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On the Californian Species of Fusus.

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Without entering into the question of their exact generic relations, a short review of the Californian mollusks, usually referred to the genus *Fusus* (*sensu lato*), may prove not without interest.

With the exception of one species, the synonymy and nomenclature of these forms are in a very confused condition, as will shortly appear. After the description of *F. dirus*, by Reeve, in 1846, two miocene fossils were the first described species from this coast, and from a mistaken desire to confine the number of species within the narrowest limits, these names, or one of them, have been repeatedly injected into the nomenclature of the recent forms. Disposing of these two fossils, the remainder will be referred to in chronological order.

FUSUS GENICULUS, Conrad. 1849.

Geol. U. S. Expl. Exp., X, p. 728, pl. 20, f. 3. Miocene; Sandstones of Astoria, Oregon.

This consists of a fossil truncated at both ends, with the aperture and half the shell imbedded in the matrix, and the remainder very poorly preserved, or at least wretchedly figured. The types belonging to the National Museum have been lost for twenty years. The species is wholly unrecognizable, and should be expunged from nomenclature. For this rubbish Mr. Conrad has proposed a genus *Priscofus*, but with neither figure nor diagnosis. (Am. Journ. Conch., 1865, p. 150.)

(?) FUSUS CORPULENTUS, Conrad. 1849.

Geol. 1. c. p. 728, Pl. 20, f. 4. Same locality.

This consists of the *internal cast* of a species of mollusk, which may be a *Pleurotoma*, or almost anything else of a fusiform shape. Otherwise, the remarks under the preceding species are applicable in this case.

FUSUS (CHRYSODOMUS) DIRUS, Reeve. 1846.

Buccinum dirum, Reeve. Conch. Icon., f. 92; Dec., 1846.

Fusus incisus, Gould. Proc. Boston Soc. Nat. Hist., p. 124, May, 1849. Expl. Exp., Moll., p. 245, pl. , f. . Otia Conch., p. 64, 1862.

Tritonium (*Fusus*) *Stichense*, Middendorf. Bull. Acad. Imp. Sci., St. Petersburg, VII, No. 160, 1849, p. 244. Beitr. Mal. Ross, II, 1849, p. 149, t. II, f. 5-8.

Chrysodomus dirus, Carpenter. Rep. Br. Assoc., II, 1863, p. 664, (and of Californian authors).

Habitat, Shumagin Islands, Alaska, to Monterey, Cal. One dead specimen found at San Miguel Island, Cal. This well known species is familiar

to all West Coast conchologists, and appears to flourish most abundantly from Sitka to Oregon. It is sufficiently distinct from any other Californian species to require no special care in making comparisons. The Puget Sound specimens have a tendency to a greenish-gray hue, with bright orange mouth, less conspicuous grooving and more solid shell than others. Those from further north are usually of a dark lurid brown, within and without; the revolving threads more even, and the grooves wider. This species seems particularly liable to individual abnormalities or deformities, and has the external aspect, as remarked by Gould, of a *Euthria*.

FUSUS (? COLUS) AMBUSTUS, Gould. 1852.

Fusus ambustus, Gould. Proc. Boston Soc. Nat. Hist., VI, p. 385; Oct., 1853. (extras, April, 1852); pl. XIV, f. 18.

Fusus tumens, Carpenter. Maz. Shells, p. 503, No. 640; Mar., 1857. (Brit. Mus., tablet 2,413), Mazatlan.

Not *F. ambustus* of Californian writers or Carpenter.

Habitat, Mazatlan, Mexico, Lieut. Green; Guaymas, Dr. E. Palmer.

The name of *Fusus ambustus* has been very widely quoted for one or two Californian species hereafter to be mentioned, but there is no reason for believing that it exists in California at all. Dr. Gould's figure excellently represents the fresh condition of living specimens, though fresh specimens are often lighter. The two nuclear whorls are thin, dark brown, and polished, having the texture glassy rather than porcellanous.

The fact that Dr. Gould's figure is totally unlike any of the Californian species renders it a matter of surprise that it should have been sought to apply it to any of them; however, this has been persistently and erroneously done.

From a photograph of an original drawing made by the author from his type in the British Museum, it becomes possible to identify his minute and very young shell with that of Dr. Gould. It would have been as well, on some accounts, to have avoided applying names to such material, which, unless the specimens can be consulted, is only too apt to form a stumbling block in the way of identification of mature and perfect specimens. The other species (?) *F. apertus*, described at the same time from an even less perfect specimen, is hardly likely to be identified.

