

The Family Olividae

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SHELLS OF THE FAMILY Olividae are certainly among the most beautiful in form, color, and markings that we possess. Nevertheless, they attract comparatively little attention from the general collector. This is remarkable because the shells are extensively distributed over the globe, are easily collected, and are easily procured at a moderate rate. We believe that this lack of attention is due to the uncertainty with regard to the number of species, and to the lack of reference material. It is difficult to define the limits of many of the species on account of the great variation in color and the extraordinary manner in which the markings gradually change in character while species of other groups are easily distinguished.

Linnaeus (1758) divided the shells we know as the Olividae into 3 species, *Voluta oliva*, *V. porphyria*, and *V. ispidula*. Gmelin (1791) added a few, and Lamarck (1811), extended the number to 62. Dillwyn (1817) reduced it to 18. Duclos (1835) figured 84 species; he considered that 22 of the species which Lamarck described as distinct were only varieties of other species. Reeve (1850) published figures of 100 species. In 1858 J. E. Gray published "An attempt to distribute the species of *Oliva* into natural groups," but his work did not meet with general acceptance by other authors. In 1870–1871 F. P. Marrat published his "Monograph of the Genus *Oliva*" in which he figured 220 species. In 1883 George W. Tryon published volume V of the *Manual of Conchology*, which contains his monograph of the Olividae. This was a monumental work, but Tryon was disposed to group related species to a greater extent than most authors have approved. Tryon reduced the number of species to 55. The more recent major publications on this family include those of Johnson (1910–1911, 1915, 1928); Dautzenberg (1927); Dodge (1950); and Olsson and Dance (1966).

Marrat (1870–1871) made the following statement regarding the Olividae: "Specific differences confined within limited areas constitute the exceptions not the rule. In almost every case where the shells can be obtained in numbers they approach the so called species above and below them so as to render it a matter of uncertainty whether they constitute a variety of one or the other." In an effort to trace the relationships between the species Marrat introduced many new names. Sowerby (1870–1871) commented in *Thesaurus Conchyliorum*: "In his study of the affinities he has been led to register and nominally to admit as species many forms which will appear to the readers as they do to the editor quite indistinguishable."

Ford (1953) said of Marrat: "Judged from the number of forms to which he gave names Marrat might be considered a splitter. Later, however, he stated that the 220 species of *Oliva* might, if carefully examined, be reduced to twenty, and the greater part of his own species reduced to varieties."

The Marrat collection of shells of the Olividae was purchased by the Liverpool Museum in 1875 and remains intact and available. The work of the late J. R. le B. Tomlin listing the species and designating the various type specimens was published by Ford (1953). Tomlin's comments are of great value to the worker on this group. Lamarck's types of the *Annales du Museum* are in Caen. The Duclos collection is in the Geological Society of London. The Lovell Reeve collection of olives was sold at public auction at the Steven's Auction Rooms. A large part of the specimens were purchased by Marrat and incorporated in his collection. The Weinkauff collection is in the museum at Frankfurt, Germany. All of the great collections of Olividae remain intact in large public institutions. The type specimens representing the work of leading scholars from Lamarck to those of the present day remain available to the serious student. These specimens were named and studied in good faith by recognized workers

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who did original investigation, and they have been studied by a host of serious authors who followed them. It is tragic that we are compelled to abandon such solid material and accept references to a series of poorly drawn old wood cuts. Typical of these are some of Röding in the notorious Museum Boltenianum in which, for some, Röding lists as many as four references all to entirely different species, some of them unrecognizable, and the actual shell has been sold as a curio and lost. What the species may have been is known only to God.

We propose to recognize four major divisions in the Olividae with others as subgenera: *Oliva*, *Olivella*, *Agaronia*, and *Ancilla*. On shell characters alone the generic distinctions between *Oliva* and *Olivella* are difficult to define. In general, the species of *Oliva* are larger, although there are many exceptions. *Oliva* has no operculum and no epidermis. In general, *Olivella* is distinguished from *Oliva* by the small size of the shell, its more produced spire, and the presence of a thin horny operculum. Nevertheless, some species of *Olivella*, e.g., *Olivella nivea* (Gmelin, 1791), lack an operculum. Anatomical characters must be considered. The animal of *Olivella* is like that of *Oliva*, but the tentacles and eyes are wanting, the foot is shorter, rounded behind, and does not extend beyond the tip of the spire. Species of *Olivella* are best distinguished from *Oliva* by the radulae. In *Oliva* the radular ribbon generally shows but little variation, the differences between species being small. The ribbon of *Oliva* is generally long and narrow, with many rows of teeth (about 100), while the rhachidian teeth are tricuspidate, the basal margin of the ribbon is wide and often yoke-shaped. In *Olivella* the ribbon is short and wide, with fewer rows of teeth (generally less than 50), the rhachidian teeth are multicuspidate, the cusps being small and numerous. While the rhachidian teeth of both *Agaronia* and *Olivancillaria* are tricuspidate, there are small denticles on the sides that are not present in *Oliva*. The rhachidian teeth of both are very similar in this character. The radula of *Ancilla* is somewhat different. The rhachidian teeth are tricuspidate, but there are two strong lateral teeth.

Some species of *Oliva* are a source of confusion, with various authors accepting different

names for the same species. These notes are an attempt to indicate our diagnosis of the taxonomy. We have freely adopted the work of many others. It would seem that the only advantage to be gained from the recognition of color forms is to give the references to the writing of authors in which they frequently add substantially to an understanding of the species involved. With few exceptions there are intergrades in and out of all of them. It is our opinion that naming them is somewhat analogous to describing all of the kittens in a litter. We will discuss the better known color forms that have been given names.

In this paper we will discuss the taxonomy of certain species from the Indo-Pacific of the genus *Oliva* Bruguière 1789.

Oliva oliva (Linnaeus 1758), *Systema Naturae*, ed. 10, p. 729, no. 350; ed. 12, p. 1188, no. 399.

This species has been confused by many authors with *O. ispidula* (Linnaeus 1758). The recent publication by Olsson and Dance (1966) seems to have established the fact that the true *Voluta ispidula* Linnaeus is a fossil species of *Agaronia*, and that the *O. ispidula* of authors is the *Voluta oliva* of Linnaeus. Generations of authors have described and figured this species as *O. ispidula*. The synonymy is extensive. The figures and discussion given by Reeve (1850) are excellent. Tryon (1883) gives a clear description: "White, ash, yellow, brown, chestnut or chocolate colored, without markings, or with nebulous spots, zigzag lines or reticulations, often with a band near the top of the body whorl; columella white; interior chocolate colored. Length 1-1.5 inches." It is impossible to enumerate the shades and patterns of coloring of this species. The chocolate-colored interior is the most characteristic feature. We will mention a few of the described color forms.

algida Vanatta 1915. *Nautilus* 29:67-72.

It is our opinion that this variety is not sufficiently distinct. It was based, with doubt, on a figure of Reeve (1850). Nevertheless, other workers have accepted this as a variety, and Reeve's figure is clear. The shell is a bluish-white with light-brown longitudinal streaks, a yellow-brown lip, and a shorter spire than usual.

A brown and white callus is seen in the posterior corner of the aperture.

candida Lamarck 1811. Ann. Mus. Hist. Nat. 16:322.

It is doubtful if this is a form of *O. oliva*. The figures represent a much shorter and more obese olive than any example of *O. oliva*, and also the interior of the aperture is white. Nevertheless, others have accepted this form. Dodge (1955) lists it as a recognized variety stating: "An albino form with the aperture more orange than brown."

flaveola Duclos 1845. In Chenu 1845.

Duclos has represented under this name four shells of different colors. According to the description, this variety is light or dark, yellow or orange, the others being of unusual pattern. In this form the interior of the aperture is frequently whitish or rose, but we possess a number of specimens in which it is dark brown. The dark coloration of the aperture nearly always permits identification of this species. This form can be regarded as albinistic, with an aperture of light brown to almost white. Dodge (1955) states: "A yellow form with a white aperture."

gratiosa Vanatta 1915. Nautilus 29:71.

This is a doubtful form and we have failed to recognize it. Vanatta's description is brief and without references: "Shell slender, dark brown, spire elevated, columellar callus cream-white." Dodge (1955) states: "A dark brown, slender form with an elevated spire. It is possibly the form which Lamarck called *O. oriola* (1811) although the spire is considerably higher. The columella is cream-white."

jayana Ducros de St. Germain 1857. Revue Critique, p. 68, pl. III, fig. 44a, 44b.

