

A REMARKABLE MELONGENID GASTROPOD FROM
THE GATUN FORMATION, PANAMA

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The Gatun Formation of the Republic of Panamá and the former Canal Zone — Neogene marine sediments cropping out from Gatun Lake to the Caribbean coast — has been a prolific source of molluscan fossils and the object of intensive study for many years (Olsson, 1942; Keen and Thompson, 1946; Woodring, 1957-1973). One of the more enigmatic mollusks discovered there is the oddly adorned gastropod fragment cited by Woodring (1973, pp. 461, 480, pl. 73, figs. 12, 13) as "xancid? genus?." That author described this puzzling fossil at some length, but its systematic allocation eluded him, and he concluded, "were it not for the columella, it would not be unreasonable to interpret it as a bizarre *Vasum*. It is by no means certain, however, that it is a xancid; it may possibly be a cymatid" (Woodring, 1973, p. 480).

A recent collecting venture by Mr. and Mrs. William D. Pitt of Sacramento, California, turned up, in addition to many other interesting mollusks, a nearly intact specimen of the same species. This specimen provides a basis for a fuller, formal description of the species and an assessment of its affinities. In addition, a new generic name is proposed.

Thanks are due to Drs. Wendell P. Woodring, Harold and Emily Vokes, and Peter U. Rodda for advice and consultation in the course of this study. Emily Vokes's thoughtful critique of the relationships of the new genus was especially helpful. Wayne S. Barnett kindly photographed the holotype under ultraviolet light.

Class GASTROPODA
Order NEOGASTROPODA
Superfamily BUCCINACEA
Family MELONGENIDAE

Genus TORQUIFER Roth, n. gen.

Type-species: *Torquifer pittorum* Roth,
n. sp.

Diagnosis: Shell of moderate size for the family, solid, short-pyriform. Whorls coronate, with thick, upturned spines at the shoulder. Parietal callus extensive posterior to aperture, exposed at suture on later whorls. Region between shoulder and suture ornamented with prominent spiral sculpture consisting of raised cords and series of large knobs or beads. Body whorl short, constricted anteriorly. Siphonal fasciole broad, prominent, umbilicate, bordered by a keel.

Discussion: The salient feature of this monotypic genus is the presence of complex spiral sculpture on the area between the suture and the shoulder of the whorl, in combination with a stout body whorl that is most strongly constricted anteriorly. Mature specimens belonging to the related melongenid genera *Melongenina* Schumacher, 1817 (type-species *M. fasciata* Schumacher, 1817 [= *Murex melongenina* Linnaeus, 1758]), *Volema* Röding, 1798 (type-species *V. paradisiaca* Röding, 1798), and *Pugilina* Schumacher, 1817 (type-species *P. fasciata* Schumacher, 1817 [= *Murex morio* Linnaeus, 1758]), sometimes show subdued spiral sculpture between suture and shoulder, usually consisting of smooth cords more or less interrupted by axial lines of growth. A puckered sutural band occurs in some species of *Melongenina* — for example, the familiar *Melongenina corona* (Gmelin, 1791) — but consists of raised axial lamellae that are former margins of the anal canal. Similar lamellae border the suture of the Indo-Pacific *Volema myristica* Röding, 1798, and project above the suture as a row of small, hollow spines open toward the aperture. In *Melongenina lainei* (Basterot, 1825), Aquitanian of France, the spiral cords between the suture and shoulder are sometimes produced into knobs, concave in the direction of growth; but these are never as complex or prominent as those of *Torquifer*, and the body whorl is subconic with its chief region of constriction being medial, behind the anterior row of spines.

The early whorls of all these forms are similar and have 9-13 blunt axial ribs, usually showing no carination until about the third neanic whorl, crossed by smooth, narrow spiral cords. These cords extend below the shoulder onto the main portion of the whorl. In most species of *Melongenidae* they tend to become weaker with advancing growth. Their prominence on the adult conch is variable within species and within populations, but they are typically simple and proportionally weaker than on young shells. By contrast, in *Torquifer* three of the early subsutural spiral cords are exaggerated ("transformed," in the words of Woodring, 1973) into rows of knobs as the shell enlarges; other of the cords increase in strength. This diagnostic sculpture is most elaborate at the latest stage of growth.

