

A NEW SPECIES OF *TRICHOTROPIS* (GASTROPODA: MESOGASTROPODA)  
FROM THE ESMERALDAS BEDS, ONZOLE FORMATION,  
NORTHWESTERN ECUADOR

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ABSTRACT

Only one species of *Trichotropis*, *T. pacifica* (Dall, 1908b), is known to occur in the Recent fauna of the Panamic-Galapagan faunal province of the Tropical East Pacific. A new species, *Trichotropis vokesae*, described herein from the Pliocene Esmeraldas beds, Onzole Formation, of northwestern Ecuador, is the first species of *Trichotropis* from the fossil record in the Tropical East Pacific.

INTRODUCTION

In the Tropical East Pacific, the family Trichotropidae is represented by one extant species, *Trichotropis pacifica* (Dall, 1908b), a deep-water species from Panama Bay, Panama. *Trichotropis vokesae*, n. sp., from the Pliocene Esmeraldas beds, Onzole Formation, near the village of Camarones, Esmeraldas Province, Ecuador, is the first member of the genus *Trichotropis* to be reported from the fossil record of the area.

In discussing the formational name to be used for the fossiliferous deposits at Quebrada Camarones, Vokes (1988, p. 3) notes that the name Esmeraldas Formation was proposed by Olsson (1942, p. 260) for the "highly foraminiferous, tuffaceous shales so extensively exposed along the coast of Esmeraldas and along the Esmeraldas river itself." Bristow and Hoffstetter (1977) confirmed the name "Esmeraldas Formation" of Olsson, 1942, but stated: "Olsson thought that the Esmeraldas Facies was equivalent to the Borbón Formation, differing only by the depositional zone. But in reality the Esmeraldas Formation is the Onzole Formation" (1977, p. 142, *translated*). The name "Onzole Formation" was first published by Stainforth (1948, p. 143) following an unpublished work of the I.E.P.C. by Smith (1946) (*vide* Bristow and Hoffstetter, 1977, p. 217). Bristow (1976, p. 193) claims that

the Esmeraldas Formation was never properly defined by Olsson, and, as the name Onzole Formation has been widely used in Ecuador and accepted through common usage, it is best to retain the name Onzole Formation over Esmeraldas Formation. Vokes (1988, p. 4) finds it difficult to accept the name Onzole Formation for the mollusk-rich shallow-water gravity-flows of the upper part of the Onzole Formation and proposed usage of the term "Esmeraldas beds" for these deposits in northwestern Ecuador. In this usage the Esmeraldas beds are equal to the upper Onzole Formation.

Whittaker (1988, p. 11) cited the age of the Onzole Formation in Esmeraldas Province (Borbón Basin) as between late Miocene (N 16) and late Pliocene (N 21); however, he (p. 12) cites the upper Onzole as being wholly of Pliocene age. Haman and Kohl (1986, p. 181) dated the "Esmeraldas beds" at Camarones as early Pliocene (N 18-19), which has been accepted by Vokes (1988, p. 4) and DuShane (1988, p. 51).

In discussing the deposition of the Esmeraldas Formation, Olsson (1964, p. 7) stated that the fauna of the "Esmeraldas beds" has many species closely allied to Caribbean taxa because the Isthmus of Panama was open, at least part of the time, during the deposition of the Esmeraldas beds. Olsson added that most of the species with deep-water characteristics were well preserved while the shallow-water forms showed signs of transport. He further observed (1964, p. 17): "The bathymetric range of most deep-sea mollusks is still poorly understood, and their distribution at varying depths may be as much dependent upon water temperature as on any other single factor."

