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**The problematic identity of *Nerita undata* Linné, 1758,
with designation of a neotype. (Gastropoda: Neritidae)**

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Summary: We revised the taxonomical status of *Nerita undata* Linné, 1758, analyzing opinions of all post-Linnean authors. It was found that the figures referred to by Linné are actually *Nerita versicolor* Gmelin, 1791.

Although many authors, specially in the nineteenth century, considered figs. 1950-1951 of Chemnitz to represent *N. undata*, it is in fact not clear at all what species is represented by these figures. They should rather be considered generic for a complex of species.

Therefore, in order to clarify the taxonomical status and to stabilize the name, a neotype for *N. undata* is designated. The selected specimen originates from the Moluccas.

Introduction: Our study of *Nerita*-species during the past 10 years or so (Delsaerd, 1996, 1998, 1999; Krijnen et al, 1995, 1997, 1999, 2001, 2005; Krijnen, 1997, 1998, 2001, 2002), finally led to *Nerita undata* Linné, 1758 and related species, the so-called *undata*-complex. Within this complex of species subtle differences determine different species. In the past and still today the complexity of these differences has caused a lot of confusion in the identification of closely related species.

Before discussing the different species of the *undata*-complex (Krijnen et al, to be published), it is of crucial importance to establish what species is the genuine *N. undata* Linné, 1758.

During our study of the nerites we collected a vast amount of publications and historical works, which were all meticulously investigated. With regard to the survey of species of the *undata*-complex we rediscovered lots of valid names and synonyms. Each of these taxa was checked for its taxonomical validity, starting with the Linnean taxa up to the taxa of present authors.

In addition, we made an overview of (putative) species of the *undata*-complex. Apart from the specimens in our own collections, specimens from several other collections were borrowed so as to get a good insight into the essential characteristics within the *undata*-complex. The selected specimens made us discriminate approximately eight different species without being concerned about valid taxa for these species at that moment. This will be published elsewhere (Krijnen et al, to be published).

Soon it became clear that *N. undata* Linné, 1758 differs from *N. undata* (auctores). This discrepancy had already been noticed in the 19th century but has never been solved properly. We (re)discovered that *N. undata* Linné, 1758 is in fact a completely different species than the present *N. undata* (auctores). However, following the rules about stability of taxa formulated by the Code (1999, art. 23.2), we follow the historical mind resulting in the designation of a neotype. We finally took care of meeting all the qualifying conditions that are mentioned in the Code (1999, art. 75.3) for the designation of a neotype.

Abbreviations used:

- KBIN Royal Belgian Institute of Natural Sciences
 LSBH Linnean Society of London, Burlington House.
 MHNG Muséum d'Histoire Naturelle, Genève.
 MNHN Muséum National d'Histoire Naturelle, Paris.
 NHML Natural History Museum London.
 NMNH National Museum of Natural History, Leiden.
 ZMA Zoological Museum Amsterdam.

The identity of *Nerita undata* Linné, 1758 throughout history

The original description of *Nerita undata* Linné, 1758

In the original description Linné (1758: 645) wrote:

undata. 645. *N. testa fulcata fulcis triginta, labiis dentatis : interiore rugoso tuberculato.*
Rumph. mus. t. 22. f. 4.
Gvalt. test. t. 66. f. X.
Habitat in O. Asiæ ad Amboinam.
Differt a precedenti etiam apice magis prominente, & fasciis latiusculis, nec tenuibus striis.

645. *N. testa sulcata sulcis triginta, labiis dentatis: interiore rugoso tuberculato.*ⁱ

Rumph. mus. t. 22. f.4 (See: fig. 1).

Gvalt. test. t. 66. f. X. (See: fig. 2).

Habitat in O. Asiæ ad Amboinam.

Differt a præcedenti (= *N. chamaeleon*) etiam apice magis prominente, & fasciis latiusculis, nec tenuibus striis.



Fig. 1

From: Rumphius, G.E., 1705.

D'Amboinsche Rareitekamer, ...,
t. 22, f. 4.

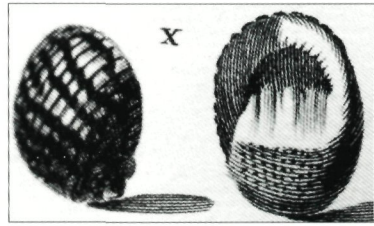


Fig. 2

From: Gualtieri, 1742.

Index testarum conchyliorum, t. 66, f. X

The references to the works of Rumphius (t. 22, f.4) (Fig. 1) and Gualtieri (t. 66, f. X) (Fig. 2) were repeated in Linné, 1764 (p. 682, sp. 399). Although the description in Linné, 1764 is more comprehensive than the original one, it is still insufficient for an unambiguous identification of the species meant by Linné. The description of *N. undata* in the 12th edition of Linné (1767: 1255, sp. 738) is a copy of the original description.

The problem of the type material

No type material of *N. undata* Linné, 1758 is present in the Collection of the Linnean Society, Burlington House, London (pers. comm. K. Way (2000)) nor in the Collection of the Linnean Society in Uppsala, Sweden. Dekker (2005) informed us about a note made by Odhner fifty years ago from which it appears that a specimen was originally present in Uppsala but when we inquired, Israelsson (2005) stated that at present no specimen is present there. A list provided by Israelsson containing all *Nerita* specimens of Linné, including species that now belong to the genus *Natica*, present at the Uppsala Museum can be found in the Appendix.

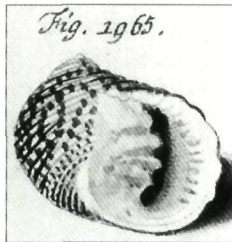
It must be concluded that the whereabouts of the syntypes of *N. undata* are unknown. However, apart from the personal specimen(s) of Linné, the specimens figured by Rumphius and Gualtieri (to which Linné referred in his original description) also belong to the type series according to the International Code of Zoological Nomenclature, art. 72.4.1. (1999).

Confusion already in the 18th century

Of all figures listed in Linné's original description, Rumphius' figure (f.4, t.22.: see fig. 1) is the most detailed one. Unfortunately this is a figure labeled with a number ('f.4') indicating that Simon Schijnvoet^m added it (Strack & Goud, 1996) after the Rumphius manuscript had arrived in Holland. Martens (1887: 34) stated that this figure corresponds to *N. undata* (see also Beekman, 1999: 428), but our investigation proved this to be wrong.

Chemnitz (1781: 298-299) referred to this figure 'f.4' of Rumphius (Fig. 1) when describing the species corresponding to his figs 1964-1965 (Fig. 3). The picture of Rumphius (1705) indeed shows much resemblance to the picture in Chemnitz (1780-1795: figs. 1964-1965); see Fig. 3. Fortunately a ventral view was added by Chemnitz. This is unmistakably *N. versicolor*.