The short, broad proportions of the shell are similar to some species of *Melongenina* and *Volema*, but in many other respects *Torquifer* resembles the predominantly Eocene genus *Cornulina* Conrad, 1853 (type-species *Melongenina armigerus* Conrad, 1833). A heavy and well defined parietal callus is characteristic of many species of *Cornulina*. The callus of adult *C. armigera* (Conrad, 1833) and *C. minax* (Solander, 1766) is practically as extensive as that of *Torquifer*. *Cornulina* species typically have two spiral rows of spines, the anterior row weaker and sometimes evanescent. The spines are thick and begin as open, triangular scales that seal over with growth, as in *Torquifer*. The region of constriction of the body whorl is in front of the anterior row of spines; as in *Torquifer*, the constricted region bears strongly incised spiral sculpture. The siphonal fasciole is prominent, usually bordered by a keel, and at times umbilicate. A relatively strong anal notch is present.

and this sometimes leaves projecting traces below the suture (Plate 1, figure 5).

The Latin name *Torquifer* — one who wears a *torques*, or necklace — refers to the singular adornment on the spire. Its gender is masculine.

TORQUIFER PITTORUM Roth, n. sp.

Plate 1, figures 1-4, 6

Xancid?, genus? Woodring, 1973, U. S. Geol. Surv. Prof. Paper 306-E, 461, 480 (as "Family Xancidae? Genus?"), pl. 73, figs. 12, 13.

Diagnosis: As for genus.

Description: Shell of moderate size for the family, solid, fairly heavy, short-pyriform. Apex not preserved; five remaining whorls. Spire of moderate height, slightly concave in profile, apical angle 75°. First three preserved whorls obtusely shouldered, with nine blunt axial ribs and about five smooth, faint spiral cords between suture and shoulder; later whorls coronate. Suture distinct, impressed, undulating between axial ribs. From about fourth whorl on, band of parietal callus visible at suture, obliquely striated by lines of growth, tumid. Axial ribs of spire transformed, on succeeding whorls, into well-spaced, stout, upturning, triangular spines at shoulder (10 on last whorl). Beginning on third whorl, inner (most posterior) spiral cord enlarging; bordered in front by narrow, flat-bottomed sulcus; becoming nodose, with nodes increasing in prominence and developing medial groove, finally developing into row of closely set, bilobed knobs or beads. Other cords on spire also increasing in prominence, although irregularly, the middle one bearing a series of narrow, compressed knobs, somewhat hook-shaped in direction of aperture; next outboard cord with minor thickenings in rhythm with knobs of middle cord. Body whorl almost smooth in front of shoulder, convex, with sculpture of irregular, fine, spiral lirations and even finer lines of growth; constricted anterior to middle. Lirations more prominent and widely spaced on constricted portion.

PLATE 1

Figures

- 1-4, 6. *Torquifer pittorum* Roth, n. sp. Holotype, CASGTC 60375. Locality CAS 58335, Gatun Formation, Republic of Panama; middle Miocene(?). 1, 2, 4. Top, back, and front views ($\times 1$). 3. Color pattern as revealed by ultraviolet light ($\times 1$). Photograph by W. S. Barnett. 6. Detail of spire ornamentation ($\times 1.25$).
5. *Cornulina minax compressa* Dockery, 1980 ($\times 1.6$). Figured specimen, CAS 60564; length 49.1 mm, diameter 37.7 mm. Locality TU 656, Bashi Formation, road cut on east side of Alabama Highway 69, south bluff of Bashi Creek, about 1.3 mi north of junction at Campbell, Alabama; lower Eocene.

