# *Lamarckofusus*, a new genus for a well-known Eocene gastropod and its relatives (Gastropoda, Fasciolariidae, Fusininae)

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The new genus *Lamarckofusus* is introduced with *Fusus subcarinatus* Lamarck, 1803, as type species, for a small group of Paleocene and Eocene gastropods tentatively assigned to the fasciolariid gastropod subfamily Fusininae. It is characterized by a smooth-edged, convex outer lip, absence of lirae inside the outer lip, and presence of scaly growth increments, among other features. Species are recognized from Europe and perhaps Peru.

Keywords: Gastropoda, Fasciolariidae, *Lamarckofusus*, taxonomy, Eocene, Europe, Peru.

## Introduction

Despite more than two hundred years of careful study, many of the hundreds of molluscan species in the classic faunas of the Eocene of the Paris Basin of France remain taxonomically enigmatic. Some of these species, including common large ones, have been uncritically assigned to genera with living representatives on the basis of superficial resemblance and insufficient comparison between the fossil forms and the type species of the genera to which they have been allocated.

A case in point is the Lutetian (Middle Eocene) species originally named *Fusus subcarinatus* Lamarck, 1803. This species has been variously assigned to *Melongena* (*Pugilina*) Schumacher, 1817 (Cossmann, 1889) and *Cantharus* (*Solenosteira*) Dall, 1890 (Glibert, 1963; Dolin et al., 1980; Merle & Pacaud, 2002). Dolin and colleagues (1980) thought the species might belong to the melongenid genera *Pugilina* Schumacher, 1817, or *Hemifusus* Swainson, 1840, but Glibert (1963) rejected such an assignment (as did Dolin and colleagues in the end) because of the twisted columella and circumumbilical fasciole in *Fusus subcarinatus*. Vermeij (2001, 2006) pointed out that the species is neither a *Pugilina* nor a *Solenosteira*, and suggested that it, together with several related species, should be placed in a new genus. Dolin and colleagues (1980) further noted a long-standing confusion between *Fusus subcarinatus* Lamarck, 1803, and *Fusus subcarinatus* Deshayes, 1834, non Lamarck, a taxon later renamed *Melongena palissyi* Pezant, 1908.

Besides confusion about its generic allocation, the familial placement of *Fusus subcarinatus* remains to be settled. *Solenosteira* Dall, 1890, was originally named as a member of what today would be called the Melongenidae, the same family to which *Pugilina* and *Hemifusus* belong. However, true *Solenosteira* belongs to the buccinid subfamily

Pisaniinae (reviewed in Vermeij, 2006).

We formally name the new genus *Lamarckofusus* for *F. subcarinatus* and related Paleogene species, and we tentatively assign this genus to the fasciolariid subfamily Fusininae. We also briefly discuss *Melongena palissyi* and reaffirm its assignment to the Melongenidae, a family that was already well differentiated in the Paleogene.

## Systematic part

Family Fasciolariidae
Subfamily Fusininae

### *Lamarckofusus* gen. nov.

Type species: *Fusus subcarinatus* Lamarck, 1803 (Middle Eocene, France).

Included species:
*Melongena (Pugilina) oedicnema* Olsson, 1928 (Early Eocene, Peru)
*Fusus subcarinatus* Lamarck, 1803 (Middle and perhaps Late Eocene, Europe)
*Melongena (Pugilina) robusta* Dainelli, 1915 (Middle Eocene, Italy)



Diagnosis. — Shell solid, fusiform, small, average maximum height 34 mm, abapically constricted; protoconch globose, paucispiral; teleoconch of up to six whorls, angulated at shoulder-periphery, with axial and spiral sculpture; axial sculpture consisting of seven to nine high, rounded ribs extending on last whorl from suture to basal constriction; growth increments give surface a scaly texture; spiral sculpture consisting of about five cords between shoulder angulation and constriction, and four cords on siphonal protuberance; shoulder angulation marked by prominent tubercles; aperture small, pyriform; outer lip edge smooth, ventrally convex, its inner side smooth; adapical sinus very weakly expressed; inner lip smooth, adherent; entrance fold to siphonal canal angular, well developed; adapical parietal tubercle or ridge absent; siphonal canal narrow, open, relatively long; siphonal fasciole keel-like, surrounding small pseudumbilicus.