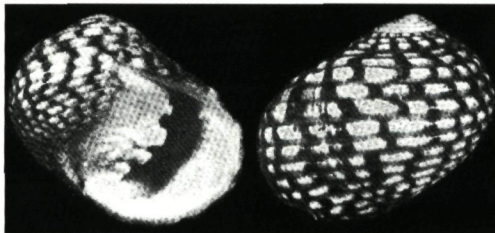
Gmelin (1791: 3684) referred to the same figure 'f.4' of Rumphius (Fig. 1) in his description of *Nerita pica* Gmelin, 1791 (Fig. 4) with type locality 'mari indico', which he probably copied from Linné's original description of *N. undata*. Just above the description of *N. pica* Gmelin described *Nerita versicolor* Gmelin, 1791 with type locality 'insulas Antillas' (= Caribbean area).



From: Chemnitz, 1781.
Neues systematisches
Conchylien-Cabinet.
t. 191, f. 1964-1965

Fig. 3

Cernohorsky (1974: 168) stated that the type locality given by Gmelin for *N. pica* (Fig. 4) is wrong and that *N. pica* is a synonym of *N. versicolor* Gmelin, 1791. One thus concludes that when Schijnvoet added the figure 'f.4' to Rumphius' manuscript, he added a nerite which only occurs in the Caribbean area instead of an Indo-Pacific species!



Type specimen of *Nerita pica* Gmelin, 1791
(= *N. versicolor* Gmelin, 1791)
From: Cernohorsky, W.O., 1974.
Type specimen of Mollusca ..., p. 168, fig. 37.

Fig. 4

Houttuyn (1771: 498) noted that figure ‘*f.X*’ of Gualtieri (fig. 2) seems to have less ribs than the 30 ribs mentioned in the description of Linné (‘*N. testa sulcata sulcis triginta ...*’). Although he did not change the references given by Linné, he added a reference to ‘Knorr. *Verzam.* VI. D. Pl. 13 f. 2.’ (Fig. 5). Houttuyn thus had real doubts about Linné’s reference to Gualtieri’s figure ‘*f. X*’. Knorr’s figure shows resemblance to Gualtieri’s figure ‘*f. P*’ (Fig. 6a)!



From:
Knorr, G.W., 1771.
Les Delices des Yeux et de l’Esprit, ...
pl. 13, f. 2.

Fig. 5

Indeed, after Houttuyn, most authors (e.g. Chemnitz, 1781, Gmelin, 1791) referred to figure ‘*f.P*’ of Gualtieri instead of his figure ‘*f.X*’ (Figs 6a-b). In our opinion, the nerite pictured by Gualtieri under ‘*f. X*’ matches Rumphius’ figure ‘*f. 4*’ well, meaning that Gualtieri’s figure ‘*f. X*’ in fact shows *N. versicolor* Gmelin, 1791, while Gualtieri’s figure ‘*f. P*’ does not. Figure ‘*f. P*’ apparently represents the species which was from then on -and today still is- called “*N. undata* Linné, 1758 (auctores)”. In our opinion figure ‘*f. P*’ clearly represents a species from the *undata*-complex but it is of too poor a quality to identify any specific species of the complex.

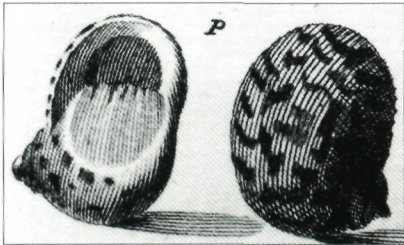
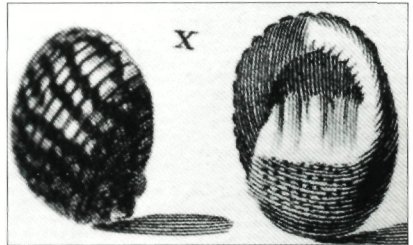


Fig. 6a-b



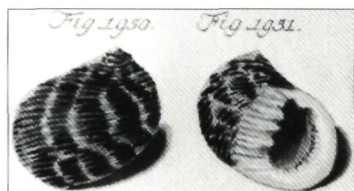
From: Gualtieri, 1742. *Index testarum conchyliorum*, t. 66, f. P, X.

The following table shows the historical shifts in the references to the relevant figures for “*Nerita undata*” by different authors until Lamarck , 1822 (‘undata’ stands for *undata*-complex).

Figure	Actual species	Linné 1758, 1764, 1767	Houttuyn 1771	Born 1780	Chemnitz 1781	Gmelin 1791	Lamarck 1822
Rumphius' f. 4	versicolor	X	X	X			
Gualtieri's f. X	versicolor	X	X	X			
Gualtieri's f. P	'undata'				X	X	X
Knorr's f. 2	'undata'		X	X	X		X
Chemnitz's f. 1950-1951	'undata'				X	X	X

Remark: some authors, like Chemnitz, Gmelin and Lamarck, referred to more figures than the ones mentioned in this table (e.g. Lister, Bonanni, etc.). However, adding these to this table does not provide additional information.

It is clear that already shortly after Linné's description of *N. undata* confusion about the true identity of this species started. Chemnitz (1781: 292-293) put this confusion into words when he stated that *N. undata* (in sensu Born) is different from *N. undata* Linné. As can be seen from the table, after Born the original references mentioned by Linné were not cited anymore. Authors rather referred to Gualtieri's figure 'f.P' (Fig. 6a) and Chemnitz's figures 'f. 1950-1951' (Fig. 7). In the nineteenth century, the latter were generally accepted as the correct representations of *N. undata*. Unfortunately, however, the whereabouts of these illustrated specimens are also unknown.



From Chemnitz, 1781.
Neues systematisches
Conchylien-Cabinet. 5.
t. 190, f. 1950-1951.^{iv}

Fig. 7

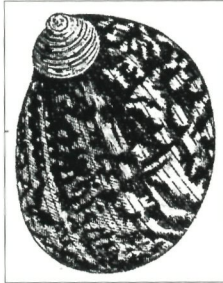
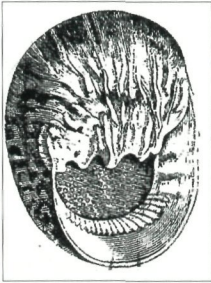
Continued confusion in the 19th century

Dillwyn (1817: 1004-1005) is the first author discussing *N. undata* Linné in the 19th century. He clearly formulated the existing confusion. '*Linnaeus, in the Systema Naturae, for this species has quoted Rumphius, t.22. f.4, and Gualtieri, t.66. f. X, neither of which answer the description given in his account of the Museum of the Queen of Sweden, and the former is more like N. pica, and the latter N. chamaeleon.*'. Dillwyn referred to Chemnitz figs. 1950-1951. Knorr's figure was omitted, as also Gmelin did.