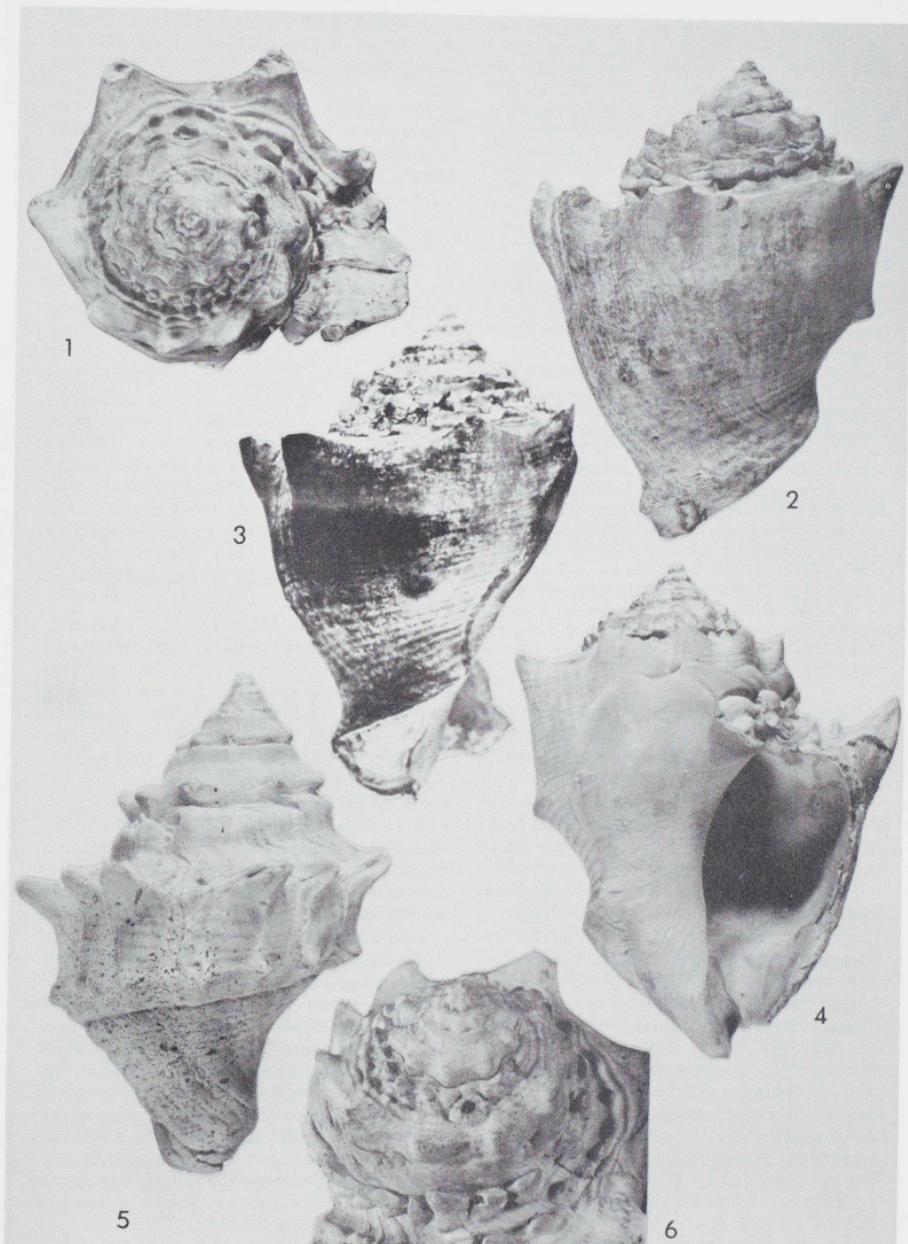


PLATE 1

Just posterior to constriction, a weak spiral row of small, blunt, widely spaced, triangular spines (four visible on holotype). Siphonal fasciole strong, broad, umbilicate, set off from remainder of whorl by a keel. Parietal callus broad, thick, extending well onto face of body whorl and somewhat posterior to suture; posterior portion detached from whorl between spines of the shoulder; weakly and irregularly spirally grooved, particularly near anterior end. Aperture subovate, smooth within; anal canal small, located under knobs of subsutural spiral cord. Outer lip broken but apparently not thickened; simple or with small marginal denticulations. Anterior siphonal canal short, oblique, twisted backward and to the right.

Length 82.8 mm; diameter 63.6 mm.

Holotype: California Academy of Sciences Geology Type Collection 60375.

Type locality: CAS 58335, north of Transisthmian Highway, about 1 km northwest of Sabanita, Republic of Panama (9°21.25' N, 79°48.75' W). Mr. and Mrs. William D. Pitt, January 1977.

Occurrence: Lower part of Gatun Formation, Republic of Panama; middle Miocene(?).

Figured specimen: CASGTC 60375 (holotype). Other occurrence: Locality 138c of Woodring (1964, 1973) (=USGS Cenozoic loc. 21956, about 100 m north of Transisthmian Highway and about 75 m west of road to refinery site on Payardi Island, Panama; R. H. Stewart and Anselmo Mena, 1957); one incomplete specimen (Woodring, 1973, pl. 73, figs. 12, 13).