O. jayana, described as a distinct species by Ducros, is only a form of *O. oliva*, very close to *tigridella* Duclos 1835, having a slender body and short spire. Its pattern is formed of very fine lines composing a condensed network of small triangular meshes. Ducros admitted that he considered his species doubtful. Dodge (1955) described *jayana*: "White or flesh colored with fine longitudinal brown lines and two or more less prominent bands of irregular markings."

lacteana Dautzenberg 1927. J. Conchyl. 71:49. Dautzenberg stated that the external color is entirely white, without pattern, the aperture brown. He also stated that this form has been confused by many authors with *O. candida* Lamarck 1811. Large series in the Burch collection contain specimens that fit the description in every way, but the gradation into other forms is obvious.

longispira Bridgman 1906. Proc. Malacol. Soc. London 7:195.

This form differs from typical *O. oliva* by having a more elevated spire. Dodge (1955) comments: "A name given to a high spired form which Johnson believed to be identical with the latter's *samarensis* 1915."

martini Dautzenberg 1927. J. Conchyl. 71:53. Dautzenberg described this form as whitish or flesh colored, ornamented at the top of the last whorl with a transverse orange band. Numerous sets in the Burch collection could be assigned to this form, but all are associated with other forms.

oriola Lamarck 1811. Ann. Mus. Hist. Nat. 16:321.

O. oriola of Lamarck is a black form of *O. oliva* in which the interior is usually lighter and sometimes nearly white. The external black coloration is not always uniform. It is often blended with white spots more or less widespread, which in some specimens occupy half the surface. Sets in the Burch collection from numerous localities could be assigned to this form. Duclos (1835) has represented under the name *O. oriola* several dark examples of *O. reticularia* Lamarck 1811.

samarensis Johnson 1915. Nautilus 29:71.

Johnson stated that his shells were from Samar, Philippines. All were uniform in color representing the dark reticulated form (Thes. Conchyl., fig. 248). The types are in the Academy of Natural Sciences at Philadelphia (no. 111759). We consider this name questionable on all counts.

stellata Duclos 1835. Monogr. *Oliva*, pl. 8, figs. 11, 12.

This form is ornamented with little lines or dots more or less disposed in zigzags. It is devoid

of a transversal zone. Dodge (1955) describes it as "A white form with broad coarse markings, and a shorter spire than in most forms of this species." An interesting series in the Burch collection contains specimens of this color form, and would fit the figure of Reeve (1850, pl. 17, fig. 34*d*), being ivory-white marked sparingly with dashes of violet-brown. However, other color forms are taken from the same locality. Specimens are easily selected from large sets from the Philippines and other localities.

taeniata Link 1807. Besch. Nat. Samml. 2:98. This is a form stated by Link to be distinguished by the dark unicolored band at the upper end of the last whorl. This description is far too inadequate, and in our opinion the name should be ignored.

tigridella Duclos 1835. Monogr. *Oliva*, pl. 8, figs. 13, 14.

This form differs from *stellata* by the pattern of numerous punctations, sometimes isolated, sometimes close together, and aligned longitudinally in zigzags. The background is yellowish gray, rather dark. Dodge (1955) lists this form: "Fawn colored with dark spots." We do not accept the findings of Bridgman (1905), who made a case for the recognition of *O. tigridella* as a distinct species. Reeve (1850), Weinkauff (1878), Tryon (1883), and others have considered it to be a form of the species under discussion. The name has been used by collectors, and specimens of this color form may be selected from large sets from many localities.

Oliva miniacea (Röding 1798). Mus. Boltinianum, p. 33, sp. 391. 6. Das Mergenroth Gmel. V, *Porphyria*, sp. 16 b; Martini 2, t. 45, f. 476, 477, 9 St.

These references are unmistakably to the species long known as *O. erythrostoma* (Meuschen 1787), Mus. Geversianum, p. 376. The work of Meuschen has been officially declared invalid by the International Commission of Zoological Nomenclature in opinions 260 and 261.

It is our opinion that *O. sericea* (Röding 1798) and *O. tremulina* Lamarck 1811 are recognizable distinct species. Johnson (1910)

and others wished to incorporate these species as forms of *O. miniacea*. Typical *O. miniacea* (Röding) is composed of shells ornamented with wavy longitudinal lines, and two transverse bands more or less interrupted, encircling one at the top and one at the center of the last whorl. All, however, are yellow-white, streaked and banded with blue, green, and purple. The aperture is always a deep orange.

O. miniacea is well illustrated in many publications and often as *O. erythrostoma* (Meuschen 1787). Among the more recent publications are those of Kira (1962, pl. 32, figs. 4, 5), and Habe (1966, vol. II, pl. 27, fig. 16).

The species name *porphyretica* Martini 1773, used by some authors, can not be defended because it was not established according to the International Rules. The name was used by Marrat (1871) and was based on a small specimen otherwise close to the typical.

Melville and Standen (1897) cited an *O. mesaris* Duclos 1835 which is perhaps a form of *O. miniacea*, but it is impossible to know exactly the species they intended to designate since Duclos described and figured two very different shells. One (pl. 12, fig. e), which agrees with the description, is a large example of *O. tremulina*, while the other (pl. 22, figs. 7, 8), half as large, is, according to Duclos de St. Germain (1857), a worn and discolored *O. miniacea*.

O. azemula Duclos 1835 should be nullified, as it is based on *O. ponderosa* Duclos 1835, pl. 15, figs. 1, 2, and on an *O. miniacea* without bands (pl. 15, figs. 10, 11).

It is impossible to mention the many color forms of *O. miniacea*, but some of the better known follow.

efasciata Dautzenberg 1927. J. Conchyl. 71: 39.

Dautzenberg named this form on the theory that since Duclos (1835) had first figured an *O. ponderosa* under the name *azemula*, the second figure could not be designated as *O. azemula*. In any event, this is the form without bands which is not uncommon from many localities.

johnsoni Higgins 1919. Nautilus 33:58.

This form is based on Figure 110 of Marrat

(1871). It is a form of dark brown to black color with large white markings. The form is common from many localities, and in colonies merging into other color forms.

marrati Johnson 1910. Nautilus 24:51.
This form is entirely dark brown to black. It is common in many localities.

saturata Dautzenberg 1927. J. Conchyl. 71:39.
This form is described as having darker longitudinal lines, more numerous and the bands more colored, in such a manner that the entire shell has a more sombre aspect. Shells of this description can be selected from almost any long series of specimens from the Philippines and other localities.

sylvia Duclos 1835. Monogr. *Oliva*, pl. 14, figs. 10, 11.

It would seem that the shells generally assigned to this form are orange-yellow with irregular lines, and having two bands of brown usually smaller than in other forms. This color form is quite common in specimens from Zamboanga, Philippines.

Oliva tremulina Lamarck 1811. Ann. Mus. Hist. Nat. 16:310.

The only reference given by Lamarck for *O. tremulina* is the figure of Lister (1685, pl. 727, fig. 14). It is a large shell of which the background is yellowish-white, and is ornamented with heavy longitudinal lines and purplish-brown dots. The last whorl is crossed by two transverse bands of wide blackish dots. The interior of the aperture is fleshy white. *O. nobilis* Reeve 1850, pl. 2, sp. 3 a.b.c., of which the dimensions are exactly those of Lister's figure, and of which the pattern is quite similar, falls into synonymy with typical *O. tremulina*. Johnson (1928:8-9) considered *O. tremulina* to be a form of *O. miniacea* (Röding 1798). A number of authors accepted this conclusion, but it seems to us that the specimens before us labelled *O. tremulina* not only have a fleshy-white aperture, but seem to be less swollen at the posterior or shoulder of the shells. They are otherwise close, but we think that they are easily separable.

Some of the color forms of *O. tremulina* follow.

concinna Marrat 1871. Thes. Conchyl., p. 13, pl. 7, figs. 100, 101.

This form is of a uniform blackish brown, or well sprinkled with a few unusually white spottings more or less triangular. Occasionally, one also sees examples irregularly marked with brown and gray. *O. tenebrosa* Marrat 1871 differs only in the smaller size, which is insufficient to make another form inasmuch as many examples of intermediate sizes are encountered. We think that Johnson (1928) was incorrect in placing *O. concinna* Marrat 1871 with *O. pica* Lamarck 1811 as these shells are very different. Weinkauff (1878) placed *O. concinna* in the synonymy of *O. zeilanica* Lamarck 1811.