In his systematic treatment of species, Olsson (1964, p. 112), noted that *Aforia ecuadoriana* Olsson, 1964, is remarkably similar to the Pleistocene to Recent *A. circinata* (Dall, 1873), which is found in the "Bering Sea; Alaska and Japan" (Abbott, 1974, p. 265). Vokes (1988, p. 9) included three muricid species in her Table 1, Group III, California-Northern Pacific:

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*Ceratostoma notiale* Vokes, 1988; *Pteropurpura marksi* Olsson, 1964; and *Pteropurpura ecuadoria* (Olsson, 1964). These three species from the Esmeraldas beds are either living in the more northern waters or have close allies there. In view of these species that either occur in deep-water or have northern cold-water allies it is not surprising to see occurring at Quebrada Camarones, *Trichotropis vokesae*, n. sp., a member of a genus which seems to be represented only in more northern or colder waters today.

#### SYSTEMATIC PALEONTOLOGY

Class GASTROPODA

Order MESOGASTROPODA

Superfamily CREPIDULOIDEA

Family TRICHOTROPIDAE Gray, 1850

Genus TRICHOTROPIS

Broderip and Sowerby, 1829

*Trichotropis* BRODERIP and SOWERBY, 1829,  
Zool. Jour., London, v. 4, p. 373.

Type species: *Turbo bicarinata* Sowerby, 1825, by subsequent design., Herrmannsen, 1849.

TRICHOTROPIS VOKESAE Pitt and Pitt, n. sp.  
Pl. 1, figs. 1, 2a, 2b

*Description:* Shell thin; four whorls, plus a protoconch of about one and one-half smooth, rounded whorls with a blunt ending. Whorls straight-sided, slightly tapering inward, suture distinct. Spiral sculpture of two sharp carinae, one at the periphery and one near the base; basal carina adjacent to posterior side of suture. Axial sculpture of seven to nine irregular ribs extending from suture to suture, crossing the spiral carinae, and decreasing in number on later whorls, disappearing on last two whorls; otherwise only retractive growth lines. Aperture wide, somewhat triangular, truncated below basal carina. Body whorl slightly shorter than spire. Columella arcuate, narrow, ending with a small anterior notch. Umbilicus narrowly open, with a narrow groove to tip of columella.

*Holotype:* CASG 66058.01; height 24.0 mm, diameter 18.9 mm (pl. 1, fig. 1).

*Paratype:* CASG 66058.02; height 13.9 mm, diameter 10.0 mm (pl. 1, figs. 2a, 2b).

*Type locality:* TU 1397, "Esmeraldas beds"; Quebrada Camarones, cut-bank on east side of canyon, east of the village of Camarones, 20 km (by road) east of bridge over Rio Esmeraldas, Esmeraldas Prov., Ecuador.

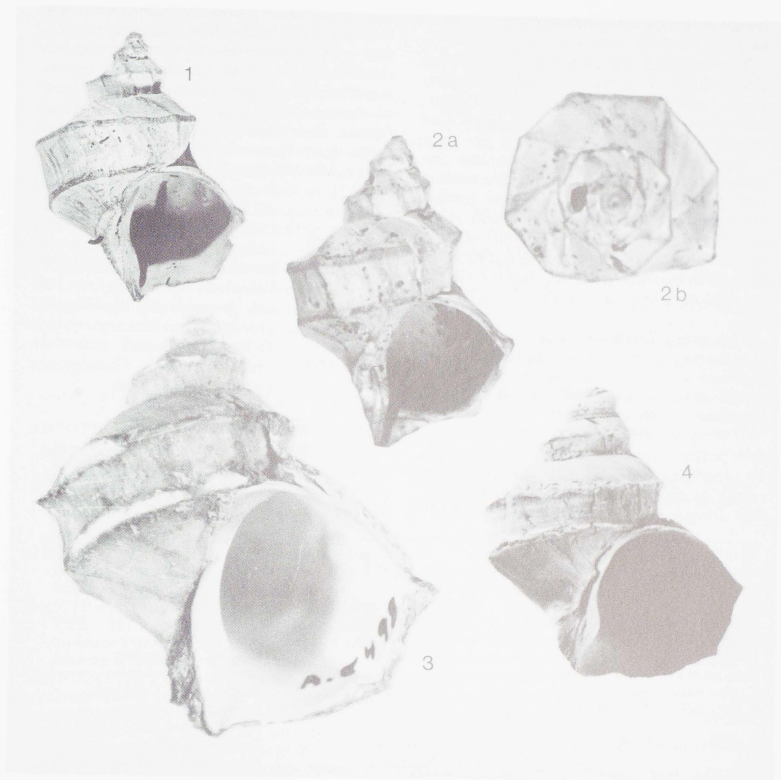
*Occurrence:* Esmeraldas beds, Onzole Formation, Esmeraldas Prov., Ecuador.

