus* (*Semifusus* Fischer!) by Fischer. There are good reasons for giving the group generic rank. It certainly does not belong to *Fusus*, the embryonic whorls being very different from those of the typical species of that genus. Neither can it be referred to *Hemifusus* as Fischer has done. *Perostylus* [Pilsbry, 1894a, p. 17] will, of course, become a synonym of Fischer's group." *Perostylus* was first described by Pilsbry as a good genus, but further investigation by Tate and E. A. Smith demonstrated that the specimen on which it was based was merely the embryonic shell of *Megalatractus aruanus* showing the intact embryonic spire.

1767, *Systema naturae*, ed. 12, p. 1222, no. 557.

LOCALITY: "In O. Americano" (1758, 1767).

"M. testa patulo-repandoque caudata, spira contraria subcoronata."

The *Murex perversum* of the "Systema," which is now included in the genus *Busycon* Röding, 1798, is a comparatively rare shell found along the American coast from Cape Hatteras southward and into the Gulf of Mexico. There has been considerable discussion as to the treatment of this species on two points. In the first place it occurs both as a dextral and a sinistral shell, and the naming of the dextral form has been the subject of controversy. The name *kieneri* Philippi has often been applied to the sinistral form, Philippi having described his "species" in *Pyrula* Lamarck, 1799, and referred it to Kiener's "variety" of *Pyrula perversa* Linné. The dextral form has been given the name *eliceans* Montfort, 1810, described as *Fulgur eliceans*. This division has, however, not been adopted, as it is established today that both names refer to forms of Linnaeus' *perversus*, although until recently this was not appreciated. Johnson (1934, p. 126) and other conchologists of his time treated *kieneri* as a subspecies of *perversum*. Burnett Smith, however (1939, p. 26), in a paper discussing photographs of Linnaeus' type of *perversus* in the Linnaean collection in London, considered *kieneri* as a junior synonym of *Busycon perversum*, and this view is adopted by Abbott (1954b, p. 236) and by Puffer and Emerson (1954, p. 134).

In the case of the dextral *eliceans* Montfort, Gill (1867, p. 145) considered it a junior synonym of *Busycon carica* (Gmelin, 1791). Tryon (1879-1888, vol. 4, p. 141) and Morris (1951, p. 205) referred to it as a variety of *carica*. Johnson (*loc. cit.*) treated it as a subspecies of *carica*. Abbott (*loc. cit.*) disassociates it entirely from *carica*, treating it merely as the dextral form of *perversum*, and this allocation is adopted by the present writer.

Second, *perversus* Linné has been confused, both in the literature and in collections, with *Busycon contrarium* (Conrad, 1840), described as *Fulgur contrarius*. This is the abundant sinistral *Busycon* of the southeastern and Gulf coasts of the United States, and the fact that it is a sinistral shell, added to its large populations in its locality, deluded

the early American conchologists and almost all later collectors in the belief that it was Linnaeus' shell. The two species are easily distinguishable. The early figures referred to the Linnaean species are either based on *contrarium* or are extremely equivocal. The two species have approximately the same range.

The difference between the two shells is not revealed by the Linnaean description of *perversus*, which could be read as applying to either, nor by Conrad's description of his *contrarius*. The two figures in Linnaeus' synonymy (Gualtieri, pl. 30, fig. B, and Argenville, 1742, pl. 18, fig. F) are unsatisfactory. The Gualtieri figure is extremely crude and does not show the swollen ridge around the body whorl, which is one of the diagnostic features of *perversus* Linné, although its entire anterior canal is abnormally twisted and is much longer and more slender than in that species. The Argenville figure is also crude but does show the ridge around the lower part of the body whorl which gives to the Linnaean shell its peculiarly distorted appearance. Linnaeus added two further figures by a manuscript note in his interleaved copy of the twelfth edition (Lister, pls. 907-908). Plate 907 shows a sinistral shell with a very short canal, a feature of *perversum*, but with no evidence of distortion. Plate 908 may have been based on *perversum*. It is a dorsal view showing considerable distortion in the canal. It seems probable that Linnaeus' diagnosis included two different sinistral species, the sturdy and heavy species with the swollen ridge and a consequently distorted appearance and with a comparatively short canal, which is seen in the Argenville figure (*perversum*), and the light, undistorted shell with a long and slender canal figured by Gualtieri, which is Conrad's *contrarium*.

Other than these differences, the maximum size of the two species is quite different. The height of *perversum* varies from 4 to 8 inches, whereas it is not unusual to find individuals of *contrarium* that reach 16 inches. Conrad's type specimen of *Fulgur contrarius* was described by him as "length 4 inches," which indicates a subadult individual.

Chemnitz (1780-1795, vol. 9, pt. 1, pp. 67-74) listed "*Murex perversus* Linnaei,"

but while he referred it to both editions of the "Systema" and to the "Museum Ulricae" his description does not mention any details that would serve to distinguish it from Conrad's shell, unless the words "testa . . . gy-rata . . . carinata" can be read to refer to *perversum*. His own figures (*tom. cit.*, pl. 107, figs. 906–907) resemble *contrarium* much more than *perversum*.¹

Born (1870, p. 3130), in describing *perversus* Linné, used the phrase "rostrum, elongato, recto," which can be applied only to *contrarium*, and his two figures (pl. 11, figs. 8–9) are clearly *contrarium*.

Link (1807, p. 116) places *perversus* Linné in his genus *Volema*,² which is a mixed group containing, among other generally discordant species, both *Busycon carica* (Gmelin) and the present species. For *V. perversum*³ he cited Chemnitz' figures 906 and 907, as did Gmelin.

Röding (1798, p. 149) erected the genus *Busycon* for the group including both Linnaeus' *perversus* and his *canaliculatus*. The figure he cited for *perversus* ("Martini," error for Chemnitz, vol. 9, pt. 1, pl. 106, fig. 902) is equivocal but seems closer to *contrarium*.

¹ The application of the Chemnitz figures is complicated by the fact that his heading to the species refers only to plate 107, figures 906–907, whereas the running heads for the pages relating to the species say "Tab. 107, figs. 900–907." Most of these figures are on plate 106 (figs. 900–905, inclusive) and with two exceptions (figs. 904–905) they resemble *contrarium*. The two latter figures, which show a very inflated, sinistral shell with an abnormally short canal, are hardly close to either species, although I would be inclined to say that they were meant for *perversum*. Chemnitz called these two figures "Murex perversus, teste valde crassa, tumida, ponderosa." I cannot unequivocally identify them with any form of *perversum*. They were, incidentally, cited by Gmelin (1791, p. 3546) for his variety "γ" of *M. perversus*, while he cited for his principal species figures 906 and 907 which show characters of both species.

² This is not *Volema* Röding, 1798, which is another mixed genus containing such unrelated species as *Xancus pyrum* (Linné) and *Thais hippocastanum* (Linné), among others.

³ The adjectival terminations of the species in *Volema* Link are all neuter. The name *Volema* Link is probably derived from "volemum pirum," the name for a species of pear large enough to fill the hollow of the hand ("vola"). While "vola" is a feminine noun, "pirum" is neuter, but the use of the neuter gender in the coined name *Volema* is questionable grammar.

It shows a very slight bulging of the middle of the whorl but hardly enough to represent *perversum*.

Lamarck, 1816, included the species in his *Pyrula*, 1799. In his 1822 description (1822b, p. 138) there is nothing that could not be applied to *contrarium*. His references included Born's figure of *contrarium*, Lister's plates 907–908, referred to above, the bad Gualtieri figure, and the fair figure from Argenville which probably showed *perversum*. The figures cited from the "Tableau encyclopédique" (pl. 433, figs. 4a, b) are almost as equivocal as those of Lamarck's predecessors, but were probably based on *perversum*, as they show a moderately short and thickened canal. The swollen ridge is faintly indicated.

Reeve (1843–1878, vol. 4, *Pyrula*, pl. 3, sp. 13) supplied another innocuous description, which suggests that, even if he had seen a specimen of *contrarium*, he believed it to be conspecific with *perversum* and was unaware that it had been described as a good species. His figure, however, is of the heavier *perversum* with the short and wide canal.

In general it may be said that all the figures referred to above are equivocal. In my allotting some of them to either of the two species in question, my conclusions must not be taken as anything but tentative, as there is not a satisfactory figure published prior to Reeve. Most of them show features of both species or appear to be midway between the two.

Hanley's contribution to the question throws no light on the differences between the two species. He merely said (1855, p. 302): "The *Pyrula perversa* of authors (Reeve, Conch. System, pl. 236, f. 5) is marked for this shell in the Linnean collection. . . . All the synonyms are usually accepted as correct, but Gualtieri's engraving (manifestly taken from a broken example) . . . is not worthy of being quoted."

Ever since Conrad described *contrarium* as a fossil species from the Miocene of North Carolina over 100 years ago, most writers have continued to describe its Recent prototype as the Linnaean *perversus*, probably because of the rarity of the Linnaean species. The first critical comment on this complex was by Burnett Smith (1939, pp. 23–26), who

was the first writer after Hanley to discuss Linnaeus' holotype in the London collection and to review the relationship between the two sinistral *Busycon* species.

Synonyms of *perversum* are *Pyrula kieneri* Philippi, 1848, and *Fulgur eliceans* Montfort, 1810. Dall (1890-1903, vol. 3 pt. 1, p. 116) listed *Busycon gibbosum* Conrad, 1863, as a synonym of *perversum* Linné. Conrad first described this name as *Fulgur gibbosum* in 1854, and said of it: "It is not known to inhabit the coast of the United States and is probably from Campeachy [Campeche] Bay" (1854, p. 319). Puffer and Emerson (1954, p. 133) concluded: "... in light of present information it is difficult to ascertain whether the species represents *perversus* Linné (1758) or *contrarius* Conrad (1840)." These authors accordingly list *gibbosum* as a synonym of *perversus* with a query. *Busycon adversarium* Conrad, 1863, was considered by Burnett Smith (1939, p. 26) to be a fairly mature example of *contrarium* Conrad. Conrad referred his *adversarium* to *B. perversum* Tuomey and Holmes, not *B. perversum* (Linné).

The best figures of the sinistral *perversum* are Burnett Smith's photographs of the holotype in the Linnaean collection (1939, pl. 7, figs. 1-2). The dextral form (formerly *eliceans* Montfort) is reproduced by Abbott (1954b, pl. 23, fig. k). Conrad's *contrarium* is shown by Abbott (pl. 23, fig. o) and Platt (1949, p. 45, fig. 7, in color).

Neither *Busycon contrarium* (Conrad) nor *Busycon perversum* (Linné) should be confused with *Murex contrarius* Linné of the "Mantissa," which is discussed below (p. 208).

The species *perversus* was described in the "Museum Ulricae" with a repetition of the description in the tenth edition and the same synonymy. The details of the added description point more clearly to the true *perversus* of Linnaeus than the language of the "Systema." The phrases "venter gibbus, inferne flexuosus," "cauda . . . omnino patens," and "columella laevis, flexuosa" are suggestive, and the mention of the dextral form of the shell in the concluding sentence of the added description, "Singularis nota est, quod a dextris sinistrorsum flectantur anfractus, quod paucis commune," ties the shell in the

Queen's collection securely to *perversus* Linné, as Conrad's species has no dextral form, and the shell there labeled *perversus* is the heavy, twisted, typical form.

THE *Neptunea* SPECIES IN *Murex* LINNÉ

Three members of the genus *Neptunea* Röding, 1798, were listed by Linnaeus in *Murex*: *N. antiqua* and *despecta* in the "Systema naturae," and *N. contraria* in the "Mantissa." The genus was first erected by Röding (p. 115) and included, in addition to the names of the three species mentioned, a number of others, some of which were additional names for the Linnaean species and others that properly belong in other genera (*Melongena* and possibly *Murex*). Röding's names *antiqua*, *despecta*, *neglecta*, and *limbara* all apparently represent forms of *M. antiquus* Linné, and his *contraria* and *perversa* seen to be forms of *M. contrarius* Linné. He did not supply any name for the true *despectus* Linné, nor do any of his figures on which his several names are based show any form of that species.

The majority of Röding's 16 *Neptunea* names cannot be identified, either because of the absence of cited figures or because the figures cited are unidentifiable.

Neptunea was purified by the selection of "*Fusus antiquus* monstr. *contrarius*" by Monterosato in 1872 (p. 17) as type species. While this is the earliest, and a valid, designation, it is an unfortunate choice, as it involves a sinistral species. I consider Monterosato to have been in error, as well, in his style of designation, as I am of the opinion that *contrarius* is a good species and not a left-handed *antiquus*. Four years later Kobelt (1876, p. 63) selected *M. antiquus* Linné as type species. Cossmann (1901-1904, vol 4, p. 99) also designated *antiquus*. Dall (1918b, p. 137) selected *N. clathrus* Röding, as type. I have been unable to identify this name, as the only figure cited (Kammerer, pl. 9, fig. 2) was not available, but it is probably the *clathrus* designated by Fischer in 1884 (1880-1887, p. 640) as type species of *Boreotrophon* Fischer, a subgenus of *Trophon* Montfort, 1810.

In 1840 Swainson (pp. 90, 308) had erected the genus *Chrysodomus*, designating *Murex*

antiquus Linné as type species.¹ *Chrysodomus* thus became a junior synonym of *Neptunea*. It was, however, used for this group by many conchologists as late as Dall's paper on *Chrysodomus* and other north Pacific species (1918a, pp. 213-214).

The three Linnaean *Neptunea* are all either cold-water or temperate-zone species, and *N. despecta*, at least, is susceptible of great variation in sculpture and other shell characters. The variation in the three species is discussed below.

Murex antiquus

1758, *Systema naturae*, ed. 10, p. 754, no. 486.

1767, *Systema naturae*, ed. 12, p. 1222, no. 558.

LOCALITY: "In O. Europaeo" (1758); "in O. Europaeo; Norvegico" (1767).

"M. testa patulo-caudata oblonga, anfractibus octo teretibus . . . Simillimus, cum sequenti, est Buccino undato."

Murex despectus

1758, *Systema naturae*, ed. 10, p. 754, no. 487.

1767, *Systema naturae*, ed. 12, p. 1222, no. 559.

LOCALITY: "In O. Septentrionali" (1758); "in O. Septentrionali: Islandia" (1767).

"M. testa patulo-subcaudata oblonga, anfractibus octo: lineis duabus elevatis . . . Rudis omnino uti praecedens testa est."

These two names are here considered together, as the ranges of the two species overlap to a certain degree, and *despectus* has been considered by some writers to be a subspecies or form of *antiquus*. The descriptions of each are identical in the tenth and twelfth editions of the "*Systema naturae*."

The two descriptions point out very clearly the differences in shell characters between the two shells. *Murex antiquus* is said to have "anfractibus teretibus," words that mean either "smooth, polished" or "graceful," both translations applying to the appearance of the shell, although Linnaeus omitted to mention the extremely fine revolving striae, which, it is true, are hardly visible to the naked eye. He might well have added a reference to the strong growth lines which are seen in all adult individuals. Some specimens of *antiquus* show a very obscure angulation of the body whorl just below the roundly

sloping shoulder. The apical whorls are, in such individuals, even more obscurely angulated. The outer lip of the adult shell is thickened and slightly everted, and the aperture is typically pale yellow, while that of *despectus* is white. The latter never attains the size of large adult examples of *antiquus*. The most noticeable difference between the two is the prominence of the spiral sculpture in *despectus*. This is not mentioned in the description of *despectus*, unless the words "lineis duabus elevatis," which some commentators have referred to the spiral sculpture, were meant to describe this feature. The only basis for this claim is that the phrase was intended to convey the idea of "pairing" or "twinning" of the revolving striae. While the major striae are separated by fine raised threads in the interspaces, they are in no sense paired, although the protagonists of the above theory must mean that the whole arrangement suggested to Linnaeus the appearance of pairs of lines. Their idea seems a mere attempt to explain the word "duabus" by what is to me a far-fetched interpretation. The quoted words surely refer to the double carination of the whorls in *despectus*, and in fact they are separated from the words "anfractibus octo" by a colon. The fact remains, however, that Linnaeus did not mention the spiral sculpture in either description. The defect was remedied in the case of *antiquus* by the insertion of a manuscript note in Linnaeus' interleaved copy of the twelfth edition, which reads "Tenuissime transversim striatus."

The descriptions of both species in the "*Fauna Suecica*" (1761, p. 524) give no additional light on the species, as they are mere copies of the descriptions in the tenth edition.

Only one figure was cited for *antiquus* (Gualtieri, pl. 46, fig. E). Although this figure suggests *antiquus* in size and general appearance, I would refer it only tentatively to that species. However, the correct locality, "Norvegica," supported by the figure, probably insured the later identification, as no other Scandinavian shell except *antiquus* can be referred to the figure. Linnaeus unfortunately passed over Seba's several figures of the species (pl. 39, fig. 75; pl. 83, figs. 3-6; and pl. 93, fig. 3).

¹ Cossmann (*tom. cit.*, in text, p. 98) later designated *M. despectus* Linné as type of *Chrysodomus* Swainson.

For *despectus* Linnaeus cited a figure from Lister (1678, pl. 3, fig. 1) which shows *antiquus* and not *despectus* and probably represents an error. Linnaeus also cited a figure from his "Wästgota Resa" (1747, pl. 5, fig. 8) which is a recognizable picture of *despectus*.

Several radically different forms are assumed by *despectus*. Typically it has a flat, keeled shoulder, which is somewhat nodulous. In some individuals the angulation of the shoulder both of the body whorl and spire consists of two carinae, rather widely spaced, the upper being the most salient. In others the nodular sculpture of the carina is so highly developed that it extends over the shoulder and a short distance down the body whorl as short, longitudinal elevated ribs which are often lamellose and everted. Occasional individuals are found that carry a series of sinuous, everted, and crowded, knife-like ribs near the lip, which extend the entire length of the whorl. The more noticeably keeled form was called *carinatus* by Pennant (1812, vol. 4, p. 279, pl. 80, fig. 96). Numerous other names have been given to the gradations in sculptural forms noted above, most of which are unnecessary and no longer recognized.

Fusus tornatus Gould (1840, p. 197) is a western Atlantic, arctic form very close to the typical *despectus*, if, indeed, we may speak of any one form of that species as "typical." Binney (1870, p. 375) reported that it had been found in the stomachs of cod taken on the Grand Banks, and added: "This shell is undescribed, unless it be the much debated and equivocal *Murex despectus* of Linnaeus, about which the British writers seem to have been so much puzzled. It differs from the early state of the *Fusus antiquus* of Linnaeus, the *F. despectus* of most British conchologists, in the more rounded form of the whorls, and in being destitute of the network formed by the close revolving and longitudinal striae, and it would evidently never assume the appearance of a mature *F. antiquus*. I have very little doubt that it is the genuine *M. despectus* of Linnaeus; but as another shell is now universally received under that name, it seems the most judicious way to apply a new name to this, with the above explanation." I agree that *tornatus* is not any form of *antiquus*, and from Binney's

figure (*op. cit.*, p. 374, fig. 641) I would consider it a western form of *despectus*, which has been reported from Greenland and Newfoundland. It is apparent, from Binney's reference to the fact that the name *despectus* had been applied to another shell, that he did appreciate its extraordinary variability. Kobelt ([1877-]1881) supplies a good figure of *tornatus*.

Both *antiquus* and *despectus* have been known from very early times, but the pre-Linnaean writers did not properly separate them. Buonanni (p. 137, pl. 190), Petiver (pl. 77, fig. 2), and Seba (pl. 39, fig. 75, and the other Seba figures cited above) all figured one or another of the two species, but the data supplied by them are quite different. Seba called his species "Buccinum from the Davis Strait." His figure resembles *despectus*, while his description suggests *antiquus*. Chemnitz (1780-1795, vol. 4, p. 126) described a "Buccina Norwegica et Islandia striata, plicata et clathrata," which suggests *despectus*, but he referred the species to both *antiquus* and *despectus* Linné. His five figures (*tom. cit.*, pl. 138, figs. 1292-1296) are a mixture of the two species. Figures 1292 and 1294 show *antiquus*. Figures 1295 and 1296 are clearly *despectus*. Figure 1293 shows a form with which I am unfamiliar. It is a decussately sculptured shell with nodosely angulated whorls, with a markedly concave shoulder to the body whorl and an extremely turreted spire. Its aperture is yellow, a color that is not seen in any form of *despectus*. Except for the nodes at the angulations of all whorls it resembles Binney's figure of *tornatus*.

Born's *M. despectus* (1780, p. 313) is clearly *antiquus*, based both on its description and synonymy, which cites two good figures of that shell. Born did not list *antiquus*, nor did he list *despectus* under its proper name, or figure it. A figure cited for his *aruanus* (p. 313) shows *despectus*.

Donovan (1799-1803, vols. 1, 4, and 5) first reversed the two names and later corrected his error. In volume 1 (pl. 31) he described *Murex despectus* and said that it "is said to be a common shell on the Essex, Sussex, and many other of the English shores as well as in Scotland, the Orkneys and many of the Irish shores also." This presence in

south England definitely points away from *despectus*, and his figure is an excellent picture of a large *antiquus* with a typically yellow aperture. In volume 4 (pl. 119) he described *Murex antiquus*, giving no locality except "the northern parts of Europe," and supplied a figure of a very highly angulated and turreted shell deeply constricted at the suture, and with the carinae sinuous. It may have been an extremely inaccurate drawing of one of the more carinated forms of *despectus*. In volume 5, in connection with plate 180, he again described a *Murex despectus*, "inserted among the rarer shells of this country on very slight authority; namely that of a friend, who believes he once saw a few specimens of this *Murex* that were fished up in the sea at a short distance to the north of the Orkneys." His figures for the latter species show a completely smooth shell, each whorl encircled by two lines of brown, which is not referable to any known form of either *antiquus* or *despectus*. Following this plate is a lengthy explanation of his errors and a substituted heading for his earlier plates of *despectus* (pl. 31), which he now properly called *antiquus*, and of *antiquus* (pl. 119) for which he gave a new name "*Murex duplicatus*, Tuberculated *Murex*." This leaves his book with no description or figure of *despectus*. This is probably correct as *despectus* has not, to my knowledge, been authoritatively reported from Britain.

Dillwyn (1817, pp. 724–726) not only described both *antiquus* and *despectus* as good species, but also *M. fornicatus* Gmelin and *M. carinatus* Pennant, 1812, both of which are now included among the many synonyms of *despectus*.

Lamarck (1822b, pp. 125–126) also treated *antiquus* and *despectus* as distinct and included *carinatus* as a good species. He characterized *despectus* as "Similar to the preceding [*antiquus*] in its characters, . . . distinguished from it by its carinae and the tubercles on its spire."

Kobelt (*op. cit.*, vol. 3, div. 3b, p. 56) reverted to the earlier theory that *antiquus* and *despectus* were conspecific, making *despectus* a variety of the former, "varicosa-carinata, spira tuberculata." He reproduced the original plate 138 of Chemnitz showing both species. He also listed "*Neptunea antiqua* var.

tornata Gould" and supplied a good figure (pl. 36, fig. 2).

Jeffreys (1867, pp. 323–329) gave a long account of the British *F. antiquus*, its description, range, habitat, and commercial use. He regarded *M. contrarius* Linné (1771, "Mantissa," p. 551; see below, p. 208) as equal to *antiquus*, probably basing his opinion on sinistral specimens of the latter found in Britain, although the range of *contrarius* does not include any part of the British Isles. He did not list *despectus* as a British species.

Tryon (1879–1888, vol. 3, pp. 113–115), in describing *antiquus*, said, "Kobelt has varieties *carinatus* and *despectus*, but Jeffreys considers them distinct . . . of more Arctic distribution and not found living (although fossil) in the British Isles." Of the varieties *alba*, *ventricosa*, *striata*, and *gracilis* of Jeffreys he said, "They are merely arbitrary distinctions among forms of this very variable species." His description of *despectus* confines itself to two forms, the nodulose and the longitudinally lamellose, but he emphasizes the extraordinary variability of the species. He gives a list of its better-known synonyms, to which the reader is referred, and treats *tornatus* Gould, the American form, as "equivalent to the typical *despectus*." In a species of such variability I would hesitate to assign the word "typical" to any single form.

The respective ranges of the two species here considered are: For *antiquus*: generally northern European waters, being reported from Cornwall to Scotland in Britain, and throughout the North Sea. *Murex despectus* has a wider and more northerly range. It is circumboreal, having been found in Norway, Spitzbergen, Iceland, Greenland, and Newfoundland, and in Alaska and Japan in the Pacific.

Both species belong in the genus *Neptunea* Röding, 1798, the type species of which is "*Fusus antiquus* monstr. *contrarius* L." as designated by Monterosato in 1872. (See discussion of the several type designations for this genus, p. 165, above.)

Neptunea antiqua is well figured in the "Tableau encyclopédique" (pl. 426, fig. 5) as *Fusus antiqua*, by Kiener (1834–1850, vol. 6, *Fusus*, pl. 18, fig. 1, apertural and dorsal views), by Reeve (1843–1878, vol. 4, *Fusus*,

pl. 11, sp. 44), and by Tryon (1879–1888, vol. 3, *Neptunea*, pl. 45, fig. 243). Its synonyms are *Buccinum magna* da Costa, 1778, and *Murex despectus* Born, 1780, Donovan, 1799 (not Donovan, 1803), and Pennant, 1812. It is not *Tritonium antiquum* O. Fabricius, 1780, which is *Fusus islandicus* Lamarck, 1816.