Discussion: Like certain other mollusks from the Gatun Formation (Pitt and Barnett, 1979), the holotype of *Torquifer pittorum* shows a color pattern under ultraviolet light. The holotype was photographed by the method of Pitt and Barnett (1979), without soaking in sodium hypochlorite. A band is visible (Plate 1, figure 3) near the middle of the body whorl and another, less distinct, just anterior to the shoulder, extending over the outer surfaces of the shoulder spines. There is a less well defined zone of fluorescence just posterior to the siphonal fasciole. These bands and zone, which fluoresce more brightly than the rest of the shell, appear dark in the figure because of the photographic reversal process. They probably represent regions of the shell that were more darkly pigmented in life.

As pointed out to me by Emily Vokes, *Cornulina armigera* from the Eocene Gosport Sand (loc. TU 306, Little Stave Creek, Alabama) fluoresces with a similar pattern. Placed under ultraviolet light after soaking in sodium hypochlorite, specimens show a bright band on the body whorl, anterior to,

and including the lower facets of, the shoulder spines. There is another, less well defined, zone of fluorescence just below the suture.

The nearly complete holotype of *T. pittorum* leaves no doubt about the assignment to family Melongenidae. Its overall resemblance to the well-known "crown conchs" (*Melongenina*, subgenus *Rexmela* Olsson and Harbison, 1953: type-species *Melongenina subcoronata* Heilprin, 1887), of Florida and the Gulf of Mexico, strikes the eye at once. Details of the shell, however, as discussed above, suggest that its closest phylogenetic relationship may not be with *Melongenina* but with *Cornulina*. The posteriorly stout body whorl, with its faint sculpture and broad, solid, shoulder spination, strong, umbilicate siphonal fasciole, and the presence of a weak series of spines posterior to the premedial constriction are all *Cornulina*-type characteristics. In forms of *Rexmela* that have them, the anterior rows of spines are borne within or anterior to the constriction of the body whorl; they may not be homologous to the weak row of spines in *T. pittorum*.

Eocene species of *Cornulina* — such as *C. minax compressa* Dockery, 1980, illustrated here (Plate 1, figure 5) — differ from *Torquifer pittorum* chiefly in having less tabulate whorls, with more strongly developed anterior spines, and in lacking the elaborate "necklace" between shoulder and suture. *Torquifer pittorum* is larger than any recorded *Cornulina*.

It seems, therefore, that a lineage descended from the Eocene cornulinas and preserving many of their fundamental characters, persisted in the American tropics well into the Neogene.

The function of the bizarre "necklace" of knobs is open to speculation. Its close association with the anal notch — a site of structural elaboration in certain other melongenid shells — suggests a function related to elimination. The necklace may strengthen the shell or divert stress in this region, which might otherwise be a point of attack for shell-crushing predators such as brachyuran crabs (cf. Vermeij, 1978, pp. 40-46). It may in addition serve to visually disrupt the spiral pattern of the top of the shell, thus offering some protection against predators hunting by sight.

The species is named for Mr. and Mrs. William D. Pitt, who collected the type

specimen and for many years have favored the California Academy of Sciences with valued donations of fossil and Recent mollusks.

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REVIEWS

THE LANDFORMS OF JAPAN, by Torao Yoshikawa, Sohei Kaizuka, and Yoko Ota. Published by the University of Tokyo Press, Tokyo, Japan, 1981, viii + 22 pp., illus., index, folding map, \$39.50 (Distributed by Columbia University Press, New York, New York)

This volume presents the geomorphology of Japan, stressing the growth and dynamic characteristics of the landforms. Previously, no book in an Occidental language has systematically described the distinctive features of the four island arcs comprising the Japanese archipelago. Japanese landforms developed under variable tectonic and denudational conditions in recent geological times. Tectonic and volcanic forces are considered as agents of change, but present-day geomorphological processes are not described in detail except where the explanation of these processes is indispensable to an understanding of the growth features of the landforms. This work will be of major

interest to both geographers and geologists, especially to those investigating volcanic phenomena and tectonic activity.

THE UNITED STATES ENERGY ATLAS, by David J. Cuff and William J. Young, published by The Free Press, a division of Macmillan Publishing Co., Inc., New York, New York, 1980, viii + 415 pp., illus., index, \$75.00

The amount and distribution of all energy sources, including coal, oil, natural gas, solar power, windpower, and biomass, is described along with hundreds of maps, diagrams, photographs, charts, and tables as illustration of the distribution of these resources. The work is concerned with an attempt to put the present and future status of our energy sources into a comprehensible perspective. It does provide an overview of this vital subject and places it in clearer perspective.

--H.C.S.