This species is, of course, only included here to assist in clearing up the synonymy.

FUSUS (? CHRYSODOMUS) HARFORDI, Stearns. 1871.

Prel. Descr., Aug. 1871. Proc. Cal. Acad. Sciences, V, p. 79, 1873

Habitat, Mendocino Co., Cal., Harford; Farallones, Watkins.

This is an excellent species, but very rare. The reception from Dr. Carpenter of a specimen obtained by him from Mr. Stearns, has enabled me to identify a young specimen in my own collection received from Mr. Watkins, and collected by him on the Farallones. This is the more fortunate, as the original type has not been accessible for some years. As the original diagnosis is brief, a few additional remarks may be useful.

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Fusus cinnamomeus, Rve. (Conch. Ic., 16) presents some resemblance to this species, which differs from the former in having a shorter canal, a longer spire, more rounded whorls and much deeper sutures, more numerous revolving ridges, which are also narrower, and especially in the presence of strongly marked, beautifully rounded costæ, which become obsolete next the suture and on the last whorl. These costæ recall those on the upper whorls in denticulated *Priene oregonensis*, but are not cancellated. They reach across the whorls in the young shell, fading out anteriorly as it approaches the adult condition. In young shells the epidermis is usually polished and of a bright ruddy brown; in an adult it is raised between the revolving ridges into successive lamellæ, which indicate that a fresh and perfect specimen must present a pubescent appearance, verging on shagginess. The interspaces in the posterior whorls are about as wide as the revolving ridges, but on the last whorl smaller intercalary ridges appear, especially on the anterior half of the whorl. There is a tendency to a smoothish space on each side of the suture, which gives it a channelled appearance. Excluding the nuclear portion, there are about five ridges on the first five whorls. On the fifth there are about ten costæ. On the last whorl of the adult, the costæ being evanescent, there are about seventeen main ridges and ten or eleven intercalary threads. The spire is a little longer than the length of the aperture plus the canal. In the interior of the aperture (which is white), beside the grooves due to the external ridges, there are numerous very fine incised striae, not quite reaching the margin, and a rather strong groove at the junction of this whorl with the last. There is no siphonal fasciole. Length, $2\frac{1}{4}$ inches. I have little doubt that this is the shell called by Middendorf *Tritonium Sabini*, from Kenai; at least, there is no other shell of the coast resembling Gray's *Fusus Sabini*, which is the same as *Fusus berniciensis*, King.

FUSUS LUTEOPICTUS, Dall. n. s.

Fusus ambustus, Cpr. Suppl. Rep. Brit. Assoc., 1863, p. 664 (pars), not of Gould.

Fusus geniculus, Gabb. Pal. Cal., II, p. 71, (pars. syn. excl.)

Fusus ambustus, Cooper, Cat. Monterey Shells, Am. Journ. Conch., VI, p. 70. Geogr. Cat. No. 787, (most Cala. writers).

Habitat, Farallone Islands, rare, Watkins; to San Diego, Cala.

Shell small, fusiform, rather thin, provided with numerous revolving ridges and transverse costæ. Aperture plus canal less in length than the spire. Whorls rounded, somewhat excavated near the sutures. General coloration dark brown, occasionally interrupted on the ridges. Costæ, with that portion of the ridges which pass over them, bright yellow, in dead specimens fading to whitish. On the last whorl, when the costæ become obsolete, the lighter coloration is often continued as a light band marked within the aperture, as well as externally, while the anterior half of the whorl continues dark, the darker coloration appearing on the inner edge of the lip as a brown spot or spots. Spire, when perfect, containing six or seven whorls, the nuclear portion light colored, with delicate cancellation. Canal short, two-thirds as long as the aperture at most. Aperture rounded-ovate, within white,

when adult provided with about twelve threads, strongly marked and disposed in pairs. These stop just within the margin of the outer lip, which is crenulated. On the fourth whorl there are about ten costæ, which pass the periphery, but are obsolete just beyond it. The canal is often of a lighter brown than the rest. The ridges are slightly thickened on the costæ, and on the last whorl are about twelve in number, with a few intercalary threads. An adult measures 0.82 in. long; 0.35 in. greatest width; canal 0.14 in.; canal and aperture 0.37 in.; remainder of spire 0.45 in.