Neptunea despecta is figured in the "Tableau encyclopédique" (pl. 426, fig. 4, a stylized figure) as *Fusus despectus*, by Kiener (1834–1850, vol. 6, *Fusus*, pl. 19, fig. 2), by Reeve (1843–1878, vol. 4, *Fusus*, pl. 10, figs. 39a, b, c), and by Tryon (1879–1888, vol. 3, *Neptunea*, pl. 45, figs. 246–248). A long list of its abandoned synonyms is found in Tryon (*tom. cit.*, pp. 116–117).

The most recent discussion of this complex, and the clearest and most accurate colored figures, are to be found in a lesser known work on the voyage of the expedition to the North Sea in the Prince of Monaco's yacht "Hirondelle" (Dautzenberg and Fischer, 1912, pls. 1–3). These writers treated *Neptunea despecta*, in several of its forms, as a subspecies of *N. antiqua*.

In arriving at a conclusion that these two species are biologically separable, I suggest that the great susceptibility of *despecta* to variation, in contrast to the comparative uniformity of *antiqua* in this respect, is a factor not to be overlooked.

Murex tritonis

1758, *Systema naturae*, ed. 10, p. 754, no. 488.

1767, *Systema naturae*, ed. 12, p. 1222, no. 560.

LOCALITY: "In Archipelago, America (1758); "in Archipelago, America, in Oriente et Africa . . ." (1767).

"M. testa ventricosus oblonga laevi, anfractibus rotundatis, apertura dentata, cauda brevi Anfractus distincti sutura nodulosa, hinc inde quasi abscissi et aglutinati nodo. Apex saepe diffractus. Columella striis transversis nigris. Color lividus, nigro quasi imbricatus."

After the reference to "Africa" in Linnaeus' locality in the twelfth edition is inserted a long account of the present and past uses of the shell.

The entire subdescription was added in the twelfth edition.

This distinctive species is unequivocally defined in the above ample and characteristic description and in the completely accurate

synonymy in the tenth edition, and this identification is confirmed by the finding of a specimen of the *tritonis* of all authors in the Linnaean collection in London. This specimen was not identified by being marked by a name or number, but it uniquely conforms to the description and to the figures in the tenth-edition synonymy and may therefore be accepted as Linnaeus' "ostensible" type specimen.

In 1849 Conrad (p. 212) separated *Triton variegatus* Lamarck, as the species was then called, into three species: *T. tritonis* for the Indo-Pacific shell; *T. nobilis*, a new name, for its western Atlantic relative; and, as a third species, *T. variegatus*, a name borrowed from Lamarck's *Triton variegatum* ("Liste," 1816). Conrad was not clear as to what his western Atlantic *variegatus* really was. He merely said (*loc. cit.*), "The third species is common in the West Indies and is smaller and more ponderous in proportion." Later on the same page he said, "In *variegatus* and *nobilis* there is a much larger proportion of the dark waved bands to the white or light colored shell, and in every stage of growth the former is thicker and heavier than in corresponding ages of the other." His observation as to the color difference between the West Indies and Indo-Pacific shells may be correct, although in specimens examined by the present writer the difference in this respect is little marked. I have never seen the "thicker and heavier" shell that was his *variegatus*. There is only one subspecies of *tritonis* known to me in the western Atlantic, and its variation in the features noted by Conrad is almost imperceptible. His *nobilis* is generally accepted today as a subspecies of *tritonis*.¹

¹ The figures cited by Conrad for his "third species," *variegatus* (Lister, pl. 959, fig. 12; Seba, pl. 73, "two upper figures"; Martini, vol. 4, pl. 134, figs. 1277, 1281, and pl. 135, figs. 1282–1283; and Kiener, vol. 7, pl. 2), are not instructive. The Seba plate was an error for plate 81, which shows 12 figures of *tritonis*. None of them conforms to Conrad's words "smaller and more ponderous," and the arrangement of the figures makes it impossible to decide which are "the upper two." The other figures cited are equally insufficient to show the distinctions laid down by Conrad.

Stimpson (1893, p. 50) may have found the form that Conrad called "*variegatus*," for he said, "I found about 30 living specimens on the reefs at Tortugas, of an apparently stunted form, being very solid and having a very heavy lip, though not over seven or eight inches

The synonymy of *Murex tritonis* in the tenth edition of the "Systema" is entirely correct, although it is impossible to assign these crude drawings to either one or the other of the subspecies. All three figures cited (Buonanni, pl. 188; Rumphius, pl. 28, fig. B; and Gualtieri, pl. 46, fig. A) cannot, however, be taken for any species but *tritonis*. The synonymy in the twelfth edition is less accurate. The 12 Seba figures ("t. 81, f. omnes") all show recognizable pictures of *tritonis*. Hanley (1855, p. 303) said that "they all belong to the *Triton variegatus*, but exhibit various forms of it." While they show slight differences, it is difficult to assign any of them categorically to either *tritonis* or *tritonis nobilis*. The good Buonanni figure was for some reason omitted, and a figure from Rondelet (1554-1555, pl. 21) was added which is not *tritonis* and more nearly resembles the *Triton nodiferum* of Lamarck, 1822 [*Charonia lampas* (Linné, 1858); see *Murex lampas*, p. 103, above], a related but quite distinct species from the Mediterranean Sea. It is an extremely nodose shell without the distinctive color pattern of *tritonis* and lacking the pronounced and characteristic distortion of the spire of the latter.

The localities given by Linnaeus in both the tenth and twelfth editions cover both the typical *tritonis* and its western Atlantic subspecies *nobilis*. It is assumed that by "Archipelago" Linnaeus referred to the East Indies, as otherwise the word "America" would be redundant. There is nothing in the description, however, to indicate that Linnaeus had perceived any difference between the two forms. I have not seen a report of *tritonis* from Africa, as noted in the "habitat" in the twelfth edition of the "Systema," if by that locality was meant west Africa, nor have I seen reports from the Indian Ocean as far west as the African coast, Madagascar, or

Mauritius. Neither Adanson, 1757, nor Fischer-Piette and his co-authors, 1942, refer to the species as having been found in Senegal. Dillwyn (1817, p. 727) lists it from the Mediterranean Sea, a locality he attributes to Ulysses,¹ but such a report must have been founded on a specimen of *Charonia lampas* Linné (*Triton nodiferum* Lamarck).

Murex tritonis is now placed in the genus *Charonia* Gistel, 1848, of which the type species is *C. marmorata* (Link, 1807), which is the first valid name for Conrad's western Atlantic *tritonis nobilis*. The figures cited by Link (Chemnitz, 1780-1795, pls. 134-135, figs. 1277-1283) all show that shell. *Murex tritonis* is also the type species of *Tritonium* Röding, 1798, as *T. pilosa* Röding, *vide* Winckworth, 1945. *Triton variegatum* Lamarck, as conceived by Mörch, 1852, Blainville, 1825, and Reeve, var. β , 1844, all appear to be based on the subspecies *nobilis*. The western Atlantic subspecies may be synonymized as follows:

- 1807, *Tritonium marmoratum* Link.
- 1816, *Triton variegatum* Lamarck, as of Blainville, 1825, Mörch, 1852, and Reeve, var. β , 1844.
- 1822, *Tritonia atlantica* Bowditch.
- 1849, *Triton nobilis* Conrad.
- 1871, *Triton sequenzae* Aradas and Benoit.
- 1878, *Triton commutatus* Dunker MSS. Küster, in Martini and Chemnitz, 1837-1907.
- 1954b, *Charonia tritonis nobilis* (Conrad) Abbott.

A short-lived discussion took place as to the earliest genus to receive *tritonis*. Dall (1912, pp. 58-59) said: "The first name available for the group typified by *Murex tritonis* L. seems to be *Nyctilochus* of Gistel, 1848, and if, in accordance with usage, we take this to be the typical genus of the family, the family name would be Nyctilochidae. The genus *Aquillus* Montfort, 1810, upon which the family name was based by Dr. Pilsbry some years ago, is unfortunately synonymous with *Cabestana* Bolten, 1798, and therefore cannot be used."

in height." He called these specimens, however, *nobilis* Conrad. This report, together with the paucity of any further information on Conrad's "*variegatus*," as distinguished from Lamarck's name, makes one suspect that *nobilis* and "*variegatus*" were identical, Conrad's distinctions being based on slight individual variation, possibly ecological. Stimpson's specimens were reef-dwellers, whereas the present writer has collected *nobilis* in the Bahamas, alive in sandy and grassy stations in protected water.

¹ Dillwyn's bibliography (pp. vii-xii) identifies this reference with "Travels through various provinces of the Kingdom of Naples," by Charles Ulysses, translated from the German by A. Aufrère, London, 1795. (Not seen.) Dillwyn refers to Ulysses for several Bay of Naples locality reports. It seems probable that he was merely a traveler and observer rather than a conchologist.

In the following year Iredale (1913, pp. 55–56) disagreed with Dall and demonstrated that *Charonia* Gistel should be used instead of *Nyctilochus*. He called attention to the fact that Gistel (1848, p. 11) used the latter name merely in a list of preoccupied names and substitutes, listing *Nyctilochus* as a substitute for *Triton* Broderip. Dall apparently based his conclusion on this entry. In the latter part of Gistel's paper, however, the author provided a good generic name for *M. tritonis*, and Iredale added, "I conclude that this name should be used." He quoted Gistel's erection of the name as follows: "Tritons-hornschnecke (*Charonia* Nob: sonst: *Tritonium*)." Gistel also supplied a generic description and a description of "*Ch. tritonis* Nob."

Tritonium Röding, 1798, not Müller, 1776, *Triton* Montfort, 1810, and *Eutriton* Cossmann, 1904, are synonyms, at least in part.

The present species has from time to time been included in several genera. Humphrey, 1787, in the "Museum Calonnianum," used it in *Buccinum* Linné; Schumacher, 1817, in his *Lampusia*; Lamarck, 1816 and 1822, Küster, 1878, Tryon, 1881, and many others in *Triton* Montfort, 1910; Aradas and Benoit, 1871, in *Tritonium* Link, 1807; Cossmann, 1904, and Dautzenberg, 1929, in *Eutritonium* Cossmann, 1904; Dautzenberg, 1910, in *Cymatium* Röding, 1798; Oostingh, 1925, in *Septa* Perry, 1810.

Buccinum nerideus and *neptuni* Humphrey, 1797, and *Tritonium polosa* Röding, 1798, are probably synonyms of the Indo-Pacific *tritonis*.

The description of *tritonis* in the "Museum Ulricae" is not sufficiently clear to indicate either the Indo-Pacific or the western Atlantic shell exclusively, in spite of its added details. The two specimens labeled *M. tritonis* in the collection at Uppsala, based on the dorsal and apertural views in the microfilm of the collection, appear to be the Indo-Pacific shell.

The Indo-Pacific *tritonis* is figured by Reeve (1843–1878, vol. 2, *Triton*, pl. 1, sp. 3b), and the western Atlantic *nobilis* appears on the same plate, figure 3a.¹ Reeve distin-

guished the western form by saying that it tends to be stouter than its analogue in the east and "forms a peculiar hump around the upper part of the whorl, and the spire is smooth towards the apex." He called both forms varieties of *Triton variegatus* Lamarck. Abbott (1854b, p. 197) described these differences more clearly: "The early whorls [of *nobilis*] are purplish-pink. In old specimens these are generally lost. Adults usually have a swollen angular shoulder on the last whorl, a feature which distinguishes our Atlantic subspecies from the typical *tritonis* of the Indo-Pacific area." Reeve was correct in saying that the western subspecies is stouter, and he might well have added that it has a less tapering spire. The figures in Blainville (1825, 1827, plate vol., pl. 18, figs. 3, 3a) seems to represent the western shell, although they are not good. The most recent figures of *nobilis* are found in Maxwell Smith (1941, pl. 1, fig. 3) and in Abbott (1954, pl. 5, fig. f).

The photograph of *tritonis* on the microfilm of the Linnaean collection in London, while it is obviously *tritonis*, is not sufficiently clear to disclose whether it represents the eastern or western form, and part of the shell is cut off by the edge of the film. It is probably the Indo-Pacific shell, as Linnaeus was more apt to possess that shell.

Further figures of the Indo-Pacific *tritonis* are found in the "Tableau encyclopédique" (pl. 421, figs. 2a, b), in Küster and Kobelt ([1839–] 1878, vol. 3, div. 2, pl. 48), and in Tryon (1879–1888, vol. 3, pl. 1, fig. 1, pl. 3, fig. 16, and pl. 5, fig. 25).

The western Atlantic *nobilis* is also figured by Küster and Kobelt (*tom. cit.*, pl. 63, fig. 1), and by Tryon (*tom. cit.*, pl. 4, figs. 21, 26).

Murex pusio

1758, *Systema naturae*, ed. 10, p. 754, no. 490. 1767, *Systema naturae*, ed. 12, p. 1223, no. 561.

LOCALITY: "In M. Mediterraneo" (1758, 1767).

"M. testa ventricosa oblonga laevi, anfractibus rotundatis, spira striata, apertura laevi, cauda brevi . . . Testa magnitudine nucis Avellanae, glauco-caerulescens, fasciis longitudinalibus griseis undatis. Sutura simplex."

Two specimens of the *Pisania pusio* of authors are found in the Linnaean collection in London, marked for *Murex pusio* in the handwriting of Linnaeus, which confirms the

¹ Reeve's two figures do not precisely conform to the differences stated in his descriptions, each figure having certain features belonging to the other. The preponderance of characters in each, however, makes one almost suspect that Reeve had reversed his figures.

identification arrived at by all conchologists of at least the last hundred years. Had it not, however, been for our knowledge of the type it would seem impossible to have treated the Linnaean species as anything but a *species dubia*. First, the locality is inaccurate, as *pusio* is confined to the western Atlantic and is a fairly common species in its range—southwest Florida, the Florida Keys, and the West Indies. Second, the aperture is not “laevi,” but shows widely spaced striae just inside the lip, which become more numerous farther within the aperture by the intercalation of subsidiary striae. Third, and most important, the description contains a phrase that is completely inaccurate as applied to *pusio*. That species is described as having “fasciis longitudinalibus griseis undatis.” In as much as Linnaeus based his description on a shell possessed by him, and undoubtedly had before him when he wrote, it seems inconceivable that he could have used the phrase, as the color pattern of *pusio* is arranged spirally, consisting of a series of dark brown, squarish spots, or articulated spiral bands on a purplish brown background, the band of spots nearest the suture being the most brilliant and the least concealed by the dark epidermis. Encircling the midsection of the body whorl is a narrow whitish band decorated with arrow-shaped or chevron-shaped brown markings. The pattern is in no sense longitudinal.

Hanley (1855, p. 394) suggested a possible explanation of Linnaeus' peculiar error. He referred to Kiener's figure of *Fusus articulatus* (Lamarck, 1816), which shows *P. pusio* and which is a characteristic figure, and said: “The *Fusus articulatus* (Kiener, Coq. Viv. Fus., pl. 26, fig. 2) is marked for the shell in the Linnaean collection. The specified painting [by Linnaeus] corresponds so ill to that of ordinary adult examples, that, despite of the inscribed numerals and the harmony of the cited figure of Gualtier, one might have distrusted the identification, had not a second individual, an immature one, that precisely answers to the description, in which the imperfectly connected bands assume the appearance of longitudinal streaks, and the spiral throat-striae are not developed, been also marked for the same species.” The present writer has seen a few juvenile specimens of

pusio, but neither these nor the specimen mentioned by Hanley, as shown in the microfilm of the collection, bears out Hanley's statement to any appreciable degree. A figure of the young shell of *pusio* is found in Chemnitz (1780–1795, vol. 4, pl. 127, fig. 1220) next to a pair of figures of the adult shell (figs. 1218–1219). As the median white band is absent in the figure of the young shell and in the immature specimen in the Linnaean collection, and as the brown spots are arranged so that each is directly above or below the corresponding spot in the adjacent row, one might conceivably say that the pattern was both spiral and axial. This is hardly a convincing explanation of Linnaeus' phrase or of Hanley's suggestion.

Another phrase in the description is equivocal. “Spira striata” does not conform to the facts. There are no striations of the spire of *pusio*, although the first two (or three?) whorls are closely and finely nodose.

The synonymy includes a figure from Gualtieri (pl. 52, fig. I) which shows the articulated spiral color pattern of the *pusio* of authors rather than the axial pattern described by Linnaeus. It seems to have been based on a young shell. The figure from Buonanni (pl. 40) is neither the *pusio* described in the “Systema” nor the *pusio* of authors. In Buonanni's pertinent text (p. 118) he said that it was drawn from a shell from Syracuse decorated with longitudinal stripes colored yellowish to black. Hanley (*loc. cit.*) tentatively suggested that it was meant for *Columbella corniculata*, but the drawing has little resemblance to a *Columbella*.

The early history of the name *Murex pusio* in confusing, as might be expected. Chemnitz (1780–1795, vol. 4, p. 73) listed a *Buccinum pennatum*, the description of which strongly suggests *pusio* Linné. He referred this species to *Murex accinctus* Born (1778, p. 317, no fig.) which, as I suggest below, is Linnaeus' *pusio*. Chemnitz' figures, as well (*tom. cit.*, pl. 127, figs. 1218–1220), are clearly based on *pusio*. Figures 1218–1219 show a mature specimen with the color pattern associated with *pusio*, their only defect being that the sculpture of the lip and columella is very strongly indicated. The third figure (fig. 1220) is apparently based on a juvenile shell, as it pictures a shell slightly smaller than the

adult *pusio* which has lost its epidermis, thus showing the whitish median band much less distinctly. Both these figures and Chemnitz' description, with its words "zonis tessellatis" and "elegantissime condecoratum," should convince one that *pennatum* was indeed the *pusio* of Linnaeus. Chemnitz' "Murex pusio Linnaei," on the other hand (*tom. cit.*, p. 202), represents the first instance in which an author confused *pusio* with "le Nifat" of Adanson. Although Chemnitz referred his species to the *pusio* of the "Systema," he cited Adanson's shell as a reference along with the Gualtieri figure cited by Linnaeus and the *Murex accinctus* of Born, both of which are, I strongly suggest, based on *pusio*. Chemnitz' figure, however (*tom. cit.*, pl. 147, fig. 1357), is assuredly not *pusio* and was almost certainly based on Adanson's "Nifat," and his comments indicate that he was convinced that he was describing that shell. "Le Nifat" is a turreted shell with a clearly marked suture, a strongly striated base, and decorated with a spiral series of small brown spots, without, however, the light median band of *pusio*. It is described and figured in Adanson (1757, p. 52, pl. 4, G, 9, fig. 3). Fischer-Piette and his co-authors (1942, p. 162) identify it with *Clavatula nifat* which they attribute to Bruguière, 1789, who first validly used the specific name *nifat*, their identification being based not only on Adanson's description and figure but on a specimen labeled "Nifat" which they found in Adanson's "retained" collection (see Dodge, 1955, p. 53) and which they figure (pl. 2, figs. 10a, b).

Born also confused the two species. His *Murex accinctus* (1778, p. 317, no figure) which is referred to above, is very suggestive of *pusio* Linné, and I am of the opinion that it may be treated as a synonym. For his *pusio*, on the other hand (1780, p. 316, no figure), while he copied the Linnaean description and referred to the three good Chemnitz figures of *pusio* (figs. 1218–1220, *Buccinum pennatum*), he added a figure from Knorr (pt. 4, pl. 21, fig. 7) which resembles "Nifat" more than *pusio*. Several writers have insisted that his shell was "Nifat" and not *pusio*, but while I am tempted to agree I am too uncertain so to identify it.

Gmelin (1791, p. 3550) listed a *pusio*,

copied Linnaeus' main description verbatim, but changed the subdescription of the color pattern to "alba maculis fucis aut fulvis interdum seriatis," which is extremely equivocal language in which to describe the pattern either of "Nifat" or of *pusio*, although the omission of a mention of the median band makes one lean to the side of "Nifat." His synonymy, however, is almost entirely devoted to the latter. It includes Adanson's figure, the Chemnitz figure 1357, and figures from Rumphius (pl. 49, fig. E) and Lister (pl. 914, fig. 7), all of which I have no difficulty in referring to "Nifat." The only discordant figure is the Gualtieri figure (pl. 52, fig. I) properly cited by Linnaeus for *pusio*. His locality, "mari mediterraneo, et ad Africam littora," also suggests "Nifat" in part. We cannot be certain what species Gmelin had before him, if any, but I am unable to associate his *pusio* with the Linnaean species other than to treat it as a composite species.

Gmelin also listed a *Buccinum plumatum* (*tom. cit.*, p. 3494). This cannot be other than the true *pusio* Linné. All the figures he cited for it (Lister, pl. 822b, fig. 41; Knorr, pt. 4, pl. 21, fig. 6; and the good Chemnitz figs. 1218–1220) clearly tie it to *pusio*. Moreover, his American locality, "in insulis americae australi obversis," is added evidence of considerable weight. Gmelin's description of *B. plumatum* is even somewhat more accurate for *pusio* than that of Linnaeus and is here quoted: "B. testa oblonga angusta spadicea, cingulis obscurioribus, fauce angusta atra caeruleave; dentibus albis labroque intus striata." The words "dentibus albis" may represent merely an inaccurate way of describing the short white ridges just inside the lip of *pusio*, or, if these ridges are already covered by the words "labroque intus striata," they might refer to the single white tooth at the posterior end of the parietal area.

Bruguière (1789–1792, pt. 1, p. 282), as said above, had already described a *Buccinum nifat*, which was demonstrably the "Nifat" of Adanson. He mentioned the color pattern as arranged spirally. He cited for it only the figure of "Nifat" supplied by Chemnitz (fig. 1357) for "Murex pusio Linnaei" and noted that Schröter, Chemnitz, and Born had confused it with *pusio* Linné.

Dillwyn's treatment of *pusio* (1817, p. 728) was also confused. In referring it to the *pusio* of the twelfth edition of the "Systema," he did so only with a query, and referred to the *pusio* of Chemnitz (fig. 1357), of Gmelin (p. 3550), which were both "Nifat," as well as to Adanson's species itself. The disharmony of his synonymy is shown by the fact that he also cited Linnaeus' Gualtieri figure, which was probably based on the true *pusio*. In spite of this great preponderance of figures of "Nifat," both his main description and subdescription give us an almost perfect picture of *pusio*. An excerpt from the latter description is quoted: "The present shell, which all authors, except Bruguère, have considered to be the same, is about an inch and three-quarters long and three-quarters of an inch broad, with transverse rows of square spots corresponding with the above-mentioned figure of Gualter's, but Bonanni's has longitudinal stripes." Dillwyn's whole diagnosis leaves us with a feeling that his opinion as to the identity of his species was not at all crystallized. Dillwyn also listed *Buccinum plumatum* Gmelin (*op. cit.*, p. 624) and cited for it Born's *Murex accinctus* and Chemnitz' *Buccinum pennatum*, both of which I refer to *pusio* Linné. In summary, Dillwyn's two species were, first, his *pusio*, which carries a good description of *pusio* Linné, but which has a synonymy largely made up of figures of "Nifat," and, second, *Buccinum plumatum* Gmelin, which is *pusio* Linné as appears both from his description and his synonymy. His description of *plumatum* contains three particularly significant phrases: "pillar-lip with a tooth at the upper end," "the outer lip striated," and "with . . . a narrow reticulated white band which extends only to the second whirl." These three phrases alone are almost an adequate description of *pusio*. He correctly added: "Born's reference to Martini [error for Chemnitz] is erroneous, and this is certainly his *Murex accinctus*." It is, in brief, a very rewarding diagnosis.

Wood's *pusio* (1828, p. 127, pl. 27, fig. 97) also reveals a conflict. His synonymy is a mixture of *pusio* and "Nifat," but his figure, small though it is, seems to show *pusio*. Hanley, in his edition of Wood (1856, p. 132), attributed Wood's *pusio* to "Born (not Lin.)

p. 316." I have already noted that Born's *pusio* is uncertain.

Lamarck placed *pusio* in *Fusus* in his 1816 "Liste," and in his 1822 work (1822b, p. 132) changed the specific name to *articulatus*, a much more graphic name, as it suggests the spiral system of broken bands of color. He specifically mentioned in his French description "the white band on the middle of the last whorl and at the base of the penultimate." His Latin description also specifies a spiral arrangement: "lineis spadieco-fuscis articulatis cincta." Although he did not specifically refer to the *pusio* of the "Systema," he definitely avoided any confusion between *pusio* and "Nifat" by citing the latter separately (p. 131), correctly referring it to *Buccinum nifat* Bruguère, and to several good figures, including the Chemnitz figure 1357, and to "*Murex pusio* Gmelin . . . Non Linnaei." We have in Lamarck's *pusio* the first completely accurate diagnosis of the species. His figures in the "Tableau encyclopédique" (pl. 426, figs. 1a, b) are the most characteristic that had yet appeared, and show all the distinguishing features of the shell except that the parietal wall and the tooth at its posterior end are over-drawn.

Deshayes (1838-1845, vol. 9, p. 460) may have fallen into the same confusion that is evident in the works of Lamarck's predecessors. After referring to the *Fusus articulatus* of the "Tableau" figures and the good Chemnitz figures (1218-1220) he cited *Murex pusio* of the twelfth edition of the "Systema" with a query, and added in a footnote: "There is much reason to suppose that this is not at all the *Murex pusio* of Linné: accordingly I have only doubtfully cited it. . . . Deceived by the characters of the Linnaean species, Born transposed, under the name of *pusio*, the description and the synonymy of *Fusus Nifat*; and in this he was imitated by Gmelin and by Dillwyn. Also these authors gave the name *Buccinum plumatum* to a species which is perhaps the *pusio* of Linné. Instead of giving still another name to this shell, Lamarck should have preferred to use that of Gmelin which, by its priority should be selected. This species should then become *Fusus plumatus*." I quote this passage to show Deshayes' continued disinclination to recognize the identity of Linnaeus' *pusio*.