Etymology. — Named after Jean Baptiste Pierre Antoine de Monet de Lamarck, the first author to study the fossils of the Paris Basin intensively, and author of the type species of the genus.

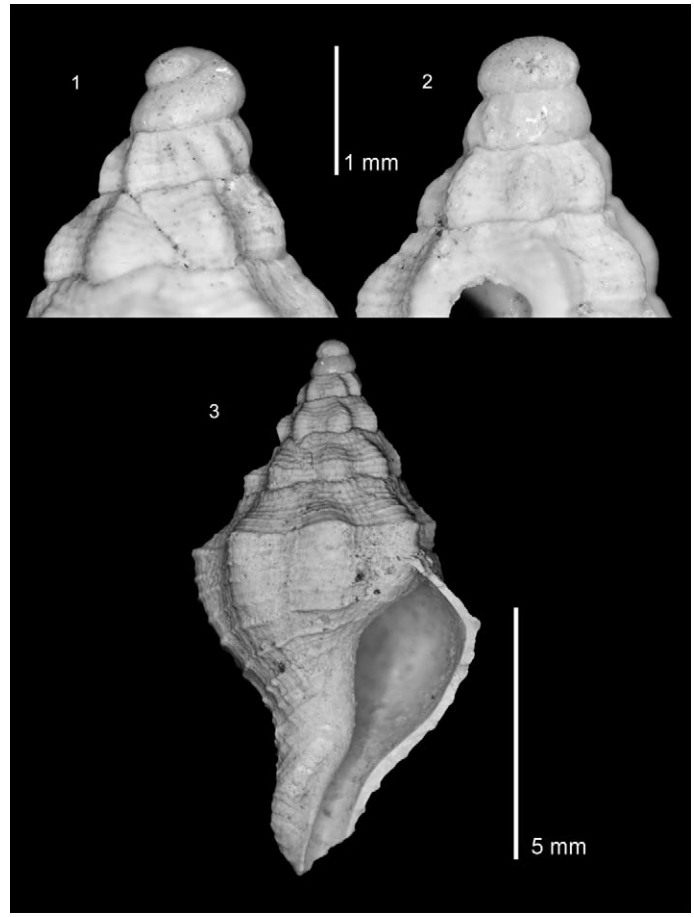



Fig. **1-3**. Protoconch and adult shell of *Lamarckofusus subcarinatus* (Lamarck, 1803), Lutetian (Middle Eocene) at Cressay, Paris Basin, France. **1** and **2**, dorsal and ventral views of the protoconch. **3**, Whole shell.

Remarks. — *Lamarckofusus* gen. nov. comprises a distinctive group of Eocene gastropods found in open-marine conditions in warm tropical waters. The following combination of characters sets it apart from other gastropod taxa: strong rounded axial ribs forming peripheral tubercles, scaly growth increments most apparent on abapical sector of last whorl, ventrally convex smooth-edged outer lip lacking

spiral lirae on its inner side, smooth columella, angular entrance fold to siphonal canal, and absence of parietal tubercle or ridge. Adult shells show crowding of the axial elements near the adult outer lip. The contemporaneous genus most closely similar and easily confused with *Lamarckofusus* is *Editharus* Vermeij, 2001 (type species: *Fusus polygonus* Lamarck, 1803; Middle Eocene, Paris Basin). It shares with *Lamarckofusus* an outer lip without lirae, a siphonal protuberance that is slightly dorsally deflected at its abapical end, and the presence of prominent tubercles on short rounded axial ribs. Several species of *Editharus* including *E. ditropis* (Bayan, 1870), *E. dumasi* (Cossmann, 1897), and *E. marcellini* (Cossmann, 1902) were either originally named as, or later assigned to, *Melongena* (*Pugilina*) (Cossmann, 1889, 1897, 1902; Glibert, 1963; Le Renard & Pacaud, 1995) because of their superficial similarity to *Fusus muricoides* Deshayes, 1834, a subjective synonym of *F. subcarinatus*, which these authors also assigned to *Pugilina* and which is here made the type of *Lamarckofusus*.