Lamarck (1822: 190-191) again added the reference to Knorr for *N. undata* Linné, 1758. He also added two figures of his own ('Tab. Enc. Méth.: Pl. 454. f.6. a. b.'). However, the illustrated specimen (see Fig. 8) shows a smooth nerite not at all matching the species figured by Chemnitz in his figs. 1950-1951 (Fig. 7), even though Lamarck referred to these figures. It turns out that Lamarck in fact described a different species, viz. *N. spengleriana* Récluz, 1843. This was already noted by Deshayes (1838: 602) and later by Mermod (1953: 159), who showed one of Lamarck's specimens.

Deshayes (1838: 601) fully supported Chemnitz's opinion. He stated that 'Le *Nerita undata* de Born est une espèce toujours distincte de l'*undata* de Linné.' In the same footnote he mentioned that the figs. 1950-1951 of Chemnitz exactly match the description of Linné.

Deshayes (1838: 602) also asserted that even Lamarck misidentified *N. undata* Linné, 1758 as has already been mentioned above^{vi}. Plainly he formulated: '...la description de Lamarck et surtout la figure qu'il donne de son espèce dans l'*Encyclopédie* (see fig. 8), prouvent que son espèce n'est pas la même que celle de Linné ... , il est impossible, ... de compléter et de rectifier la synonymie adoptée ici par Lamarck, car il faudrait tout détruire pour rétablir exactement l'espèce de Linné...^{vii}'.



From Lamarck, 1816. Tableau
Encyclopédie et Méthodique des trois
règnes de la Nature.
pl. 454, f. 6.a.b.

Fig. 8

Further down Deshayes (1838: 616) stated that the specimens figured by Chemnitz as figs. 1970-1971 and which Chemnitz considered a variety of *N. undata* Linné, 1758 in fact belong to a different species.

Chemnitz (1781: 301-302) noted that the species he figured in figs. 1970-1971 is a finer and lighter variety of *N. undata* Linné, 1758. Gmelin (1791: 3678) referred to these figures in his original description of *Nerita undulata* Gmelin, 1791. Finally Cernohorsky (1974: 168) proved beyond any doubt that the type material of *N. undulata* is *N. chamaeleon* Linné, 1758.

Remarkably, shortly after Deshayes doubt arose again. In several descriptions of new species Récluz (1841) compared these new species with *N. undata*, as in the description of *Nerita chrysostoma* Récluz, 1841 (p. 105). He literally wrote there:

‘Comparée à la *Ner. undata* de Linné, elle offre les différences suivantes: La forme de dernier tour de spire de notre coquille (i.e. *N. chrystostoma*), mesurant 38 millim. de large sur 27 de hauteur, ses côtes étroites, sa columelle non comprimée circulairement dans le centre, le labre ne présentant point cette dépression canaliculaire qu’on observe vers les $\frac{2}{3}$ de la circonférence interne du *Ner. undata*, et son ouverture couleur citron, séparant nettement notre Nérîte de l’ondée, avec laquelle elle présente des rapports éloignés.’^{viii}

Only indirectly it is possible to gather a picture of *N. undata* from the above mentioned comparisons. *N. undata* must have the following characteristics: a different size of the final whorl than in *N. chrystostoma*, no small ribs, a circular depressed columella at its centre, a canal-like depression on $\frac{2}{3}$ of the internal outer lip and no lemon-coloured aperture.

Martens (1887: 37) also noticed that Récluz had an unclear idea about the true identity of *N. undata*. He mentioned the following putative characteristics of *N. undata*: a circular depression on the columellar area, a kind of canal on $\frac{2}{3}$ of the inside of the outer lip, and the highest columellar tooth equal or smaller in size than the lower one. He referred to *Revue Zool.*, 1841: 105-106 and *Revue Zool.*, 1842: 179.

In 1850, Récluz mentioned *N. undata* in his ‘Catalogue des Nérîtes’ on page 283 with as a locality the Solomon Islands and a reference to Chemnitz’s figs. 1950-1951.

After Récluz, Reeve, in his monograph on the genus *Nerita* (1855), remarkably did not even mention *N. undata* Linné, 1758 as a valid species, and when discussing *undata*-like species Reeve never compared the nerite in question with *N. undata*.

At the same time Hanley (1855: 407-408) followed Deshayes (see above) and stated that ‘almost all writers have concurred in regarding figures 1950-1951, of the fifth Chemnitz’s ‘*Conchylien Cabinet*’ as correct representations of the Linnean species and these engravings have been alike quoted for it by the learned Deshayes, and by the laborious Récluz.’ He ended with ‘...that scarcely a doubt of the accuracy of this identification any longer exists.’

In our opinion Chemnitz’s figs. 1950-1951 are more on a generic level. It is hard to unambiguously identify a species of the *undata*-complex with these figures. Besides that, fig. 1951 does not show a cubed tooth on the upper part of the columella, thereby more resembling *Nerita spengleriana* Récluz, 1843 (auctores) than *N. undata*.

At the end of the 19th century, Martens gave a detailed overview of the genus *Nerita*. It is still one of the leading works about nerites. He discussed nine different species in the *undata*-complex: *N. undata* Linné, 1758, *N. striata* Burrow, 1815, *N. spengleriana* Récluz, 1843, *N. quadricolor* Gmelin, 1791, *N. grayana*, Récluz, 1843, *N. funiculata*

Reeve, 1855, *N. flammulata* Récluz, 1841, *N. affinis* Reeve, 1855 and *N. incurva* von Martens, 1887 and likewise distinguished one variety: *N. undata* var. *micronesica* von Martens, 1887. In all descriptions of these *undata*-like species, Martens accurately discussed and tabulated the similarities and differences. Despite his elaborative efforts a lot of confusion still exists nowadays. It is e.g. easy to find two recent works that contradict each other.

Studying Martens' description of *N. undata* (1887: 34-37) we get a clear picture of what is meant by *N. undata* by Martens. Unfortunately, several of the references Martens gave, contradict his discussion of *N. undata* (see for example Fig. 8 above). These figures represent more of a *spengleriana*-like species (i.e. lacking the cubed tooth on the columella). As has already been mentioned above, Lamarck also figured a specimen of *N. spengleriana* when describing *N. undata*.

Further, and to enlarge the confusion about the references to Gualtieri, Martens referred to Gualtieri's figs. M and N (Fig. 9). Thus, the references to Gualtieri's figures changed in 130 years from fig. X (by Linné) to fig. P (e.g. Gmelin) and, finally, to fig M. and N. The last two figures also remarkably differ from Rumphius' figure 'f. 4'!

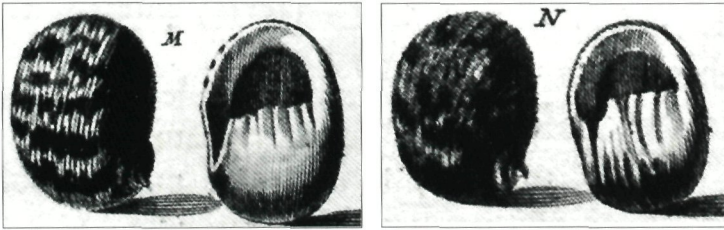


Fig. 9

From: Gualtieri, 1742. Index testarum conchyliorum, t. 66, f. M, N.

