A REVIEW OF CYPRAEIFORM GASTROPODS FROM NEOGENE STRATA OF NORTHWESTERN ECUADOR, WITH THE DESCRIPTION OF TWO NEW SPECIES

LINDSEY T. GROVES*

MALACOLOGY AND INVERTEBRATE PALEONTOLOGY SECTIONS
NATURAL HISTORY MUSEUM OF LOS ANGELES COUNTY
LOS ANGELES, CALIFORNIA

I. ABSTRACT

Six cypraeacean species, two of them new, and one unidentified triviid specimen are reviewed from Neogene strata of northwestern Ecuador. New species of *Zonaria* s.s. and *Z. (Pseudozonaria)* are described from the lower Pliocene Esmeraldas beds of the Onzole Formation. These new species and *Jenneria (Jenneria) panamensis* (Olsson, 1967) are the first cypraeaceans reported from the Esmeraldas beds. The unidentified triviid is the first of its kind reported from the Neogene of Ecuador. Three previously described cypraeid species are also included in this review.

II. INTRODUCTION

Cypraeid, ovulid, and triviid gastropods are rare in the Neogene rock record of northwestern Ecuador. Herein are the first reports of these groups from the lower Pliocene Esmeraldas beds of the Onzole Formation and a review of the species from the upper Miocene Angostura and Guayacan formations and the lower Pliocene Jama Formation. All six of the species included here are extinct; however, all of the genera and/or subgenera are represented in the living fauna of either the tropical eastern Pacific Ocean or the Caribbean Sea.

Pilsbry and Olsson (1941) described *Cypraea cayapa* from the lower Pliocene Jama Formation, the first reported Neogene cypraeid from Ecuador. Marks (1951) identified poorly preserved single specimens from the "Blue siltstone" member of the upper Miocene Daule Formation [= Guayacan Formation] as *Cypraea* cf. *C. henekeni* and *Cypraea* sp. Unfortunately, these specimens are unavailable for examination. In 1964, Olsson described *Cypraea (Pseudozonaria) telembiensis* from the upper Miocene Angostura Formation near Telembi, Río Cayapas. From the same formation he reported two poorly preserved specimens of *Siphocypraea (Muracypraea) henekeni* from Cueva de Angostura, Río Santiago. Most recently Olsson (1967) described *Jenneria panamensis* from the upper Pliocene Charco Azul Formation, Río Blanco, Chiriquí Province, Panamá and it is herein reported from the Esmeraldas beds of the Onzole Formation at Quebrada Camarones. Two new species, *Zonaria (Zonaria) pittorum* and *Z. (Pseudozonaria) cathyae*, are the first cypraeids described from the Esmeraldas beds of the Onzole Formation (Text-figure 1). An incomplete specimen of *Pusula (Pusula)* sp. from these same beds is the first reported fossil triviid from Ecuador.

III. STRATIGRAPHIC NOMENCLATURE AND AGE

Because much has been published recently concerning the age of the Neogene formations of northwestern Ecuador (Haman and Kohl, 1986; Hasson and Fischer, 1986; DuShane, 1988; Vokes, 1988; 1989; 1990; Whittaker, 1988; Pitt and Pitt, 1989; 1992; 1997), only a brief overview of stratigraphic nomenclature and age will be discussed.

Miocene Units

The upper Miocene Angostura Formation of Stainforth (1948:142), named for outcrops along the Río Santiago, Esmeraldas Province, is the Ecuadorian equivalent of the Gatun Formation of Panamá (Pitt and Pitt, 1992). However,

* 900 Exposition Boulevard, Los Angeles, California 90007 USA, lgroves@nhm.org

EDITORIAL COMMITTEE FOR THIS PAPER:
JAMES H. MCLEAN, Natural History Museum, Los Angeles, California
RICHARD L. SQUIRES, California State University, Northridge

gravity flows" in the upper part of the Onzole Formation. This usage is retained herein. Haman and Kohl (1986) based the age of strata at Quebrada Camarones (= Esmeraldas beds of the Onzole Formation) on the presence of the benthic foraminiferal genus *Montfortella.* Micropaleontologic anaylses by Hasson and Fischer (1986) yielded a lower Pliocene (= Zanclian Stage of Seguenza, 1868) age for the Esmeraldas beds. Whittaker (1988) cited the age of the Onzole Formation as between upper Miocene and early Pliocene but considered the upper part of the Onzole, presumably including the Esmeraldas beds, to be entirely Pliocene as dated by benthic foraminifera.

Based upon a rich molluscan fauna, the lower Pliocene Jama Formation was proposed by Pilsbry and Olsson (1941) for exposures along Bahía Jama, Manabí Province. Benthic foraminifera within the formation indicate littoral to sublittoral depositional environments. Whittaker (1988) equated the Jama Formation with his lower Pliocene Bahía Formation [= Upper Calcareous member of Marks (1951)], both within the Manabí Basin, and he separated them on lithologic and faunal differences.

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ABBREVIATIONS CITED

ANSP:	Academy of Natural Sciences of Philadelphia
BM(NH):	The Natural History Museum, London
CAS:	California Academy of Sciences, San Francisco
LACMIP:	Natural History Museum of Los Angeles County (Invertebrate Paleontology Section)
P:	Collecting locality numbers of W.D. and L.J. Pitt
TU:	Tulane University, New Orleans
UCMP:	University of California, Museum of Paleontology, Berkeley
USNM:	National Museum of Natural History, Smithsonian Institution, Washington, D.C.

V. SYSTEMATICS

For the most part, the classification scheme of Schilder and Schilder (1971) is utilized for generic and higher level taxonomy. The notable exception is that the *Siphocypraea (Muracypraea)* group is accepted as a full genus, as proposed by Kay (1995). Synonymy citations are limited to original descriptions, material examined, and all records of each species from Ecuador. Measurement parameters are defined as follows: length = greatest distance between anterior and posterior ends; width = greatest distance between lateral margins; and height = greatest distance between base and dorsum.

Superfamily VELUTINACEA Gray, 1840
Family TRIVIIDAE Troschel, 1863
Subfamily TRIVIINAE Troschel, 1863
Tribe PUSULINI Schilder, 1936

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