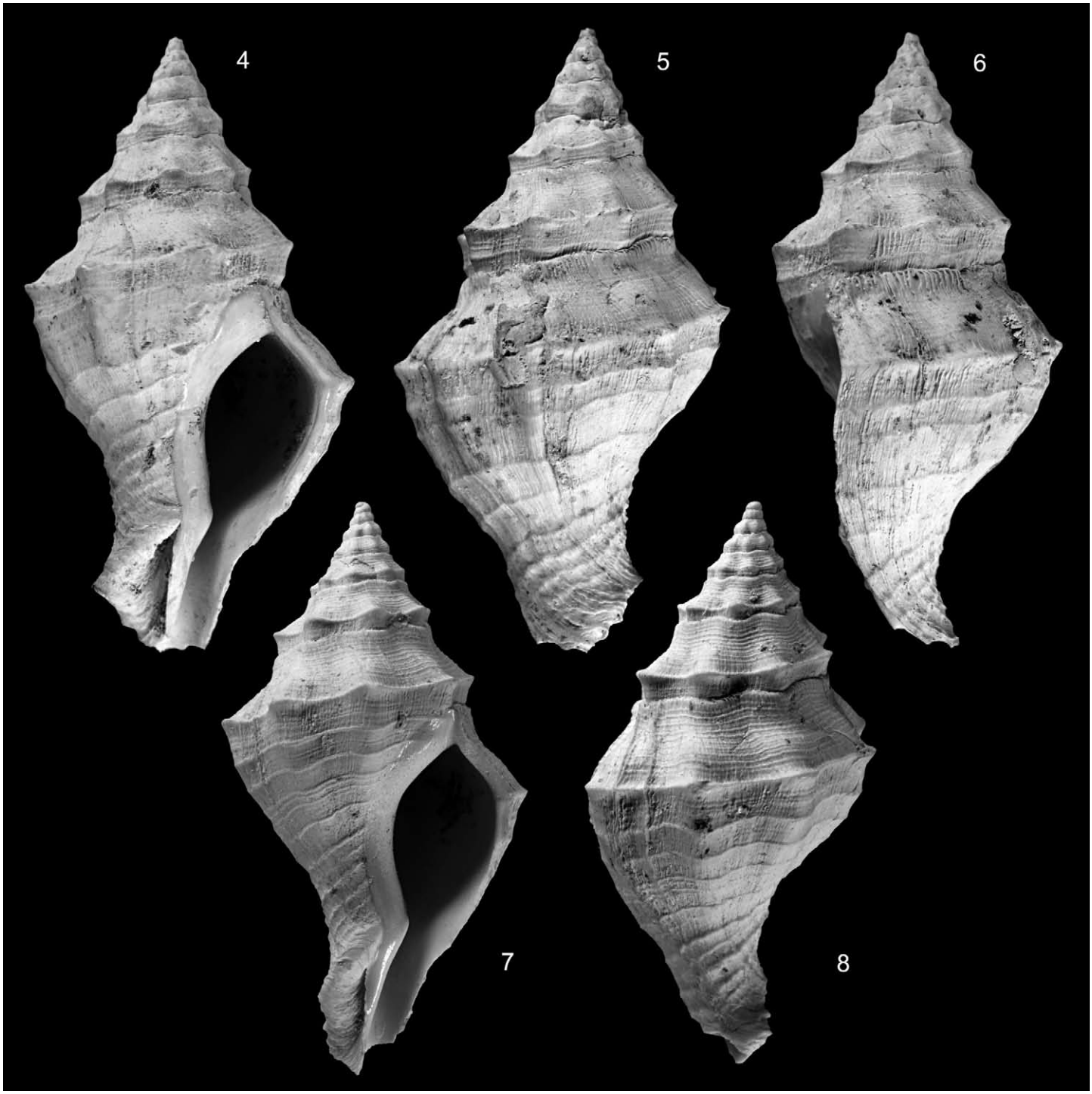
*Editharus* differs from *Lamarckofusus* in having a shorter siphonal canal and therefore a more biconic shell, absence of scaly growth lines, having spiral sculpture whose expression increases adapically instead of abapically, by having fewer axial ribs on the last whorl than on earlier whorls, by having the tubercles situated lower (more abapically) on the whorl, and most notably by possessing a strong, tooth-like angulation at the midpoint of the outer lip in the adult shell. A parietal tubercle and outer-lip denticulations may be present in adult specimens of *Editharus*, but these features are absent in *Lamarckofusus*.