Martens' description of *N. undata* can be summarized as follows: Shell semi-globose, undulated coloured with three blackish bands, 30-40 flat ribs, axially striated. On upper half of last body whorl alternating primary and secondary ribs, on lower half all ribs more equal in size and smaller. Yellowish apex. Outer lip thick with canal-like depression near teeth above crenations on inside of outer lip. 14-16 crenations with a hardly visible basal tooth. On columella a cubed tooth, followed by two sharp teeth towards base. Sometimes the lowest one split when a wrinkle runs out until columella. Size of parietal shield less than half the 'total aperture'. After this discussion, Martens continued with a detailed description of the wrinkles and pustules on the parietal shield.

Whereas Martens distinguished nine different species in the *undata*-complex, almost simultaneously Tryon (1888: 28-30) lumped all *undata*-like species together and

noticed that the following 'species' could be regarded as synonyms of *N. undata*: *Nerita papuana* Récluz, 1841, *Nerita leguillouana* Récluz, 1842, *Nerita marmorata* Hombron & Jacquinet, 1854, *Nerita savieana* Récluz in Reeve, 1855, *Nerita crassa* Gould, 1852, *Nerita undulata* Gmelin, 1791 and *Nerita novæguineæ* Lesson, 1830. Further, he degraded the following species to a variety of *N. undata*: *Nerita spengleriana* Récluz, 1843, *Nerita quadricolor* Gmelin, 1791, *Nerita incurva* von Martens, 1887, *Nerita grayana* Récluz, 1843, *Nerita funiculata* Reeve, 1855 (non Menke, 1851) and *Nerita flammulata* Récluz, 1841. Notice that in both lists of synonyms and varieties valid species are mentioned, e.g. *N. quadricolor* and *N. spengleriana*.

All in all this only indicated the imbroglio of taxa related to *N. undata*. The work of Tryon is furthermore also interesting for the copies of original figures from different authors on the plates.

For convenience's sake all these species and varieties were later considered as mere synonyms of *N. undata* by Adam & Leloup (1938: 45-46).

The table below gives an overview of the figures to which 19th century authors referred for *N. undata* Linné, 1758.

Figure	Dillwyn 1817	Lamarck 1822	Deshayes 1838, No. 3*	Deshayes 1838, No. 27*	Récluz 1850	Martens 1887
Rumphius' f. 4						X
Gualtieri's f. X						
Gualtieri's f. P	X	X	X			
Knorr's f. 2		X	X			
Chemnitz's f. 1950-1951	X	X	X	X	X	X

(*). Deshayes commented *N. undata* Lamarck (No. 3) and *N. undata* Linné (No. 27). Remark: some authors like Lamarck and Deshayes referred to more figures than the ones mentioned in this table (e.g. Lister, Bonanni, etc.). However, adding these to the table would not provide additional information.

During the previous century

In the twentieth century, few books and articles pay serious attention to nerites. Mostly the conchological and taxonomical knowledge of nerites was fragmentarily contained in all kind of articles. The attention for nerites faded, which unfortunately resulted in taxonomical errors among conchologists. In the early seventies, after serious study, Henk Mienis tried to bring order and revived interest for nerites.

Authors who made taxonomical remarks about *N. undata* were (not exhaustive):

- Cernohorsky (1972: 51-52) summarized some of the 30 synonyms for *N. undata*; among them valid species as *N. quadricolor* Gmelin, 1791 and *N. striata* Burrow, 1815. Mienis (1976: 492) commented on this.

- Dance (1963), in imitation of Hanley (1855), studied the nerites of the Linnean collection in Burlington House, London, which resulted in valuable remarks on the Linnean types. But, for example, in his popular work "The Collectors Encyclopedia of Shells" (1974: 56) he synonymized *N. quadricolor* Gmelin, 1791 with *N. undata* Linné, 1758.

- Dautzenberg (1929: 525-526) mentioned the discrepancy between the description and the references given by Linné and confirmed that all authors accept the identification of Chemnitz. Furthermore he noticed that Tryon reproduced 17 pictures of the typical *N. undata* and one of the variety *N. striata* Burrow, 1815.

- Dekker (2000: 35-36, 59) reintroduced *N. incurva* von Martens in Kobelt, 1887 as a valid species from the east coast of Africa. He also noticed that *N. quadricolor* Gmelin, 1791 is often confused with *N. undata*. He further made valuable taxonomical remarks about *N. radiata* Récluz, 1841 and its putative synonyms *N. aurantia* Récluz, 1842, *N. spengleriana* Récluz, 1843 and *N. oleagina* Reeve, 1855.

- Komatsu (1986: 29-30, pl. IX, fig. 1) noted that *N. nigrita* Röding, 1798 (according to a study of Wium-Andersen, 1977) has equal 'chromosome number and chromosomal condensation' as *N. undata*. He further stated that *N. proxima* Sowerby, 1903 (holotype figured) 'was consistent with a small individual of *N. undata* Linné'. He moved *N. undata* from the subgenus *Ritena* to the subgenus *Nerita*, as was done by more Japanese authors (Komatsu (1986: 30)), based on corresponding characteristics of the radula and the overall shape of the shell (= habitus).

- Mienis (1978: 762) separated *N. undata* and *N. quadricolor* Gmelin, 1791 as two valid species and noted that in most popular books *N. quadricolor* is seen as a synonym of *N. undata*. He already realized that a lot of incorrectness existed about the valid taxonomy of the species in the *undata*-complex.

- Indirectly, Vermeij (1973: 333) made an important taxonomical statement by distinguishing *N. undata*, *N. striata* Burrow, 1815 and *N. grayana* Récluz, 1844 as different species. This was followed by Subba Rao (2003: 110) as far as *N. grayana* is concerned.

- Wilson (1994: 41) had the same approach as Cernohorsky (1972). For example, valid species as *N. quadricolor* Gmelin, 1791, *N. longii* Récluz, 1842 and *N. striata* Burrow, 1815 were mentioned as synonyms of *N. undata* by him.

We have critically investigated all the names belonging to the *undata*-complex and their taxonomical status. Results of our investigations on the validity of the various names pertaining to the *undata*-complex will be published elsewhere (Krijnen et al, in preparation). In what follows, we restrict our scope to the species *N. undata* Linné, 1758.

Conclusion on the status of the taxon *Nerita undata* Linné, 1758

From our research we can conclude that:

- Linné's description of *Nerita undata* is obscure;
- no type material is available;
- type figures mentioned by Linné (type locality: "... O. Asiæ ad Amboinam.") represent the Caribbean species *Nerita versicolor* Gmelin, 1791;
- historical confusion exists about the true identity of *Nerita undata* Linné, 1758;
- this problem could not be solved by any of the later authors;
- the taxon *Nerita undata* Linné, 1758 cannot be dropped because it is used too often (pers. comm., Bouchet, 2005).