Deshayes seems to have been the last to have mistrusted the identity of *pusio* Linné, although he correctly followed Lamarck in distinguishing its substitute *Fusus articulatus* from the "Nifat" of Adanson. The original error, of course, lay with Linnaeus' description of the color pattern, but it is certain that the *pusio* of all modern authors is Linnaeus' species, as was first demonstrated by Hanley in his examination of the Linnaean collection in London.¹ Reeve (1843–1878, vol. 3, *Buccinum*, pl. 6, sp. 43) followed Hanley in all respects, and referred to the type in the Linnaean collection.

The species is now placed in the genus *Pisania* Bivona-Bernardi, 1832, and is the type species of the genus.

Its synonyms are recapitulated as follows: *Murex accinctus* Born, 1778; *Buccinum pennatum* Chemnitz, 1780; *Buccinum plumatum* Gmelin, 1791, and Dillwyn, 1817.

It was not described in the "Museum Ulricae."

In addition to the early figures mentioned above, figures of the species are given in Reeve (*tom. cit.*, *Buccinum*, pl. 6, fig. 43), Tryon (1879–1888, vol. 3, *Pisania*, pl. 71, figs. 188–189) and Abbott (1954b, pl. 13, fig. o).

Murex tulipa

1758, *Systema naturae*, ed. 10, p. 754, no. 489.

1767, *Systema naturae*, ed. 12, p. 1223, no. 562.

LOCALITY: Not given in either edition.

"M. testa ventricosa oblonga laevi, anfractibus rotundatis sutura geminata, apertura, uniplicata, cauda patule striata."

In spite of the lack of a locality, no question has ever been raised as to the identity of this distinctive western Atlantic species, the *Fasciolaria tulipa* of all modern systematists. The description is adequate and accurate except as to the possible question as to the word "uniplicata" applied to the columella. In reality, the columella bears two plaits, although the posterior one may not have been considered by Linnaeus a true plait, as it does not arise from the body of the columella, but is an extension of the edge of the canal. This same question has already been raised

in the discussion of the *Mitra* species (Dodge, 1955, p. 54). Linnaeus' type, marked for the species in his handwriting, is present in the Linnaean collection in London.

With few exceptions, all 17 figures in the synonymy are unquestionably based on *tulipa* and have repeatedly been cited for it. Two of the Seba figures (pl. 57, figs. 25, 26) were obviously based on Linnaeus' *Voluta lapponica* (*Haruplina lapponica*), a species vastly different from *tulipa* in appearance, and were, in fact, cited for that species by Linnaeus. It is strange that such a generally excellent synonymy should have included these discordant figures. The figure from Gualtieri (pl. 46, smaller fig. A) and one of the nine remaining Seba figures (pl. 71, fig. 31) were possibly based on *Pyrula hunteria* Perry, 1811.² This is a less heinous error, as *hunteria* is very close to *tulipa*, and the difference between the two species, at least in shape, and in a lesser degree in color pattern, are not always immediately apparent. Linnaeus may be forgiven for confusing them. In brief, *hunteria* differs from *tulipa* in the following details: the spiral lines of color are farther apart, being only five or six in number, and are almost always continuous, whereas these lines in *tulipa* are much more numerous and, consequently, more close-set, and are always interrupted, appearing as a series of short dashes or as dots; the surface is smooth, not even showing lines of growth; the shell is generally smaller, seldom exceeding 4 inches in height, whereas *tulipa* often reaches a height of 10 inches. The most important diagnostic character is its simple suture, in contrast to *tulipa* which shows two to 10 deep, crowded, spiral striae just below the suture, the cords between the striae being wrinkled or fimbriate. Another distinguishing character, which has been noted by only a few writers, is the presence of a horizontal ridge of heavy white callus at the posterior end of the parietal area, which is lacking in *tulipa*. The color variations of *tulipa* are so wide that in most of the older

¹ This collection contains three specimens of *pusio*, two adult and one a juvenile shell, not two only as mentioned by Hanley.

² Perry's *hunteria* is an earlier name for *Fasciolaria distans* Lamarck, 1822, which has been consistently used by conchologists until recently. It is unfortunate that the specific name *distans*, so familiar to all American collectors, must be dropped, but *hunteria* was validly proposed and has 11 years' priority.

figures it is difficult to distinguish the two species, but the words "sutura geminata," added to the description of *tulipa* in the twelfth edition, are usually reflected in the better figures. The remainder of the figures in the synonymy are adequately characteristic of *tulipa* and in particular the Lister figure cited (pl. 911), and its juxtaposition to plate 910 (*hunteria*), clearly demonstrate the difference in the sutural sculpture.¹ Lamarck's description of the two species (1822b, pp. 118–119) states most of these distinguishing characters and should be read.

Tryon (1879–1888, vol. 3, p. 74) called attention to a rugose form and recalled that Dunker had intended at one time to describe it as *F. scheepmakeri*, but finally included it in his "Novitates" as a variety of *tulipa*. This form is fairly common on the Gulf coast of Florida and may represent the persistence of juvenile characters, as in many young specimens of *tulipa*, especially the pinkish and mahogany-colored individuals, the basal striations are continued over the entire shell, although they usually disappear in the adult shell. A variety is occasionally found in the Bahama Islands in which the columella, in addition to the one (or two) large plaits, is supplied with a series of white spiral ridges, which are then continuations of the basal ridges seen on the dorsum of this species, as well as with a subangulate shoulder in contrast to the evenly rounded shoulder of the typical shell.

The species has remained in *Fasciolaria* ever since the erection of that genus by Lamarck, but even after Lamarck's clear separation of *distans* opinion was not unanimous as to the relationship of the two forms. Gabb (1874, p. 354) concluded that *tulipa* and *distans*, as well as the fossil species *semistriata* Sowerby, 1850, and *rhomboidea*

Rogers, 1839, were one and the same species. Tryon (*loc. cit.*) and a few other writers have followed Gabb's opinion, which has been occasionally used today. In 1890 Dall (1890–1903, pt. 1, pp. 101–102) pointed out Gabb's error and showed that, while *tulipa* and *distans* had a common ancestor, the divergence between them probably developed in the Miocene, "since we find both types characteristically developed in the southern Pliocene of the United States."²

Fasciolaria tulipa is found Recent from North Carolina to the southern half of Florida and the West Indies. Its congener *hunteria* Perry has the same northern limit of range, but is not found in the West Indies. It is, however, common on the west coast of Florida and in the Gulf states.

The present species is the type species of *Fasciolaria* Lamarck, 1799, by monotypy.

The earliest post-Linnaean figures are those of Martini (1769–1777, vol. 4, pl. 136, figs. 1286–1287, the latter figure being of the mahogany-colored form, and pl. 137, figs. 1288–1291, showing both the adult and juvenile shells). These figures can hardly be improved upon. See also Reeve (1843–1878, vol. 4, *Fasciolaria*, pl. 4, sp. 9) and Sowerby (1847–1887, vol. 5, pl. 425, figs. 12–14). The figure in the "Tableau encyclopédique" (pl. 431, fig. 2) is accurate as to color pattern but shows the whorls of the spire as somewhat too ventricose.

The species was not described in the "Museum Ulricae."

Murex clathratus

1767, *Systema naturae*, ed. 12, p. 1223, no. 563.

LOCALITY: "In Islandiae Mari" (1767).

"M. testa oblonga caudata, plicis longitudinalibus submembranaceis sulcata . . . Testa magnitudine et facie Turbinis clathri, sed leviter caudata. Plicis plurimae, longitudinales, erectae, compressae, superne inclinatae."

² Dall speaks of *tulipa* as rare in the Caloosahatchie beds (Pliocene) in Florida, and, although he mentions *distans* as occurring in the Pliocene and post-Pliocene of North Carolina, it is not found in Florida earlier than the post-Pliocene. This confirms the present writer's own observations. I have collected a single specimen of an undoubted *tulipa* from the Caloosahatchie, but the earliest specimens of *distans* were found in the Pleistocene of Pinellas County, Florida, where it is reasonably common.

¹ Wilkins (1953, p. 30), in his admirable study of the Hans Sloane collection in the British Museum, comments as follows on the fact that the early writers were not certain as to the distinction between the two forms above discussed: "Lister, Petiver and Sloane had each noticed certain differences between the several examples of this shell known to them, Lister going so far as to figure a smooth, pale form with widely spaced lines separately [pl. 910], but it was not until 1822 that Lamarck confirmed the suspicions of the early writers, and finally separated the shell now known as *Fasciolaria distans* from its congener *F. tulipa* (Linné)."

This description, together with the boreal locality, is sufficient to identify the species, although the language used is not sufficiently detailed to separate the European form of the species clearly from the American form. In fact, it might more reasonably be applied to the American subspecies *scalariformis*. Both the European and the American forms belong in the genus *Boreotrophon* Fischer, 1884.¹ The specific name seems peculiarly inapt. The word "clathrus" means a grid or trellis. In *B. clathratus* the sculpture is predominantly axial, the spiral sculpture being so fine that it is almost invisible, even in the fresh specimens, without the aid of a lens, especially in immature specimens. Linnaeus' only other use of the word for a mollusk was *Turbo clathrus*, an *Epitonium*, a case in which it is almost equally inappropriate.

The synonymy consists of a single figure (Klein, pl. 3, fig. 67), which shows a shell resembling an *Epitonium* species but specifically unidentifiable. Hanley (1855, p. 305) said of this figure: "Although the cited figure of Klein is not so unlike it, and looks plicated, it was only a distorted copy of Linter, pl. 926, f. 19, which is wholly destitute of folds." It is difficult to determine whether the sinuous lines in the Lister figure are meant for axial ribs or mere lines of color.

The species was not immediately recognized. Neither Martini, Chemnitz, nor Born referred to it. Gmelin (1791, p. 3551) copied Linnaeus' main description, made unimportant changes in the wording of the subdescription, and cited, in addition to the Klein figure, the distorted Lister drawing above referred to. It is not possible to say whether or not Gmelin had seen the species. We may assume that he was not familiar with Linnaeus' collection, in which it is represented by a documented specimen, as the collection was already in London in 1784 and in the possession of its purchaser, James (later Sir James) Smith. It is not known when Gmelin commenced the so-called thirteenth edition of the "Systema," which was not published until 1791. Gmelin also listed a *Murex*

lyratus (p. 3531) a species said to come from the "sinum R. Georgii," which probably refers to King George Sound on the western coast of Australia.² Its locality is so remote from that of *clathratus* that it need not be considered, and is only mentioned because Tryon (p. 178, below) referred to it as being equal to the large American form of *clathratus*.

Donovan (1799-1803, vol. 5, pl. 169, three figs.) published excellent figures of a *Murex bamffius*, a shell that he believed to be undescribed and that had been collected on the northern coast of Scotland. One of the figures is extremely small, only a little over a quarter of an inch in height, which Donovan admitted was a young shell. It is almost exactly the same as Binney's figure of the *American clathratus*, which is referred to below. The two larger figures seem to be identical except for a slight difference in the sinuosity of their ribs. They are about 1½ inches in height, which is somewhat larger than the *American clathratus*. That these figures represent the European *clathratus* was impliedly demonstrated by Hanley (*loc. cit.*) who found in the Linnaean collection in London a specimen of "*Fusus Bamffius* (Donov. Brit. Shells, pl. 169, f. 1)" in a box marked for *M. clathratus*, which "exactly answers to the description and recorded locality in the 'Systema.'" While the specimen itself was not marked, no other specimen from northern waters in the collection so closely conforms to the description, and we therefore accept it as at least the ostensible type of *clathratus*.

Dillwyn's treatment of *clathratus* (1817, p. 730) is not helpful. He continued the citation of the questionable Lister and Klein figures and added, in referring to the *clathratus* of Gmelin, a citation of Gmelin's *Buccinum muricinum* (p. 2503), partly, I imagine, because Gmelin cited the Lister figure for that species. Gmelin's description of *muricinum*, however, contains details that suggest *M. clathratus*, and he added a subdescription reading "murici clathrato affine, an hujus tribus?" One word in the description of *muri-*

¹ *Boreotrophon* was erected by Fischer as a subgenus of *Trophon* Montfort, 1810, with *T. (B.) clathratus* as the subgenotype, but it is today generally given generic rank.

² Dillwyn (1817, p. 696) located *lyratus* in "King George's Bay in New Zealand," and Deshayes (1838-1845, vol. 9, p. 479) gave its locality as "the seas of New Holland, in the bay of King George."

cinum, "reticulata," is even more repugnant to *clathratus* than the specific name of the latter, and the phrases "apertura crenata" and "columella rugosa" also point away from *clathratus*. Dillwyn seems to have merely copied the Linnaean description, and added synonyms of his own. I question whether he was familiar with the species *clathratus*, as he began his subdescription, as he so often did, with the words: "Linnaeus says this shell. . . ." He listed *Murex bamfflus* separately (p. 742), with no reference to *clathratus*, citing merely references to Donovan, and to Maton and Rackett and Montagu's listings of *bamfflus*.

Reeve (1843-1878, vol. 4, *Fusus*, pl. 19, sp. 76) referred *clathratus* to the *Tritonium clathratum* of Müller's "Zoologica Danica," without mentioning the "Systema," but his figure is unquestionably the European *clathratus* of Linnaeus.

Binney (1870, p. 377), in the second edition of Gould's "Invertebrata of Massachusetts," described the western Atlantic form of the species as "*Trophon clathratus* Lin.," referring to *M. bamfflus* Donovan and the other English writers and *Fusus bamfflus* of the Americans Gould and De Kay. His figure (fig. 643) is of a shell only 13 mm. in height, described as "Small, light brownish, composed of six rounded whorls . . . suture deeply defined . . . with from fifteen to twenty sharp, raised folds." He reported it as "occasionally found in the stomachs of fishes. Eastport . . . Nova Scotia. . ." As the American form of this species averages slightly larger than the European, ranging from 1½ to 2 inches in height, it is obvious that Binney figured a young shell.

Binney also described *Trophon scalariformis* Gould (1840, p. 197; 1841, p. 288, fig. 20). Binney's figure (1870, p. 378, fig. 644) shows a shell about 4.5 cm. in height, with fewer ribs but sharper and more elevated than those of *clathratus*, and with a more deeply excavated suture. No spiral sculpture is seen in his figure of either species.

Bartsch (1922, p. 87) noted that "The size, shape and sculpture differentiate the America from the European form. The Western Atlantic members will have to be called *Trophon scalariformis* Gould, Invert. Mass., p. 378, 1870." Certainly *scalariformis* differs mate-

rially from the typical *clathratus* from either region, but it is difficult for the writer to find readily discernible differences between the typical *clathratus* from eastern and western waters. At the present time it seems to be generally agreed that *scalariformis* is a good subspecies of the western *clathratus*. I also treat *M. bamfflus* Donovan as an exact synonym of the typical *clathratus* Linné.

Tryon's treatment of this species is difficult to understand. He described and figured it (1879-1888, vol. 2, pp. 140-141, pl. 31, figs. 312, 314, 316-317, 322, 325) but divided it in a manner which justifies the quotation of his entire comment: "Most authors separate this into two species, distinguished by size and number of ribs. *T. truncatus* Ström (fig. 325) is about .6 in. long with 20 ribs on the body whorl; whilst *T. clathratus* Linné (fig. 312) has fourteen ribs the same size, and grows, moreover, to much greater dimensions. I have no doubt that the British specimens are all small and correspond uniformly to the description of *T. truncatus*, but specimens from Arctic American localities vary all the way in size from the *T. clathratus* or large form (equivalent to *T. lyratus* Lam. fig. 312, and *T. scalariformis* Gld., fig. 314) to the small shells corresponding to *T. truncatus*; and the ribs vary greatly in number, not only in different species, but even on different whorls of the same species. *Murex Bamfflus* of Montagu is a synonym of the English type. A scalariform variety, with excavated sutures, shouldered whorls, coronated with spines more or less, has been called *T. gunneri* by Lovén, and *T. multicosatus* (fig. 316) by Eschscholtz. Provisionally I allow the *T. truncatus* to stand as a variety. Spitzbergen, Norway, Great Britain, Iceland, Arctic America south to Massachusetts, Newfoundland, West coast of America to Vancouver Island, Japan."

It is difficult to coordinate Tryon's remarks with the comparatively small series of this variable species available to the present writer. I do not agree that the British specimens are all small and correspond to *T. truncatus*. The British specimens examined are almost, if not quite, as large as the western Atlantic *clathratus*, exclusive of the subspecies *scalariformis* Gould. I have not seen specimens of the typical *clathratus* that could be com-

pared with the Indian Ocean *lyratus*.

The most recent comments on the status of *Boreotrophon* Fischer are by Keen and Woodring (Conchological Club of Southern California, 1945b) and by Abbott (1954, p. 206), all of whom accept it as a good genus. Woodring (Conchological Club of Southern California, 1945b) also gives generic rank to *Trophonopsis* Bucquoy, Dautzenberg, and Dollfus, 1882, of which the type species is *Murex muricatus* Montagu, 1803, by original designation.

Murex clathratus was not described in the "Museum Ulricae."

Murex dolarium¹

1767, *Systema naturae*, ed. 12, p. 1223, no. 564.
LOCALITY: "In Oceano" (1767).

"M. testa patulo-caudata ovata, anfractibus cingulis aliquot elevatis obtusis . . . Testa juglandis magnitudine, cornea, ovata, utrinque magis attenuata. Cingula maxime elevata, obtusa, plura, ventrem cingunt, inter quae testa substriata est, et 2 cingunt spiram anfractus. Apertura ovata, antice subtransversa, excavata ad marginem exteriorem secundum cingula: Postice attenuata in canalem vix manifestum, vixque emarginatum. Columella perforata."

This elaborate and detailed description cannot be read as applying to any other of this group of species than the *dolarium* of all authors. The synonymy consists of a single figure (Buonanni, p. 347). This figure somewhat resembles *dolarium*, but its anterior canal is shown as much too long. Hanley (1855, p. 305) said of it: "It was probably intended for it [*dolarium*], yet the tail is delineated as too produced for an adult example, and the magnitude as too great for an immature one." The figure may have been based on a specimen of *M. cutaceus* Linné. Somewhat better figures, and recognizable for *dolarium*, are found in Seba (pl. 52, figs. 10–

11), and it is strange that Linnaeus did not cite them, as in the twelfth edition he constantly referred to the Seba figures.²

The identification based on the description is fully confirmed by the presence of a properly documented specimen of the *dolarium* of all authors in the Linnaean collection in London.

Lamarck (1822b, p. 189), who placed the species in *Triton*, cited the Buonanni figure with a query but used the Seba figures omitted by Linnaeus. He inadvertently called attention to an error in the Explanation of the Plates, where *dolarium* is listed as "*Triton cutaceum*. T. *dolarium*, Lamk. VII, 189." The figures in the "Tableau encyclopédique" referred to in the "Liste" (pl. 422, figs. 1a, b) represent *dolarium* and clearly show the flattened spire. The latter species is also represented in another pair of figures (pl. 420, figs. 1a, b) under the name *dolarium* alone, but the latter figures do not show that shell. They picture a shell sculptured as in *dolarium*, but with a high and turreted spire, which may possibly have been based on a specimen of *cutaceum*. None of the "Tableau" figures are satisfactory for either species, which have often been confused and are sometimes mislabeled today in unrevised collections. The absence of varices in *dolarium* is, however, sufficient to distinguish them.

The present species is placed in the genus *Cabestana* Röding, 1798. In the most recent treatment of the Cymatiidae (Bayer, 1933, p. 43) *Cabestana* is used as a subgenus of *Cymatium* Röding, 1798.

The species is characteristically figured by Reeve (1843–1878, vol. 2, *Triton*, pl. 14, sp. 56) and by Tryon (1879–1888, vol. 3, pl. 9, fig. 60).

¹ The name *dolarium* is evidently meant for *dolarium*, "a place where casks are kept, from the Latin 'dolum,' 'a cask or earthenware jar.' There is no Latin word 'dolarium.' As 'an error of transcription, a lapsus calami or a typographical error,' in the words of Article 19 of the Code of Zoological Nomenclature, seems to be evident, there is no justification for the preservation of the original orthography. Linnaeus detected his error as early as 1771, as in his description of *Buccinum cingulatum* in the "Mantissa" (p. 550) he used the phrase "Murici Dolario proxima." The name is generally spelled *dolarium* today.

² Hanley (*loc. cit.* in text), who referred to these figures as figures 20–21, said: "He [Linnaeus] did not possess that costly publication." I am unable to substantiate this statement. In the introduction to his 1855 work, Hanley (p. 6) said: "Hence, it not infrequently happens that he has quoted figures in 1758 (ed. 10), when his library was less richly stored, which eight years afterwards (ed. 12), with a wider access to the costly iconographies (Seba, Regenfuss, etc.) of his day, he has either repudiated or has virtually nullified by subsequent additions" (italics mine). This statement may or may not be consistent with his statement that Linnaeus did not own Seba's work. In any case he had access to it, and his omission of the good Seba figures of *dolarium* is unexplainable.

It was not described in the "Museum Ulricaë."

Murex corneus

1758, *Systema naturae*, ed. 10, p. 754, no. 491.

1767, *Systema naturae*, ed. 12, p. 1224, no. 565.

LOCALITY: "In Europa australiore" (1758, 1767).

"M. testa oblonga rudi, anfractuum marginibus complanatis, apice tuberculoso, apertura edentula, cauda adscendente . . . Testa digito brevior, colore cornu, laevis, sed non glabra, opaca."

The entire diagnosis of this species, description, references, and locality, is identical in the tenth and twelfth editions of the "Systema."

The entire synonymy is erroneous. The figure from Linnaeus' "Wästgota Resa" (1747, pl. 5, fig. 6) shows a fossil shell which is not *corneus*, and which Hanley (1855, p. 306) assigned tentatively to *Murex clathratus* Linné, a *Boreotrophon*. The figure from Lister's "Historiae animalium Angliae" (1678, pl. 3, fig. 4) is probably based on *Fusus islandicus* (Gmelin, 1791), var. *gracilis* Da Costa, 1778. The Gualtieri figure (pl. 46, fig. F) shows a *Cerithium* species. With the exception of the Lister figure, which, as noted below, shows a species often confused with *corneus*, one wonders how Linnaeus could have selected such a discordant synonymy. Many of Linnaeus' followers disregarded the "Wästgota" and Gualtieri figures and accepted the figure from Lister as evidence of Linnaeus' intention, but at the same time they must have completely disregarded the description. The following words in the description repel the idea that *islandicus* was the species intended: "rudi," "anfractuum marginibus complanatis," "apice tuberculoso," "cauda adscendente," and "colore cornu."

The species has not only been confused with *Murex islandicus* Gmelin (*Colus islandicus*) but with *M. lignarius* Linné (*Fasciolaria tarentina* Lamarck, 1822). The descriptions of the three species can hardly have been responsible for the confusion, as they are all reasonably characteristic and describe three distinct species. The various figures, however, and particularly those in Chemnitz and in the "Tableau encyclopédique," are equivocal. The result has been an early ac-

ceptance of a "*corneus* of authors," which is not *corneus* Linné.

Chemnitz (1780-1795, vol. 4, p. 159, pl. 141, figs. 1312-1313) first described "*Fusus islandicus*," locating the species in Iceland. The figures show a white shell (fig. 1312) and one apparently covered with a heavy dark brown epidermis (fig. 1313). They are encircled with close-set, narrow, incised, spiral striae, and their outline more resembles the *Neptunea* species than the shape of *corneus*. They are shown as much larger than any specimen of *corneus* the writer has examined. They do not conform to the description of *corneus* in any of the several details mentioned above.

Gmelin (1791, p. 3552) listed *M. corneus*, using Linnaeus' main description and a paraphrase of his subdescription. He cited only the "Wästgota" figure and the figure from Gualtieri, both of which are incorrect for *corneus*. The subdescription, moreover, adds details that do not apply to *corneus*: "pellucida" and "transversim striata," and the first of these does not even describe *islandicus*. On page 3555 of the same work Gmelin listed *M. islandicus* with reasonable accuracy and cited only Chemnitz' figures of *islandicus*. He, however, used the phrase "apice papilloso," which he apparently borrowed from Linnaeus' "apice tuberculoso" and which is here inappropriate. His treatment of the two names seems to be sufficiently equivocal to indicate that he was himself confused as to both species.

While Chemnitz did not confuse the two, as his diagnosis of *islandicus* is entirely sound and he did not even list *corneus*, possibly because he could not identify it, and while Gmelin's treatment is merely somewhat equivocal, the majority of the writers of the next half-century, including Pennant, Montagu, Dillwyn, Wood, Deshayes, Reeve, and the American Gould and his editor Binney, all treated *islandicus* as being the *corneus* of Linnaeus. Say (1830-1834, pt. 7, pages unnumbered) gave the Linnaean name to the American form of *islandicus*, a shell later called *stimpsoni*¹ by Mörch (1867), who re-

¹ The American species should now be cited as *Colus stimpsoni stimpsoni*, as two subspecies, *brevis* and *liratus*, were described by Verrill after Mörch's original erection of the name.

tained the name *islandicus* for the European form.