Several authors have assigned *F. subcarinatus* to the pisaniine buccinid genus *Solenosteira* (type species: *Pyrula anomala* Reeve, 1847; Recent, tropical eastern Pacific), which was sometimes incorrectly referred to as *Hanetia* Jousseaume, 1880 and usually treated as a subgenus of *Cantharus* Röding, 1798 (see Vermeij, 2006). These assignments (Glibert, 1963; Dolin et al., 1980; Renard & Pacaud, 1995; Merle & Pacaud, 2002) were based on a misunderstanding or an overly broad interpretation of *Solenosteira*. The Miocene to Recent tropical American genus *Solenosteira* differs from *Lamarckofusus* in having a lower spire, having the peripheral angulation lower on the whorl, having a sharply crenulated outer lip with prominent spiral lirae on its inner side, the presence of a parietal ridge, and absence of scaly growth increments (see Vermeij, 2006).

Superficially, *Lamarckofusus* resembles the melongenid genus *Pugilina* (type species: *Pugilina fasciata* Schumacher, 1817 = *Murex morio* Linnaeus, 1758; Recent, tropical Atlantic). In species of *Pugilina,* the siphonal canal is wide, the outer lip edge is weakly crenulated and planar rather than smooth and ventrally convex, the spiral cords are more strongly expressed toward the shell base, and the entrance fold to the siphonal canal is rounded rather than angular. The inner side of the outer lip is always lirate in the type species of *Pugilina* and usually is lirate in most other species, whereas in *Lamarckofusus* it is always smooth within. The siphonal protuberance of *Pugilina* is not dorsally upturned near its abapical tip as it is in *Lamarckofusus* (for a review of *Pugilina* see Vermeij & Raven, 2009).

Shells of *Lamarckofusus* differ from those of Melongenidae in general by a relatively narrower siphonal canal, by having a markedly ventrally convex, smooth-edge outer lip, a relatively small aperture, and scaly growth lines. A few melongenids also have a ventrally convex outer lip, as in the Paleogene genus *Sycostoma* Cox, 1931, and in some species of *Volema* Röding, 1798; but in these melongenid taxa the shell is broad, low-spired, and weakly sculptured. Most living and fossil melongenids occur in inshore lagoonal or mangrove environments where salinity tends to fluctuate, whereas *Lamarckofusus* species occur in facies with a highly diverse fauna in fully marine environments.