Bouchet (pers. comm., 2005) suggested to designate a neotype from the type locality Moluccas (following Linné mentioning '*ad Amboinam*').

Designation of the neotype

We select the following specimen with soft parts preserved in ethanol:

Material: 20 x 20 (h x w). Coll. nr. RMNH.MOL.102560. The neotype was found '*under stones*' during the Rumphius Biohistorical Expedition (1990) at station 18 on 19-XI-1990 (see plate I).

The neotype will be deposited in Nationaal Natuurhistorisch Museum – Naturalis, Leiden, The Netherlands.

Locality: "Indonesia, Moluccas, Ambon, Hitu, Ambon Bay, outer bay, East side of Laha, up to and including Tawiri." (Strack, 1993: 26, 29).

We have taken care to meet all the qualifying conditions for the designation of a neotype mentioned in the Code, article 75.3. For completeness' sake these conditions are included.^{ix}

It is noted that *Nerita versicolor* Gmelin, 1791 remains the valid name for the Caribbean species in line with the ICZN article 23.2 about stability.

Description of the neotype

Globular shell with a moderately developed spire with yellowish protoconch. Alternating primary and secondary ribs on upper half of last body whorl; on lower half this pairing of ribs is less obvious. Ribs approximately 38 in number (secondary ribs included), hardly getting smaller towards base. Background colour ochreous with dark brown to blackish elongated spots on the ribs forming an undulated pattern of specks on the final whorl. Columella straight with three strong teeth, the uppermost cubed, the lower two more rounded, the middle one somewhat larger than the lowest one. Parietal shield slightly swollen, wrinkles from columella towards ruff are uninterrupted on upper part, but interrupted on lower part. The projection of the axil points out below the apex. Aperture and columellar area are white. Outer lip circular, sharp and ridged; inner side crenated with one small tooth near the axil followed by a more pronounced one and 16 crenations of decreasing length towards base.

Outer side operculum changing from dark grey near centre to off-white on distal strip,^x nucleus off-white; granulated, flat to concave. Inner side operculum brown, lighter near distal edge, smooth and swollen, light ochreous apophysis without a pustulous callosity on base. On columellar edge a well-developed medial tooth, lateral tooth less prominent. Pseudo-apophysis clearly visible.

Strack (1993: 29) describes the type locality as follows: '*The littoral zone consists of a relatively wide pebble beach with scattered larger stones. To the north (in front of Tawiri) there is a wide sandy beach. Here a small river flows into the sea and around the muddy river-mouth there is a 2.5 hectare mangrove forest. The sublittoral zone is gradually sloping, and characterized by coral rubble, many stones and rocks covered with a thin layer of silt.*'

Distribution of *N. undata* Linné, 1758 (sensu strictu): Indonesian Archipelago, Philippines. Our collections: Malaysia, Indonesia, Philippines.

Discussion: The following table shows the differences between *Nerita undata* Linné, 1758

and two other (well-known) species of the *undata*-complex, namely *Nerita quadricolor* Gmelin, 1791 from the East African region and the occasionally sympatrically living *Nerita spengleriana* Récluz, 1843 (auctores).

<i>Nerita undata</i> Linné, 1758	<i>Nerita quadricolor</i> Gmelin, 1791	<i>Nerita spengleriana</i> Récluz, 1843 (auct.)
1. Primary and secondary ribs pairing on last body whorl.	1. No pairing of ribs, secondary ribs only on upper half of last body whorl.	1. No pairing of ribs, secondary ribs only on upper half of last body whorl.
2. Ribs hardly getting smaller towards base.	2. Ribs getting smaller towards base.	2. Ribs getting smaller towards base.
3. Upper tooth on columella cubed.	3. Upper tooth on columella not cubed.	3. Upper tooth on columella not cubed.
4. Parietal area slightly swollen.	4. Parietal area flat.	4. Parietal area swollen.
5. Projection of axil pointing out below apex.	5. Projection of axil pointing out to apex.	5. Projection of axil pointing out to apex.
6. No pustulous callosity on base of apophysis.	6. Pustulous callosity on base of apophysis.	6. Pustulous callosity on base of apophysis.
7. Occurrence: Indonesian Archipelago and Philippines; occasionally sympatric with <i>N. spengleriana</i> (auctores).	7. Occurrence: Eastern Africa from south of Red Sea to South Africa.	7. Occurrence: Indonesian Archipelago and Philippines; occasionally sympatric with <i>N. undata</i> . (auctores).

More details in comparison with other species of the *undata*-complex will extensively be discussed in a subsequent article (Krijnen et al, to be published).

Acknowledgements

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Samenvattende Nederlandse vertaling/ Summarizing translation into Dutch

1. Een ontoereikende beschrijving

De oorspronkelijke beschrijving van *Nerita undata* Linné, 1758 is te vaag, met als gevolg dat verschillende soorten hieraan beantwoorden. Latere beschrijvingen door dezelfde auteur (1764, 1767) helpen ons niet vooruit. Type materiaal blijkt niet meer te bestaan in de collecties van de Linnean Society in Londen en Uppsala, noch elders. Linné zelf verwees naar afbeeldingen in de werken van Rumphius (pl. 22, fig. 4) en Gualtieri (pl. 66, fig. X). We weten dat de figuren in het werk van Rumphius (1705), aangeduid met een cijfer, door Schijnvoet werden toegevoegd en niets met het manuscript van Rumphius te maken hadden, waarin diens figuren trouwens met een hoofdletter aangeduid worden. De genoemde tekeningen in Rumphius en Gualtieri beelden accuraat een Caribische soort af, met name *Nerita versicolor* Gmelin, 1791. *N. undata* Linné - een Caribische soort? Maar we lezen in de oorspronkelijke beschrijving van Linné als vindplaats toch 'O. Asiae, ad Amboinam', dus in de Molukken!

