

NOTES ON THE FAUNA OF THE MOÍN FORMATION - I  
ON THE OCCURRENCE OF *GYRINEUM* IN THE EARLY PLEISTOCENE  
MOÍN FORMATION OF COSTA RICA

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This is the first of a series of papers concerning the molluscan fauna of the Moín Formation. The Moín Formation, also known in the literature as the Moen Beds (Gabb, 1881), Limón Formation (Olsson, 1922), or variations thereof, is exposed at various points on the Limón Peninsula, on the Caribbean coast of Costa Rica. Its geology and micropaleontology have been dealt with in detail by Cassell (1986), but the macrofauna has been studied only in terms of a few individual species as parts of larger taxonomic works.

All outcrops of the Moín Formation occur in the Limón Peninsula, where they are briefly exposed by the clearing of the tropical forest and subsequent bulldozing. This is followed by the building of residential developments of the encroaching town of Puerto Limón. The greatest measured section represents some 70 meters of blue clay, with horizons of mixed clay and coral rubble (Cassell, 1986). The depositional depth may vary with each outcrop, but in general lies between approximately 100 and 300 m, based on the contained molluscan and foraminiferan faunas. The formation contains molluscs from a wide variety of habitats, from intertidal to middle shelf, the shallower water material having fallen downslope to below the base of the reef. Exposures often include large sections of coral, representing accumulations of coral rubble, as well as large blocks of the fore-reef itself, that slid down to their final depositional depths.

The lower outcrops of the Moín Formation have been dated as early Pleistocene (Akers, 1972), and the higher exposures extend well into the middle Pleistocene. These outcrops contain one of the richest Pleistocene fossil molluscan faunas in the Caribbean Basin. In addition to a predominantly Recent aspect, the Moín fauna also contains significant regional and/or temporal endemic components, as well as West African, Paciphile, and other seemingly anomalous elements. Among the latter is the occurrence of *Gyrineum louisae* Lewis, 1974.

*Gyrineum louisae* was first illustrated as an unidentified shell "resembling a *Bursa*" collected during the *Pele II* expedition (Burgess, 1963). It was dredged at a depth of 180 fm (= 329 m) off Pokai Bay, Oahu, Hawaii, and it was eventually described by Lewis (1974), who recognized it as a *Gyrineum*. Another specimen, collected at a depth of between 314 and 323 m from the Great Meteor Bank in the eastern Atlantic in 1967, was described as *Gyrineum atlanticum* by Fechter (1975), as a sibling (= cognate) species of *G. louisae*. The two were later synonymized by Beu (1985, p. 56).

#### SYSTEMATICS

Family RANELLIDAE Gray, 1854  
Subfamily RANELLINAE Gray, 1854  
Genus *GYRINEUM* Link, 1807  
Subgenus *GYRINEUM* Link, 1807

*GYRINEUM (GYRINEUM) LOUISAE* Lewis, 1974

Text-figure 1

? *Bursa* sp. BURGESS, 1963, Hawaiian Shell News, vol. 11, no. 8, p. 1.

*Gyrineum louisae* LEWIS, 1974, Nautilus, vol. 88, no. 1, p. 10, figs. 1-3, 6.

*Gyrineum atlanticum* FECHTER, 1975, "Meteor" Forsch. Ergebnisse, Ser. D, no. 21, p. 62, figs. 1-3, 7 left fig., 8.

*Gyrineum (Gyrineum) louisae* Lewis. BEU, 1985, Conch. Amer. Bull., vol. 13, no. 4, p. 56.

*Description*: "Shell white, 19 mm in length and 12 mm in width at the periphery. There are six whorls producing a spire of 57°. The outer lip is thickened at the final varix. The 9 varices do not align but are slightly offset. There are 13 spiral cords crossed by 16 axial ribs between the varices which form a very fine beaded pattern. The axial ribs do not extend to the varices forming 13 distinct fine ridges on the varix of the outer lip. The siphonal canal is very short, measuring only 1½ mm from the base of the outer lip to the tip of the canal. There is a glossy raised peristome on the inner edge of the outer lip which continues to the upper edge of the glazed parietal wall. The protoconch is covered by a fine network of axial ribs and spiral cords but is similar in shape to other species in the genus. The operculum and animal are unknown." (Lewis, 1974)

*Remarks:* The only discernible difference between the Moín specimens and their Recent counterparts is that of size, the Pleistocene representatives of the species being about 1¼ times the size of the holotype with the same number of teleoconch whorls. The Atlantic specimen lies intermediate between the two, indicating that this character may indeed be variable, based on the few specimens available for study.