*Discussion:* This new species is named for Emily Vokes of Tulane University. Emily and her husband Harold Vokes have assisted on collecting trips to Ecuador and have given us much encouragement to work on these unique fossil deposits of northwestern Ecuador.

*Trichotropis vokesae* is remarkably close to the Pliocene to Recent *Trichotropis bicarinata* (Sowerby, 1825), a boreal species ranging from the Queen Charlotte Islands, British Columbia, Canada, circumpolar to Newfoundland, Canada. *Trichotropis vokesae* differs from *T. bicarinata* in that the whorls taper inward rather than being perpendicular and the faces of the whorls are flat-sided rather than slightly concave. Also the distance between the carinae is greater in proportion to shell height and the columella is more arcuate and much narrower. The aperture also is shorter in proportion to shell height.

Specimens of *T. bicarinata* examined at LACM, CAS and USGS(MP) have five whorls plus the protoconch, whereas specimens of *T. vokesae* have four plus the protoconch; however, there is a difference in shell height among specimens of the two species examined. Broderip and Sowerby (1829, p. 374), in discussing *T. bicarinata*, noted that it has four or five whorls, which leaves the difference in the number of post-nuclear whorls of little importance. Specimens of *T. bicarinata* from Penuk Island, Bering Sea, Alaska (LACM 37-1) have axials on one or two post-nuclear whorls, otherwise all other specimens of *T. bicarinata* examined have no axials. The paratype of *T. vokesae* is smaller than the holotype and has axials on all whorls, the holotype does not have axials on the last two whorls. *Trichotropis pacifica* (Dall, 1908b), the only recorded member of the genus *Trichotropis* from the Tropical East Pacific, differs from *T. vokesae* in being tall, slender, cancellate with aperture narrow and about one-third of shell height; specimens of *T. vokesae* are short, robust, have two carinae, the aperture is large and about one-half of shell height.

Vokes (1988, p. 8) noted that the average living depth for the mollusks in the deposits at Quebrada Camarones was about 75 m but, as a result of gravity flows, the sediments at this locality were redeposited in perhaps 1,000 m of water. The depth



## PLATE 1

## Figures

- 1-2. *Trichotropis vokesae* Pitt and Pitt, n. sp.
    1. CASG 66058.01 (holotype); height 24.0 mm, diameter 18.9 mm (X2).
    2. CASG 66058.02 (paratype); height 13.9 mm, diameter 10.0 mm (X4).
 Locality of both: TU 1397, Esmeraldas beds, Ecuador; Pliocene.
  - 3-4. *Trichotropis bicarinata* (Sowerby).
    3. LACM 37-1; height 39.3 mm, diameter 36.0 mm (X2).
 Locality: Punuk Island, Alaska; Recent.
  4. USNM 443585 (hypotype); height 26.6 mm, diameter 23.6 mm (X2).
- Locality: Ocean Point, Coleville River, North Slope, Alaska; Pliocene.

range of the genus *Trichotropis* is from 1 to about 2,300 m.

There are 18 listed species in the genus *Trichotropis* occurring in the eastern Pacific and Caribbean, Recent and fossil, which are distributed in time and space as shown in Table 1.