A few of the sets before us at this time follow. The shells from Ceylon are larger, lacking the brown edge of the interior lip, marbled with brown and gray. These seem to fit this form. Shells from Bougainville, Solomon Islands, are of uniform blackish brown, some with a few white spottings usually triangular. Large sets from Zamboanga, Philippines, contain shells with all patterns of this form.

chrysoides Dautzenberg 1927. J. Conchyl. 71:139.

This form is a golden-yellow or orange, solid-colored or with a very faint pattern. The slender form and high spire with open suture is very close to the form *zeilanica* (Lamarck) Philippi 1845, from which it differs only in coloration. It is difficult to see why Reeve (1850) and Marrat (1871) united it with *O. irisans* (Lamarck) Duclos 1835, in which the flattened spire is entirely covered by a callosity. Duclos (1844) cited with doubt as forms of *O. tremulina*, *O. obtusaria* and *O. hepatica*, but it is impossible to identify these names of Lamarck (1811), the descriptions of which are insufficient and which are not accompanied by a reference.

The Burch collection contains sets that fit this form from Zamboanga, Philippines, and also from the Great Barrier Reef, Australia, but the last are larger shells and more slender than those from the Philippines.

Oliva sericea (Röding 1798). Mus. Boltzenianum, p. 33, sp. 390.

Röding gave two references. One was to Martini (1773, pl. L1, figs. 559, 561), which obviously describes the species known to many as *O. textilina* Lamarck 1811. The other reference is to Gmelin (1791, sp. 17, var. 88), based on Figure 489 of Martini (1773), and is, according to Pfeiffer (1840), an *O. reticularis* Lamarck, but it is probably *O. tricolor* Lamarck because of the black points which adorn the upper whorls. It is not *O. sericea* in any event. *O. textilina* Lamarck 1811 is in the synonymy of *O. sericea* (Röding 1798). In comparing *O. sericea* with *O. tremulina* Lamarck 1811 one notices that its columellar edge is adorned up to the top of the aperture by a thick callosity which spreads wide on the base, and that the columellar plaits are stronger and less numerous. Its pattern is composed of a multitude of very fine intercrossed lines which form a network. The bands also are composed of very fine and closely knit lines. Finally, the inside of the aperture, which is white in the background and barely flesh-colored at the base of the columella and along the lip in *O. tremulina*, is entirely light yellow to slightly salmon in *O. sericea*. The species is well illustrated as *O. textilina* Lamarck 1811 by Reeve (1850, pl. 6, fig. 9, a.b.c.). Tryon (1883, pl. 27, figs. 59, 60) figured the shell well, but in our opinion confused the species with his concept of *O. irisans* Lamarck 1811. Hirase (1938, 1951, pl. 113, fig. 1) and Kira (1955, pl. 31, fig. 15) figured the species well as *O. sericea*.

Specimens matching our concept of this species may be seen, bearing a monumental assortment of names, in most of the major collections. It is understandable that many are confused with *O. tremulina* Lamarck 1811. We noted a number of sets assigned to *O. sabulosa* Marrat 1868. We place this name in the synonymy. The comments of Ford (1953) on the Liverpool types may be of interest here: "Two possible syntypes. No locality. 52 mm. \times 22 mm., 40 mm. \times 18 mm. I recently found these shells in a tray with the cut out description of the species. They had not been seen by Tomlin. G. L. Wilkins has identified them as young specimens of *O. sericea* (Röding 1798)."

A few of the described color forms of *O. sericea* follow.

granitella Lamarck 1811. Ann. Mus. Hist. Nat. 16:314.

Oliva granitella has been regarded by some authors as a distinct species, by others as a synonym of *O. sericea*, and by Ducros (1857) and Weinkauff (1878) as a variety of that species. In comparing the descriptions of Lamarck, one sees that there are no transverse bands in *O. granitella*, while *O. sericea* offers two transverse bands more or less marked, composed of little brown lines closed in zigzags and resembling the characters of script. One can thus suppose that *O. granitella* is a variety of *O. sericea* without the bands, but in the absence of all figuration this interpretation remains doubtful.

albina Melvill and Standen 1897. J. Conchyl. 8:404.

This form, designated as being ivory-white without other shell characters, may have been created for an albino specimen of *O. sericea*, as cases of albinism are known in many species of olives, but, to be sure of its determination, we must know in what sense *O. sericea* has been considered by Melvill and Standen. *O. sericea*, *O. tremulina*, *O. ponderosa*, etc. have often been considered forms of the same species. As for *O. sericea* var. *albescens* Johnson 1915, this can only be an albino form of *O. lignaria* Marrat 1868. Johnson stated that the spire is callous.

Oliva lignaria Marrat 1868. Ann. Mag. Nat. Hist., 4th series, 2:212.

The holotype is in the Liverpool Museum and was mentioned by Tomlin (1953). A set of Marrat's types is in the collection of the Academy of Natural Sciences at Philadelphia, no. 150597. These are presumably paratypes and are labelled as coming from Broome, Western Australia. It seems that the first author to recognize the distinctive characters of this species was Ford (1891), in his description of *O. cryptospira* Ford 1891. It is to be regretted that this name must fall into the synonymy. The synonymy (as well as color forms) is extensive, but the two names given

most often by authors are both homonyms: *O. ornata* Marrat 1867 (not Röding 1798) and *O. cylindrica* Marrat 1867 (not Borson 1830, nor Sowerby 1850). Reeve (1850), Tryon (1883), and others assigned the species to *O. irisans* Lamarck 1811. No reference was given to a figure by Lamarck in his description. The fact that the figure of Reeve (1850) does not agree with Lamarck's description in any essential features is quite apparent. Deshayes (1844) refers to Dillwyn (1817). Dillwyn gives one reference to Martini (1773, fig. 561), which is obviously *O. sericea* (Röding 1798). It is difficult to explain how Reeve (1850) and Marrat (1871) could have united *O. tremulina* Lamarck 1811 and *O. irisans* (Lamarck) Duclos 1835, in which the flattened spire is entirely covered with callosity. Tryon (1883) followed Reeve (1850). Kira (1955, 1962) illustrated the species under the name *O. ornata* Marrat 1867. The typical form from western and northern Australia is slender and white with a fine zigzag pattern in ash to purple-brown. The columella is white, faintly tinged with lilac, the aperture light to deep violet. The color of the interior is not a constant character: a certain percentage of specimens will range from white through light to deep violet. The apex of the Australian form is not as flat and callosed as are those from elsewhere throughout the Indo-Pacific.

A brief comment on a few of the described color forms follows.

albescens Johnson 1915. Nautilus 28:99. This pure-white albinistic form is not rare.

cryptospira Ford 1891. Nautilus 4:135-136. The types are in the Academy of Natural Sciences of Philadelphia. This form is predominantly orange in color. The spire is short with the sutures entirely covered by a heavy callus.

fordi Johnson 1910. Nautilus 24:51. This is the dark brown form. It is common with others from the Philippines, Ceylon, and many other localities throughout the Indo-Pacific.

Oлива vidua (Röding 1798). Mus. Boltenianum, pp. 34, 412, 20, *Porphyria vidua*. Die ungarische Wittwe. Gmel. V, sp. 17, Martini 2, t. 45, f. 472, 473 St.

The figures of Martini are clearly the solid

black form of the species known to many as *O. maura* Lamarck 1811. There has been an interval in which authors have placed this species in the synonymy of *O. oliva* (Linnaeus 1758). Olsson and Dance (1966) show that the true *O. oliva* is, in fact, the species known to many as *O. ispidula* (Linnaeus 1758). The name *O. vidua* must be restored.

The shape of *O. vidua* seldom varies. It is relatively a little elongated. The spire is very depressed, often completely flat. A projecting callosity restricts, at the top of the columellar ridge, a scanty canal. This species is remarkable for the richness and variety of the patterns and colors. The typical coloration is a brilliant black, which has attracted the attention of authors.

Reeve (1850, pl. 7, sp. 10a-10g) figured this plate for *O. maura* Lamarck 1811, and in his listings of synonyms cited three of Lamarck's 1811 species, *O. fulminans*, *O. septuralis*, and *O. funebris*, and also *O. macleaya* and *O. leucostoma* of Duclos (1844). These are all recognized color forms of *O. vidua* with the exception of *O. funebris* and *O. leucostoma*. However, Reeve did recognize in all figures the details of the spire and shoulder of *O. vidua*. Tryon (1883) figured the species well as *O. maura* Lamarck, as did Weinkauff (1878) with the color forms. T. Habe (1966) figured the species well as *O. oliva*.