In 1816 Lamarck included *Fusus islandicus* in the "Liste" (p. 7) and in 1822 (1822b, p. 126) he described it in language that cannot be applied to *corneus* Linné, as he used the words "albida," "transversim striata," and "cauda breviuscula, subrecurva," and omitted any reference to the tuberculate apex and the feature described by Linnaeus as "anfractuum marginibus complanatis," all of which are diagnostic for *corneus*. Indeed, like Chemnitz, he seemed willing to consider *corneus* as a *species dubia*, as he did not refer to it even in synonymy. His synonymy of *islandicus* was entirely correct, consisting of the good Chemnitz figures, a reference to Gmelin's *islandicus*, and an excellent figure from the "Tableau encyclopédique" (pl. 429, fig. 2).

Although Lamarck had properly isolated *islandicus*, Deshayes (1838–1845, vol. 9, p. 450, footnote) reverted to the incorrect view of the earlier writers mentioned above and definitely united *corneus* with *islandicus* Chemnitz, and his categorical language undoubtedly crystallized the idea that the two were identical in the minds of many of his followers. He said: "Although Linné's short description of *Murex corneus* is incomplete, nevertheless one may there recognize the species to which Lamarck later gave the name of *Fusus islandicus*. It is because of the recognized identity of the two shells that we propose to unite the entire synonymy under the name of *Fusus corneus*."

Hanley (1855, pp. 305–306), as a result of finding the holotype of *corneus* in the Linnaean collection in London marked for *Murex corneus*, was able to prove beyond question that the Linnaean species was the shell known to us as *corneus* and that it was unrelated to the *islandicus* affinity. He recognized the complete inaccuracy of Linnaeus' synonymy, and noted that a figure from Buonanni (pl. 72), an adequate figure of *corneus*, had been passed over. One detail of Hanley's discussion should be noted. He described the marked specimen in the Linnaean collection as "the *Fusus lignarius* of authors (Kiener, Coq. Viv. Fus. pl. 22, f. 1)." The shell figured in the "Tableau encyclopédique" (pl. 424, fig. 6) called *Fusus lignarius* in the explanation of

the plates and in Lamarck's seventh volume clearly represents the true *corneus* of Linnaeus, as does the Kiener figure cited by Hanley, which Kiener also called *lignarius* Lamarck. This confusion between *corneus* and *lignarius* had also been made by Reeve in 1847 (1843–1878, vol. 4, *Fusus*, pl. 2, sp. 5).

Reeve (*tom. cit.*, pl. 11, sp. 43a, b) also carried on the confusion between *corneus* and *islandicus*, as he listed *Murex islandicus* Gmelin and *Fusus islandicus* Lamarck as synonyms of *corneus* Linné, and his figures are clearly *islandicus*. It should be noted that in 1847 Reeve did not have the advantage of reading Hanley's review of the Linnaean collection, a work to which he often referred in his later volumes after 1855. Reeve's description of *corneus* covers *islandicus*, as it contains the phrase "undique spiraliter striatis," and, in his English description, "dull white, covered with a horny epidermis."

Sowerby, in 1880 (1847–1887, vol. 4, p. 83), restated the correct view, saying: "The above name [*corneus*], through a mistake in one of the references,¹ has also been applied to the British *F. islandicus*. The Linnaean name *Murex lignarius* belongs to *Fasciolaria tarentina* of Lamarck." This comment by Sowerby constitutes the first categorical separation of the three names, *corneus* Linné, *lignarius* Linné, and *islandicus* Chemnitz and Gmelin.

There has been little confusion between *corneus* and *islandicus* since Reeve, and the species have been properly separated not only by their greatly differing characters but by their localities. The range of the typical *islandicus* is a northern one, as the species is rare even on the northern coasts of Great Britain, while the home of *corneus* is primarily the Mediterranean Sea. Thiele (1931, p. 312) extends the range of the latter to South Africa, but the present writer has seen no other records from that locality or, indeed, from any part of the west African coast.

Murex corneus is accepted at the present time as belonging to the genus *Euthria* Gray, 1850, of which it is the type species. In addition to its long use in *Fusus*, it was placed

¹ Sowerby's mention of "a mistake in one of the references" refers to Linnaeus' citation of the Lister figure of the British form of *islandicus* (*gracilis* Da Costa) in the synonymy of *corneus*.

by many writers in the pre-Linnaean genus *Sipho* Klein, 1753, and even as late as the 1880's Tryon used that genus. Thiele (*op. cit.*, p. 307) and a few others have cited *Sipho* as of "(Klein 1753) Bruguière 1792," but this attribution of the genus to Bruguière is indefensible, as the name was used by him only in the course of his article "Conchology" in the first volume of the "Histoire naturelle des vers," in discussing the "Méthode de Klein," and was not accepted by him as a good genus.

Good figures of *Euthria cornea* are few. In addition to the figure in the "Tableau encyclopédique" (pl. 424, fig. 6), which Lamarck called *Fusus lignarius*, the species is figured by Reeve (*tom. cit.*, pl. 11, sp. 5) also as *lignarius*. The best figures of *islandicus* are the original colored figures of the American *stimpsoni* by Thomas Say (*op. cit.*, pt. 7, pl. 29), called by him *Fusus corneus*.

Murex corneus was not described in the "Museum Ulricae."

Murex lignarius

1758, *Systema naturae*, ed. 10, p. 755, no. 492 (as *lignarius*).

1767, *Systema naturae*, ed. 12, p. 1224, no. 566.

LOCALITY: "In Europa australi" (1758, 1767).

"M. testa oblonga rudi, anfractibus obtuse nodosis, apertura edentula, cauda brevi rectiuscula . . . Testa vix digiti longitudine; anfractus laeves, rudes, simplici serie tuberibus obtusis."

The description, references, and locality were identical in the tenth and twelfth editions of the "*Systema naturae*." It is difficult to understand how the species came to be confused with the preceding species, *M. corneus*. Nevertheless, as noted above under *corneus* (p. 181), Lamarck, Kiener, and Reeve, to mention only the most important names, all confused the two either by placing one in the synonymy of the other or by figuring one for the other. We have seen that the synonymy of *corneus* was wholly incorrect and unresponsive to the description, but for *lignarius* two of the three figures cited (Buonanni, pl. 32, and Gualtieri, pl. 52, fig. S) may be taken for the species described, although the latter reference was cited by Linnaeus with a query. Buonanni's figure is excellent and that from Gualtieri, although less clear, had been probably based on *lignarius*. The figure from Seba (pl. 52, fig. 4)

was ill chosen. It shows a series of marked spiral striations, whereas *lignarius* is smooth.

The details of the description itself should prevent any confusion between the two species. The *lignarius* of all authors, a fairly common shell in the Mediterranean Sea, is a smaller shell than *corneus*, and is significantly distinguished from it by a series of wide, triangular, and sharp spines immediately above the suture. This feature is seen only in fresh specimens. It is apparent that the shell quickly becomes water-worn or beach-worn, as the sharpness of the spines is much reduced in the majority of specimens seen in collections. Linnaeus, in using the phrase "anfractibus obtuse nodosis," was describing a worn specimen, and the two specimens of this shell in the Linnaean collection in London show much worn and flattened nodes. The phrases "cauda adscendente" for *corneus* and "cauda brevi rectiuscula" for *lignarius* are both correctly descriptive and supply another reason why the two should not have been confused.¹

Neither Martini nor Chemnitz listed *lignarius* nor mentioned it in synonymy. Born (1780, p. 318) described, but did not figure, a shell under the name of *M. lignarius* which is surely not the Linnaean species, and which is apparently neither a *Fusus* nor a *Fasciolaria*, in both of which genera *lignarius* has from time to time been placed. Born's description suggests a *Turbinella*. It is described as having three oblique plications on the columella, and Deshayes (1838-1845, vol. 9, p. 455, footnote) proposed the name *Turbinella knorri* for it, which he based on a figure from Knorr (pt. 6, pl. 20, fig. 7), a figure that had previously been unidentified.

Gmelin did no more than copy the Linnaean description, but his synonymy was much altered. He cited the Buonanni figure, this time with a query, omitted the Gualtieri figure, included the figure from Seba, and added a figure from Knorr (pt. 6, pl. 26, fig. 5), which I have not seen cited for *lignarius* by any later writer.

Dillwyn (1817, p. 734) supplied a good de-

¹ A possible explanation of the confusion between *corneus* and *lignarius* is suggested by Pallary (1900, p. 268), who said: "In the young shell, *F. lignaria* may be confused with *Euthria cornea* which is more common and is also a littoral species, but the animal of *cornea* is yellow, while that of *Fasciolaria* is vivid red."

scription of *lignarius*, citing the species both as of Linnaeus and Gmelin, and in his sub-description mentioned the Knorr figure (pt. 6, pl. 26, fig. 5) which had been added to the synonymy by Gmelin, saying that it "is more like *Voluta turrita* (Gmelin, p. 3456)." He also commented on Born's treatment of *lignarius*: "Born has described *M. nassa* under this name." Whatever Born's *lignarius* may be, it is not Gmelin's *M. nassa*. Dillwyn's next species is *M. nassa* Gmelin, and he synonymized with it *M. lignarius* Born and the figure from Knorr (pt. 6, pl. 20, fig. 7) which Deshayes (*tom. cit.*, p. 391) later used for his *Turbinella knorri*, as mentioned above. All the names and figures mentioned by Dillwyn are of a shell with a plicated columella which *lignarius* lacks.

The description of Lamarck's *lignarius* (1822b, pp. 129-130) is a mixture of *lignarius* and *corneus* Linné. He used the expression "anfractibus superne unica serie nodulosis" which applies to *lignarius*, but his figure from the "Tableau encyclopédique" is the best figure of *corneus* that had been published. It shows neither spines nor nodes. As said under *corneus* (p. 181, above), he did not list *corneus* or mention it in synonymy. His *Fasciolaria tarentina* (1822b, p. 121) has generally been referred to *lignarius* Linné, but his description of *tarentina* is not convincing. He cited no references. Deshayes (1838-1845, vol. 9, p. 435) cited several figures for *tarentina*, one pair of which from Schubert and Wagner (1829, pl. 227, figs. 4027-4028) does resemble *lignarius*. Schubert and Wagner (*op. cit.*, pp. 105-106) called then *Fasciolaria tuberculata*, but referred the species to Lamarck's *tarentina*. They also called attention to a supposed error in Lamarck's description of *tarentina*: "It is this *Fasciolaria* which is always obliquely striate on the last whorl, and not entirely smooth, as Lamarck declares." Note that it was in Linnaeus' description of *lignarius* the phrase "anfractus laeves" was used.

It is accepted today that Lamarck's *Fasciolaria tarentina* was, in fact, the *M. lignarius* of the "Systema," but the writers up to Philippi failed to recognize this identification. Chiaje (1826-1827, p. xvii, pl. 49, figs. 3-4), in the posthumous third volume of Poli's "Testacea utriusque Siciliae," Payraudau (1826, p. 146, pl. 7, fig. 16) in his work

on the mollusks of Corsica, and others listed *F. tarentina* with no mention of Linnaeus' *lignarius*. Their figures, however, clearly show *lignarius* as originally described and shown in the majority of Linnaeus' figures.

Philippi (1836, 1844, vol. 1, p. 202) was the first to assert the identification with *lignarius* Linné. While Reeve in 1847 (1843-1878, vol. 4, *Fasciolaria*, pl. 5, sp. 13) listed the species as *F. lignaria* Linné, he accepted its identity with *F. tarentina* only "according to Philippi." The discovery by Hanley (1855, p. 306) of a specimen of *tarentina* in the Linnaean collection in London, marked for *M. lignarius* in Linnaeus' handwriting, confirmed the correctness of Philippi's conclusion, arrived at without the benefit of having examined Linnaeus' collection. Later writers have synonymized *tarentina* with the Linnaean species and have restored the Linnaean specific name.¹ Occasional instances are, however, found in which the species is still called *F. tarentina* with no reference to *lignarius* Linné. (See Dutertre, 1936, p. 299.)

The species is retained in the genus *Fasciolaria* Lamarck, 1799. Thiele (1931, p. 328), in his sectional divisions of the genus, placed *lignaria* in section *Tarantinaea* Monterosato, 1917. In addition to *F. tarentina*, *Fusus conulus* Risso (1826, vol. 4, p. 207) has been cited as a synonym of *lignaria*, but I would accept this with some doubt.

The best figure of the species is that in Kiener (1834-1850, vol. 6, *Fasciolaria*, pl. 8, fig. 2).

It was not described in the "Museum Ulricae."²

Murex trapezium

1758, *Systema naturae*, ed. 10, p. 755, no. 493.

1767, *Systema naturae*, ed. 12, p. 1124, no. 567.

LOCALITY: "Ad Amboinam" (1758, 1767).

"M. testa oblonga obtuse angulata, anfractibus subnodosis, apertura dentata, cauda brevior recta . . . Lineae geminae semper, fuscae, integrae."

¹ See Sowerby (1847-1887, vol. 4, *Fusus*, p. 83, and vol. 5, *Fasciolaria*, p. 11, pl. 425, fig. 18), Weinkauff (1868, vol. 2, p. 106), Tryon (1879-1888, vol. 2, *Fasciolaria*, p. 78, pl. 63, figs. 36-37), and Hidalgo (1870, vol. 2, p. 2).

² It is to be noted that the collection of Queen Louisa Ulrica was largely made up of the exotic species and also contained very few of the smaller species. The European fauna was very sparingly represented.

The above description gives a very fair picture of the *Fasciolaria trapezium* of all authors. The only questionable phrase is "apertura dentata," words that had already been used, in one form or another, by Gualtieri and Klein. The aperture of *trapezium* has long, narrow, and close-set brown ridges in the inner reaches of the aperture, but the outer lip is not dentate, as it carries merely paired brown ridges on its inner aspect, which are only slightly raised and correspond to the pairs of brown spiral lines on the outside of the shell. Schröter (1783–1786, vol. 1, p. 532) expressed this feature somewhat more accurately: "There are just as many 'Zacken' in the aperture as there are lines on the last whorl, which Linnaeus called teeth, but one sees inside a number of fine raised striae." The word "Zacken" means notches, scallops, or, sometimes, teeth, but it is apparent that Schröter did not intend to give it the last meaning.

Linnaeus made a useful addition to the description by a manuscript note in his interleaved copy of the twelfth edition, which read "Plicata columella uti Voluta."

The synonymy is almost entirely correct. The figures from Buonanni (pl. 287), Rumphius (pl. 49, fig. K, a copy of the figure of Buonanni), and Argenville (1742, pl. 13, fig. F) are sufficiently characteristic. The other Rumphius figure (pl. 19, fig. E) is somewhat doubtful, but may have been based on the form of *trapezium* later called *ponderosa* by Jonas, 1851 (*in* Philippi, 1845–1851, vol. 3, consecutive paging p. 93, *Fasciolaria*, pl. 2). However, the other Argenville figure (*op. cit.*, pl. 13, fig. H) shows the species later called *Fusus filamentosus* by Chemnitz (*Fasciolaria filamentosa* Lamarck, 1816), which is referred to below.

Murex trapezium was identified very early. It was known to the pre-Linnaean conchologists under the name of "la robe de Perse" or "Das persianische Kleid." The name *trapezium* originated with Linnaeus. Of the post-Linnaean writers Born was the first to use the specific name in the "Systema" for the species, although he did not figure it. Chemnitz (1780–1795, vol. 4, p. 134, figs. 1298–1299) called it "Vestis persica. Das persianische Kleid" and referred it to the *trapezium* of the tenth and twelfth editions of

the "Systema" and to the "Museum Ulricaе," and his figures are fully as characteristic as any that have been published except that the spiral brown lines are not shown as paired.

Gmelin (1791, p. 3552) incorrectly introduced a variety "β," which he did not describe, but for which he cited another pair of figures from Chemnitz (*tom. cit.*, pl. 140, figs. 1310–1311). Chemnitz called them "*Murex filamentosus lineis parallelis nigricantibus cinctus*" and referred them to only the twelfth edition of the "Systema," possibly believing that Linnaeus had dealt with two distinct species in the tenth- and twelfth-edition descriptions of *trapezium* and that *filamentosus* was the only one with paired spiral lines and was the shell described in the twelfth. Chemnitz' references for *filamentosus* refer to paired lines. In fact, both species show this feature, although the pairing is somewhat less obvious in *filamentosus*. The suggestion that Chemnitz was deceived as to the lines is possibly negated by the fact that his references for *trapezium* include both of Linnaeus' editions and that words indicating paired lines are used in several of his references for that species. Whatever may have been his conception of the decoration of the two shells, his confusing treatment is reflected in some later descriptions. I feel confident, however, that Linnaeus was under no delusion that there existed two forms of *trapezium* and that the twelfth-edition subdescription, with the words "lineae geminae semper," was merely the introduction of a detail that he had omitted in the tenth.

Röding placed *trapezium* in his *Fusus* (1798, p. 118), citing for it the good Chemnitz figures 1298 and 1299. Link (1807, p. 118) transferred it to *Neptunea* Röding together with *Murex antiquus* and *despectus* Linné, an extraordinary combination, but correctly separated *filamentosus* from *trapezium* under the name *Neptunea cincta*, citing for the latter Chemnitz' figures of *filamentosus* (figs. 1310–1311) and Gmelin's "variety β" of *trapezium*.

Lamarck (1822b, pp. 119–120) described both *Fasciolaria trapezium* and *filamentosus* as good species and, incidentally, omitted any mention of the paired spiral lines in both descriptions. Both species are figured in the

"Tableau encyclopédique" (pl. 424, fig. 5, for *filamentosus*; pl. 431, figs. 3a, b, for *trapezium*), but in the figure of *filamentosus* the pairing of the lines is difficult if not impossible to perceive. The latter is correctly shown as a much more slender shell than *trapezium* and with angulated but much less nodulous shoulders. Lamarck, as was his custom, did not refer to either of Linnaeus' editions of the "Systema," as he mentioned only the Gmelin edition, but Deshayes (1838-1845, vol. 9, p. 443) referred to the twelfth edition only, thus raising the suspicion that he had been influenced by the same confusion as to the existence of the paired lines which I mention above in discussing Gmelin and Chemnitz' treatment of the two species.

Murex trapezium Linné was retained in *Fasciolaria* Lamarck until recently. Many writers had been in the habit of including it in the subgenus *Pleuroploca* P. Fischer, 1884. The characters of the species show sufficient divergence from those of the typical *Fasciolaria* to render it generically separable, and I therefore cite it as *Pleuroploca trapezium* (Linné).

It is an Indo-Pacific shell with a very wide range, being found from the east coast of Africa and the Red Sea to the Malay Archipelago and the Philippines.

In addition to the *Vestis persica* of Chemnitz and the early writers, the following are synonyms, being largely names given to describable forms of the shell: *Fasciolaria andouini* Jonas, 1851, a slightly more slender form; *F. ponderosa* Jonas, 1851, a more ponderous form, with the shoulder tubercles developed into true spines¹; and *F. lischkeana* Dunker, 1863, a completely smooth form. All these forms can be connected by intermediates. *Cunia vertiaria* Humphrey, 1797, is also a synonym.

Fasciolaria ferruginea Lamarck, 1822, is merely a more slender form of *F. filamentosa* in which the shoulder nodules are almost imperceptible. *Fasciolaria inermis* Jonas, 1846, seems to be so close to *ferruginea* that it should probably be considered a synonym of that form.

Good figures of *trapezium* are found in

¹ The dates of *F. andouini* and *ponderosa* Jonas are taken from their listing in Philippi's "Abbildungen," 1845-1851, volume 3, 1851.

Tryon (1879-1888, vol. 3, pl. 61, figs. 24-26, and pl. 62, fig. 27), in Sowerby 1847-1887, vol. 5, pl. 426, figs. 21-23), and in Reeve (1843-1878, vol. 4, *Fasciolaria*, pl. 7, sp. 16)—the moderately nodose form.

A specimen of *trapezium* is present in the Linnaean collection in London, properly marked. The species was described in the "Museum Ulricae." In Linnaeus' added description in that work the phrase "semper geminatis," later paraphrased in the twelfth edition, was used, as well as the phrase referring to the plication of the columella (here described correctly as "fuscis"), which Linnaeus did not employ in either the tenth or twelfth edition, but added in a manuscript note at some later date. A properly labeled specimen of the shell is in the collection at Uppsala.

Murex syracusanus

1758, *Systema naturae*, ed. 10, p. 755, no. 494.

1787, *Systema naturae*, ed. 12, p. 1224, no. 568.

LOCALITY: "In M. Mediterraneo" (1758, 1767).

"M. testa oblonga, anfractibus striatis plicatis, tuberculoso carinatis, apertura edentula, cauda brevi . . . Testa anfractuum testis testaceis, parietibus vero albis."

The above description leaves much to be desired. The subdescription, added in the twelfth edition, might be considered to supply a useful detail, provided that we can solve the meaning of the word "parietibus,"² but I still consider it inadequate to fix the species.

The synonymy in the tenth edition is only one-third correct. The figure from Buonanni (pl. 80), one of the most accurate figures in that work, is characteristic and was probably a cogent factor in the early identification of the species. Of the other two figures cited in the tenth, the figure from Gualtieri (pl. 52, fig. H) shows a shell that I am unable to identify, and the Argenville figure (1742, pl. 13, fig. L) has a spire which somewhat resembles that of *syracusanus*, but its anterior canal is long, abruptly constricted, and deeply

² I am assuming that, in the phrase "parietibus vero albis," Linnaeus used the word "paries" for the straight-sided, axially ribbed portion of the whorls, which are white and thus contrast strongly with the reddish brown color of the sloping shoulder. This is a peculiar use of the word "paries," but any other translation makes the phrase unintelligible.

spirally striate. I am also unable to identify this figure. Both figures may, however, be disregarded, as Linnaeus eliminated them in the twelfth edition, leaving only the Buonanni figure. It seems odd that only one figure of this well-known Mediterranean shell could have been found. Chemnitz (1780–1795, vol. 10, p. 253) commented on the two abandoned figures as follows: "The citations of Gualtieri . . . and Dargenv. . . . were left out in the twelfth edition of his *Systema naturae* because he had recognized their inaccuracy." In brief, the Buonanni figure, the specific name itself, and the Mediterranean locality were undoubtedly alone responsible for the identification. Buonanni's figure was tied to the locality by the language of his pertinent text (p. 123); "Turbo in Mari Syracusano frequens."

The identification has never been questioned, and the species has acquired no synonyms. Dillwyn (1817, p. 739) suggested *Murex asperimus* Gmelin (1791, p. 3559) as a synonym, but the description of that species can hardly apply to *syracusanus*, particularly the phrase "cauda dilatata adscendente," although it does contain a reference to the color pattern, "flavo alboque varia costata," which may have induced Dillwyn to refer it to the Linnaean species. Gmelin's *asperimus* may have been a *Cerithium*.

The present species has been almost universally placed in the genus *Fusus* Bruguière, 1792. The only exceptions I have found are those of Monterosato (1878, p. 41), who transferred it to *Trophon* Montfort, 1810, and Troschel (1856–1893, vol. 2, p. 64), who erected the subgenus *Aptyxis* for the species,¹ which he had placed in *Latrius* Montfort. *Aptyxis* is today used as a subgenus of *Fusus* (see Tryon, 1879–1888; Bucquoy, Dautzenberg, and Dollfus, 1882–1898; Pallary, 1900; and Thiele, 1931. Pallary in 1920 and 1938, and Dutertre in 1936 used it as a good genus).

The accepted identification is confirmed by the presence of Linnaeus' holotype in the

Linnaean collection in London. The specimen is large, about 2½ inches in height, and of the less strongly angulated form. It was not described in the "Museum Ulricae."

The species is figured in the "Tableau encyclopédique" (pl. 423, figs. 6a, b); by Reeve (1843–1878, vol. 4, *Fusus*, pl. 3, sp. 10a, b; a form with a rounded, non-angulate shoulder, with which I am not familiar, is shown on the same plate, figs. 10, c. d); by Kiener (1834–1850, vol. 6, *Fusus*, pl. 4, fig. 2); and by Bucquoy, Dautzenberg, and Dollfus (1882–1898, atlas, pl. 6, fig. 2). The last-named authors accurately describe the shell as having "spire-whorls step-like, carinate above." The best recent figure is found in Platt (1949, pl. 55, fig. 2, a colored photograph).

Murex craticulatus

1758, *Systema naturae*, ed. 10, p. 755, no. 495.

1767, *Systema naturae*, ed. 12, p. 1224, no. 569.

LOCALITY: Not given in 1758; "in M. Mediterraneo" (1767).

"M. testa oblonga, anfractibus rotundatis plicatis transversim reticulatis, apertura dentata, cauda brevi . . . Testa oblonga anfractibus elevato-striatis, albida, longitudinaliter subplicata angulis elevatis ferrugineis. Cauda brevis. Apertura intus striata."