At the present time, the species is represented in the Moín by a single, large, perfectly preserved specimen (text-figure 1), measuring 31.5 mm in length, as well as two other fragments, each representing the last varix of an adult specimen\*. All three were collected from Tulane locality TU 1239, which has yielded a molluscan

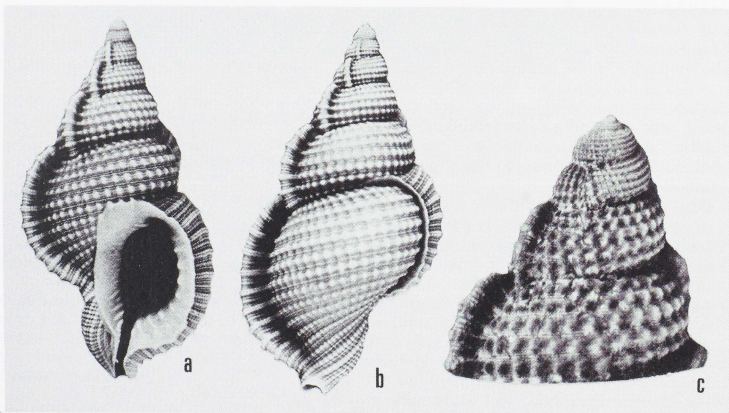
fauna characterized by a preponderance of species occurring today from fore-reef to middle-shelf environments. That both the holotype of *Gyrineum louisae* and of *G. atlanticum* were collected at depths of between 314 and 329 meters, may indicate that the depositional depth at TU 1239 lies within that range.

The species today appears to have a wide geographical if disjunct distribution and its occurrence in the Moín Formation indicates that it was probably living in the Atlantic and eastern Pacific basins prior to the last closure of the Central American Isthmus. Whether *Gyrineum louisae* is still as widely distributed but living at considerable depths, or survives in isolated spots in the Atlantic and Pacific Oceans, is yet to be ascertained.

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\*While this paper was in press, Alan G. Beu (*in litt.*), New Zealand Geological Survey, reported that a specimen of *Gyrineum louisae* was in his possession, collected by Drs. Harold Vokes and Emily Vokes from locality TU 1240 several years previously. This locality is the hilltop on Calle King Fish in Barrio Los Corales 2, 1.4 km north of the Standard Fruit Company's box factory at Pueblo Nuevo, 2 km west of Puerto Limón. Locality TU 1240 represents a depositional environment similar to TU 1239.



Text-figure 1. *Gyrineum (Gyrineum) louisae* Lewis; USNM 416234; length 31.5 mm, diameter 16.5 mm; locality TU 1239, Moín Formation, Costa Rica. (Figs. 1a, 1b, X 2; fig. 1c, X3).

## LOCALITY DATA

1239. Moín Formation, hill above Standard Fruit Company's box factory in Barrio Los Corales 1, about 2 km west of Puerto Limón, Costa Rica.

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## REVIEW

MARINE MICROPALAEONTOLOGY OF CHINA, by Wang Pinxian *et al.* Published by China Ocean Press, Beijing, China, and distributed by Springer-Verlag, Berlin, Heidelberg, New York, and Tokyo, 1985, x + 370 pp., illus., atlas of 38 pls., \$85.00

This volume contains seventeen papers by thirteen authors dealing with the distribution patterns of Foraminifera and Ostracoda and the evolutionary history of the shelf seas off China. Most of these papers were published (in Chinese) in Papers of Marine Micropaleontology (1980), but are here considerably revised and supplemented as well as translated into English; some are new. These articles cover a broad spectrum of micropaleontological groups including foraminifers, ostracods, and calcareous nannoplankton from the Tertiary to the present and represent systematic sampling and micropaleontological analyses of bottom sediments of the East China Sea, the Huanghai Sea, the South

China Sea, and the Bohai Gulf (thus, all the shelf seas off China). The studies are both qualitative and quantitative, permitting paleoenvironmental reconstructions. One paper summarizes the microfaunas from seven Chinese estuaries, compares them with estuarine microfaunas from other parts of the world, and points out their geological significance and relationship to oil-bearing sequences. Another deals with living foraminifers and ostracods in the marginal areas of the Huanghai and East China seas and reveals salinity control of the species and assemblage distributions. Other papers are concerned with bore-hole samples and the interrelationships of sea-level changes and transgression/regression cycles in the late Quaternary. Though these papers do not fully cover the extent and variety of micropaleontological research in China, they do present much insight into the present knowledge of this most important area.

—H.C.S.