Some of the color forms of *O. vidua* follow.

albofasciata Dautzenberg 1927. J. Conchyl. 71:70.

Dautzenberg based this name on a figure of Duclos (1844, pl. 25, fig. 4). The gray background covered with a compact and faint pattern is crossed by two decurrent bands linked by little irregular black swatches.

aurata Röding 1798. Mus. Boltenianum 33. This form is composed of shells with a uniform golden-yellow to orange color. We may add here that, as with other color forms, we have long series showing the gradual merging of one into others.

cincta Dautzenberg 1927. J. Conchyl. 71:63. This form is characterized by dark transverse lines on a background of light yellow, gray, or brown. The author referred to a figure of Reeve (1850, pl. 7, fig. 10e).

cinnamonea Menke 1828. Menke Synopsis 76.

This form is of cinnamon brown color with irregular longitudinal zones of darker brown.

fenestrata Röding 1798. Mus. Boltenianum 34.

This form, based by Röding on Figure 502 of Martini, is distinguished from the form *cincta* by the addition of horizontal lines which cross the vertical lines to create a trellis of quadrangular meshes. Vanatta (1915), instead of using the reference to Martini for the form *fenestrata*, substituted that of Tryon (1883, pl. 23, fig. 23), which represents an individual of the form *cincta*.

macleaya Duclos 1835. Monogr. *Oliva*, pl. 21, figs. 13-16.

This form is gray or yellowish gray covered with lines and inconspicuous compact dots sometimes broken by two unbroken transverse bands.

rumpfi Dautzenberg 1927. J. Conchyl. 71: 66.

This form is based on the figure of Rumpf (1705, p. 119, pl. 39, fig. 4). It is ornamented with lines and black spots arranged in the axial plane of the shell.

sepulchuralis Lamarck 1811. Ann. Mus. Hist. Nat. 16:312.

The comments of Dautzenberg (1927), translated from the French, regarding this form may be of interest. "The name *sepulchuralis* has been borrowed by Lamarck from the old literature. Rumpf (1705) explains that it means *sepulchrae* or *prinsegraaffnis* (funeral of a prince). These olive-like shells are ornamented with spots and black lines arranged in a manner to represent a theory of persons dressed in grand fashion and following the funeral. However, Lamarck has cited as being his *O. sepulchuralis* fig. 1, of pl. 365 of the Encyclopedia, on which the pattern is arranged in transverse bands and not longitudinal, as in the figure of Rumpf, while it is the variety b which agrees with the figure. The name *sepulchuralis* should therefore be reserved for the form with the transverse bands, and we propose for the form with longitudinal swatches the name of *rumpfi*."

Oliva angustata Marrat 1868. Ann. Mag. Nat. Hist., 4th series, 2:213; Thes. Conchyl., p. 16, pl. 13, figs. 182, 183.

Tomlin (1953) stated: "There are two syntypes in the Liverpool Museum labelled from China. Original of fig. 182, 25 mm. \times 12 mm.; shell of fig. 183, 26 mm. \times 11 mm. These are very young shells of *Oliva vidua* (Röding)."

Oliva cana Marrat 1871. Thes. Conchyl., p. 15, pl. 11, fig. 152.

Tomlin (1953) stated that the holotype is in the Liverpool Museum from New Guinea, 37 mm. \times 15 mm. It is a poor example of *O. vidua*.

Oliva reticulata (Röding 1798). Mus. Boltenianum, p. 33, sp. 396.

Generations of authors have assigned this species to *O. sanguinolenta* Lamarck 1811 (Ann. Mus. Hist. Nat. 16:316: Anim. sans Vert. 7:426). In a discussion of references this name must be used. The references of Röding are: 396.10. *Porphyria reticulata*, Die Netz-dattel. Gmel. V, *Oliva* sp. 17; Martini 2. t. 48, f. 512, 533. 9 St.

Voluta oliva var. *x* was established by Gmelin (1791) first on Plate 739, Figure 28 of Lister (1685-92), which is probably an *O. reticulata* of light coloration; second, on Figure 3 of Plate 39 of Rumpf (1705), which is certainly an *O. sericea* (Röding); and third, on Figures 512 and 513 of Martini (1773), which represent typical *O. reticulata*. Johnson (1928: 11) assumed the role of first reviser and selected the name *O. reticulata* (Röding) for this species on the basis that both Röding and Lamarck used the same figures of Martini. Johnson here abandoned the use of the name *variegata* (Röding). Earlier Johnson (1910:67) had suggested that the name *Porphyria variegata* Röding be accepted for this species. Röding's references for this species are: Mus. Boltenianum, p. 33, sp. 393, 8. *P. variegata*, Die schackigte Dattel. Gmel. *Voluta* sp. 17, 3; Martini 2, t. 45, f. 478, 479. 24 St. This species was based by Röding (1798) on the variety of *Voluta oliva* of Gmelin (1791) which includes, first, an *O. vidua* (Röding) of the form *sepulchuralis*,

Knorr (1768, III, pl. 17, fig. 3); second, an *O. vidua* Regenfuss (1758, pl. 1, fig. 2); and third, an *O. vidua* of the form *bifasciata* Martini (1773, fig. 474), and on Figures 478 and 479 of Martini, which are *O. reticulata* of light coloration. Variety a of this *Porphyria* is based by Röding on Figures 480 and 481 of Martini, which represent *O. episcopalis* Lamarck 1811 of the form *lugubris*, and upon the figure of Knorr (1768, v, pl. 19, fig. 1), which is an *O. vidua* of the form *sepulchralis* ornamented with a yellow transverse thread upon the middle of the last whorl. The opinion of the majority of students was that such an assemblage did not justify restoration of the name. The fact remains that it is in use by some authors.

The design of typical *O. reticulata* is composed of lines so close and condensed that it nearly hides the background of the shell. The last whorl is crossed by two blackish bands, and the columella is a beautiful blood-red.

This type has been well figured by Martini (1773, figs. 512, 513), Duclos (1835, pl. 22, fig. 16), Weinkauff (1878, pl. 10, fig. 4), Reeve (1850, pl. 13, fig. 25b), Tryon (1883, pl. 23, fig. 28), and Habe (1966, vol. 2, pl. 27). Habe uses the name *O. variegata* (Röding).

The name *viridescens*, borrowed from Martini by Mörch (1863), H. and A. Adams (1858), Marrat (1871), and others, cannot be used since this is only a part of a descriptive phrase in the work of Martini.

O. pintamella Duclos 1835, which has been regarded by Weinkauff (1878) and Tryon (1883) as a variety of *O. sanguinolenta*, was figured by Duclos in 1835 (Monogr. *Oliva*, pl. 33, figs. 7 and 8). It is a small, short shell; the edge of the columella is very callous and strongly folded in throughout the length. The aperture is narrow. Duclos (1844) added for the same species two figures in Chenu (Illus. Conchyl., pl. 35, figs. 9 and 10) which do not agree with the previous ones. Evidently it was these figures that Ducros (1857) considered to be yellow and discolored *O. sanguinolenta*. The true *O. pintamella* (figs. 7 and 8) seems to us to be a good species. Marrat (1771) figured it in Thes. Conchyl., pl. 15, figs. 212 and 213.

A few of the described color forms of *O. reticulata* follow.

azona Dautzenberg 1927. J. Conchyl. 71:109. This form differs from the typical only by the absence of transverse bands.

evania Duclos 1835. Monogr. *Oliva*, pl. 20, figs. 3 and 4. Reeve (1950, pl. 13, figs. 25a and 25b); Marrat (1871, fig. 163); Tryon (1883, vol. 5, p. 79, pl. 23, fig. 29).

Ducros (1857) says with reason that *O. evania* is but a form of *O. sanguinolenta* with pale background and strongly banded. It may be added that the pattern is much less closed than that of the form *pallida*, and that the bands are composed of large isolated spots, sometimes nearly black.

pallida Dautzenberg 1927. J. Conchyl. 71:110.

This form differs from the typical in that the pattern covers less of the background, giving a lighter aspect to the entire coloration.

zigzag Perry 1811. Perry Conchyl., pl. 41, fig. 4.

In this form the pattern consists of longitudinal lines disposed in zigzags and isolated from each other without decurrent bands.

Oliva rubrolabiata H. Fischer 1902. J. Conchyl. 50:409–410, pl. 8, figs. 12 and 13. Type locality, New Hebrides.

A comparison of this species with *O. reticulata* (Röding 1798) would seem logical from form alone, but the folds on the columella are much more numerous, and run the length of the columella to the suture. In addition both the columella and the outer lip are a bright crimson. The body whorl is dark brown, banded with light, close, concentric bands.