The two Cretaceous species are included here only because they are similar and possibly represent ancestral forms. *Trichotropis obstricta* (White) is only similar in general outline. *Trichotropis mississippiensis* Sohl is very close in outline and does have two sharp carinae but the rest of the sculpture is quite different from *T. vokesae*.

The genus *Trichotropis* is usually found in either cold or deep water. Its presence together with the many warm-water elements of the Quebrada Camarones fauna is presumed to be due to mixing of the faunas by gravity flows. *Trichotropis vokesae* possibly represents a divergence from *T. bicarinata* and possibly originated in colder or more northern waters. The fact that forms of neither *T. vokesae* or *T.*

*bicarinata* are found between Ecuador and the Queen Charlotte Islands may be due to either a paucity of fossil deposits on the Pacific coast of Central and South America, an artifact of collecting, or a lack of deep-water collecting of the Recent faunas. It is also possible that these two forms may have evolved separately and may not be closely related.

#### ACRONYMS

CAS	California Academy of Sciences
I.E.P.C.	International Ecuadorian Petroleum Company
LACM	Los Angeles County Museum of Natural History
TU	Tulane University
USGS(MP)	United States Geological Survey, Menlo Park

#### ACKNOWLEDGMENTS

Our thanks go to Emily and Harold Vokes of Tulane University for making their collections available and furnishing the specimens for this paper; to James Mc-

TABLE 1

<i>T. mississippiensis</i> Sohl, 1960	Cretaceous	Mississippi
<i>T. obstricta</i> (White, 1889)	Cretaceous	California
<i>T. alienensis</i> Effinger, 1938	Oligocene	Oregon, Washington
<i>T. unicarinata</i> Sowerby, 1866	Miocene	Oregon, Washington
<i>T. tricarinata</i> Addicott, 1970	Pliocene	Kern County, California
<i>T. coronata</i> Gould, 1860	Miocene-	Oregon, Washington
	Recent	Arctic Ocean, Bering Sea
<i>T. cancellata</i> (Hinds, 1843)	Pliocene-	Southern California
	Recent	Bering Sea to Oregon
<i>T. migrans</i> Dall, 1881	Recent	Cuba
<i>T. nuda</i> Dall, 1927	Recent	Florida and Gulf of Mexico
<i>T. turrita</i> Dall, 1927	Recent	Florida and Gulf of Mexico
<i>T. bicarinata</i> (Sowerby, 1825)	Recent	British Columbia; Arctic Seas to Newfoundland
<i>T. borealis</i> Brod. and Sow., 1829	Recent	Europe, Arctic Seas to Bering Sea, Alaska, Japan
<i>T. circumcinata</i> (Dall, 1873)	Recent	Arctic Ocean, Bering Sea
<i>T. insignis</i> Middendorff, 1849	Recent	Bering Sea, Alaska, Japan
<i>T. kelseyi</i> Dall, 1908a	Recent	San Diego, California; Baja California, Mexico
<i>T. kroyeri</i> (Philippi, 1849)	Recent	Arctic Ocean, Bering Sea
<i>T. lomana</i> Dall, 1918	Recent	San Diego, California; Baja California, Mexico
<i>T. pacifica</i> (Dall, 1908b)	Recent	Panama Bay, Panama

Table 1. Distribution of species of *Trichotropis*.

Lean and Gale Sphon, Los Angeles County Museum of Natural History, for making their collections available and for assistance at the museum; to Lou Ella Saul, Los Angeles County Museum of Natural History, for furnishing information on Cretaceous species of *Trichotropis*; John Whittaker, British Museum (Natural History), for making museum collections and his collecting and research data available; to Roger Bristow, British Geological Survey, Exeter, England, for making his research and collecting data available; to Peter Rodda of the California Academy of Sciences and Charles Powell, United States Geological Survey, Menlo Park, for criticizing the manuscript; and Allan McMakin for photography of the type specimens.

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December 28, 1989