While this description was amplified in the twelfth edition by the addition of the sub-description, it must be admitted that it was not improved. In the first place, the words "apertura intus striata" were probably not an explanation of the misused phrase "apertura dentata" of the original description, but an addition referring only to the faint striae well within the aperture. There are no true teeth on the lip or on its inner margin. I have already referred to Linnaeus' frequent misuse of the word "dentata" as applied to a scalloping or ridging of the lip and even to the striations in the aperture. The lip of *craticulatus*, with its faint scalloping which is merely the production of the exterior spiral sculpture, is an example of this. The sub-description, however, poses a more serious question. It speaks of the longitudinal sculpture as having "angulis elevatis." This does not fit the *craticulatus* of authors, in which the ribs are well rounded and in no sense angulated. Indeed this feature was better described in the original description as "an-

¹ Tryon (1879–1888, vol. 3, pp. 60–61) noted that Troschel had separated *Aptyxis* from *Fusus*, as he had considered its dentition to be similar to that in *Fasciolaria*, but Tryon added: ". . . it has recently appeared, however, that an undoubtedly genuine *Fusus*, and the only one of which the dentition has been hitherto examined, possesses the same type of dentition."

fractibus rotundatis plicatis." Thus in the final complete description there is a direct conflict in the way the sculpture is described. Linnaeus omitted all reference to the plications of the columella.¹

Chemnitz (1780–1795, vol. 4, p. 224) supplied a short description of "*Murex craticulatus* Linnaei" which cured Linnaeus' "angulis elevatis" by substituting for it "undulato-sinuoso," and greatly improved the description of the aperture by saying "labro serrato, columella subplicata, parietibus internis substriatis." His figures (*tom. cit.*, pl. 149, figs. 1382–1283) are characteristic of the *craticulatus* of authors. Born (1780, p. 319) used the phrase "cingulis elevatis acutis," which undoubtedly referred to the exterior spiral sculpture of parallel threads, and which was not mentioned by Linnaeus. He did not figure the species. He, however, continued the use of the word "dentato" and specifically referred the word to the lip rather than the aperture. Klein (1753, p. 54, sp. 2, no. 4) had already softened the word "serrato" by calling the lip "obtus serrato."

Linnaeus cited a single figure for *craticulatus* in both editions of the "Systema" ("Rond. test. 89"). This was page 89 from part 2, "De testaceis," of Rondelet's 1554–1555 work on fishes, and shows a shell with whorls distinctly angulated above, instead of rounded, as in *craticulatus*. Indeed, Rondelet called it "Turbo angulatus." It clearly does not represent the *craticulatus* of authors. Linnaeus' locality, the Mediterranean Sea, must also have been copied from Rondelet, who used that locality. *M. craticulatus* auct. is an Indo-Pacific species.

Linnaeus did not own a specimen of *craticulatus*, and it is not present in his collection in London. If his conception of the species was the *craticulatus* of all later authors it is strange that he did not cite the several good figures of it in Seba (pl. 50, figs. 55–56, and pl. 51, figs. 31–32), as he had access, at least, to Seba's work. This omission, the citation of the Rondelet figure, and his

incorrect description of the sculpture of our *craticulatus*, raises in my mind the gravest suspicion that he was seriously confused as to the species, and I question whether he was attempting to describe the *craticulatus* of authors, at least in 1767. No assistance is given by the "Museum Ulricae" as the species was not present in the Queen's collection. The immediate identification of the name must therefore have been based on the 1758 description alone, and the Rondelet figure disregarded. Chemnitz (*loc. cit.*) recognized the discordance of Linnaeus' descriptions and the shell he figured for *craticulatus*. After referring to Linnaeus' use of the word "dentata," and the plaits on the columella of the *craticulatus* of authors he said: "Shall this shell be positively considered the *craticulatus* of Linnaeus? Herr von Born was convinced that it was, and I must confess that it has most of the characteristics mentioned by Linnaeus, and this makes the identification quite conceivable. But I cannot find the reticulated structure 'anfractus transversim reticulatos' which it should have according to Linnaeus, and I am still doubtful about it. On the assurance of Linnaeus it lives in the Mediterranean Sea."²

Gmelin only increased the confusion begun by Linnaeus. He listed (p. 3554) a *Murex craticulatus*, copying Linnaeus' main description and repeating the subdescription with only a single change in the order of its phrases. He referred only to the Rondelet figure. He had already listed a *Voluta craticulata*, with a description which suggests a *Voluta* ("V. testa turrita transversim striate alba: costis longitudinalibus spadiceis, labro denticulato striato, columella triplicata") and also includes a few details which might be applied to Linnaeus' *M. craticulatus*. The significant fact to be noted is that for *Voluta craticulata* he cited the good Seba figures noted above

¹ In the young shell the plications on the columella appear to be merely extensions of the exterior spiral sculpture. When the columellar callus is thickened in the adult shell these ridges disappear and three or four true columellar plaits are developed which seem to have no relation to the exterior sculpture.

² In the above quotation I have shortened Chemnitz' language by merely saying "this shell." Chemnitz called it "die rostformige Schindel." The word "rostformige" means "in the form of a grid," which must refer to the fact that the species has both axial and spiral sculpture, although it can hardly be said to be reticulated as Linnaeus stated. The word "Schindel" means "a shingle" or "splint," neither of which is apt for *craticulatus*. It is possible that it was an error for "Spindel," the German conchologists' name for a fusiform shell, but this seems equally inappropriate.

which show the *craticulatus* of authors, the two Chemnitz figures of that shell, an excellent figure of it from Knorr (pt. 2, pl. 3, fig. 6), and a figure of Lister's (pl. 919, fig. 13) which may be, and has frequently been used for, the *craticulatus* of authors. He gave no locality for his *Voluta craticulata* but said that it was "vix 3 pollices longa," somewhat too long for the *craticulatus* of authors. I suggest that Gmelin's treatment of these two names cannot be explained, although it is possible that in *Murex craticulatus* he was acting in his frequent role as copyist, as is indicated by his description and his citation of only the single figure (Rondelet) cited by Linnaeus, whereas in *Voluta craticulata*, in spite of the equivocal nature of the description, his diagnosis was meant for the *craticulatus* of authors. It is difficult to disregard his very significant synonymy.

Later references to Gmelin's *Voluta* species are equally confusing. It was given as a synonym of *Murex craticulatus* Linné by Dillwyn (1817, p. 740) along with the figures mentioned above (Chemnitz, Lister, Seba, and Knorr) which show the *craticulus* of authors. Dillwyn's description and subdescription make up an excellent description of the latter shell. Lamarck (1822b, p. 109) placed *craticulatus* in *Turbinella*, referred it to "Lin. Gmel. p. 3554," and cited as a synonym *Voluta craticulata* Gmelin, page 3464. Deshayes (1838-1845, vol. 9, p. 386) followed Lamarck's synonymy, as did Schubert and Wagner (1829, p. 103), although the figures of the latter authors (pl. 227, figs. 4023-4024) show an entirely different shell which I cannot identify.

The *craticulatus* of authors has been accepted as the *craticulatus* of Linnaeus by all writers since Lamarck, although I am convinced that it is not the Linnaean species. The many figures of the shell by the majority of the early post-Linnaean conchologists as well as the modern figures cannot be tied to the twelfth-edition *craticulatus*. As to the diagnosis in the tenth edition, even though that description adequately conforms to the *craticulatus* of authors, with the possible exception of the word "dentata," which, in the last analysis, represents merely a careless misuse of the term, I cannot be persuaded that Linnaeus would have cited the non-

conforming figure from Rondelet if he had been describing our *craticulatus*. It is admitted that he often referred to figures which were only approximations to the shell he was describing, but in those cases he was handicapped by the absence of good and accurate figures. In the present case I cannot believe that he would have chosen the Rondelet figure alone, when the Seba figures, to mention only these, must have been known to him, if he had before him, or was describing, the species known to us as *craticulatus*. It has been suggested that the *Turbinella polygona*, Lamarck, 1816, was the shell covered by the Linnaean description, but that species differs from *craticulatus* auct. in so many particulars that the suggestion cannot be entertained. I am unwilling to consider *M. craticulatus* Linné as anything more than a *species dubia*. I would suggest that the *craticulatus* of authors be ascribed to Dillwyn, 1817, the first author who clearly and validly described it and cited adequate figures of it. Dillwyn first supplied a translated paraphrase of the good Linnaean description in the tenth edition and then wrote his own description, as follows: "Shell about two inches long, and three-quarters of an inch broad, with rounded longitudinal chestnut-colored plaits, crossed by transverse elevated striae, and the interstices white; the outer lip is crenulated, and striated within; the pillar has three or four oblique plaits."

The suggestion that by "dentata" Linnaeus meant the striae within the aperture was tentatively advanced by Hanley (1855, p. 307) who said: "*The Turbinella craticulata* (Kiener, Coq. Viv. Turb. pl. 19, f. 2) has been generally accepted as the representative, and, should we understand the 'apertura dentata' as explained by 'apertura intus striata,' answers very correctly to the description." I have already suggested that the second phrase mentioned by Hanley must have been an addition to, rather than an explanation or clarification of, the first. Moreover, I disagree with Hanley's opinion that Kiener's pair of figures (dorsal and apertural views), or, indeed, any of the figures published since, and including, the figure in the "Tableau encyclopédique" (pl. 429, fig. 3b), can reasonably be said to conform to Linnaeus' description in the twelfth edition or to

his synonymy in either edition. The companion "Tableau" figure (fig. 3a) shows, it is true, a very slight angulation of the crossing of the longitudinal and spiral sculpture, but it seems apparent to the writer that the two figures were not based on the same specimen.

Murex craticulatus was placed in *Fusus* by Röding, 1798; in *Cymatium* Röding by Link, 1807; in *Fasciolaria* Lamarck, 1799, in Lamarck's 1816 "Liste"; in *Turbinella* Lamarck, 1799, in Lamarck's 1822 work; and the latter genus was used for the species by many of his successors. It is now included in *Latirus* Montfort, 1810 (emend. *Lathyrus*). It should be realized that most, if not all, of these generic placements referred to the *craticulatus* of authors and not to the shell described by Linnaeus, as is evident from the synonymies these authors supplied as well as from their descriptions where the latter were given. *Polygona* Schumacher, 1817, and *Plicatella* Swainson, 1840, are synonyms of *Latirus* Montfort, at least in part.

The attribution of the name *craticulatus* to Linnaeus has been so consistently accepted ever since Linnaeus' day that it would be difficult and confusing to change it, although from the point of view of a sound nomenclature it should be recognized that *craticulatus* Linné was a *species dubia* and that the name should be attributed to Dillwyn. I know of no specific synonyms of *craticulatus* auct.

It was not described in the "Museum Ulricaë."

It is best figured by Reeve (1843-1878, vol. 4, *Turbinella*, pl. 2, sp. 7).

Murex scriptus

1758, *Systema naturae*, ed. 10, p. 755, no. 496.

1767, *Systema naturae*, ed. 12, p. 1225, no. 570.

LOCALITY: "In M. Mediterraneo" (1758, 1767).

"M. testa subcaudata fusiformis laevi pallida: striis fuscis longitudinalibus variis, labio dentato . . . Testa S. Hordei paulo major, undique laevis, oblonga, vix caudata, pallide albida, commaculata striis oblongis flexuosis subpiceis."

The length and considerable detail of the description of this species, which was identical in the tenth and twelfth editions, are somewhat deceptive, as the description contains two equivocal expressions relating to the anterior canal. Even the extremely weak words "subcaudata" and "vix caudata"

seem too strong to apply to a shell of which the "canal" is non-existent or, at least, can hardly, if at all, be differentiated from the basal end of the aperture. *Murex scriptus* was not definitely identified for almost a century. This may have been partly due to the slight defect in the description just noted, but, I suggest, stemmed largely from the fact that *scriptus* is in strange company in *Murex* Linné. It is much smaller than any of the other Linnaean murices, although this was clearly noted in Linnaeus' expression, "somewhat larger than a grain of barley," and bears little relationship to the other groups represented in *Murex*.

No synonymy was supplied, and even the explicit statement as to its size and its Mediterranean locality was apparently not sufficient for an early identification. It was not mentioned by either Martini or Chemnitz, and neither Born, Bruguière, Röding, nor Link referred to it. Gmelin's diagnosis (1891, p. 3554) is in part a copy and in part a paraphrase of that of Linnaeus and, like Linnaeus, he supplied no references. His slight changes in the description do not necessarily indicate that he was familiar with the species. Dillwyn (1817, p. 747) was no more explicit than Gmelin. He listed the name but referred only to Linnaeus and Gmelin, and admitted his ignorance of the species by saying: "Linnaeus says that this shell is larger than a grain of barley."

Lamarck did not refer to *Murex scriptus*, but it is almost certain that his *Buccinum corniculatum* (1822b, p. 274) was the same species. An undocumented specimen of *scriptus* in the Linnaean collection in London, a name that appears on Linnaeus' list of owned species, was found by Hanley (1855, p. 307) to be a specimen of what was then known to him as *B. corniculatum* Lamarck and was the only Mediterranean species present that conformed to the Linnaean description. The description of *B. corniculatum* conforms to *scriptus* and is, if anything, an even better description than that of *scriptus* in the "Systema." The photograph of the ostensible type in the microfilm of the collection in the writer's possession clearly shows *scriptus*. Philippi (1836, 1844, vol. 1, p. 225) had already reached the same conclusion without having seen the Linnaean collection

and was the first to use the name "*Buccinum scriptum* Linné."

Meanwhile, Risso (1826, p. 247) had erected the genus *Mitrella* with four species, *M. flaminea*, *laevigata*, *costulata*, and *turgidula*. The first of these clearly equals *Murex scriptus*, as appears not only from Risso's description, but from his excellent figure (fig. 144, plates unnumbered) and was generally considered to be the type species of the genus even before Cox, in 1927, so designated it, and mentioned its equivalent, *Murex scriptus*.¹

Deshayes (1838-1845, vol. 10, p. 175), writing in 1844, did not associate Lamarck's *corniculatum* with either *scriptus* Linné or *flaminea* Risso, and did not mention Risso's work. He did, however, suggest another correct synonym, saying in a footnote: "The figure which M. Kiener gives of this species [1834-1850, vol. 9, p. 48, pl. 16, fig. 56] leaves no doubt as to its identity with the *Buccinum Linnaei* of M. Payraudeau [1826, p. 161, pl. 8, figs. 10-12]." Deshayes' further comment indicates that he was familiar with Philippi's conclusions: "M. Philippi has also recognized this identity, but he was wrong to retain M. Payraudeau's name, although that of Lamarck is earlier. We have seen the animal of this species and can affirm that it belongs to the genus *Columbella*."

Murex scriptus is now placed in *Mitrella* Risso, but there is a difference of opinion among recent writers as to whether the name should be used as a good genus or as a subgenus of *Columbella* Lamarck, 1799, or *Pyrene* Röding, 1798. Tryon (1879-1888, vol.

5, p. 214), Dautzenberg (1910b, p. 209), and Nobre (1938-1940, p. 198) used *Columbella* (*Mitrella*). Thiele (1931, p. 302) used *Pyrene* (*Mitrella*). Weinkauff (1868, vol. 2, p. 36), Monterosato (1878, p. 44), and Bucquoy, Dautzenberg, and Dollfus (1882-1898, vol. 1, p. 73) used *Columbella* with no subgenus. Grant and Gale (1931, p. 689) treated *Mitrella* as a good genus, and it seems to be sufficiently differentiated from *Columbella* to justify us in giving it generic rank. Incidentally, Bucquoy, Dautzenberg, and Dollfus (*tom. cit.*, p. 74) remarked: "We think that the Mediterranean *Columbellas* are not yet sufficiently known to make it possible to establish definitive determinations." They would probably not have said this if they were writing today, as the family has been critically studied by many taxonomists since the 1880's.

In addition to *Buccinum corniculatum* Lamarck, 1822, *B. linnaei* Payraudeau, 1826, *Mitrella flaminea* Risso, 1826, which have already been noted, and *Murex conulus* Olivi, 1792, are probably this species. Bucquoy, Dautzenberg, and Dollfus (*tom. cit.*, p. 73) supplied a long list of synonyms which should be examined. Many are names of the less well-known writers, and many of these are not assisted by figures. I would accept several of them with considerable doubt.

The best colored figures of *scriptus* are found in Kiener (1834-1850, vol. 10, pl. 16, fig. 56) and in Tryon (1879-1888, vol. 5, pl. 49, figs. 18-21). Grant and Gale (1931, p. 690) give a good figure so far as the shape of the shell is concerned, but the color pattern does not appear.

The species was not described in the "Museum Ulricae."

THE SPECIES OF CERITHIIDAE AND POTAMIDIDAE IN *Murex* LINNÉ

The following eight species, described by Linnaeus as murices, belong in genera of the families Cerithiidae or Potamididae as at present constituted. Other species belonging to these families were placed by Linnaeus in *Strombus* or *Trochus*; *Strombus tuberculatus* is, I consider, a *Cerithium* and not a *species dubia* as some writers have asserted. Three others belong in genera in the Potamididae: *Strombus palustris* in *Terebralia* Swainson, *Trochus punctatus* in *Cerithidea* Swainson, and

¹ Earlier attempts to designate the type of *Mitrella* were ineffective. In 1847, Gray (p. 138), in his synonymic type list, merely cited *flaminea* under *Columbella* and placed most of Risso's other species in other families. In 1858, Mörch (p. 257) pointed out that the generic description of *Mitrella* Risso conforms to his first species, "*C. scripta* L. (*B. linnaei* Payr.) qui doit être regardée comme le type." In 1901, Cossmann (1901-1904, vol. 4, p. 235) also used *scriptus* as type species of *Mitrella* but, like Mörch, did not mention *flaminea* by name and therefore these two designations are to that extent equivocal, although Mörch referred indirectly to *flaminea* by mentioning Risso's "first species." In 1883, Tryon (1879-1888, vol. 5, p. 214) cited "*flaminea* Scacchi (Cat. p. 10)" as a synonym of *C. scripta* Linné. Although it may be regarded as certain that all these attempts referred to the same species, *flaminea* Risso, Cox's designation, mentioning that species by name along with its synonym *scriptus* Linné, was necessary to an unequivocal and valid selection.

Trochus telescopium in *Telescopium* Montfort. The species *Trochus striatellus* is possibly a *Cerithium*. It was tentatively considered by Bruguière, and doubtfully by Dillwyn, to be a *Cerithium*. Hanley suggested that it was either a *Cerithium* or a *Chemnitzia* d'Orbigny (*Turbonilla* Risso), but its diagnosis was so indefinite that I suggest that the name be dropped.

The genus *Cerithium* was erected by Bruguière (1789–1792, vol. 1, pt. 1, index, p. xv, 1789; pt. 2, text, p. 467, 1792), although Adanson (1757, p. 152, pre-Linnaean) first used the name *Cerithium* in a generic sense, and several of the earlier writers attributed the genus to him. Deshayes (1830–1832, vol. 2, p. 235) said that Bruguière created the genus.

Its type species is now accepted by most conchologists as being *Cerithium adansonii* Bruguière, by indirect virtual tautonymy.

Most of the following eight species are well described and were immediately identified. Their synonymies are less helpful, and for *torulosa* and *asper* no references were cited. In three cases, *vertagus*, *torulosa*, and *decollatus*, no locality was given.

Murex vertagus

1767, *Systema naturae*, ed. 12, p. 1225, no. 571.

LOCALITY: Not given.

"M. testa turrita, anfractibus superne plicatis, cauda adscendente, columella intus plicata . . . Teata alba, digitiformis. Anfractus saepius 15, superne plicata. Cauda brevissima, adscendens. Columella plica altera prope spiram, altera in medio."

This species, which appeared first in the twelfth edition of the "*Systema naturae*," is the first species of the "subgeneric" group designated by Linnaeus as "*Turriti subulati*, cauda brevissima," which includes the eight related species in *Cerithiidae* and *Potamididae* that are thus correctly and clearly separable from Linnaeus' other muricids. Specifically, the species is identified by the extremely characteristic description which can refer to no other member of its group. The only criticism that can be made of Linnaeus' language is the word "digitiformis," a word not used for any of the other shells in the group and one that is peculiarly inapt for any subulate shell.

The synonymy is well chosen. The figures from Buonanni (pl. 84), Argenville (1742, pl. 14, fig. P), and Gualtieri (pl. 57, fig. D) were obviously based on specimens of *vertabus*. Petiver's figure (pl. 56, fig. 4) is less characteristic but still suggests that shell. The figure from Rumphius (pl. 50, fig. K) was criticized by both Deshayes and Hanley as showing Kiener's *Cerithium procerum*, and Hanley (1855, p. 308) said that it "must consequently be excluded." Linnaeus added a fairly accurate figure from Lister (pl. 1020, fig. 83) by a manuscript note in his interleaved copy of the twelfth edition.

The species was well known to the pre-Linnaean writers at least as early as Buonanni, 1681, but the name *vertagus* was borrowed from Klein (1753, p. 31) who used it in a generic sense only. The latter's genus *Vertagus* was used by several of the post-Linnaean writers, notably by Reeve and Tryon. *Vertagus* Link (1807, p. 128) was not Klein's genus, but covered a group of *Terebra* species. *Cerithium vertagus* was attributed to Linnaeus and referred to the "*Systema*" species as early as Chemnitz, 1780 (1780–1795, vol. 4, p. 319, pl. 156, fig. 1479, and pl. 157, fig. 1480). His figures are not entirely accurate but may be cited for *vertagus*. He called them "Rostrum anatis. *Murex vertagus* Linnaei." Chemnitz' next species (p. 321, pl. 157, figs. 1481–1482) was described as "*Turbo fasciatum oblique rostrata*" and was also referred to *vertagus* Linné, but not only his Latin name but his vernacular name "Die bandirte Schnabelschraube" suggest either *Cerithium lineatum* Lamarck, 1816, or *C. fasciatum* Bruguière, 1792.¹

¹ *Cerithium lineatum* Lamarck, 1816, is merely a form of *asper* Linné, and is discussed under that species (p. 203, below). *Cerithium fasciatum* Bruguière, 1792, is a good species which is, however, often confused with *lineatum* in collections. It is generally larger than *lineatum*. Its axial ribs extend over approximately one-half of the last three or four whorls, as in *vertagus*, and above that point over the entire whorl. The upper whorls of the spire are not granulose as in *vertagus*. The yellowish brown bands are variable in width and differently dispersed than in *lineatum* and are less distant. Occasionally one or more of the bands are wider than the rest. The shell is much smoother than in any form of *asper*. In a common form of this species the bands of color are interrupted, consisting of wide, light brown, irregular streaks on the lower half of the whorl.

Gmelin's synonymy (1791, p. 3560) included not only satisfactory figures of *vertagus*, as principal species, but several figures grouped under his variety " β ," two of which were the Chemnitz figures 1481-1482, referred to above, which indicates that Gmelin considered the banded shell as conspecific with *vertagus*. Deshayes (1838-1845, vol. 9, p. 297, footnote) commented on the Linnaean synonymy of *vertagus* and its interpretation by Gmelin: "The synonymy of this species, in Linné, is almost irreproachable. That of Gmelin needs to be corrected; it contains first, as a variety, a quite distinct species which Bruguière separated under the name of *fasciatum*. Then, he confused with *vertagus* still another species recently called *Cerithium procerum* by Kiener. Lamarck recognized Gmelin's confusion, and in order to establish the Linnaean species accurately [pour rendre à l'espèce . . . toute son intégrité], we propose to eliminate from Lamarck's synonymy the figure from Rumphius, from Knorr, the figure 1840 of Martini [*sic*, error for Chemnitz], and finally that from the Encyclopedia." While the Knorr figure is not particularly characteristic and the Rumphius figure is questionable, the other two that Deshayes wished to suppress are very creditable figures of *vertagus* and should be retained.¹

Röding (1798, p. 96) included *vertagus* in his *Strombus*, retaining the Linnaean specific name, but his species must be considered the *vertagus* of Linnaeus only in part. His synonymy shows a mixture of species. He first cited Gmelin's *vertagus*, variety " β ," which is undoubtedly the *fasciatum* of Bruguière, as, of Gmelin's nine figures of " β ," all but two show *fasciatum*. He then correctly cited Chemnitz' figure 1480, referred to above, which is *vertagus* Linné. This is one of the

figures Deshayes wished to suppress in order to purify Lamarck's synonymy. Link (1807, p. 130) used *Cerithium* for the species but attributed the genus to Lamarck. He referred to the *vertagus* of Gmelin and to the Chemnitz figures 1479 and 1480. His own genus *Vertagus*, not *Vertagus* Klein, has been referred to above.

Dillwyn (1817, p. 748) supplied an excellent description of the species, but he, too, described Gmelin's variety " β " as a variety "less ventricose and ornamented with yellowish or reddish transverse stripes," and later, "The variety is narrower, and has the plaits less prominent, and crossed by more distinct transverse striae." Although Dillwyn correctly described *vertagus* in his main description as having a one-plaited columella, and mentioned "plaits" in his subdescription of the "variety," he confused *lineatum* Lamarck, which has two columellar plaits, with *fasciatum* Bruguière, which has only one, as in his synonymy of the variety he cited *fasciatum*.

Deshayes (*loc. cit.*) correctly made *Vertagus vulgaris* Schumacher, 1817 (not *C. vulgatum* Bruguière), a synonym of *vertagus*. He treated *Murex vertagus* Born as a synonym in part only as Born's synonymy included more than one species, although Born's description points to *vertagus*.

Reeve (1843-1878, vol. 15, *Vertagus*, pl. 4, sp. 19) placed the species in *Vertagus* Klein, as he did the Linnaean species *aluco* and *asper*, but correctly described it and supplied an entirely characteristic figure.