This species must be comparatively rare. We have seen only a few specimens. There is a set of two in the collection of the California Academy of Sciences (no. 37876). These specimens match the description and figures in all details. Dautzenberg (1927) reported the species from New Caledonia, but we have seen none from this locality. The Burch collection at this time contains two specimens, both from the New Hebrides, which is the type locality. One is from Tasariki, Espiritu Santo, New Hebrides, from black volcanic sand in about 7 m of water (J. R. Bollard, October 1966), the other from

the north coast of Tanna, New Hebrides, from black volcanic sand (Mrs. H. Dale, August 30, 1966).

Oliva tricolor Lamarck 1811. Ann. Mus. Hist. Nat. 16:316.

The coloring of this species consists of a profuse mottling of clouded blue and saffron-yellow spots with, in most specimens, a large proportion of green, showing two bands, one around the middle of the shell, and one beneath the sutures. But the most characteristic feature of the species is that the spire is obliquely tessellated with black and a slight mixture of red. The aperture is white.

This species has the outline of *O. reticulata* (Röding) and not of *O. elegans* Lamarck. It has the salmon-colored fasciole, but the color of shell is very different from either. The dark specimens are bluish green with bands of slightly darker shade. The entire shell is spotted with yellow; spire and lip are coarsely marked with brown. Light-colored specimens often have bright yellow and blue spots with the bands obsolete. Such specimens often resemble *O. caerulea* (Röding) so closely as to be separated only by the violet-colored aperture of the latter. *O. philantha* Duclos 1835 is a light-colored form approaching *O. caerulea* in external appearance.

This species is common from many Indo-Pacific localities.

Oliva caerulea (Röding 1798). Mus. Boltinianum. *Porphyria caerulea*. Die himmelblaue Dattel. Gmel. V, *Oliva* fp. 17x. Martini 2, t. 48, f. 518. Rumpf t. 39, f. 5. 13 St.

Of the three references cited by Röding the one of Martini (1773, pl. 48, fig. 518) is the only one which agrees with the species. That of Gmelin (1791), *Voluta oliva* var. *x*, is based on three figures: Lister (1685, pl. 739, fig. 28), which is *O. reticulata* (Röding 1798); Rumpf (1705, pl. 39, fig. 3), which is *O. sericea* (Röding 1798); and Martini (1773, figs. 512, 513), which is *O. reticulata* (Röding). The third reference by Röding to Rumpf (1705, pl. 39, fig. 5) represents *O. tricolor* Lamarck

1811 and *O. elegans* Lamarck 1811, but certainly not *O. caerulea*.

This species is known in almost all of the literature as *O. episcopalis* Lamarck 1811. It is unfortunate that we are compelled to accept the *O. caerulea* of Röding, but the name has priority and has been extensively used. It was proposed by H. and A. Adams (1858), and Mörch (1863). Needless to add, the references to the literature, with few exceptions, are to *O. episcopalis* Lamarck.

The typical pattern is a shell covered with scattered punctations mingled with a few little black specks, but in certain examples the spots are grouped in such a manner as to form two interrupted bands situated one at the top, the other about the middle of the last whorl. In others the pattern is transformed into two longitudinal undulations. The aperture is a deep violet.

This is a common species, distributed throughout the Indo-Pacific.

We will mention two of the named color forms.

lugubris Lamarck 1811. Ann. Mus. Hist. Nat. 16:313.

This form differs from the typical by the coloration being darker throughout. The pattern is more marked, and runs into zigzags and large blackish-brown spots. In certain individuals the brown color overruns nearly all the surface, not allowing sight of the white background, which takes the shape of little isolated spaces.

emelliiodina Duclos 1844. In: Chenu, Illus. Conchyl., pl. 21, figs. 19, 20.

According to Duclos (1857) this is a peculiar form of the species. The figure of Duclos represents a shell of small size, short, with a spire very little elongated when compared with most specimens.

Oliva atalina Duclos 1835. Monogr. *Oliva*, pl. 10, figs. 9, 10.

Tryon (1883) stated that *O. atalina* Duclos and *O. quersolina* Duclos 1835 are discolored specimens of *O. caerulea* (Röding 1798). Tryon used the name *O. episcopalis* Lamarck. Duclos (1857), while agreeing that *O. quersolina* is a discolored state of *O. caerulea*, was

of the opinion that *O. atalina* is a distinct species. We share his opinion because, despite the resemblance of the pattern of *O. atalina* and *O. caerulea*, the background of the aperture is always white in the first and purple in the second.

Oliva tigrina Lamarck 1811. Ann. Mus. Hist. Nat. 16:322.

This species is based on Figure 475 of Martini (1773), which represents a shell swollen about the top, with a short spire on which the pattern is composed of numerous greenish-gray punctations, and with a few groups of short brown lines. The band is ornamented with black spots, but most specimens are destitute of lines and black spots on the band, and the background is tawny gray instead of white.

Meuschen (1787:370) created a *Cylindrus tigrinum*. This work has been declared invalid but, in any event, Meuschen supported his species by three figures representing olives, of which none is determinable. The name has no meaning.

Marrat (1871) replaced *O. tigrina* Lamarck with *O. holoserica* Martini, a substitution which cannot be accepted since the nomenclature used in the first volume of the Conchylien Cabinet is only occasionally binomial. Furthermore, in the present case, the words *Cylinder holosericus* are used as part of a descriptive phrase. Finally, Martini's species is based on four figures of which only one (Fig. 475) concerns the species in question.

According to Ducros (1857), who examined the type of Duclos, *O. othonia* Duclos 1844 is a young specimen of *O. tigrina* Lamarck.

It is impossible to identify in a satisfactory manner *O. glandiformis* Lamarck 1811. For some authors, this is a variety of *O. tigrina*. The description is quite insufficient, and is accompanied by no reference.

The variety associated by Lamarck, *girol* Adanson 1757, is an entirely different species and already has been named *O. flammulata* by Lamarck himself.

We mention one of the named color forms frequently used by authors.

fallax Johnson 1910. Nautilus 24:64.

In this form the bands are suffused and cover the entire shell. We noted Johnson's type in the Academy of Natural Sciences of Philadelphia. It is the common all-black color form. It may be mentioned that this form is often confused with the black form of *O. vidua* (Röding), but the shell is much less cylindrical in outline, and the sutural callus is less elevated.

Oliva elegans Lamarck 1811. Ann. Mus. Hist. Nat. 16:312.

The shell is olive or brownish yellow closely covered with zigzag lines or punctations or both, varying from chocolate to nearly black. The fasciole is salmon-colored. This species seems to be confusing to many, with other species being assigned to it in error. It is separable from *O. tigrina* Lamarck 1811 and *O. tricolor* Lamarck 1811 by the shorter and more tumid growth, and the erect callous production of the last whorl upon the spire, which is proportionally depressed. Although this species is smaller, it has the more cylindrical form and elevated sutural callus of *O. vidua* (Röding 1798). Light-colored specimens with the bright salmon-colored fasciole resemble in a general way *O. reticulata* (Röding 1798). It also has a range in color similar to that of the latter species, and lacks the dark fulvous and melanistic forms of *O. vidua* (Röding). Small dark specimens are often very close to specimens referable to *O. funebris* Lamarck 1811. This species is common, with a wide distribution throughout the Indo-Pacific.

Oliva lecoquiana Ducros 1857. Revue Critique, p. 43, pl. 2, figs. a-c.

The shell is banded with chocolate-colored triangular markings, as in *O. elegans* Lamarck 1811. The fasciole is stained with saffron. The form is somewhat more bulbous, and the interior of the aperture is violaceous.

O. similis Marrat 1867 is a minor form of *O. lecoquiana*. *O. calosoma* Marrat 1871 (not Duclos 1835) is a small form.

We have specimens that fit the description of *O. lecoquiana* from Madagascar, Fiji Islands, and other localities.

Oliva calosoma Duclos 1835. Monogr. *Oliva*, pl. 26, figs. 1, 2.

Tryon (1883) describes the species as "Pure white, or with slight indications of three bands composed of occasional triangular brown markings. Length 27 mm. China." Weinkauff (1878) accepted the species.

Oliva bulbiformis Duclos 1835. Monogr. *Oliva*, pl. 27, fig. 10.

The shell is short and very bulbous, colored as *O. elegans* Lamarck 1811, but the interior of the aperture is chocolate brown. Reeve (1850) figured and described *O. bulbiformis*, but mentioned *O. dactyliola* Duclos 1835 and *O. caroliniana* Duclos in the synonymy. We do not accept this (see below).