Several Paleocene species have been compared to *Fusus subcarinatus* and therefore could be candidates for inclusion in *Lamarckofusus*, but we reject such assignment here. *Pugilina akoi* Adegoke, 1977, from the Ewekoro Formation (mid Paleocene, Nigeria) has abaxially oriented varices and appears to be a muricid, perhaps a member of *Crassimurex* Merle, 1989. *Poirieria braumuelleri* Traub, 1979 (Oiching beds, late Thanetian to Early Ypresian, Austria) was tentatively assigned along with *Fusus subcarinatus* to *Solenosteira* by Merle & Pacaud (2002). Although Vermeij (2006) accepted a close relationship between *P. braumuelleri* and *F. subcarinatus*, he rejected assignment to *Solenosteira*. *Poirieria braumuelleri* differs from *Fusus subcarinatus* and from *Solenosteira* by having a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well-marked posterior notch and by having small spines on the shoulder angulation. Its placement remains uncertain, but we reject a close relationship with *F. subcarinatus*. The species might belong either to the muricid genus *Poirieria* Jousseaume, 1880, in the broad sense, or to the family Melongenidae.

The species now known as *Melongena palissyi* Pezant, 1908, from the Marinesian (Late Middle Eocene, Paris Basin) was long confused with *Lamarckofusus subcarinatus*. It differs by having a markedly thinner shell, sharp shoulder spines, a wider siphonal canal, and a rounded instead of angulated entrance fold to the siphonal canal. These shell characters, together with the lagoonal facies in which this species is found, indicate an assignment to the Melongenidae. The absence of lirae on the inner side of the outer lip of *M. palissyi*, and the presence of a protoconch indicating planktotrophic larval life, are character states indicating that *M. palissyi* is not a typical member of the genus *Pugilina*. We refrain from a more definitive generic assignment until other potentially related fossil melongenids are examined and compared with undoubted members of *Pugilina*.

Assignment of *Lamarckofusus* to the Muricidae, in which scaly growth lines are characteristic, is also precluded. Unlike Paleogene muricids, *Lamarckofusus* has rounded ribs instead of sharp-edge varices, and the shoulder tubercles are rounded and not spine-like.

The rather heterogeneous family Buccinidae is likewise an unsuitable placement for *Lamarckofusus*. The scaly increments of *Lamarckofusus* are unlike the growth lines in buccinids.

We tentatively assign *Lamarckofusus* to the fasciolariid subfamily Fusininae, with the proviso that it is an atypical member. Although most living fusinines (and fasciolariids generally) have a crenulated outer-lip edge, a smooth edge as observed in *Lamarckofusus* is known in the Recent fusinine genus *Chryseofusus* Hadorn & Fraussen, 2003. Scaly growth lines are widespread in fusinine, fasciolariine, and peristerniine fasciolariids, and the outer lip is ventrally convex in most genera of Fasciolariidae. Many living and fossil fusinines lack lirae on the inner side of the outer lip, as in *Lamarckofusus*. Likewise, the absence of a parietal tubercle, the condition seen in *Lamarckofusus*, is common in Fusininae. The smooth columella and angular entrance fold of *Lamarckofusus* are also consistent with, if not diagnostic of, placement in Fusininae. We emphasize, however, that *Lamarckofusus* is rather distinctive within Fasciolariidae, and that it appears to represent a Paleogene lineage without close living relatives. Ancestors of *Lamarckofusus* are also far from obvious.

As far as is currently known, *Lamarckofusus* comprises a small group of Eocene species from Europe and Peru. The species we have included in the genus besides *L. subcarinatus* are mostly poorly known, and it is possible that additional and better specimens will exclude some of them from *Lamarckofusus* and perhaps include other species in the genus.

The protoconch of *F. subcarinatus* is globose and paucispiral, indicating nonplanktonic larval development. This kind of development is very widespread in the gastropod fauna of the Lutetian of the Paris Basin. Many gastropod species in that basin consequently have narrow geographic distributions, with the result that the level of endemism of the fauna is very high.

Fig. **4-8**. *Lamarckofusus subcarinatus* (Lamarck, 1803), specimens from the Lutetian of the Paris Basin, Villiers-St-Frédéric (Yvelines) (Colln MNHN-Paris. **4-6**, height 32 mm; **7-8**, height 26 mm.

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