2. Drie eeuwen lang verwarring

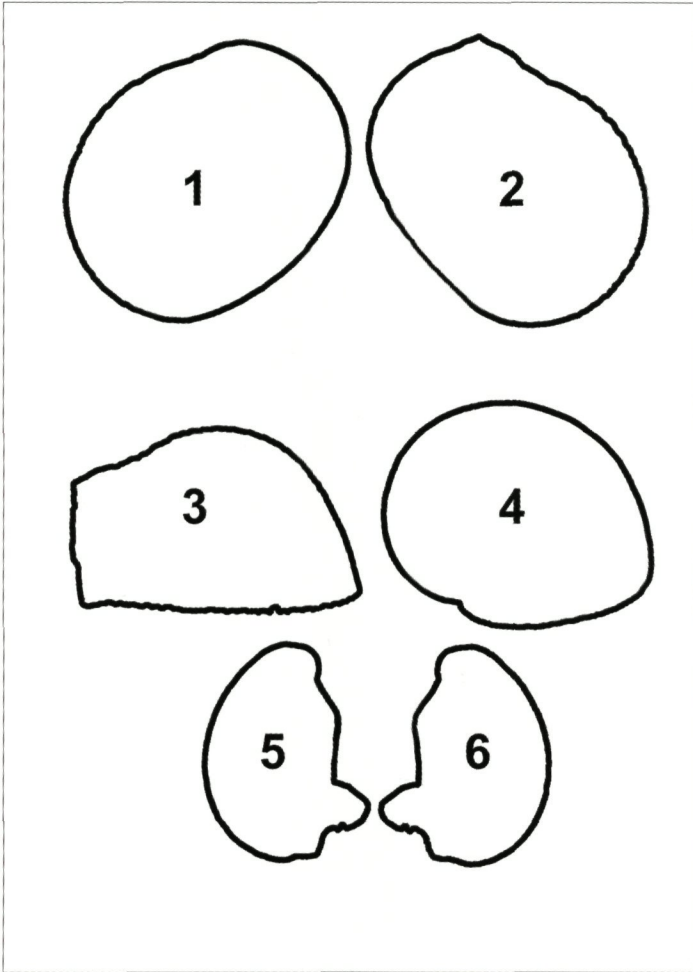
Onze doorgedreven studie leert ons dat er al kort na de beschrijving van *N. undata* verwarring ontstond over de identiteit van de soort. Deze verwarring nam nog toe in de 19e eeuw en niet in het minst door Lamarck die (Tabl. Enc. Méth., pl. 454, fig. 6.a.b.) onder dezelfde naam een andere soort liet afbeelden, namelijk *N. spengleriana* Récluz, 1843. Alhoewel Deshayes (1838: 601) een opvallende rechtzetting noteerde en zwaar uithaalde naar Lamarck, werd het *N. undata*-probleem nog groter: Récluz (1850), die de Salomon Eilanden als vindplaats aangaf, had evenmin een klare kijk op *N. undata*, aldus von Martens (1887); Reeve vermeldde in zijn monografie over het genus *Nerita* (1855) de naam *undata* zelfs helemaal niet. Hanley (1855) volgde Deshayes en verwees ook naar Chemnitz' figuren 1950-1951. Helaas zijn ook deze afbeeldingen ontoereikend om een soort uit het *undata*-complex met zekerheid te identificeren. Tenslotte gooide Tryon (1888) alle *N. undata*-achtigen bij elkaar als synoniemen of variëteiten. De 20e eeuw bracht weinig verandering. Voor Adams & Leloup (1938) bestond alleen *N. undata* en de rest van het complex was allemaal synoniem. In hun spoor volgde Cernohorsky (1972): hij gaf dertig synoniemen voor *N. undata*, waaronder *N. quadricolor* Gmelin, 1791 - een volwaardige soort en als zodanig ook begrepen door o.a. Mienis (1978) en Dekker (2000). Wilson (1994) sloot dan weer aan bij Cernohorsky. Enz.

3. De oplossing: een neotype

Alles in de studie van de nomenclatorische en taxonomische geschiedenis betreffende *N. undata* Linné wijst ontegensprekelijk op een nomen dubium. Anderzijds kunnen we moeilijk vragen één van de meest gebruikte *Nerita*-namen sinds Linné te laten verdwijnen. Wat gedaan? Ph. Bouchet (MNHN-Parijs), hierover geraadpleegd, stelde ons voor een neotype aan te duiden, indien mogelijk van de Molukken ('...ad Amboinam'). We mochten beschikken over materiaal dat verzameld werd tijdens de Rumphius Expeditie naar Ambon en bewaard in Naturalis (Leiden). De uitvoerige beschrijving van het neotype en de duidelijke foto's in ons artikel moeten aan drie eeuwen verwarring over de identiteit van *N. undata* Linné, 1758 een einde maken. In een tweede artikel zullen we het soortcomplex uitklaren.

PLATE 1: Neotype *Nerita undata* Linné, 1758

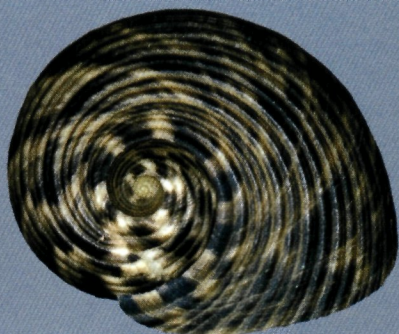
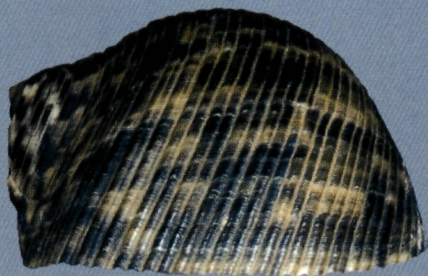
- 1: dorsal view
- 2: ventral view
- 3: side view on outer lip
- 4: top view
- 5: inner side operculum
- 6: outer side operculum





20mm

20mm



10mm

5mm

Endnotes

ⁱ 645. *N. body whorl sulcated with 30 grooves, with toothed lips: of which inside lip coarsely knobbed.*

ⁱⁱ Differs from preceding nerite (= *N. chamaeleon*) by a more prominent apex, broader bands and finer grooves.

ⁱⁱⁱ Simon Schijnvoet (1652-1727), a Dutch master builder, designer, architect, horticulturist, poet and collector, was asked to edit the first Rumphius-manuscript. He obtained animals and drawings from other collectors to insert missing pictures. Schijnvoet acted very carefully by putting his own observations in a different letter type in order to clearly distinguish his efforts from Rumphius's (Strack & Goud, 1996: 34).

^{iv} For completeness' sake Chemnitz's description:

'Die gewäfferte Nerite wird von einer Menge gleichförmiger Streifen und Furchen auf ihrem ziemlich rund gewölbten Gebäude umgeben, und auf einem aschgrauweien oder etwas gelblichen Grunde durch schwarze von der Spitze herablaufende vielmals in einander fließende Flecken und flammichte Wolken bemahlet. Der Wirbel tritt merklich hervor. Die aussere Lippe ist innerlich geriffelt, und hat nahe bei der Spindellippe ein paar Zähne. An der inneren Lippe zeigen sich viele länglichte Runzeln, eining erhobene Punkte, und unten am Saumen drei bis vier Zähne. Beide Lippen nebst den inneren Wänden sind schneewei. Es wird diese Nerite in den ostindischen Gewässern gefunden.'

'The clearly globular body whorl of the nerite has many similar ribs and grooves, and on an ash-coloured or yellowish background intertwining black and cloudy flame-like spots. The spiral axis clearly comes forward. The outer lip is crenated on the inside and has a few teeth in the upper part of it. On the parietal region some elongated folds and elevated points, and on the columella three to four teeth. Both lips and the inside of the aperture are snow-white. This nerite occurs in the East-Indian waters!