This is a common species from many localities throughout the Indo-Pacific.

Oliva dactyliola Duclos 1835. Monogr. *Oliva*, pl. 27, figs. 5-8.

We have eliminated from the synonymy Figure 9 of Duclos. It presents no well-defined character, and Ducros (1857), who studied the shell represented by this figure, stated that it is *O. bulbiformis* Duclos and not *O. dactyliola*. Reeve (1850) supposed that *O. dactyliola* could be a synonym of *O. bulbiformis* Duclos, and Tryon (1883) made it a variety of *O. funebris* Lamarck, to which he compared, moreover, *O. picta* Reeve and, with doubt, *O. blanda* Marrat. Finally, Johnson (1910), although maintaining that *O. dactyliola* is a distinct species, said that it appears to be intermediate between *O. funebris* Lamarck and *O. bulbiformis* Duclos, having the spire of the first and the form of the second. Sowerby (1900) accepted the species with the statement that he had specimens from Pondoland and also from Cebu, Philippines. We have specimens from the Philippines, New Guinea, Indonesia, New Caledonia, and elsewhere that agree well with the Figures 5-8 of *O. dactyliola* Duclos.

Oliva funebris Lamarck 1811. Ann. Mus. Hist. Nat. 16:332.

The shell is more cylindrical than *O. bulbiformis* Duclos. It differs from *O. lecoquiana*

Ducros in that the lower band of the fasciole is deeply strigated with chocolate. The aperture is slightly bluish or chocolate. Johnson (1910) stated that this species seems to occupy an intermediate position between *O. tigrina* Lamarck and *O. elegans* Lamarck. It is beautifully illustrated by Marrat (1871, pl. 11, figs. 143-148) under the name *leucostoma* Duclos 1835 and *labradorensis* (Röding 1798). The figure attributed by Röding to Lister (1685, tab. 731, fig. 20) is unrecognizable, and so *labradorensis* can be dropped. The narrower form suggests a relationship to *O. mustellina* Lamarck, while the broader form shows a tendency toward the more inflated *O. dactyliola* Duclos. Johnson (1915) discussed the species again, stating that it is extremely variable, with limits which are difficult to define. Reeve (1850, pl. 7, sp. 10) figured a specimen of this species which he considered a form of *O. vidua* (Röding). Tomlin (1953) considered *O. leucostoma* Duclos to be separable from *O. funebris*, but we are disposed to place it in the synonymy. Some authors have thought the following species of Marrat (1871) to be valid, but we think that they belong in the synonymy of *O. funebris*: *O. clara*, *O. propinqua*, *O. lutea*, and *O. inornata*.

It is probable that further study will indicate that this is one entity including a number of related forms.

Oliva similis Marrat 1867. Ann. Mag. Nat. Hist., 3rd series, 20:215. Thes. Conchyl. pl. 14, figs. 205, 207.

Tomlin's comments on the shells in the Liverpool Museum follow: "Four (not types). Eastern seas. Max. 35 mm \times 16 mm, Min. 31 mm \times 14 mm. Av. 32.2 mm \times 15 mm. I do not think the shells numbered 206 and 207 are the originals of these figures. None of the four seem to fit any of the three figures that Marrat gives of *O. similis* though they are that species right enough." Weinkauff (1878, pp. 27, 7, 7, 11, sp. 10) accepted the species. At first we thought to place this species in the synonymy of *O. bulbiformis* Duclos 1835 but, after seeing more specimen material, we are now disposed to admit the species. A few sets noted are: Acad. Nat. Sci. Philadelphia, no. 128327 and 15853

from Ceylon, and 104786 from New Guinea; Am. Mus. Natl. Hist. no. 48428 from Singapore. The specimens are white or cream in color, the pattern is somewhat as in *O. scripta* Lamarck, the size about 32 mm. All seem to be more cylindrical than *O. bulbiformis*. All have a violaceous aperture.

Oliva laevis Marrat 1871. Thes. Conchyl. p. 4, pl. 20, figs. 330–331.

Tomlin (1953) states that the holotype only is in the Liverpool Museum. It is from the Seychelles, 18 mm \times 7 mm. A very young shell of *O. similis* Marrat (spelled *laevis* on page 26, *laeve* on caption to plate). Weinkauff (1878) thought it to be a juvenile *O. elegans* or *O. tigrina*. The confusion here is apparent.

Oliva caroliniana Duclos 1835. Monogr. *Oliva*, pl. 19, figs. 5, 8.

This species is close to *O. mustellina* Lamarck 1811. The shells are more bulbous and the spire more exserted. Weinkauff (1878) and Marrat (1871) accepted the species. Sets so labelled in the major collections are of interest. Acad. Nat. Sci. Philadelphia, no. 15855 from Singapore, and set no. 104782 from Mauritius are the same.

Oliva mustellina Lamarck 1811. Ann. Mus. Hist. Nat. 16:316.

The shell is cylindrical, the aperture long and narrow, the spire short. The color is a pale yellow covered with light chestnut figurations. The interior of the aperture is a deep violet. Many specimens in the large museum collections seem to be assigned to this species in error. It is surprising to note so many assigned to the quite different *O. elegans* Lamarck. Variation in one biological entity or grouping of several related species are possibilities to consider in this as well as other species in this family. Specimens from Japan, China, Singapore, India, and the Philippines seem to be typical. We place the following species tentatively in the synonymy.

Oliva pacifica Marrat 1871. Thes. Conchyl., p. 15, pl. 11, fig. 151. Some authors have accepted *O. pacifica* as valid. Weinkauff (1878) accepted the species and placed *O. arctata*

Marrat in the synonymy. Shell labelled from China.

Oliva arctata Marrat 1871. Thes. Conchyl., sp. 99, p. 20, figs. 229, 230. The holotype only is in the Liverpool Museum, labelled China Sea, 25 mm \times 10 mm. Tomlin (1953) stated that this is obviously the young of *O. pacifica* Marrat.

Oliva ponderosa Duclos 1835. Monogr. *Oliva*, pl. 15, figs. 8, 9.

The shell is cream-white, slightly colored with obscure bluish or violet short interrupted streaks, and a few brown reticulations. The columella and interior of the aperture is carnelian-white, sometimes tinged with flesh-pink. The shell is thick and stout, with the spire but little exserted. The last whorl is more or less produced toward the apex. Long sets from Mauritius, Seychelles, Maldive Islands, and other localities of the Indian Ocean produce shells with both white and light-salmon apertures. The high callosity above the suture becomes less pronounced in the more juvenile specimens. The pronounced growth of the last whorl in all adults of this form, and the consistently more obese shape leads us to admit the species. Other species are considered distinct on grounds much less apparent.

The species was well illustrated by Reeve (1850), Weinkauff (1878), and Marrat (1871).

Oliva rufula Duclos 1835. Monogr. *Oliva*, pl. 19, figs. 9, 10.

The shell is fawn colored, crossed diagonally or transversely by dark-chestnut bands formed by the coalescence of trigonal markings. The aperture is white.

This species seems to maintain both form and pattern consistently, showing no noticeable variations. It is distinctive and easily recognized. This is a fairly scarce shell. Most specimens come from the Philippines.

Oliva scripta Lamarck 1811. Ann. Mus. Hist. Nat. 16:315.

The shell is yellowish brown with pale chestnut zigzag markings, and two bands of

brown waved characters. The shell is cylindrically ovate with a short spire.

All authors agree about the similarities of this species with some forms from the West Indies. At times it is difficult to separate *O. scripta* from specimens of the West Indies called *O. jamaicensis* by Marrat (1871) and *O. caribbensis* Dall and Simpson 1901. The subcylindrical form a little bulging at the top of the last whorl, the short spire, the pattern and color are identical. The pattern of *O. sayana* Ravenel 1834 from the western Atlantic resembles that of *O. scripta*, but the form is more elongate, the spire higher, and the last whorl is not swollen above. It is our opinion that *O. scripta* may be easily separable from the above forms by the fact that the produced posterior of the last whorl gives the shell more the shape of *O. mustellina*. The species was well illustrated by Reeve (1850) and by Tryon (1883). Kuroda and Habe (1952) listed the species from Japan.

We have this species from China, Ceylon, the Moluccas, and from Thailand. We also have sets from the Cook Islands that seem to be identical.

Oliva annulata (Gmelin 1791). Syst. Nat., ed. 13, p. 3441.