Kiener's figures (1834-1850, vol. 5, *Cerithium*, pl. 18, figs. 2) are an apertural and dorsal view of a form in which the axial striae are obsolete on the body whorl and only faintly indicated on the next two whorls. The complete absence of sculpture on the body whorl, except on the apertural face, is not typical. Most specimens show a partial series of very short plications on the body whorl just below the suture, similar in length to those on the later whorls of the spire. The length and prominence of these plications are, however, very variable features. The upper whorls of the spire, excluding the nuclear whorls, bear one to three rows of small granules, the rows decreasing in number posteriorly. Kiener's *Cerithium procerum*,

¹ The present writer is constantly impressed by the ease with which the nineteenth century writers categorically dismiss many of the pre-Linnaean figures and just as categorically accept even worse figures. I realize that for a considerable proportion of the figures in the early iconographies one should be guarded in their identification. One need only point out the large number of sinistral shells pictured in them and the frequent omission of diagnostic characters to realize that the early artists were often not conchologists. But if a figure more nearly resembles the species under discussion than any other, and can be applied to no other species, it should not be dismissed without comment.

which was mentioned by both Deshayes and Hanley (p. 191, above) as being a discordant element in Gmelin's synonymy (the Rumphius figure, pl. 30, fig. K, also cited by Linnaeus) is described and figured by Kiener (*tom. cit.*, p. 22, pl. 18, figs. 1, 1a). It is a narrower shell than *vertagus*, has a more produced spire, a larger number of whorls, and the whorls are less convex. The axial plications are said by Kiener to be more distant, but I am unable to confirm this. It is, in any case, a distinct species. One variety of *procerum* shows a color pattern of small brown dots irregularly disposed.

Tryon (1879-1888, vol. 9, p. 149, pl. 29, figs. 69-70) placed the species in *Cerithium* but used *Vertagus* Klein as the subgenus to contain it. His description and figure (fig. 69) are excellent. His figure 70 was referred to what he called a variety of *vertagus*, *C. taeniata* Quoy, described by Tryon as "smoother, the sutural plaits obsolete; yellowish white, chestnut banded." This language recalls *lineatum* Lamarck. I have not seen a specimen labeled *taeniata*, but from Quoy and Gaimard's description and figure (1832, pp. 115-116, atlas, vol. 4, pl. 54, fig. 2) it would seem to be distinct from either *lineatum* or *vertagus*.

In addition to *Vertagus* Klein, 1753, and Schumacher, 1817, *vertagus* has been placed, from time to time, in *Clava* Martyn, 1784, and *Rhinoclavis* Swainson, 1840. Thiele (1931, p. 212) and Adam and Leloup (1938, p. 102) used *Rhinoclavis* as a subgenus of *Cerithium* Bruguière to contain this species.

Specific synonyms are: *Clava volvox* and *varia* Humphrey, 1797, *Cerithium virgatum* Montfort, 1810(?),¹ and *Vertagus vulgaris* Schumacher, 1817.

A correctly documented specimen of *Cerithium vertagus*, marked for *Murex vertagus*, is present in the Linnaean collection in London. It was not described in the "Museum Ulricae."

The classic figures of *vertagus* have already

¹ Montfort's sole species was "Cerith rubanné. *Cerithium virgatum*." The references he cited were both to the banded and non-banded shell indiscriminately, although the majority referred to the non-banded *vertagus*. His wretched figure shows no bands. However, his vernacular name "rubanné," meaning "striped" or "banded," makes it unwise to treat it as a synonym of *vertagus*, although it has been so used.

been cited. The best of the modern photographic figures is found in Thiele (*op. cit.*, fig. 213) except that it does not show the columellar plait.

Murex aluco

1758, *Systema naturae*, ed. 10, p. 755, no. 497.

1767, *Systema naturae*, ed. 12, p. 1225, no. 572.

LOCALITY: "In M. Mediterraneo" (1758, 1767).

"M. testa turrita, anfractibus tuberculatis, stria media spinosa, columella uniplicata, cauda adscendente . . . Testa cinerea labro rotundato."

The description of this species, which is identical in the tenth and twelfth editions of the "Systema," is adequate to identify it. The synonymy, however, is discordant, as it shows more than one species. Two of the figures (Argenville, 1742, pl. 14, fig. H; Seba, pl. 56, fig. 25) are not readily identifiable. The Argenville figure may be based on *aluco*, but shows a shell with much coarser sculpture than that in the *aluco* of authors and with more highly developed spines. Argenville called it by the inappropriate name of "Erica contabulata." The Seba figure is drawn as a sinistral shell, a common fault of the early conchological artists. The two figures from Buonanni (pls. 69 and 83) are also questionable. Each shows a sinistral shell. Plate 69 has large erect nodes. Plate 83 bears sharp spines. Both are highly stylized drawings, although they show obvious *Cerithium* species and may possibly have been meant for *aluco*. Of Rumphius' two figures (pl. 30, figs. N, O), figure O, which Rumphius called "Strombus angulatus," is undoubtedly *Cerithium nodulosum* Bruguière, 1792. Figure N, called "Strombus tuberosus," might, with reservations, be referred to *aluco*. Of the two Gualtieri figures (pl. 57, figs. G, A), figure G is also *nodulosum*, while figure A might be meant for *aluco*. Not only is a species quite distinct from *aluco* introduced, but the remaining figures are so poor that none of them can with any certainty be cited for *aluco*. Linnaeus apparently became convinced, after the publication of the twelfth edition, that he had confused two species, as he wrote the figure "2" before the synonymy in his interleaved copy of that edition. It is, of course, not certain which of the two species he proposed to eliminate, as in the tenth edition he had cited only one of the Rumphius figures (*nodulosum*) and in the

"Museum Ulricae," although he there restricted the synonymy, he again cited figure O of Rumphius and not figure N, which is more like *aluco*, and also cited both Gualtieri figures (*nodulosum* and ?*aluco*). This persistence in citing figures of *nodulosum* certainly casts some doubt on his conception of the species *aluco*.

The species under discussion was well known to most of the pre-Linnaean writers and was almost immediately identified under the Linnaean specific name. Chemnitz (1780-1795, vol. 4, p. 317, pl. 156, fig. 1478) referred his species to the *aluco* of the "Systema," although he called it "Turbo muricatus, oblique incurvatus. Rostrum corvi [error for 'curvi']." Born (1780, p. 321), on the other hand, possibly being deceived by the two figures of *nodulosum* in Linnaeus' synonymy, described a *Murex aluco* which is clearly *nodulosum*, although he supplied no figure. The true *aluco* he described separately as *Murex coronatus*, a name that falls into the synonymy of *aluco*.¹

Deshayes (1838-1845, vol. 9, p. 291, footnote) commented on the error of Born: "This *Murex coronatus* of Born is the real *aluco* of Linné. The first error of Born carried a second in its wake; he gave the name *aluco* to *Cerithium nodulosum*, which is a very different shell." *Cerithium nodulosum* is a much larger shell than *aluco*, heavily and bluntly spinose, with a widely flaring aperture and a lip that is deeply scalloped. The scallops are continued into the aperture as deep grooves corresponding to the basal cords of the exterior.

In addition to *coronatus* Bruguière, *Clavatica erica* and *hercula* Humphrey, 1797, and possibly *Strombus coronatus* Röding, 1798, are synonyms.

The present species belongs in the genus

¹ The *Strombus coronatus* of Röding (1798, p. 98) is a dubious species. Röding cited for it, first, *Murex aluco* Gmelin, which, with its six varieties, certainly included both *aluco* Linné and *nodulosum* Bruguière and possibly *Cerithium ebeninum* Bruguière and other shells which cannot be identified from the figures cited, and, second, two figures from Chemnitz (1780-1795, vol. 4, pl. 156, figs. 1478-1479) the first of which shows *aluco* and the second *C. vertagus* Linné. It is impossible, from this discordant synonymy, to determine what Röding had before him.

Cerithium Bruguière, 1789. It was placed in the pre-Linnaean genus *Vertagus* Klein, 1753, by H. and A. Adams, 1858, and Reeve, 1866. In Chenu's "Manuel," 1859, *Vertagus* was used as a subgenus of *Cerithium*. *Pseudovertagus* Vignal, 1904 (*Aluco* von Martens, 1880), was used as a subgenus to contain this species by Schepman (1909), and Thiele (1931, p. 213) used *Aluco* as a subgenus of *Cerithium*, with *aluco* Linné as subgenotype.

A duly documented specimen of *Cerithium aluco* is found in the Linnaean collection in London. In the same tray there are several unmarked examples of *Cerithium vulgatum* Bruguière, 1792, a species from the Mediterranean which resembles in many respects a small *aluco*. This mixture does not necessarily debar us from accepting the specimen of *aluco* as Linnaeus' holotype, as he probably believed *vulgatum* to be a variety of that shell. This is to some extent supported by Linnaeus' erroneous locality for *aluco*, the Mediterranean. *Cerithium aluco* is an Indo-Pacific species. Moreover, *vulgatum* is undoubtedly the variety described as "cauda recta brevi" in the "Museum Ulricae" description of *aluco*. It is sufficiently apparent from the above that Linnaeus considered *aluco* and *vulgatum* to be conspecific. I here restrict the name *Murex aluco* to the western Pacific and east Indian Ocean shell now known by that name, as I do not find that the restriction of the composite species has ever been stated in apt language.

Murex aluco was the only one of the Cerithiidae or Potamididae species described in the "Museum Ulricae." The description in that work is improved by the addition of several helpful phrases: "Testa solida, crassior," "Color albidus, adpersus scriptusque punctis ferrugineis s. fuscis," and "Labium interius unica ruga elevata superius notatum."

It is curious that Linnaeus failed to mention, in any of his three works, the prominent bulge developed on the body whorl immediately to the left of the parietal flange, which is not seen in any of the other Linnaean *Cerithium* species.

Cerithium aluco is well figured in Reeve (1843-1878, vol. 15, *Vertagus*, pl. 1, sp. 3) and in Kiener (1834-1850, vol. 5, *Cerithium*, pl. 6, figs. 1, dorsal and apertural views).

Murex fuscatus

1758, *Systema naturae*, ed. 10, p. 755, no. 498.

1767, *Systema naturae*, ed. 12, p. 1225, no. 573.

LOCALITY: "In M. Mediterraneo" (1758, 1767).

"M. testa turrita, anfractibus crenulatis: stria superiore denticulata . . . Testa fusca, basi obtusa.

Murex radula

1758, *Systema naturae*, ed. 10, p. 756, no. 499.

1767, *Systema naturae*, ed. 12, p. 1226, no. 575.

LOCALITY: "In O. Africano" (1758, 1767).

"M. testa turrita, anfractibus tuberculatis: striis duplici serie punctatis . . . Testa subincarnata, basi obtusa; Anfractuum puncta saepe apice alba."

The two above names are here discussed together as the generally received opinion at the present time is that *radula* is merely a sculptural and color form of *fuscatus*. It is admitted that so far as the Linnaean diagnoses are concerned this allocation rests on a very conjectural basis, as the radical differences between the two shells are clearly set out in Linnaeus' descriptions. Compare the "stria superiore denticulata" of *fuscatus* with the "anfractibus tuberculatis" of *radula*, the "testa fusca" of *fuscatus* with the "testa subincarnata" of *radula*, the "anfractibus crenulatis" of *fuscatus* with the "striis duplici serie punctatis" of *radula*.¹ These differences seem, at first glance, to point to two different species.

The name *fuscatus* is now generally applied to the form having spines or pointed nodes developed on the middle portion of the lower six whorls, these spines or nodes being usually tipped with white, and with two or more rows of contiguous small nodes or beads, some above and some below the suture, and with two rows of larger beads at the basal angle. The name *radula* is associated with the form in which the spines are lacking and are replaced by two rows of small tubercles on

each whorl and a row of even smaller tubercles which are sometimes above and sometimes below the suture. In both forms the suture is only vaguely defined. The only word in the description of *fuscatus* that can be taken to describe spines is "denticulata," which is an extremely euphemistic word to describe the elaborate spinose development of the shell. The phrase "apice alba," if it means the apex of the spire and not the tip of the spines, applies equally to both forms.

The synonymies are somewhat more rewarding. For *fuscatus* Linnaeus cited a figure from Argenville (1742, pl. 14, fig. &) which is an excellent picture of the spinose shell, and a figure from Gualtieri (pl. 56, fig. H) which, although badly drawn, is unquestionably *fuscatus*. On the other hand, the single figure cited for *radula* (pl. 58, fig. F) is a bad figure. Though it shows no spines I question whether it was drawn from a specimen of *radula*.

Adanson's "le Popel" (1757, p. 153, pl. 10, G, 4, figs. 1, dorsal and apertural views) has often appeared in synonymies of one or another of these two forms. The figures show a drastically decollated shell, with a stylized representation of spines, which are on the upper portion of the whorl adjacent to the suture instead of midway on the whorl. However, remembering that the figures in this work were not drawn by Adanson himself and are generally poor, I am willing to admit that his specimen might have been *fuscatus*. Fischer-Piette and his co-authors (1942, p. 250) found in Adanson's "retained" collection (see Dodge, 1955, p. 53) five specimens of a shell labeled "Popel" which they referred "either to *radula* or *oweni*" rather than to the typical spinose *fuscatus*. They did not figure these specimens and said that the original of the Adanson figures were not found. Thus, if Adanson's figure was, in fact, based on a specimen of *fuscatus*, it seems evident that he believed that the two forms were conspecific. Fischer-Piette and his co-authors list *fuscatus* as the typical form, place it in *Tympanotonus* (Klein) Schumacher, 1817, and place both *radula* and *oweni* in its synonymy.

Because of the lack of clarity in the two Linnaean descriptions and the confusion caused by them, the treatments of some of

¹ I confess that the expression "stria superiore denticulata" in the description of *fuscatus* is extremely equivocal. The denticulations in *fuscatus* have no connection with striae, as they arise from the comparatively smooth portion of the whorl, and the shell has no striae, properly speaking, but rather two or three rows of small contiguous nodes at the suture, which were apparently covered by the expression "anfractibus crenulatis."

the early successors of Linnaeus are here discussed:

Martini and Chemnitz were apparently so impressed with the lack of precision in the descriptions that neither name appears in any of their volumes. However, the spinose *fuscatus* was characteristically figured by Chemnitz (1780–1795, vol. 9, p. 193, pl. 136, figs. 1267–1268). These figures are as accurate as any that appeared before the advent of photography. Chemnitz called the species "Strombus tympanorum aculeatis Africanus fluviatilis," and his references do not include the "Systema naturae" but consist of several pre-Linnaean figures, including the good Argenville figure cited by Linnaeus for *fuscatus* and one post-Linnaean reference, the *Nerita aculeata* of Müller (1773–1774, vol. 2, p. 193), a name that is found today in all complete synonymies of *fuscatus*. Two further figures from Chemnitz (*op. cit.*, vol. 4, p. 304, pl. 155, figs. 1458–1459) have been cited several times for the form *radula*. Chemnitz called them "Turbinis circulis granulatis excavatis cincti" with no references. They are badly drawn, but one of them (fig. 1459) could conceivably have been modeled on a young specimen of *radula*. The word "excavatis" describes the deeply incised suture seen in senile specimens of *radula*, but this is not present in the young shell. The figures have little evidential value.

Born (1780, p. 323) supplied a description of *fuscatus*, which clearly points to the spinose shell, but he gave no figure. His *radula* (p. 324, pl. 11, fig. 16) is the granulose form.

Bruguière did not list *fuscatus*, but his *Cerithium muricatum* (1789–1792, vol. 1, pt. 2, p. 491) is demonstrably the same species and has been considered a synonym of *fuscatus*, beginning with Deshayes (1843, see p. 197, below). Bruguière's *Cerithium radula* (*tom. cit.* pt. 2, p. 491) described both the adult and the juvenile shells. For the adult he referred, among other figures, to Adanson's questionable figure of "le Popel," which appears to the present writer to have been based on the spinose form, the *fuscatus* of modern authors. It has been noted above that the specimens actually present in Adanson's "retained" collection are of the granulose form. Bruguière also included a reference to Müller's *Nerita aculeata*, which is the spinose shell. For the young shell he referred to the

Gualtieri figure cited by Linnaeus for *radula* (pl. 58, fig. F), Chemnitz' questionable figure 1459 which has, however, been cited for *radula*, Born's good description of *radula* and the latter's good figure, and, most significantly, the *radula* of the twelfth edition of the "Systema naturae." It is obvious, therefore, that Bruguière partially reversed Linnaeus' conception of the two forms, as revealed by the terms of the latter's descriptions, not only by giving the name *radula* to both but by treating them as life stages of a single shell. The following quotation from his comments is as close a translation as can be made of his usual peculiarly and vaguely constructed sentences, but at least shows his confusion of mind as to the two forms:

"If one refers to the number of tuberculate ribs on each spiral whorl of this shell, one cannot refuse to believe that this was the true 'Cerite Potel' of M. Adanson and the *Nerita aculeata* of Müller; as, outside of the fact that the number of ribs does not conform to the two in the Cerite murique and that it varies from four to five on each whorl in this species, I am obliged to believe that this Cerite ratissonne [*radula*] is the true shell of these two authors [Adanson and Müller], which they had very improperly confused with the other species, and of which they have even included some of the features in their descriptions

"The Cerite ratissonne is almost always in a brown epidermis, less dark than that of the preceding species [*muricatus*] and just as persistent. It is white in the aperture and sometimes marked in youth by a whitish band along the suture. Linné says that it is found in the Seas of Africa.

"M. Adanson says, on the contrary, that it is found in the muddy rivers of Senegal, where the tide-water reaches, but it is obvious that this author is speaking of the *Cerithium muricatum*, which, as I have sufficiently demonstrated, he confused with our species, and of which he gave a mixed description under the name of le Popel."

Gmelin (1791, pp. 3562–3563) used the Linnaean descriptions of both names, but with some paraphrasing that conformed them more closely to the modern view. One detail in his description of *radula* should be noted. Linnaeus used the phrase "Anfractuum

puncta saepe apice alba." This was altered by Gmelin to "tuberculis saepe apice alba." I have never seen a specimen of *radula* in which the tubercles were tipped with white, although the tip of the spire of both forms is usually white, but Gmelin's amendment at least more clearly ties the phrase to the tubercles of *radula*. In the case of *fuscatus*, a very slight amount of wear whitens the tips of the spines. In his synonymy of *fuscatus* Gmelin cited the Gualtieri and Argenville figures used by Linnaeus for that name, both of which show the spinose form. For *radula* he omitted the Gualtieri figure cited by Linnaeus (pl. 58, fig. F), a very bad figure, although it showed no spines, and substituted for it a figure from Schröter (1783-1786, vol. 1, pl. 3, fig. 6), which I feel was an unsuccessful attempt to figure the granulose *radula*. At least it shows no spines. Thus Gmelin took a position opposed to that of Bruguière and adopted the modern conception of the allocation of the two Linnaean names.

Röding (1798, p. 97) listed a *Strombus tornatus* which is clearly *radula*, as he cited for it the *radula* of Gmelin, the Schröter figure of a granulose, non-spinose shell, and a figure from Favanne's edition of Argenville (1780, pl. 40, fig. F) which is also granulose. He did not list *fuscatus*.

Link's *Aluco radula* (1807, p. 130) is referred to the *radula* of Gmelin and the questionable Schröter figure. It is a reasonable assumption that his was the granulose form. His *A. aculeatus* is referred to *Strombus aculeatus* Gmelin (p. 3523), which is in turn referred to Adanson's figure of "le Popel," and the excellent Chemnitz figures of the spinose *fuscatus*, which Chemnitz had called "*Strombus tympanorum aculeatus Africanus fluviatilis*," but had not referred to the "Systema" species. Link's species is thus clearly *fuscatus*.

Dillwyn (1817, pp. 752, 754) correctly separated the two forms, as his descriptions of both are excellent and the first elaborate and correct diagnoses which had appeared. He, however, treated them as distinct species. His synonymy of *fuscatus* is almost entirely accurate. That of *radula* is mixed, as he included the *Nerita aculeata* of Müller, the figure of "le Popel" of Adanson, which appears to have been modeled on a specimen of

fuscatus, and the *Cerithium radula* of Bruguière which, if he considered only Bruguière's "adult" shell, was *fuscatus*.

Lamarck did not list *fuscatus* under that name, but his *Cerithium muricatum*, like the *muricatum* of Bruguière, was clearly *fuscatus* Linné. He cited for it (1822b, p. 70) three unquestioned figures of *fuscatus* (Argenville, 1742, pl. 14, fig. &, and Chemnitz' figs. 1267-1268), together with a reference to Bruguière's *muricatum*. He did not mention the *fuscatus* of Linnaeus. Deshayes, however, in the second edition of Lamarck's work (1838-1845, vol. 9, p. 292) added to Lamarck's synonymy a reference to the *fuscatus* of both the tenth and twelfth editions of the "Systema," among several other unquestioned references.

Lamarck's synonymy of *radula* (*tom. cit.*, p. 70) is extremely bad. It contains at least three obvious references to *fuscatus*: *Nerita aculeata* Müller, *Cerithium radula* Bruguière, and *Strombus aculeatus* Gmelin.

The first categorical statement that *C. muricatum* was in fact *fuscatus* Linné was made by Deshayes (*tom. cit.*, p. 292, footnote), who said: "A careful examination of *Murex fuscatus* Linné leaves no doubt as to its identity with the species which Bruguière and Lamarck called *Cerithium muricatum*. The species should therefore resume the name *Cerithium fuscatum*." Deshayes did not, however, improve Lamarck's *C. radula*, as he left in its synonymy all the figures of *fuscatus*, correct or not, which Lamarck had used, and added others, thus leaving this complex in its original confused condition.

Kiener, in 1840, was also confused. He supplied a good figure of the spinose form (1834-1850, vol. 5, *Cerithium*, pl. 31, figs. 2, dorsal and apertural views) but called it *radula*. His figures of *C. muricatum* Bruguière (*tom. cit.*, pl. 13, figs. 1, dorsal and apertural views) also show the true *fuscatus*. The only difference in the two pairs of figures is that the shell he called *radula* is shown in a lighter brown, which is correct. He did not describe or figure the true *radula*. He listed a *Cerithium fuscatum* O. G. Costa (*in* Philippi, 1836, 1844, vol. 2, p. 161, pl. 11, fig. 7), a shell distinct from either *fuscatus* or *radula* Linné. It is a Mediterranean species, with granulations larger than in *radula* but lacking the spines of

fuscatus. It was renamed *Cerithium mediterraneum* by Deshayes (*loc. cit.*, footnote, above). Kiener's text and plates covering this complex were published before Deshayes' correct identification of *fuscatus* in 1843, but at least he must have known of the accurate treatments by Link and Dillwyn.

Reeve, in 1866, correctly allocated the two forms, as appears from his figures and pertinent text (1843-1878, vol. 15, *Tympanotonus*, pl. 1, sp. 3, for *fuscatus*; pl. 1, sp. 4, for *radula*). His figure 5 on the same plate shows *T. ownei* (Ferussac) Reeve, a recognized form of *fuscatus* and close to form *radula*, distinguished only by the slightly greater coarseness of its sculpture. Reeve's figure illustrated its characteristics. It will be remembered that Fischer-Piette and his co-authors were in doubt as to whether the specimen labeled "Popel" in Adanson's "retained" collection were *radula* or *oweni*.

Since Reeve's volume 15 appeared, there has been little difference of opinion in regard to this group of forms. The spinose shell has seemingly been accepted as *fuscatus* Linné and the granulose form as *radula* Linné. The most recent and complete synonymy of *fuscatus*, *radula*, and *oweni* is found in Dautzenberg (1927, pp. 495-499). Dautzenberg, however, emphasizes the questionable character of any proposed synonymy by saying (p. 496): "The nomenclature of the *Tympanotomus* [*sic*] of West Africa is made very doubtful by the lack of precision of the Linnaean names which have been attributed to them. The name *fuscatus* has been generally applied to the form decorated, above the suture, with very prominent tubercles, pointed and far apart." The difficulty in arriving at a correct allocation of the two principal forms has not only been the "lack of precision" noted by Dautzenberg, but also the vagueness or inaccuracy of many of the published figures and the worn condition of the specimens of this complex in the Linnaean collection in London.

The two principal forms, as now accepted, are placed in the genus *Tympanotonus* (Klein) Schumacher, 1817,¹ after having been in-

cluded in *Cerithium* Bruguière, 1789, *Potamides* Brongniart, 1818, or *Cerithidea* Swainson, 1840, by many writers. A recent treatment (Thiele, 1931, p. 206) makes *radula* the typical species and the type species of *Tympanotonus*.

The important synonyms of each of the members of this complex are listed below and clearly illustrate some of the differences of opinion among the earlier writers. These synonyms are based on the conclusions accepted at the present time as to the relationship of the three names.

Tympanotonus fuscatus Linné

"Le Popel" Adanson, 1757 (as figured by Adanson, type not found)

Nerita aculeata Müller, 1774

Cerithium muricatum Bruguière, 1792

Cerithium radula Bruguière, 1792 (adult only, and of Kiener, 1839-1840, *non* Linné, 1758)

Strombus aculeatus Gmelin, 1791

Aluco aculeatus Link, 1807

Cerithium spicatum Perry, 1811

Tympanotonus fuscatus Linné, form *radula* Linné
? "Le Popel" Adanson, 1757 (in "retained" collection)²

Cerithium granulatum Kiener, 1839-1840, *non* *M. granulatus* Linné, 1758

Tympanotonus fuscatus Linné, form *oweni* (Ferussac) Reeve, 1866

? "Le Popel" Adanson, 1757 (in "retained" collection)²

Potamides (*Tympanotonos*) *radula* (Linné) Tryon, 1887, and Kobelt, 1898

Potamides (*Tympanotomus*) *fuscatus* Linné, var. *oweni*, Dautzenberg, 1912

An attempt to coordinate Hanley's comments (1855, pp. 308, 309) on this complex with the documentation of the two shells in the Linnaean collection in London is inconclusive. Of *fuscatus* he said that "the *Cerithium radula* of Bruguière' is marked for this shell in the Linnaean cabinet, and accurately agrees with the description." This statement is partly equivocal. As said above, Bruguière's adult *radula* was, it is true, *fuscatus*, but his

also appeared as *Tympanotonus*, the correct form, and *Tympanotomus*.