^v *Nerita undata* of Born has always been another species than the *undata* of Linné.

^{vi} Deshayes discussed *N. undata* Lamarck and *N. undata* Linné. The former on page 601-602, the latter on page 616!

^{vii} '...the description of Lamarck and certainly the corresponding figure in the *Encyclopédie*, show that his species differs from Linné..., it is impossible,... to complement and to correct the synonymy of Lamarck because one has to change everything to re-establish the species of Linné.'

viii 'Compared with *N. undata* Linné, 1758, the following differences occur: The size of the final whorl of our shell, which measures 38 mm in width and 27 mm in height, its small ribs, its columella, which is not circularly depressed at the centre, the outer lip, which does not show the canal-like depression that can be observed at $\frac{2}{3}$ of the internal circumference of *N. undata*, and its lemon-coloured aperture, obviously distinguish our nerite from *N. undata*, with which it (i.e. *N. chrysostoma*) only faintly connects.'

ix **75.3.** Qualifying conditions. A neotype is validly designated when there is an exceptional need and only when that need is stated expressly and when the designation is published with the following particulars:

75.3.1. a statement that it is designated with the express purpose of clarifying the taxonomic status or the type locality of a nominal taxon;

75.3.2. a statement of the characters that the author regards as differentiating from other taxa the nominal species-group taxon for which the neotype is designated, or a bibliographic reference to such a statement;

75.3.3. data and description sufficient to ensure recognition of the specimen designated;

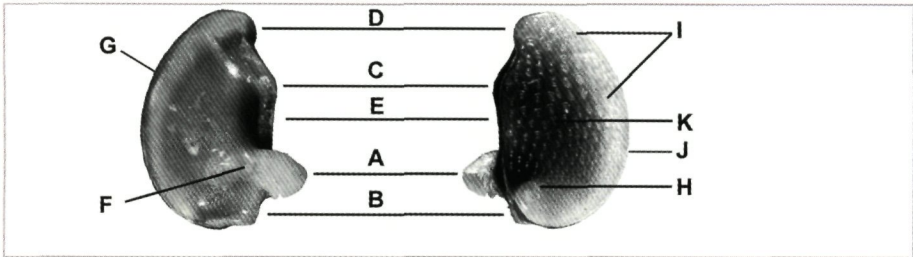
75.3.4. the author's reasons for believing the name-bearing type specimen(s) (i.e. holotype, or lectotype, or all syntypes, or prior neotype) to be lost or destroyed, and the steps that had been taken to trace it or them;

75.3.5. evidence that the neotype is consistent with what is known of the former name-bearing type from the original description and from other sources; however, a neotype may be based on a different sex or life stage, if necessary or desirable to secure stability of nomenclature;

75.3.6. evidence that the neotype came as nearly as practicable from the original type locality [Art. 76.1] and, where relevant, from the same geological horizon or host species as the original name-bearing type (see also Article 76.3 and Recommendation 76A.1);

75.3.7. a statement that the neotype is, or immediately upon publication has become, the property of a recognized scientific or educational institution, cited by name, that maintains a research collection, with proper facilities for preserving name-bearing types, and that makes them accessible for study.

* For convenience's sake some explanation of used terms of the operculum as were defined by Krijnen (1997: 16):



(Illustration by Rob Vink)

Outer side operculum:

- A: apophysis
- B: pseudo-apophysis
- C: medial tooth
- D: lateral tooth
- E: columellar side of operculum
- H: nucleus
- I: distal strip
- J: outer edge
- K: central area

Inner side operculum:

- A: apophysis
- B: pseudo-apophysis
- C: medial tooth
- D: lateral tooth
- E: columellar side of operculum
- F: pustulous callosity
- G: calloused outer ridge

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Appendix: Linnean Material of *Nerita* at Museum of Evolution, Uppsala University, Uppsala, Sweden.

Source: Catalogue data.

<i>Nerita albicilla</i>	UUZM Types 776a-c (Old catalogue: Linnaeus 776 a-c)Autoreference in Linné 1767. Swartz label: 'Albicilla' (# 776a, #776b, and # 776c). <i>Nerita albicilla</i> L. (cf. Odhner 1953, p. 20).
<i>Nerita albumen</i>	UUZM Types 768a (Old catalogue: Linnaeus 768a)Autoreference in Linné, 1767. Swartz label: 'albumen'. <i>Natica albumen</i> (L.) (cf. Odhner 1953, p. 19). Des. of paralectotype, <i>Nerita albumen</i> L., <i>Neverita albumen</i> (L.) in Kabat 1990.
	UUZM Types 768b (Old catalogue: Linnaeus 768b) Autoreference in Linné, 1767. No Swartz label. Des. of lectotype, <i>Nerita albumen</i> L., <i>Neverita albumen</i> (L.) in Kabat 1990.
	UUZM Types 1270a-b (Old catalogue: Linnaeus 1270a-b) No Thunberg collection-label. Swartz label: 'albumen'. Not included in Odhner 1953.
<i>Nerita aterrima</i>	UUZM Types 774 (Old catalogue: Linnaeus 774a-b) No Swartz label. Not included in Odhner 1953.
<i>Nerita canrena</i>	UUZM Types 765a (Old catalogue: Linnaeus 765a) Autoreference in Linné 1767. Swartz label: 'Nerita Canrena'. <i>Natica canrena</i> (L.) (cf. Odhner 1953, p. 19). Des. of lectotype, <i>Nerita canrena</i> L., <i>Naticarius canrena</i> (L.) in Kabat 1990.
	UUZM Types 765b (Old catalogue: Linnaeus 765b) Autoreference in Linné 1767. Swartz label: 'Canrena'. Des. of paralectotype, <i>Nerita canrena</i> L., <i>Naticarius canrena</i> (L.) in Kabat 1990, <i>Nerita lineata</i> .
	UUZM Types 766a (Old catalogue: Linnaeus 766a) Swartz label: 'Canrena'. Not <i>Nerita canrena</i> L., <i>Natica millepunctata</i> Lamarck (cf. Odhner 1953, p. 19). <i>Natica stercusmuscarum</i> (Gmelin 1791) (cf. Kabat 1990)
	UUZM Types 766b (Old catalogue: Linnaeus 766b) Swartz label: 'Canrena'. Not <i>Nerita canrena</i> L., <i>Natica zebra</i> Lamarck (cf. Odhner 1953, p. 19). <i>Natica undulata</i> (Röding 1798) (cf. Kabat 1990).
	UUZM Types 1273 (Old catalogue: Linnaeus 1273)) No Thunberg labels. Swartz label: 'Canrena'. Not included in Odhner 1953.
	UUZM Types 1279 (Old catalogue: Linnaeus 1279a-b) No Thunberg labels. Swartz label: 'Canrena'. Not included in Odhner 1953.
	UUZM Types 1280 (Old catalogue: Linnaeus 1280a-b) No Thunberg labels. Swartz label: 'Canrena'. Not included in Odhner 1953.
	UUZM Types 1281 (Old catalogue: Linnaeus 1281) No Thunberg labels. Swartz label: 'Canrena'. Not included in Odhner 1953.
<i>Nerita cornea</i>	UUZM Types 771 (Old catalogue: Linnaeus 771) Autoreference in Linné 1767. No Swartz label. <i>Nerita brevispina</i> Lamarck (cf. Odhner 1953, p. 19).
	UUZM Types 1654 (Old catalogue: Linnaeus 1654) Autoreference in Linné 1767. No Thunberg labels. Swartz label: 'cornea'. Not <i>Nerita cornea</i> auct., <i>Nerita pennata</i> Born (det. N. Odhner). Not included in Odhner 1953.