This species is listed widely in the literature as *O. emicator* (Meuschen 1787). Meuschen's names have been declared invalid by the International Commission. The name *O. guttata* Lamarck 1811 has also been used by many authors.

It is unfortunate that the first available name for this species seems to be *O. annulata*. This name was given to an abnormal ringed shell. The color is entirely white and the shell is characterized by a protruding ring encircling the middle of the last whorl. The ring is not uncommon in this species. We have many specimens of all color forms with this character. We know the shell from the figure of Lister (1685), and that of Martini (1773), the last having been copied by Wood (1828) in the Index Testalogicus.

Vanatta (1915) cited as representing typical *O. annulata* Figure b of Plate 16 of Duclos, and Figure 60 of Plate 5 of Marrat. Both figures

represent a yellow-orange shell, without a ring in the middle of the last whorl. This is completely wrong, since it is especially the ring which characterizes the *O. annulata* of Gmelin.

O. leucophaea Lamarck 1811 is an absolute synonym. It is odd that Lamarck substituted the name for *annulata*, even though he cited it among the references to his species.

Some of the named color forms follow.

amethystina (Röding 1798). Mus. Bolteni-anum, p. 35.

This should perhaps be recognized, as this represents the common color which is ornamented with round, purple spots, fairly regularly spaced on a clear flesh-colored background.

alba Sowerby 1825. Cat. Tankerville, p. 86. The shell is entirely white inside and out.

carnicolor Dautzenberg 1927. J. Conchyl. 71:22.

The background is yellowish white without spots. The dorsal region of the last whorl is reddish pink.

intricata Dautzenberg 1927. J. Conchyl. 71:23.

This form differs in the pattern of a compact confusion of little brownish lines sprinkled throughout with black dots. The white background appears between the meshes of the network in the shape of little gaps more or less triangular.

mantichora Duclos 1835. Monogr. *Oliva*, pl. 15, figs. 7, 8.

The form *mantichora* presents at the top of the last whorl an angle more or less pronounced. The pattern and coloration resemble those of the form *intricata*, but there are also examples of which the background is more open. Marrat (1871, pl. 5, fig. 29) shows an individual in which the keel, situated lower down, tends to approach that of the typical *annulata*, but this keel is blunt and does not have the aspect of a ring.

nebulosa Dautzenberg 1927. J. Conchyl. 71:22.

This form was figured by Reeve (1850, pl. 14, species 30g) as *O. leucophaea* Lamarck. The

spots have the character of scattered triangular blotches, and the ground is of a ruddy tinge.

O. annulata (Gmelin) is a common species distributed throughout the Indo-Pacific. We have sets of mixed and intergrading forms from Tahiti, Solomon Islands, Guam, New Guinea, Marquesas, Mauritius, Admiralty Islands, and many localities in the Philippines.

Oliva carneola (Gmelin 1791). Syst. Nat., ed. 13, p. 3443.

The figure of Martini (1773, fig. 495) upon which Gmelin based this species is very poor, but one can still recognize that it concerns a shell with reddish background crossed on the last whorl by bluish-gray bands running downward. This coloration may be regarded as typical.

O. carneola is either short or elongate, either swollen or cylindrical; the spire is constantly covered with a thick callosity which completely hides the superior whorls, that of the last whorl alone being free. The pattern and coloration give this species a great number of modifications, and change so often during growth that it is impossible to place the shells into determined color forms. We will mention a few of the most characteristic.

We have avoided discussion of generic names in *Oliva*. The differences in radula or anatomy are slight, and we see no systematic advantage in the recognition of such names in this group. For example, some authors place this species in the genus *Galeola* Gray 1858.

This is a common species throughout the Indo-Pacific. Inasmuch as many or all of the described color forms appear in most of a large series from all localities, it seems futile to attempt a division of them. A few of the named color forms follow.

adpersa Dautzenberg 1927. J. Conchyl. 71:9. The shell is irregularly sprinkled with numerous small, white, rather conspicuous triangular flecks.

bizonalis Dautzenberg 1927. J. Conchyl. 71:8. This shell has a red background crossed in the middle of the last whorl by two white bands rather large and close. (See Duclos 1844, pl. 28, fig. 13.)

candidula Dautzenberg 1927. J. Conchyl. 71:8.

The bands are barely visible at the beginning of the last whorl and disappear completely thereafter. (See Duclos 1844, pl. 28, figs. 12, 16.)

coccinata Dautzenberg 1927. J. Conchyl. 71:8.

The shell is a nearly uniform red, with bands visible. (See Duclos 1844, pl. 28, fig. 8.)

trichroma Dautzenberg 1927. J. Conchyl. 71:9.

The shell differs from *unizonalis* by the presence at the summit of the last whorl of a deep-purple band at the suture which imparts to the shell a three-colored aspect.

unizonalis Dautzenberg 1927. J. Conchyl. 71:9.

The shell has a red background crossed by one large white band in the middle of the last whorl. (See Duclos 1844, pl. 28, figs. 6, 14.)

Oliva athenia Duclos 1835. Monogr. *Oliva*, pl. 26, figs. 17, 18 (excl. 19, 20).

O. athenia is a well defined species, characterized by the squat form, the spire nearly flat and mucronated in the center. Nevertheless, it has often been misunderstood. Duclos himself, after correctly representing it on Plate 28, Figures 17, 18, has added under the same name Figures 19 and 20, which are of *O. mucronata* Marrat and *O. faba* Marrat. Tryon (1883) considered it a synonym of *O. sidelia* Duclos 1835.

A typical *O. athenia* is ornamented with longitudinal blotches standing out clearly in zigzags on a tawny background. These blotches are either separated or approximate. In certain examples they stand out on a dotted or obscurely reticulated background. We have specimens from New Caledonia, Andaman Islands, Fiji Islands, and Australia.

This species has been the source of much disagreement. Reeve (1850) placed it in the synonymy of *O. carneola* (Gmelin 1791).

Johnson (1910) said under his discussion of *O. mustellina* Duclos, "*O. athenia* Duclos resembles this species in miniature." Johnson's comment might be in order if one failed to

note the spire. We think that it is distinct. Most of our specimens were received labelled *O. faba* Marrat 1867, a name which we now place in the synonymy.

Oliva sidelia Duclos 1835. Monogr. *Oliva*, pl. 19, figs. 1, 2. Duclos (1844, p. 23, pl. 21, figs. 1, 2). Ducros (1857, p. 69). Marrat (1871, pl. 15, figs. 231, 232) (a copy of the figures of Duclos). Tryon (1883, pl. 33, figs. 27, 44) (a copy of the figures of Duclos).

Tryon (1883) united, under the name *O. sidelia*, *O. volvaroides* Duclos 1835, *O. lepida* Duclos 1835, and *O. todosina* Duclos 1835. We share his opinion for *sidelia*, *volvaroides*, *lepida*, and *todosina*, but it is our opinion that *athenia*, *mucronata*, and *faba* constitute a distinct species, more squat, with a more depressed spire, and closely mucronated in the middle. The pattern is much plainer and darker. Finally, *sidelia*, *volvaroides*, *lepida*, and *todosina* have the last whorl separated by a suture greatly canaliculated, while in *athenia*, *mucronata*, and *faba* the suture of the last whorl is deep but very tight. We find ourselves presented with two distinct species, *sidelia* and *athenia*. It is to be regretted that the name *sidelia*, which was created for a young shell, should have been selected for this species. *O. volvaroides*, *O. lepida*, and *O. todosina* apply to adult specimens. The type of *O. sidelia* is a shell 10 mm in length, white, with faint violet undulations, and having on the dorsal region a large brown spot which occupies nearly the whole length of the last whorl, except for a white zone close below the suture. This coloration must be infrequent, since Marrat (1871) and Tryon (1883) copied the figures of Duclos. Weinkauff (1878) gave three figures of *O. sidelia*, but this interpretation is difficult, the author admitting that they are not elongated enough, and that the relation between the height and width is not exact. Reeve (1850, pl. 22, sp. 59) figured and described *O. volvaroides*.

Specimens from China, Mauritius, Seychelles, Solomon Islands, and other localities indicate a distribution throughout the Indo-Pacific. A few forms of this species follow.

lepida Duclos 1835. Monogr. *Oliva*, pl. 25, figs. 15 to 20.

The shell has a pattern of triangular spots. We have specimens that may fit this form from Mauritius, Seychelles, China, and the Philippines.

todosina Duclos 1835. Monogr. *Oliva*, pl. 25, figs. 9, 10.