² The five specimens labeled "Popel" found by Fischer-Piette and his co-authors (1942) in Adanson's retained collection were, according to these writers, either form *radula* or form *oweni*. They did not figure them.

¹ Schumacher's genus has been spelled in three different ways. Its author used *Tympanotonos*, but it has

juvenile *radula* appears both from his description and his references to have been the true *radula*. In the case of *radula* he did not say that any specimens were marked as such by Linnaeus, but merely commented (p. 309): "An immature decorticated example, however (Born, Test. Mus. Vind. pl. 11, f. 16, nearly) in the Linnaean collection, in which two central rows of raised white dots are alone conspicuous (the infrasutural series being indistinct), so fairly agrees with the described characters that one may readily believe that our author described the species from this uncharacteristic individual. Assuredly no other object in the entire collection, wherein its presence is asserted in the list that accompanies the tenth edition, at all suits the definition, yet, as no mention of it occurs in the final list . . . no proof of its identity can be derived from that circumstance."

The above is certainly not in accord with what is shown on the microfilm of the collection in the present writer's hands. Three good specimens of *fuscatus*, the spinose shell, are there shown, accompanied by a printed label in Gothic lettering reading "*Murex fuscatus*," a label that we are reasonably certain was supplied by Hanley himself (see Dodge, 1955, p. 7). The "marking" reported by Hanley is not brought out in the photographs, but this is true of all but a few species shown on the film. Two specimens of the granulose *radula* are also present and, as appears from the film, one is a much worn adult and possibly senile individual, the other a subadult a little over 2 inches in height and apparently a fresh specimen. Both are heavily granulose and clearly *radula*. These specimens are also accompanied by a "Hanley" printed label reading "*Murex radula*." As it seems apparent from Hanley's text that these specimens were not in any way documented by Linnaeus, as Hanley was careful to point out all specimens that were so marked, we cannot accept them as syntypes of *radula*, although there is no evidence to indicate a mixing of specimens or the later introduction of a shell not owned by Linnaeus. The name *radula* does not appear on his final 1767 list, although it was noted in the 1758 list.

Thus the collection demonstrates that Linnaeus' *fuscatus* was the spinose shell, but in the case of *radula* the collection yields no proof, although it seems a fair assumption based on the Linnaean description and the citation of the Gualtieri figure (pl. 58, fig. F) that it was the granulose shell.

The best figures of *fuscatus* are those in Reeve (1843-1878, vol 15, pl. 1, sp. 3) and in Tryon (1879-1888, vol. 9, pl. 31, fig. 34). The Chemnitz figures (1780-1895, pl. 136, figs. 1267-1268) are the most characteristic of the early drawings. Good figures of the form *radula* are difficult to find. The best is Thiele's photograph (1931, p. 206, fig. 202).

Murex torulosa

1767, Systema naturae, ed. 12, p. 1226, no. 574.

LOCALITY: Not given; "e Museo Hen. Gyllenborg."

"M. testa turrita, anfractibus superne zona torulosa, cauda brevi . . . Testa alba, laevis, s. parum longitudinaliter striata. Anfractus cincti zona gibba, elevata, obtusa, torulosa. Apex plicatus."

This name, which appeared for the first time in the twelfth edition, is described in language that cannot be improved. It is a graphic description of the corded shell now known as *Cerithium torulosum*, and there has been no question of its identification since the vagueness with which the early writers treated it. It is one of the few Linnaean mollusks that can be readily identified even with the lack of any locality or references. Linnaeus did not own a specimen of the species, and the mention of the Gyllenborg collection makes it reasonably certain that his description was based on a specimen from that source. The Linnaean collection in London, therefore, contains no specimen.

It should be emphasized at the outset that two distinct forms have been given the name *torulosa*, at least since the middle of the nineteenth century. One is a shell that conforms to the Linnaean description. Its three, and sometimes four, anterior whorls are smooth and encircled just below the suture with a continuous, heavy, rope-like cord which, in fresh specimens, is longitudinally plicate. The upper whorls are more heavily plicate. In the other form the revolving cord is lacking and is replaced by a band of

nodes. Its whorls are somewhat more convex, and the suture is often defined by a bluish line. The entire shell is granulose, the heavier nodes at the suture producing a slight tumidity at that point. The outer lip is expanded and somewhat deeply scalloped or toothed.

It is obvious that Linnaeus' description was based on the corded shell, and this is true of the descriptions of the early writers, as is noted below, all of whom used graphic language in describing the revolving cord. Indeed, I doubt whether any author before Reeve was aware that the other form existed. Reeve (1843–1878, vol. 15, *Vertagus*, pl. 5, sp. 25a, b) listed the non-corded form as typical, although he cited two references to the corded shell as synonyms. His figure 25b is a good figure of the corded shell as shown in the early illustrations, and he said of this figure: "Figure 25b is a frequently occurring, irregular growth peculiar to this species; it may be identified with the more regularly formed shell by the apex, which is characterized by broad ribs with livid-blue between them." I have not seen a specimen having a spire as described by Reeve and have not seen a specimen of the corded shell showing any blue color. Tryon (1879–1888, vol. 9, p. 147, pl. 28, figs. 50, 52, 53) clearly distinguished the two forms, saying of the non-corded shell: "Whitish, noduliform ribs, beaded and tumid at the suture, spirally ribbed, outer lip digitated." He selected this form as typical and clearly figured both. I cite these two treatments of the species in order to emphasize my opinion that Reeve and Tryon were both in error in selecting the typical form. Based on the specimens examined and on the figures and descriptions covering a period of two hundred years, the corded shell seems to be the most common, rather than a rare or monstrous form. Indeed, I seriously doubt whether the two are conspecific. In any event, the corded shell was the form that Linnaeus described as *torulosa*, a name used for that form for many years. I have not been able to examine a specimen of the so-called "typical" shell and cannot find that it has been given another name.

In the review of the earlier mentions of the species, it will be noticed that it was not immediately identified with the *torulosa* of

Linnaeus. The earliest figure that has been referred to it by later writers was from Chemnitz (1780–1795, vol. 4, p. 325, pl. 157, fig. 1486). It is not a good figure, as its revolving cord involves the five lower whorls, and the base is deeply striate. The plications of the spire are not shown. Chemnitz called his species by the appropriate name "*Turbo annulatus*, rostro recurva, ad basin spirarum fascia torosa cinctus," but supplied no references. In his four-line comment on the species he merely noted that he had nothing to say about it, that it was unknown to him, and that Spengler did not own a specimen or know what it was. Where he obtained his descriptive name presents an interesting problem.

In a later volume (1780–1795, vol. 10, p. 280, pl. 164, figs. 1575–1576), Chemnitz described and figured a shell that is somewhat closer to *torulosa*. His figures are recognizable, although not entirely accurate, as the revolving cord appears only on the last two whorls. He called it "*Murex larva Erucae* . . . anfractibus cingulo calloso-crenato vitatis . . ." but gave no references, even to his earlier "*Turbo annulatus*." He mentioned that the specimen described was in the Spengler collection, that he did not know its locality, and that it was undescribed. In spite of the defects in both the fourth- and tenth-volume figures, I suggest that both listings, based on these figures, referred to the corded *M. torulosa*.

Gmelin (1791, p. 3563) merely paraphrased the Linnaean description and continued the omission of locality or references, not even referring to the first Chemnitz figure (1780), which had already appeared. He also vastly complicated the question by listing three other "species," two of which were referred to Chemnitz' figures. His *Murex annularis* (p. 3561) was referred to Chemnitz' figure 1486 ("*Turbo annulatus*"). His *M. fuscus*, on the same page, was referred to two pre-Linnaean figures (Lister, pl. 120, fig. 15, and Klein, pl. 2, fig. 38). The first of these might have been a very conventionalized attempt at reproducing *torulosa*. The second appears to be a copy of Lister's figure. The two are mentioned here because the Klein figure was later synonymized with *torulosus* by Dillwyn, and the Lister figure on plate 120, figure 16,

was substituted by Dillwyn for the one cited by Gmelin. Gmelin's *Murex larva* (p. 3559), a name probably taken from Chemnitz' "Murex larva Erucae," cited the Chemnitz figure of that species. It is probable that all three of Gmelin's names referred to the same species.

Link (1817) did not list any of the above names nor refer to any of the figures supporting them.

Dillwyn (1817, p. 753), as was his almost invariable custom, cited a comprehensive synonymy which included every name and every figure that had been cited by his predecessors, including the poor pre-Linnaean figures referred to by Gmelin for *M. fuscus*, although he altered the Lister figure (pl. 120, fig. 15) to a later figure (pl. 121, fig. 16) which is even less characteristic.¹ His description surely refers to the corded shell, as it employs the phrases "with a convex belt at the suture of the lower . . . whorls" and "The three lower whorls have a thick rounded belt at the sutures."

Lamarck (1822b, p. 74) was the first to have recorded the possession of a specimen of *torulosus*. He clearly identified the species with both of Chemnitz' shells, citing the figures for both, and also referred to the *torulosus* of "Lin. Gmel.," the *C. torulosum* of Bruguière, and Gmelin's *annularis*, omitting the repetitious species *larva* and *fuscus* of Gmelin. He described only the corded shell, as he used the significant phrase "A curious shell in that the upper part of the whorls is corded."

Deshayes (1838-1845, vol. 9, p. 300, text) added several items to Lamarck's synonymy, including *larva* Gmelin, but limited Dillwyn's synonymy by accepting it only as "exclus. plur. syn." Like Lamarck, he was vague as to the number of whorls that bore the cord, saying only "the upper part of its whorls are as if corded."

Hanley, too, recognized only one form of

¹ The Lister and Klein figures were criticized by Deshayes (1838-1845, vol. 9, p. 300), who said of them: "Dillwyn included in his synonymy of this species, the figure 16 on plate 121 of Lister, and reproduced by Klein tent. pl. 2, fig. 38. These figures represent a shell quite distinct from that to which Gmelin gave the name of *Murex fuscus*, and one which is a true *Melania*, probably the *carinifera* of Lamarck." I hesitate to refer either figure to *Melania* or to *C. torulosum*.

the species, and the only figures he referred to were Chemnitz' figures 1575 and 1576, "being the only known shell which exhibited the required characteristics." He accepted the identification of this "peculiar" shell with the *torulosa* of Linnaeus.

Since Lamarck no question has been raised as to this identification, and, until Reeve, the uncorded form, if, indeed, it be a form of *torulosus*, does not appear in the literature. I am willing to agree that all the figures mentioned above, with the exception of the undecipherable Lister and Klein figures, and all of Gmelin's four specific names may be referred to *torulosa* Linné.

Murex torulosa is now placed in *Cerithium* Bruguière, 1792, and is allocated by Thiele (1931, p. 213) to the subgenus *Tiaracerithium* Sacco, 1895, as the subgenotype.

It is well figured in Reeve (1843-1878, vol. 15, *Vertagus*, pl. 5, sp. 25a, b), who figures both forms, but gives as synonyms only *Murex annulatus* Martyn and *M. annularis* Gmelin, both of which I consider to have been the corded form. See Kiener's figures (1834-1850, vol. 5, *Cerithium*, pl. 2, figs. 2, dorsal and apertural views), which resemble Reeve's figure 26b, the corded shell.

It was not described in the "Museum Ulricaë."

Murex asper

1758, *Systema naturae*, ed. 10, p. 756, no. 500.

1767, *Systema naturae*, ed. 12, p. 1226, no. 576.

LOCALITY: Not given in 1758; "in *M. Guineensi*" (1767).

"*M. testa turrita, anfractibus sulcatis transversim striatis muricatis, cauda adscendente . . . Testa lactea, subulata, solida, 12 s. 14 sulcis longitudinalibus: singulis 4 pluribus; ore spinis brevibus. Cauda adscendens labro interiore planiuscula, uniplicato.*"

In the tenth edition of the "Systema" only the main description was given, with the words "cauda adscendente" omitted. No locality was supplied; no references were given in either edition. The species could hardly have been identified from such an uninformative diagnosis. Even with the addition of the detailed subdescription in the twelfth edition, which somewhat amplified and explained the vague details of the tenth, and even with the stating of a definite locality, it would seem that any early identifica-

tion must have been tentative. The species was not immediately recognized by any of Linnaeus' followers except Bruguière (1789-1792, vol. 1, pt. 2, p. 275). He placed it in his new genus *Cerithium* but altered the specific name to *asperum*, referring it specifically to *Murex asper* of the twelfth edition.

Several items in the description may be criticized. The phrase "ore spinis brevibus" is misleading, as the irregularities of the outer lip are merely the terminations of the nodose transverse riblets and should not be dignified by the word "teeth." The "12 or 14 longitudinal sulci" required by the description are more than the present writer has observed in any form of *asper*. The phrase "singulis 4 pluribus," which is separated from the other phrases of the description by a colon and a semicolon, is obscure. Hanley (1855, p. 310) said of these words: "I cannot but surmise it to have been a misprint for 'singulis 4 pluribusve spinis, &c.'" I assume that Hanley considered that the word "singulis" meant "each whorl," but his interpretation seems equally obscure, as there are six rows of spines on the body whorl and only three on the rest of the shell.

Neither Martini nor Chemnitz mentioned the name or described any species that can be referred to it. Gmelin listed *asper* twice. The first use (1791, p. 3542) is not the *asper* of Linnaeus, as it is described as a reddish brown shell, without murications or spines, with acute transverse ribs, axially plicate, and with a crenulated lip and a spire of only five to six whorls. The only figures he cited (Chemnitz, 1780-1795, vol. 4, pl. 150, figs. 1396-1397) correspond well enough to his description but are utterly dissimilar to *Cerithium*. Chemnitz (*tom. cit.*, p. 232) called his species "Turricula striis exasperata," a name inappropriate either for his figures or for *asper* Linné. Gmelin's *asper* number one was renamed *Murex dubius* by Dillwyn (1817, p. 716), who said of it: "It possesses no affinity with the Linnaean *M. asper* and would perhaps stand better near *Buccinum plicatulum*." I cannot identify it. Gmelin's second use of the name *asper* (p. 3563) is probably the true *asper* Linné. His description is a fair paraphrase of that of Linnaeus and seems to have been based on the form *lineatum* Lamarck which is discussed below. He did not, how-

ever, refer it specifically to the "Systema" species and cited only one figure (Schröter, 1783-1786, vol. 1, p. 540, pl. 3, fig. 7), an extremely bad drawing which resembles *M. aluco* Linné more closely than *asper*.

I have said above that neither Martini nor Chemnitz described any shell that could be referred to *asper* Linné. Chemnitz (*tom. cit.*, p. 322, pl. 157, fig. 1483) did list a "*Murex granulatus* Linnaei" which he referred to *Murex granulatus* of the "Systema," and, as is noted below, the latter name covers merely a form of *asper*. While Chemnitz' description is reasonably accurate, the figure he cited is not *granulatus*. It shows a shell devoid of granulations or spines, and with extremely strong axial ribs covering the entire shell. The twist of its anterior canal is much exaggerated. In fact, the figure is so unresponsive to the description that it casts the gravest doubt on his species. This fact was noted by Bruguière, who said (*loc. cit.*), "Messieurs Chemnitz and Schröter were deceived in speaking of this shell [*asperum*], the first as describing it under the name *granulatus* of Linné, and the other in figuring, under the name *Murex asper* of the same author, a shell which, although of the genus *Cerithium*, is nevertheless quite distinct from the present species."

Röding did not describe *asper*, although he listed a *Strombus granulatus* for which he cited Chemnitz' figure of "*granulatus*," mentioned in the preceding paragraph. Link did not describe *asper* or its forms *granulatus* and *lineatum*. Dillwyn's treatment of *Murex asper* was the first categorical identification of the species after Bruguière. He supplied a description which is almost perfect in its detail, although he still did not unite it with *granulatus* Linné or with the color variety later called *lineatum* by Lamarck.

Lamarck (1822b, p. 72) adopted Bruguière's specific name *asperum* and referred to it in his synonymy. He located the species in the "Ile de France" (Mauritius) and qualified Bruguière's erroneous Antillean locality by saying "according to Bruguière." His synonymy was a mixture of references to the typical form of the species and to the form *granulatus* Linné.

Since Lamarck the nomenclatural history of the species has been uneventful, and the specific name has been restored to its original

form, *asper*, although the spelling *asperum* has persisted in the works of some European conchologists. The only question has been the relationship between *asper* Linné, *granulatus* Linné, and *lineatum* Lamarck, but it seems to be now universally conceded that both of the latter are conspecific with *asper*. While the three forms show some difference in color and in sculpture, the underlying sculptural structure is almost identical, and it is possible to find the necessary chain of intermediates to connect the three forms. In the case of *lineatum* the descriptions often show more radical differences from *asper* than are justified and give one the impression that the describers are unconsciously attempting to rationalize their thesis that the species is distinct. *Cerithium lineatum* differs from the typical *asper* only in the reddish lines which encircle the shell along the series of murications on the transverse riblets, although there is a great variation in the depth of color of these lines and in their frequency. *Cerithium granulatum* (Linné) is discussed below in its proper order. It is perhaps unfortunate that Linnaeus supplied no synonymy for *asper*. Had he done so the common identity of the forms, particularly of *lineatum*, might have been more apparent.

Lamarck (*loc. cit.*), in his synonymy of *lineatum*, queried the identity of his shell with Bruguière's variety " β " of *asperum*. However, a comparison of the description of the variety with Lamarck's description of *lineatum* leaves no doubt that they covered the same form. Deshayes (1838–1845, vol. 9, p. 256, footnote) made them conspecific, saying: "It is very probable that we must reunite in a single species *Cerithium asperum* and *lineatum*." Both Kiener, prior to Deshayes' conclusion, and Reeve some years later, continued to use *lineatum* as a good species, but later writers have generally synonymized it with *asper*.

In addition to *granulatus* and *lineatum*, *Clava rugata* Martyn (1784 [–1792], vol. 1, pl. 12) is a synonym of *asper*. *Strombus vibex* Gmelin, 1791 (p. 3522), has been frequently cited as a synonym. The description of *S. vibex* does contain features applicable to *asper*, but its synonymy is not convincing. Gmelin referred it to a pair of figures from Chemnitz (1780–1795, vol. 9, pl. 136, figs.

1261–1262). These show a shell which might be meant for an *Alaba*, but which is certainly not a *Cerithium*; to a figure from Gualtieri (pl. 6, fig. G) which, while possibly meant for a *Cerithium*, cannot be referred to *asper*; to a Lister figure (pl. 119, fig. 4, possibly an error for fig. 14 on the same plate) which, even when corrected, cannot be taken for *asper*; and to a Petiver figure (pl. 100, fig. 11) which the present writer has not seen, as that plate is lacking in the copy consulted. In the face of the figures examined I cannot refer *asper* to Gmelin's *vibex*.

Murex asper is not *Cerithium asperum* Pease, 1860, nor *C. asperulum* Tryon, 1887. The form *granulatum* is not *C. granulatum* Bruguière, 1792, which, while it is to me an equivocally defined species, seems much closer to *Murex cingulatus* Gmelin, 1791, than to Linnaeus' *granulatus*. *Murex asper* is also not *C. granosum* Wood, 1828, nor *C. granosum* Kiener, 1839–1840.

The present species was not described in the "Museum Ulricaë."

The best of the early figures of *asper* are found in Schubert and Wagner (1829, pl. 219, figs. 3046–3047). They show the form *lineatum* and were so described (p. 23). See also the "Tableau encyclopédique" (pl. 443, figs. 3a, b, form *lineatum*), Reeve (1843–1878, vol. 15, *Vertagus*, pl. 5, sp. 21), and Tryon (1879–1888, pl. 28, figs. 62–63). Tryon's figure 63 is *lineatum*.

Murex granulatus

1758, *Systema naturae*, ed. 10, p. 756, no. 501.

1767, *Systema naturae*, ed. 12, p. 1226, no. 577.

LOCALITY: "In O. Asiatico" (1758, 1767).

"M. testa turrita tuberculis decussatim adspersa, cauda acuta adscendente . . . Testam tantum vidi, quam inhabitavit et reformavit hospes Bernardus Eremita."

It is now considered that this name should be accepted only as a form of the preceding species, *Cerithium asper*. The differences between its description and that of *asper* may seem significant at first glance, but the variations between the two are in reality very slight, and the basic underlying sculpture is almost the same in both. In other respects the shells are identical. Indeed, such minor differences as exist in the sculpture would be explainable if we assume that Linnaeus had

before him specimens of *asper* so worn that the spines or prickles had become mere granulations scattered over the surface.

The early writers, almost without exception, considered *granulatus* a good species.¹ Deshayes (1838–1845, vol. 9, p. 295, footnote) was the first to assert the common identity of the two shells, although I am tempted to discount one of the bases of his reasoning. He there said: "We reunite two species of Linnaeus which, based on their characteristics, seem to us to be identical. Their separation has been explained by Linnaeus himself, who said that he had only seen *Murex granulatus* when mutilated and deformed by having been used as the home of hermit crabs, animals most of whom have the power of dissolving the interior portions of shells which hamper their movements and their growth." When Linnaeus' language is examined, it is seen, first, that his "explanation" did not "separate" the two forms and, second, the phenomenon recorded by him could only refer to the aperture and interior of the shell. Some species of hermit crabs admittedly destroy or dissolve the interior of the shell they occupy, a result the present writer has often seen, but it is difficult to imagine any *action of the crab* that could wear away the exterior sculpture. All dead shells that have been water-worn or beach-worn tend to have their exterior sculpture radically changed in appearance, but it is very problematical how much the movements of the crab in crawling could materially increase this wear.

It is unfortunate and curious that Linnaeus should not have supplied a synonymy of the common and well-known *asper*, as the references he gave for *granulatus* are extremely equivocal, although some of them appear to be a mixture of the two forms. The Buonanni figure (pl. 81) was not modeled on either form, as its spiral sculpture is shown as much too heavy. The figure from Rumphius (pl. 30, fig. L) is much like *asper*, although it is a granulose rather than a spiny

shell and one in which the axial sculpture is not dominant. Argenville's figure (1742, pl. 14, fig. K) shows what is apparently a worn specimen of *asper* with a broken or worn aperture, although its sides are markedly turreted rather than evenly sloping. The figure from Klein (pl. 7, fig. 119) shows a granulose shell almost identical with that of Rumphius. These figures were cited indiscriminately for *asper* or *granulatum* by later writers. Hanley (1855, p. 310), in his discussion of *asper*, remarked: "It is somewhat singular that all but the first of the four synonyms attached to the next species [*granulatus*] belong properly to this shell. Might it not have been an error of transposition or of the press?" I cannot go so far, as all of the figures for *granulatus* show a granulose and not a spiny shell. None of them could have been modeled on the typical unworn *asper*, and Linnaeus specifically used the word "*muricatis*" in his description of the latter.

The name *granulatus* Linné is seldom used today. Both Reeve (1843–1878, vol. 15, *Vertagus*, pl. 5, sp. 21) and Tryon (1879–1888, vol. 9, p. 148) mentioned it only as a synonym of *asper*. Hanley (*loc. cit.*) referred to Deshayes' view of their common identity with tepid approval and concluded by recommending that "the name of a *Murex* confusedly characterized from imperfect specimens" be dropped, although he modified this by adding, "with a ? attached."

Although Linnaeus mentioned having "seen" specimens of his *granulatus*, no specimens of that form are in the Linnaean collection in London. Possibly, as the specimens were crab shells, he did not consider them worthy of being placed in his cabinet. This is a remote possibility, however, as the collection contains many worn specimens which are properly documented by Linnaeus, either on the shell itself or on the tray containing it. In any event, nothing in the collection conforms more closely to the description of *granulatus* than the fresh, unworn, and authenticated specimen of *asper*.

Murex decollatus

1767, *Systema naturae*, ed. 12, p. 1226, no. 578.

LOCALITY: Not given; "Museo De Geer."

"M. testa turrita anfractibus longitudinaliter plicato-sulcatis, apice decollato . . . Similis Helici

¹ See Chemnitz (1780–1795, vol. 4, pl. 322, pl. 157, fig. 1483), whose figure, however, is not *granulatus*, as it has neither granulations nor spines; Bruguière (1789–1792, vol. 1, pt. 2, p. 476), who referred his *C. granulatum* to that of Linnaeus, but which is clearly another species, probably *Murex cingulatus* Gmelin (1791, p. 3561); Lamarck (1822b, p. 69) whose *C. granulatum* is also *cingulatus* Gmelin.

decollatae, sed basi emarginata. Anfractus margine superiore attenuato: striae longitudinales plicis imbricatis, interjectis sulcis ipsis atris opacis. Apex truncatus. Apertura obovata."