This rather common little shell is rare in a perfect condition, but may be obtained in a worn and rolled condition on the beaches without much trouble, especially at Monterey. It is familiar to all West Coast conchologists. The only characters common to it and *F. geniculus*, so far as the latter exhibits any, are those of sculpture, which are also common to nearly all the species of the *Colus* group and those related to them. It has been often considered as a variety, or the young of the next species, from comparison of rolled specimens. When perfect, no such confusion is likely. As both have been confounded together, and with *ambustus* as well as the apocryphal *geniculus*, it is difficult to assert the synonymy. To some part of this *omnium gatherum* Dr. Carpenter has compared the *Fusus clavatus*, Brocchi, a Calabrian miocene fossil, an inch wide and three inches long. From the descriptions of Deshayes and Philippi no necessity for such allocation appears. It is in the highest degree improbable that *F. clavatus* is closely related to any Californian species, other than generically.

FUSUS KOBELTI, Dall. n. s.

Fusus ambustus + *geniculus* (pars) of Californian authors.

Habitat, Monterey to San Diego.

Shell elegantly and regularly fusiform, of seven or eight whorls, sculptured with revolving lines and transverse costæ. In young specimens the whorls are somewhat rounded, in the adult elongated. Epidermis in perfect specimens dark ashy or greenish olivaceous, rising in crowded lamellæ and obscuring the coloration. This varies, however, with age and habitat. Apex acute, the second and third whorls hardly larger than the embryo. Color whitish, the alternate revolving ridges of a dark brown, which occasionally extends to all the ridges. These ridges do not lose their color in passing over the costæ, except where worn off by rolling on the beach. Except on the earlier whorls the ridges do not show any tendency to enlarge in passing over the costæ. On the posterior edge of the whorls the shell is appressed on the suture, and the ridges here are inconspicuous, in most specimens, compared with those on the body of the whorl. These ridges, moreover, bear the character of threads, the interspaces not being channelled as in *F. Harfordi* and *luteopictus*. In the most perfect specimen, on the last whorl there are twenty-two brown ridges and as many more intercalary, of the same color as the shell. In melanitic specimens all may be tinged brown. On the antepenultimate whorl between the sutures there are about six main ridges and eight intercalary. The costæ are rounded and prominent only on the earlier whorls, but they remain on the last whorl in a flattened condition, but ex-

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tend well over the periphery, and are not obsolescent as in the last species. The interior of the aperture is white; before the lips are thickened the brown lines show through, and the prominent white threads of the throat are distant from the outer edge. In this stage there is no siphonal fasciole. Later, both lips may be strongly thickened; the threads (ten or fifteen in number) nearly reach the edge, a labial callus and fasciole are formed. In [adults there are about twelve costæ on the last and ten on the sixth whorl.

This species may reach two inches in length. A specimen perfect, but with the lip still unthickened, measures 1.85 in. long; spire, 0.86 in.; aperture, 0.6 in. (to posterior notch); canal, 0.5 in. The total is more than the total length, not being measured on a median line.

This beautiful species appears to be very rare in a perfect condition, though rolled specimens are common on Catalina Island (northern) beaches and at San Pedro. The features of a young living specimen from Monterey are obscured by the shaggy epidermis, of which beach specimens show no trace whatever. In much thickened specimens there is a lump on the whorl at the posterior angle of the aperture. It is perfectly distinct from the other Californian species, and from any I find figured in the monographs. In a general way it is perhaps a little like *F. ustulatus*, Reeve, (Conch. Icon., Pl. XVII, f. 66.) It is named in honor of Dr. W. Kobelt, of Frankfurt on the Main, who is engaged upon a monograph of the genus.

There are several other species which approach California but not known to be found within its borders, such as *F. (Colus) Dupetithouarsi* of Lower California, and *Chrysodomus rectirostris*, Cpr., and *liratus*, Martyn from the Puget Sound district. *C. rectirostris* singularly enough almost always has the long and very slender canal crooked, by reason of repaired fractures. The adult is covered with a peculiar olive green epidermis, somewhat like that of a fresh water shell; the young are clear translucent whitish; elegantly sculptured and bear little resemblance to the adult. The former have narrowly escaped description as new, by a prominent naturalist. All the fossil Tertiary species which can be identified have been referred to, in order that this paper might not uselessly add to synonymy. None, however, appear to be related to the species here described.