This form was based by Duclos on a shell of which the pattern and especially the middle band of the last whorl are darker. The habitat of California indicated by Duclos is certainly erroneous.

volvaroides Duclos 1835. Monogr. *Oliva*, pl. 25, figs. 11 to 14.

The type of *O. volvaroides* represented by Duclos (pl. 25, figs. 11 and 12) is coffee-and-cream colored with some transverse lines hardly visible. His Figure 13 is of a variety entirely white, and Figure 14 is of a uniform blackish brown which is so similar to Figure 20 (inscribed as a variety of *lepida*) that one might be tempted to believe that these two figures were made from the same shell. While maintaining *O. volvaroides* as a species, Ducros (1844) said that a study of a great number of individuals from diverse localities might authorize a reunion with *O. lepida*.

Oliva tessellata Lamarck 1811. Ann. Mus. Hist. Nat. 16: 320, b. 28.

The shell is yellow, spotted with purple. The aperture and columella are deep violet.

Dillwyn (1817) and Marrat (1871) took the name *O. tigrina* (Meuschen 1787) for this species. Meuschen's names have been declared invalid by the International Commission, but in any event it is an obvious error because no reference cited in the Museum Geversianum relates to *O. tessellata*.

O. tessellata varies only in the number of punctations with which the surface is ornamented. In adult specimens they deviate rarely on the end of the last whorl. The dark purple of the interior is constant.

Some authors place this in the genus *Neocylindrus* Fischer 1883, with *O. tessellata* Lamarck as the type.

This is a common species distributed throughout the Indo-Pacific.

Oliva bulbosa (Röding 1798). Mus. Boltenianum, p. 34, *Porphyrina bulbosa*.

It is to be regretted that the vagaries of the system permit no escape from abandoning the name *O. inflata* Lamarck 1811 under which this well known species has been recognized for generations. It is needless to add that almost all of the following references to the literature are the work of authors who knew the species as *O. inflata* Lamarck.

Both Röding (1798) and Lamarck (1811) refer to the same figures of Martini (Conchyl. Cab. II, tab. 47, figs. 507, 508). These figures represent specimens having undulating longitudinal stripes of brown. Hence we must accept this form as typical.

The form of this species is very characteristic: swollen gibbous growth, fasciole with a heavy callous ridge which is independent of the columellar plaits. This is the only species of *Oliva* with this character.

Inasmuch as most of the large sets in collections from various localities seem to contain specimens of almost all of the described forms, it seems futile to consider them in great detail. However, a few will be mentioned to give the references.

bicingulata Lamarck 1811. Ann. Mus. Hist.

Nat. 16:94. *bicincta* Lamarck 1822.

Two revolving dark lines are present.

fabagina Lamarck 1811. Ann. Mus. Hist.

Nat. 16:94.

The bands fuse and cover irregularly the greater portion of the shell. This form was figured by Marrat (1871) as *O. crassa* Martini.

immaculata Vanatta 1915. Nautilus 29:68.

This is the white albino form. In some collections this form is labelled *O. alba* Dillwyn 1817.

inflata Lamarck 1811. Ann. Mus. Hist. Nat. 16:310.

Specimens with only the small uniform bluish-gray spots.

lacertina Quoy and Gaimard 1825. Voy.

Uranie, p. 432, pl. 72, figs. 4, 5.

This is a peculiarly banded color form of this species.

This species is generally distributed throughout the Indo-Pacific. We have large sets from Mozambique, Zanzibar, the Red Sea, Mauritius, Suez, Tanzania, Singapore, Indonesia, etc.

Oliva paxillus Reeve 1840. Conchol. Icon., pl. 21, sp. 56, a, b.

The shell is cone shaped, yellowish white in color, smooth, with triangular brown markings forming interrupted bands, and spots beneath the sutures and on the fasciole. The interior of the aperture is sometimes two- or three-banded, but this is not a constant character.

We are accepting the opinion of the late J. R. le B. Tomlin (1934), a very careful observer, who studied the types of all of the species involved. We also studied the types. All of them are in the British Museum (Natural History).

Omogymna was described by von Martens (1897) as a subgenus of *Oliva*, with *O. paxillus* Reeve as the type. Tryon (1883) pointed out that *O. nitidula* Duclos 1835 is preoccupied by *nitidula* Dillwyn 1817 (not Gmelin 1791). *Oliva ozodona* Duclos 1835 is certainly not *O. paxillus*. On the other hand, *Oliva sandwichiensis* Pease 1860 and *Oliva thomasi* Crosse 1861 are both the same as *O. paxillus* Reeve.

While not common, the species seems to be rather generally distributed. It seems to be the only species of *Oliva* from the Hawaiian Islands.

We have specimens from various localities in the Indian Ocean, and from Okinawa, Guam, Marshall Islands, etc.

Oliva duclosi Reeve 1850. Conchol. Icon., pl. 19, sp. 44.

The shell is orange-yellow, thickly reticulated with olive-brown, the spaces of the network being rather distant and sharply triangular. The columella and interior of the aperture are orange-yellow.

It is difficult to know how so many authors have confused this species with *O. paxillus* Reeve 1850. *O. duclosi* has been reported from numerous Pacific localities, but it is more common from Tahiti and neighboring islands.

According to Ducros (1857), *O. natalia*

Duclos 1844 is typical *O. duclosi*, but blighted and discolored, and his figure is enlarged, too red, and embellished to suit. Ducros studied the type. The same author considers *O. stainforthi* Reeve 1850 to be a squat specimen of the form *lentiginosa* Reeve 1850.

We wish to mention the two following names as color forms of *O. duclosi* because both are occasionally seen in the literature. Both are placed in the synonymy.

lentiginosa Reeve 1850. Conchol. Icon., pl. 19, sp. 45, a.b.

This seems to be no more than a lighter-colored specimen.

esiadina Duclos 1844. In Chenu, Illus. Conchyl., p. 18, pl. 16, figs. 19, 20.

This form or species is questionable, but it is obvious that if it is possible to identify *O. esiadina*, and that it is conspecific with *O. duclosi*, the name of Duclos has priority. We have failed to locate even one locality record.

The shell is very thick with the spire exceptionally elevated. We know this only from the figures of Duclos, of which one has been reproduced by Tryon (1883).

Oliva panniculata Duclos 1835. Monogr. *Oliva*, pl. 15, figs. 15, 16. In Chenu, Illus. Conchyl., p. 12, pl. 6, figs. 15, 16.

The pattern of *O. panniculata* represented by the Figures 15 and 16 of Duclos is composed of very fine longitudinal lines of a light fawn color. The last whorl is crossed, a little below the middle, by a narrow band of gray spots, and by another of the same color under the suture. Figure 17 of Duclos represents a form slightly more slender, and Figures 19 and 20 an example in which the last whorl is crossed by two decurrent gray bands.

Some references to this species are: Reeve (1850, pl. 26, sp. 77); Tryon (1883, pl. 32, figs. 24, 25); Ducros de St. Germain (1857, p. 64); Marrat (1871, p. 10, figs. 83, 84); Wein-kauff (1878, p. 84, pl. 22, figs. 10, 11, 12).

Marrat (1871) figured under the name *O. panniculata* an exceptionally large shell ornamented with a highly-colored pattern. Schepman (1911) listed the species with comments on variation. Melvill and Sykes (1896) reported the species from the Andaman Islands.

Melvill and Standen (1897) described a variety *williamsi* as one having the pattern more sharply marked and farther apart as well as by the absence of a band on the last whorl.

While not a common species, this has a wide distribution. We have it from Andaman Islands, Thailand, Madagascar, Mauritius, and Ceylon.

We place the following species in the synonymy of *O. panniculata*: *O. ozodona* Duclos 1835, Monogr. *Oliva*, pl. 5, figs. 19, 20. In studying the work of Duclos, we note that he figured the species under discussion on Plate 5, Figures 15 to 18 (which are *O. panniculata*), and that Figures 19 and 20 on the same plate are *O. ozodona*. They are very similar in all characters observable in Duclos' fine color plate.

Oliva concavospira G. B. Sowerby 1914. New mollusca of the genera *Pleurotoma* (*Surcula*), *Oliva*, and *Limopsis* from Japan. Ann. Mag. Nat. Hist., 1914, ser. 8, 13: 445, pl. 18, fig. 2.

The sunken spire of this species seems to be a constant character. The spire is sunk in a concavity below the shoulder of the last whorl.

Excellent color figures of the species showing both views were given by Kira (1955, p. 63, pl. 31, fig. 6), and Kira (1962, pl. 32, fig. 6).

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