Neither locality nor references were given for this species, and there is no specimen of *decollatus* in the Linnaean collection in London. Under the circumstances we are forced to rely on the description alone for the identification of the shell. The name does not appear on either of Linnaeus' lists of owned species, and was said only to have come from the De Geer collection. This indicates either that Linnaeus' model was a borrowed specimen or that the description was written from memory. Although the latter is ample and fairly clear, so that it is probable that he had a specimen before him when he wrote, it is equivocal in some respects. The comparison with *Helix decollata* (*Rumina decollata*), as limited by the mention of the difference in the bases of the two shells, is fairly apt, although the sculpture of the *Murex* is much stronger. The reference to the "attenuation" of the upper part of the whorl is misleading, as the whorl is no more constricted at this point than in most turreted shells with convex whorls. The phrase "interjectis sulcis ipsis atris opacis" is not understood except on the basis that Linnaeus had seen a specimen showing this feature. The color scheme of the species is not at all constant, and the variation in the deepness of the striping as well as of the background color is noticeable in lots from different localities. Nevertheless the description has been held adequate to define the species, although it was not immediately recognized. It was passed over by both Martini and Chemnitz. Schröter (1783-1786, vol. 1, p. 542) described it in a way which indicates that he was not familiar with it. I am confident that Gmelin (1791, p. 3563) did not know it, as he merely copied Linnaeus' description and added neither locality nor references. Bruguière described it (1789-1792, vol. 1, p. 501) in terms that indicate that he had examined a considerable series of specimens, although he emphasized the lack of figures available to the early writers by citing only the references to the "Systema" and to Schröter. Dillwyn also appears to have been a mere copyist. His description was a combination of that of Linnaeus and of

Bruguière, and his only references were to those mentioned above, Linnaeus, Schröter, Gmelin, and Bruguière. He supplied no locality and his entire subdescription begins with the words "M. Bruguière says. . ."

Lamarck (1822b, p. 71), while he added nothing to the synonymy, citing only the references to Gmelin and Bruguière, and while he, too, was ignorant of the locality of the species, reported the shell as being in his collection and added important details in his French description: "It has always five and one half whorls and resembles, in its appearance the 'bulime decollé' (*Rumina decollata*). Its ribs are obsolete in part on the last whorl. Very fine [spiral] striations. Canal almost lacking."

Thus, none of the writers, up to this point, who had listed the species, were able to state its locality, although it is certain that Bruguière and Lamarck, and possibly Schröter, had seen specimens. That it was still a rare shell in European collections is indicated by the total lack of figures of it.

Kiener (1834-1850, vol. 5, *Cerithium*, p. 96, pl. 28, fig. 2) supplied the first figure of the shell.

Deshayes (1838-1845, vol. 9, p. 294) copied Lamarck's description and synonymy, but credited the species to Bruguière, probably because he distrusted the Linnaean diagnosis, but possibly because the French naturalists of the period, including even Deshayes, tended to emphasize French writers at the expense of foreigners. He added to the synonymy the Kiener figure above-mentioned and also cited, although with a query, *Turbo pulcher* Dillwyn, 1817. This name has been cited as a synonym of *decollatus* Linné as late as by Tryon (1879-1888, vol. 9, p. 161), but appears from Dillwyn's description and synonymy to be unrelated to that species, and to be a true *Epitonium*.

Hanley (1855, p. 311) followed one of the motives I have tentatively attributed to Deshayes, in insisting that the *C. decollatum* of Bruguière was not the *M. decollatus* of Linnaeus, and said that the Linnaean description was "wholly insufficient for the purpose of definition" and noted that Linnaeus did not possess a specimen and that no type nor any shell conforming to the description was found in his examination of the London collection.

He impliedly left the Linnaean species as a *species dubia*. As said above I find the description adequate. In commenting on the relationship of the species of Bruguière and Linnaeus he said: "The supposition of Bruguière, that the species was identical with the *Cerithium* (*Potamis*) thus named by him, although ingenious, must, I fear, be erroneous, for that shell neither corresponds with the 'margine superiore attenuato,' nor with the 'interjectis sulcis atris opacis' of the description. Nevertheless, it is not desirable to suggest another hypothetical representative." I find Hanley's objections not only trivial but explainable. There is a slight pinching-in of the whorl just below and at the suture, and the color reference certainly indicates that Linnaeus was describing a specimen rather than a species. Hanley's comments were written 12 years after Deshayes' unequivocal identification of the Linnaean species and his citation of *decollatum* Bruguière for it, and I am not aware of any writer who has since questioned Deshayes' conclusions.

Lamarck's *Cerithium obtusum* (*tom. cit.*, p. 71) has at times been confused with *decollatus* Linné, but that species is not only much larger, and differs materially in the number and frequency of its longitudinal ribs, but is not a decollate shell. The spire of all adult specimens of *decollatus* has been broken or dissolved, but repaired by the animal, so that, at a casual glance, it might appear to be merely an obtuse spire. The spire of *C. obtusum*, on the other hand, is complete although markedly obtuse, as in all specimens the nuclear whorl is plainly visible, partly sunken in the canaliculation of the first post-nuclear whorl. *Rumina decollata* (Linné, 1758) is another decollate shell, and in Linnaeus' description of that species the decollation is graphically expressed as "Testa apice transversim abscissa et consolidata est." The *Cerithium decollatum* of both James C. Sowerby (1820, 1825-1834, vol. 2, *Cerithium*, pl. 214, fig. 2) and of Reeve (1842, vol. 2, p. 178, pl. 227, fig. 2) is plainly *C. obtusum*.

The present species is now placed in the genus *Cerithidea* Swainson, 1840. Gray, in 1847, selected *decollatus* Linné as his first choice for the type species of *Cerithidea*, with *Strombiformis costatus* da Costa, 1878, as

second choice, but neither of these names was on Swainson's original list, and neither was therefore available.¹

Cerithium decollata is figured by Kiener (1834-1850, vol. 5, *Cerithium*, pl. 28, fig. 34), Reeve (1843-1878, vol. 15, *Cerithidea*, pl. 2, sp. 14), and Tryon (1879, 1888, vol. pl. 32, fig. 34).

It was not described in the "Museum Ulricaë."

THE *Murex* SPECIES IN THE "MANTISSA"

Murex succinctus

1771, Mantissa plantarum . . . regni animalis appendix, p. 551.

LOCALITY: Not given.

"*Murex succinctus* testa ovata cincta striis elevatis distinctis rubris, labio varicoso . . . Testa magnitudine Cerasi, ovata, anfractibus 3 s. 4, obtusa. Anfractus ventricosi, pallidi, cincti lineis elevatis, rubris, 7 (at ventris 13, praeter caudae) distinctis, sed in spira reticulatis. Labrum varicosum, articulatum, interne ordine punctorum rubrorum. Labium interius fere nullum. Cauda integra, subcylindrica, longitudine fere ventris, subascendens, striis similibus, obliquis."

Hanley (1855, p. 456) reported that "The *Triton clandestinus* (Chemn. Conch. Cab., 11, f. 1856, 1857) is marked for this species in the Linnaean collection." The microfilm of that collection in the present writer's possession contains a none too clear photograph of a dorsal view of a shell which resembles Chemnitz' species in every respect. It bears no marking visible in the photograph, but that is true of all the species represented on the film, with very few exceptions. It is not even provided with the printed label in gothic lettering which Hanley affixed to the majority of trays in the collection containing species he had isolated. The specimen, however, conforms to Linnaeus description, with a few possibly unimportant exceptions.

The description of *succinctus* in the "Mantissa" is not only long and detailed, as is the case with that of the majority of species in

¹ The earliest valid designation of a type species for *Cerithidea* was found by Bequaert (1942, p. 20) to have been that of Pilsbry and Harbison (1933, p. 115), who stated that the type species was *Cerithidea obtusa* (Lamarck, 1822), which equals Swainson's first species *lineolata* Griffith and Pidgeon, 1834. Bequaert listed and discarded several other earlier but ineffective type designations for this genus.

that work, but gives an excellent picture of *clandestinus*. Three details might be criticized: That species, in its adult state, is much larger than a cherry, and the specimen in the Linnaean collection, although a subadult shell, is still too large to fit the description. The expression "anfractibus 3 s. 4" is misleading and suggests that Linnaeus was describing a decollate or defective specimen, although the shell in the collection has six whorls, which is normal for the species. "Spira reticulatis" is also misleading, as the fine spiral sculpture is seen over the entire shell. In the specimens examined the longitudinal lines vary in strength in a single specimen, only four or five being appreciably elevated, the elevation being most marked just below the suture of the body whorl. I suggest that these criticisms are inconsequential when compared to the excellence and accuracy of the rest of the description, and that the divergence from normal may be explained by assuming that the shell may have been carelessly described in respect to the first and third points noted above. The count of the number of whorls is a less innocuous fault and seems to be the only appreciable defect in the description. In spite of these equivocal items, I am convinced that Linnaeus was describing the *clandestinus* of Chemnitz.

Murex clandestinus Chemnitz, 1795 (*tom. cit.*, p. 127), is also described with great accuracy and with sufficient detail to identify the shell there described with the *M. succinctus* of Linnaeus. It is here quoted for purposes of comparison: "Testa caudata, anfractibus sex rotundato globosis, striis transversis exaratis flavescentibus intersectis et cancellatis lineis longitudinalibus clandestinis aut subtilissimis, labro fimbriato duplicato, decussatis striato, dentato; apertura semilunare definente in canalem rectum; labio crenato." This is an even better description of the species than that of Linnaeus, as it corrects the number of whorls and adds the detail that the lip is crenulate, although "dentato," also used for the lip, is a less accurate word to describe the pronounced scalloping of that feature. It is obvious that the graphic word "clandestinis," as applied to the longitudinal sculpture, was the basis for his specific name. Chemnitz did not refer

his species to the *succinctus* of the "Mantissa," and it is doubtful that he was familiar with that work. He cited three references. The figures from Lister (pl. 940, fig. 36) and Knorr (pt. 6, pl. 29, fig. S, error for fig. 5) are recognizable pictures of *clandestinus*. Chemnitz' error in the designation of Knorr's figure was later corrected by Gmelin, Dillwyn, and Lamarck. His reference to Favanne's "Catalogue raisonné" (p. 197, no. 947) was not seen. This is a rare work, only two copies being owned in the United States (see Dodge, 1955, p. 118, footnote). Favanne's vernacular name for his species, as quoted by Chemnitz, "der Knaul von einen Bindfaden," "Pelotte de Ficelle" (a ball of twine), is eminently appropriate. Chemnitz' own figures (*tom. cit.*, pl. 193, figs. 1856-1857) are the classic figures of the species and have been widely cited. The Buonanni figure referred by Linnaeus to his *succinctus* (pl. 47) is characteristic.

Murex clandestinus became a well-known species to the conchologists who succeeded Chemnitz, but for the next 60 years no writer associated it with *succinctus* Linné or even mentioned that species. In spite of the remarkable similarity of the two descriptions, *succinctus* was apparently dropped as a *species dubia*. Neither Born, Bruguière, Röding, or Link referred to it or to *clandestinus*. Dillwyn was the first to list *clandestinus*, after Chemnitz, and he noted the minute longitudinal striae. He cited two of the references used by Chemnitz, and also *Buccinum caudatum*, var. "β" Gmelin (1791, p. 3471). The latter species is probably Gmelin's name for *clandestinus*. For his typical *caudatum* he cited a Martini figure (1769-1777, vol. 3, p. 408, pl. 118, fig. 1083) which is an unmistakable figure of *clandestinus*, although it was called "Dolium rostratum" and for variety "β" he cited two of the figures (Lister and Knorr) which Chemnitz cited for *clandestinus*. His description of *caudatum* conforms to that of *clandestinus* except for the inappropriate word "umbilicata." It should be noted that Gmelin did not use the name *clandestinus* or *succinctus* for the present species either in *Buccinum* or *Murex*. Dillwyn's only comment on his synonym was: "It [*clandestinus*] a good deal resembles *Buccinum caudatum* [?typical],

but the aperture ends in rather a narrow beak nearly half an inch long." I cannot reconcile his distinction with the facts.

Lamarck also listed *clandestinus*, which he placed in *Triton*, in the "Liste," 1816, and the "Tableau encyclopédique" figure he referred to it (pl. 433, fig. 1) is an almost exact copy of Chemnitz' figure 1856, the dorsal view of *M. clandestinus*. Lamarck, in his 1822 description (1822b, p. 187), followed Dillwyn in referring to the minute longitudinal striae, and continued the citation of the Lister and Knorr figures and the *clandestinus* of Chemnitz. Subsequent authors almost without exception listed and described the species, placing it either in *Triton* (Blainville, Kiener, and Reeve) or in *Fusus* (J. de C. Sowerby and the majority of later writers), but until Hanley reported on his examination of the Linnaean collection no one associated it with *succinctus* Linné or mentioned the latter name. I have found no later comment on *succinctus* since Hanley. Tryon briefly described *Triton clandestinus* (1879-1888, vol. 3, p. 15, pl. 9, fig. 58), and his figure is characteristic. He did not refer to the name *succinctus*.

There can be little doubt, based on the description of *succinctus* and the several descriptions and figures of *clandestinus*, that the two names refer to the same species. However, because of the defects in the description of *succinctus*, Linnaeus' failure to cite the two good figures of the species referred to by Chemnitz and many later writers, both of which were available to him, and the brevity of Hanley's comments on the specimen of *succinctus* in the Linnaean collection, it would be not only unwise but impracticable to suggest the restoration of the Linnaean name and the dropping of the name *clandestinus* which has been currently employed for almost 200 years.

The species belongs in the genus *Cymatium* Röding, 1798. It has been placed by some writers in the subgenus *Lagena* (Klein) Mörch, 1852 (not Walker, 1784), of which *Gelagna* Schaufuss, 1869, is a synonym.

In addition to the figures already cited, there are figures by Kiener (1834-1850, vol. 7, *Triton*, pl. 11, figs. 2d, a) and by Reeve (1843-1878, vol. 2, *Triton*, pl. 4, sp. 13). The Kiener figures show a prominent varix oppo-

site the outer lip, which I have never observed on any specimen, and which is not seen in any of the other figures or mentioned in any description read.

Murex succinctus was not described in the "Museum Ulricaë," as that work appeared seven years before the publication of the "Mantissa."

Murex contrarius

1771, *Mantissa plantarum . . . regni animalis* appendix, p. 551.

LOCALITY: "In Oceano Europaeo" (1771).

"*Murex contrarius* testa patulo-caudata contraria, striis geminatis . . . Testa simillima *M. antiquo*, rudis, sed perversa. Anfractus striis transversis, elevatis, aequalibus, binis, interjecta minore, lineola elevata."

The *contrarius* of authors is now placed in the genus *Neptunea* Röding, 1798, and was designated as the type species by Monterosato, 1872, as "*Murex antiquus* monstr. *contrarius* L." Although Monterosato, as well as several of his predecessors, considered it to be a mere sinistral form of *antiquus*, it is now treated as a good species. Not only does it differ from *antiquus* in shell characters, but its range is more southerly than the home of that species, being found on the Atlantic coast of southern France, Spain, and Portugal and in the Mediterranean, whereas *antiquus* has not been found south of the British Isles. Its sculpture differs from that of *antiquus* in that the revolving threads of its body whorl are somewhat stronger and more elevated than those of the more northern shell, and are separated by intercalary threads, which recall the sculpture of the boreal species *M. despectus* (p. 166). Occasionally a double thread is found between some of the major threads. It is typically darker in color than *antiquus*, being pale fulvous to fulvous brown, and its aperture does not show the typical yellow tint of *antiquus*. It has also a more expanded aperture and a somewhat thinner lip.

A sinistral *Neptunea*, which may have been *contrarius* or a sinistral form of *antiquus*, was known to some of Linnaeus' predecessors. Lister (1685-1692 [1697], pl. 950, figs. 40b, c) figured such a shell, calling it "*Buccinum heterostrophum* ab ora maritima prope Harwich," and Buonanni (1782, vol. 2, p. 90, no.

399, pl. 47, fig. 399) figured a sinistral species, but his description does not refer to sinistral-ity.

The first post-Linnaean figures of a left-handed *Neptunea* are found in Favanne's edition of the Argenville plates (1780, pl. 32, fig. N, pl. 79, fig. F, and pl. 80, fig. R). The first shows prominent longitudinal, rounded folds. The second is a dorsal view of a shell with crowded, sharp, lamellose ribs near the outer lip. I have seen a dextral specimen of such a form labeled for *Neptunea antiqua*, but not a sinistral shell with this feature. It may have been that the artist, as so often happened, paid little attention to the orientation of the specimen before him. The third figure shows what appear to be merely growth lines. While all three are drawn as sinistral, I cannot refer any of them to *contrarius*.

The description of *contrarius* in the "Mantissa" apparently differentiates that species from *antiquus* by the words "striis geminatis" and "striis transversis . . . binis, interjecta minore." The reference to the intercalary "minore" threads is to a feature not seen in *antiquus*, it is true, and I have never seen a specimen of either that showed any "twinning" or "pairing" of the spiral sculpture, nor have I seen any reference to such a feature in any later description of either. The words can be explained only on the supposition that the interposition of the subordinate threads, particularly in the rare instances in which there were one or two groups of two, suggested the appearance of twinning to Linnaeus. This seems a remote possibility, however, and the words cast some doubt on the common identity of Linnaeus' species and the *N. contraria* of authors. No references were supplied, as is true of almost all the "Mantissa" species, and Linnaeus did not own a specimen, as is also true of most species in that work, and consequently an examination of the Linnaean collection in London gives us no additional information.

Chemnitz (1780-1795, vol. 9, pt. 1, pp. 58-62, pl. 105, figs. 894-895) described and figured a shell that he called "Murex contrarius Linnaei, testa crassa, rufescente . . ." and referred it to the "Mantissa" species. He cited the Lister and Buonanni figures mentioned above, and said that, according to

Lister, the shell came from Harwich. This locality suggests a sinistral specimen of *antiquus* rather than *contrarius*. Chemnitz' own figures, however, are too dark brown in color for *contrarius* and show no spiral sculpture whatever, although the rough and sinuous growth lines appear. These figures appear to be badly drawn figures of a sinistral *antiquus* and are certainly not the *contrarius* of modern writers.

If we are to refer our *contrarius* to the "Mantissa" species and cite it as of Linnaeus, 1771, we must do so only on the basis that Linnaeus was deceived in his recollection of the specimen he had seen or that the latter was, in fact, a variant with paired striae. As said above, I know of no such form. Chemnitz (*op. cit.*, p. 60), in his lengthy comments on "Murex contrarius Linnaei," did refer to a form of *despectus* with paired striae but did not mention having seen them in *contrarius*. He said: "The other, which shows on its dorsum two markedly elevated ribs, or is seen with 'Lineis geminatis elevatis,' was by him [Linnaeus] named *Murex despectus*." The present writer has not observed this pairing even in *despectus*, as Chemnitz reports.

Gmelin (1791, p. 3564) copied the main description from the "Mantissa," which he cited as a reference, but entirely omitted the subdescription. His references were apparently lifted bodily from Chemnitz. He altered the locality to "mari septentrionali." As in the case of many of Gmelin's species, it is impossible to state whether or not he was familiar with the shell described.

Röding (1798, p. 115) placed it in his new genus *Neptunea*, where, with a few exceptions, it has remained. He based his specific name on the pair of Chemnitz figures above noted and on a Regenfuss figure (pl. 4, fig. 36). There is no such combination of plate and figure in Regenfuss, and he did not figure or describe any *Neptunea*. Röding also listed *N. perversa*, for which he supplied no references or any locality. In as much as his *contraria* is called "Das nordische Neptunus-Horn," it is possible that the latter was a sinistral *antiqua*, while his *perversa* was the true *contraria* of the European coast and the Mediterranean. While Link (1807, pp. 117-118) listed both *antiqua* and *despecta*, the

Rostock collection evidently did not contain a specimen of *contraria*.¹

Dillwyn (1817, p. 724) treated *M. contrarius* as a variety of *M. antiquus* "With whirls reversed," and in his synonymy he cited for it Gmelin's variety " γ " of *antiquus*. This variety was based on "Martin. n. Mannigf. 4, p. 419. t. 2. f. 14," with a query. The present writer has not been able to locate a copy of this work, but as Gmelin, in his subdescription of *antiquus*, refers to it as "*rarius contrariis*," I assume that both his own and Dillwyn's sinistral variety were the rare left-handed *antiquus*. Dillwyn added, in his subdescription: "Linnaeus has described his *M. contrarius* [as] '*striis geminatis*,' but I think there can be no doubt that it is only a variety of this species."

Jeffreys (1867, p. 325) also believed *contrarius* to be a monstrosity of the British *antiquus*.

The next, and almost the latest, considered discussion of the species was that of Tryon (1879-1888, vol. 3, p. 122, pl. 50, figs. 291-292). After referring to Jeffrey's opinion he said: "But of this species [*Neptunea contraria*] it has been shown that it has an extensive distribution in Southern Europe, where the normal *antiqua* is unknown, and that the so-called reversed *antiqua* is very rare where the normal form is abundant." It is not understood why Tryon used the expression "so-called reversed *antiqua*," as these northern sinistral shells are demonstrably *antiqua*, *contraria* not being found north of the lower Atlantic coast of France. Tryon also said under *antiqua* (*tom. cit.*, p. 114): "Crosse considers *contraria* L. (t. 50, f. 291-292) a good species and not a reversed *antiqua* because it is so abundant at Vigo, a locality more southern than any for the normal *antiqua*, and Weinkauff² also, remarking upon the abundance of *contraria* in the Mediterranean and the absence of *antiqua*, comes to the same conclusion." By Tryon's day, therefore, this group of species

had become established as belonging in *Neptunea* Röding, and it had become generally agreed that the *N. contraria* of southern Europe was a good species. Tryon added: "The so-called English specimens may be veritable reversed monstrosities of *N. antiqua*."

Chrysodomus Swainson, 1840, which was used for this group of species for many years, is a junior synonym of *Neptunea* Röding, as is *Atractus* L. Agassiz, 1840. *Neptunea contraria* has been placed by some writers (notably Tryon) in the subgenus *Heliotropis* Dall, 1873, and *Pyrulofusus* (Beck) Mörch, 1869, has also been used.

The present species is figured in the "Tableau encyclopédique" (pl. 437, figs. 1a, b) by rather distorted drawings, by Kiener (1834-1850, vol. 6, *Fusus*, pl. 20, figs. 1a, b) as *Fusus perversus*, and by Reeve (1843-1878, vol. 4, *Fusus*, pl. 12, sp. 46). The last-mentioned figure shows the revolving striae as twinned, and is the only figure I have found in which such sculpture is indicated. See also the figure by Nobre (1931, pl. 23, fig. 2) as *Chrysodomus contrarius*.

Hanley (1855, p. 456) remarked in his short comment on the species: "*Murex contrarius* we learn from the typical examples, to have been the *Fusus perversus* of Kiener's 'Coquilles Vivantes' (*Fus.* pl. 20, f. 1)." He gave no further information as to what he meant by the "typical examples." The types of the "Mantissa" species were, for the most part, according to Hanley, in the cabinets of De Geer and Ziergovell, but I have been able to obtain no information as to the fate of those collections, and it is reasonably certain that Hanley had not seen them, as there is no record of his having visited Sweden. Indeed, in several instances, he referred to species of which he said that the type was *probably to be found* in the Queen's collection in Sweden.

In spite of our doubts as to the identity of the *contrarius* of the "Mantissa," it is wisest to retain the Linnaean name for the shell universally so called today. This is not a case of a manifest error on the part of either Linnaeus or of those who succeeded him, but probably represents, as already said, a failure in memory on the part of Linnaeus in describing a shell that was not before him when

¹ Link's *Neptunea* is a heterogeneous group containing species of *Neptunea*, *Fasciolaria*, and *Fusus*, and other species that are not identified by being referred to any description or figure.

² Weinkauff, 1868, volume 2, page 108.

he wrote and that he had seen only in another collection. If we are to treat as a *species dubia* every Linnaean species of which the description contains vague or apparently unexplainable language we would be forced to

drop an inordinate number of Linnaean names.

The following species, placed in *Murex* in the tenth edition, were moved in the twelfth edition to the genera indicated:

TENTH EDITION

Murex capitellum, no. 465
Murex ceramicus, no. 470
Murex scabriculus, no. 473
Murex turbinellus, no. 466
Murex ficus, no. 475
Murex rapa, no. 476
Murex fusus, no. 478

TWELFTH EDITION

Voluta capitellum, no. 431
Voluta ceramica, no. 432
Voluta cancellata, no. 413
Voluta turbinellus, no. 430
Bulla ficus, no. 382
Bulla rapa, no. 383
Strombus fusus, no. 489

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[Lamarck, Jean Baptiste Pierre Antoine de Monet de]

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The dates in brackets are based on external evidence. Plates 1-95 were published before Bruguière's departure from France in late 1782 and were probably supervised by him. He may have been responsible for plates 96-189 [1792]. The remaining plates were to have been approved by Lamarck, and the majority probably were, although Bory de Saint-Vincent, who succeeded to Lamarck's task, and possibly others, were responsible for many of them. The name of Bruguière appears alone on the title page of the livraison containing the 1791 [-1792] plates; the 1797 plates were anonymous so far as the title page is concerned; Lamarck's name appears alone on the title page of the livraison containing the [1798] and 1816 plates.

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CORRECTIONS FOR PART 4 (DODGE, 1956)

Page 160, column 1, line 16: For "1906" read "1906a."

Page 169, column 2, line 19 from bottom: For "*echinophora*" read "*echinophorum*."

Page 177, column 2, line 14: Delete "1,."

Page 196, column 1, line 12 from bottom: For "figure" read "figures."

Page 219, column 1, line 4: For "*Terebra oculata*" read "*Buccinum oculatum*."

Page 219, column 1, line 10: For "*subulata*" read

"*subulatum*."

Page 219, column 1, line 20 from bottom: For "indivisis" read "in divisis."

Page 238, column 1, line 20: For "STOMBUS" read "STROMBUS."

Page 253, column 2, line 16: For "as" read "is."

Page 268, column 1, line 23 from bottom: For "*Stombus*" read "*Strombus*."

Page 309, column 1, line 21: For "1834-80" read "1834-50."

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