<i>Nerita exuvia</i>	UZM Types 779 (Old catalogue: Linnaeus 779) Autoreference in Linné 1767. Swartz label: 'Exuvia'. <i>Nerita exuvia</i> L. (cf. Odhner 1953, p. 20).
<i>Nerita glaucina</i>	UZM Types 767 (Old catalogue: Linnaeus 767a-b) Autoreference in Linné 1767. Swartz label: 'glaucina' (# 767a and # 767b). <i>Natica ampla</i> Philippi (cf. Odhner 1953, p. 19).
	UZM Types 1282 (Old catalogue: Linnaeus 1282a-b) No Thunberg labels. Swartz label: 'glaucina'. Not included in Odhner 1953. 1282b: Inscription on shell: 'jp' (indicating exchange with Thunberg specimen from Japan?) (L. Wallin).
<i>Nerita lineata</i>	UZM Types 1283 (Old catalogue: Linnaeus 1283a-c) No Thunberg collection-label. Swartz label: 'Canrena' (<i>Nerita canrena</i> Linnaeus 1758: 776). Not included in Odhner 1953.
<i>Nerita mammilla</i>	UZM Types 769 (Old catalogue: Linnaeus 769) Autoreference in Linné 1767. Swartz label: 'Mammilla'. <i>Polynices (Mammilla) mammilla</i> (L.) (cf. Odhner 1953, p. 19). Des. of lectotype, <i>Nerita mammilla</i> L., <i>Polinices mammilla</i> (L.) in Kabat 1990.
	UZM Types 770 (Old catalogue: Linnaeus 770) No Swartz label. <i>Polynices (Mammilla) aurantia</i> Lamarck (cf. Odhner 1953, p. 19). <i>Polinices aurantius</i> (Röding 1798) (cf. Kabat 1990).
	UZM Types 1266 (Old catalogue: Linnaeus 1266a-b) No Thunberg collection-label. Swartz label: 'mammillaris' (<i>Helix mammillaris</i> Linnaeus 1767: 1246). Not included in Odhner 1953.
	UZM Types 1275 (Old catalogue: Linnaeus 1275) No Thunberg collection-label. Swartz label: 'Mammilla'. Not included in Odhner 1953.
	UZM Types 1276 (Old catalogue: Linnaeus 1276a-e) No Thunberg labels. Swartz label: 'Mammilla'. Not included in Odhner 1953.
	UZM Types 1277 (Old catalogue: Linnaeus 1277a-b) No Thunberg labels. Swartz label: 'Mammilla'. Not included in Odhner 1953.
	UZM Types 1278 (Old catalogue: Linnaeus 1278a-b) No Thunberg labels. Swartz label: 'Mammilla'. Not included in Odhner 1953.
<i>Nerita peloronta</i>	UZM Types 777 (Old catalogue: Linnaeus 777) No original labels (displaced specimen, cf. Odhner). Not listed by Thunberg (1804). <i>Nerita peloronta</i> L. (cf. Odhner 1953, p. 20).
<i>Nerita plicata</i>	UZM Types 778 (Old catalogue: Linnaeus 778) Autoreference to manuscript (full reference in Linné 1767). Swartz label: 'plicata'. <i>Nerita plicata</i> L. (cf. Odhner 1953, p. 20).
<i>Nerita polita</i>	UZM Types 775 (Old catalogue: Linnaeus 775a-b) Autoreference in Linné 1767. No Swartz label. Not <i>Nerita polita</i> L., <i>Littorina obtusata</i> (L.) (cf. Odhner 1953, p. 20).
	UZM Types 780 (Old catalogue: Linnaeus 780) Thunberg name-label ('midæ') probably displaced from specimen of either <i>Voluta midæ</i> Thunberg (<i>Bulla aurismidæ</i> L.) or <i>Haliotis midæ</i> . No Swartz label. Autoreference in Linné 1767. <i>Nerita polita</i> L. (cf. Odhner 1953, p. 20).
	UZM Types 781 (Old catalogue: Linnaeus 781) No Thunberg name-label or Swartz label.

<i>Nerita pulligera</i>	UUZM Types 1006 (Old catalogue: Linnaeus 1006) Swartz label: 'pulligera'. <i>Neritina pulligera</i> (L.) (cf. Odhner 1953, p. 26).
<i>Nerita pupa</i>	UUZM Types 1191 (Old catalogue: Linnaeus 1191a-d) No Thunberg collection label. Swartz label: 'Pupa'. Not included in Odhner 1953.
<i>Nerita radula</i>	UUZM Types 772 (Old catalogue: Linnaeus 772) Autoreference to manuscript (full reference in Linné 1767). Swartz label: 'Radula'. <i>Neritopsis radula</i> (L.) (cf. Odhner 1953, p. 19).
	UUZM Types 1287 (Old catalogue: Linnaeus 1287a-b) No Thunberg collection-label. Swartz label: 'Radula'. Not included in Odhner 1953.
<i>Nerita virginea</i>	UUZM Types 773a (Old catalogue: Linnaeus 773a) Autoreference in Linné 1767. Swartz label: 'virginea'. <i>Neritina virginea</i> (L.) (cf. Odhner 1953, p. 19).
	UUZM Types 773b (Old catalogue: Linnaeus 773b) Autoreference in Linné 1767. No Swartz label. <i>Neritina turrata</i> Chemnitz (cf. Odhner 1953, p. 20).
	UUZM Types 773c (Old catalogue: Linnaeus 773c) Autoreference in Linné 1767. No Swartz label. <i>Neritina dubia</i> Chemnitz (cf. Odhner 1953, p. 20).
<i>Nerita vitellus</i>	UUZM Types 911 (Old catalogue: Linnaeus 911) Swartz label: 'Vitellus'. <i>Natica vitellus</i> (L.) (cf. Odhner 1953, p. 26). <i>Natica stellata</i> Hedley 1913 (cf. Kabat 1990).
<i>Murex neritoideus</i>	UUZM Types 1585 (Old catalogue: Linnaeus 1585) = <i>Nerita nodosa</i> Linnaeus 1758: 777. No Thunberg labels. Swartz label: 'Neritoideus'. Not included in Odhner 1953.