SOME COMMON SMALLER FORAMINIFERA FROM THE PLEIOCENE OF PANAY ISLAND, PHILIPPINES

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ABSTRACT—The more common smaller Foraminifera from 23 samples of Pliocene sediments in Panay Island, Philippines, (fig. 1) are recorded and illustrated. A characteristic feature of the fauna is the marked abundance of the genera Nonion, Elphidium, Botulin and Bobulus. These point to a shallow water deposition with open sea connections. There are 158 species and varieties but only 60 species representing the most common forms are presented.

INTRODUCTION

This paper presents some of the more common smaller Foraminifera from the uppermost Tertiary sediments of Panay Island, Philippines. The Iloilo Basin, in the southeastern part of this island opens to the sea. It is surrounded by highlands on the west, north and northeast. The material that forms the basis of this work was taken along the Tigum and Ulian Rivers and partly from the Tarao River in the southwestern part of the Iloilo Basin (Fig. 2). They were collected by E. Taylor, F. Fryxell, F. Merchant, and J. S. Hollister, geologists of the Petroleum Survey conducted by the National Development Company in 1939. Because of its thick sediments ranging in age from Middle Tertiary to Recent, almost without a break, the Tarao River in the vicinity of Tubungan, in the southwestern part of Iloilo Basin was selected as the type section with which the sediments on the other islands were correlated by R. M. Kleinpell, a palaeontologist who worked with the said survey.

For the purpose of this paper the writers have carefully studied the more common smaller Foraminifera from 23 of these Panay samples, all of Pliocene age (Fig. 2). The uppermost Tertiary beds of the Tarao River from where the samples were collected, are concealed by terrace deposits, but passing northward, successively younger beds in the same sequence are exposed. The sample numbers and locality description of these samples are given on page 207.

STRATIGRAPHY

Following the letter classification used by the Petroleum Survey, Pliocene in the Philippines is divided into Tertiary Lower Z and Tertiary Upper Z. In Panay, the first is made up of the Ulian Mudstone while the latter, of the Cabatuan Formation which is composed of three members namely, Balic clay member, Maraget sand member and Santa Barbara silt member.

Ulian Formation: The Ulian formation is exposed in a zone of low rolling hills along

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the west margin of Iloilo Basin. It is 275 meters thick in the Lambunao region and on sediments of Tertiary Y stage (Iday conglomerate).

Figure 1.—Index map showing area under discussion with reference to the rest of the Philippines.

400 meters thick near Cabatuan. The characteristic material of the Ulian Formation is a massive blue clay that weathers to brown. This formation lies conformably

Cabatuan Formation\(^1\) : The Cabatuan formation outcrops in the central part of the Iloilo Basin where the beds are nearly flat. The most complete section of the formation

\(^1\) See foot-note 2, p. 193.
is exposed along the Tigum River between Cabatuan and Santa Barbara.

The Balic clay member, which is stratigraphically the lowest member, outcrops north of the Tigum River where small streams have cut through the overlying Maraget. The Balic resembles the Ulian lithologically, but they were mapped separately because of their different stratigraphic relationship to Maraget. The Balic lies conformably below the Maraget, the Ulian, unconformably.

The Cabatuan formation is made up largely of the Maraget sandstone. This member lies conformably on the Balic clay in the Santa Barbara area, while west and north of this, where the Balic clay pinches out, the Maraget sandstone transgresses the Ulian and Iday formations. Its thickness ranges from 50 meters along Maraget Creek, near Santa Barbara to 70 meters east of Lambunao. It is composed mostly of soft ferruginous sandstone, which is largely cross-beded.

**ACKNOWLEDGEMENT**

The writers wish to express their indebtedness to Mr. Pascual Bautista, Chief of the Petroleum Division for the encouragement given them in the presentation of the paper, to Mr. Juan S. Teves, Assistant Chief Geologist, Bureau of Mines, for his many helpful suggestions during the course of study, to Mr. Jose B. Barcelon, Chief, Technical Information Division for going over the manuscript and also for his helpful suggestions, and to Mr. Apollo Quidayan who made all the camera-lucida drawings.

Sincere thanks are given to Mr. Sisenando Samaniego for preparing the maps and lastly but not the least to Mr. Abelardo G. Carlos who photographed the drawings.

**SYSTEMATIC CLASSIFICATION**

Phylum PROTOZOA

Class SARCODINA Butchi, 1882

Order FORAMINIFERA d'Orbigny, 1826

Family LAGENIDAE

Subfamily NODOSARIINAE

Genus ROBULUS Montfort, 1808

**ROBULUS CALCAR (Linné)**

Pl. 21, figs. 1a–b

_Cristellaria calcar_ (Linnaeus), Cushman, 1921, _U.S. Nat. Mus. Bull._ 100, vol. 4, p. 231, pl. 45, figs. 2a, b.

_Robulus calcareus_ (Linné), LeRoy, 1941, _Col. School of Mines Quart._ vol. 36, no. 1, pt. 1, p. 24, pl. 1, figs. 88–91.—Asano, 1951, _Inst. of Geol. and Paleo., Tohoku Univ., Sendai, Japan._, pt. 15, p. 2, fig. 5.

This widely distributed species is well developed in the lower Pliocene of Panay.

**Dimensions:** Diameter 0.64 mm.

**Locality:** P-FF ≠ 15, B.M. Paleo. Coll. No. SF–1547.

**ROBULUS CALCAR (Linné) var. sp.**

Several specimens have been found which appear to be different from the typical _Robulus calcareus_ (Linné) in having a thicker test and a much more developed umbo.
Dimensions: Average diameter 0.46 mm.

Robulus inornatus (d’Orbigny)
Pl. 21, figs. 3a−b

This species has a widespread occurrence. In the Philippines, it has been recorded from Sulu Sea, off Romblon, Sogod Bay, southern Leyte, off Marinduque, east coast of Mindanao, off Panay, off southeastern Mindoro, Palawan Passage, both east and west coasts of Luzon, between Negros and Siquijor, and off eastern Mindanao.

Dimensions: Length 0.32 mm.; Width 0.22 mm.; thickness 0.20 mm.

Subfamily Lageninae

Genus Lagenonodosaria Silvestri, 1900

Lagenonodosaria scalaris (Batsch)


This species is present in most of the Lower Z assemblages, and in only one locality in Upper Z.

Dimensions: Diameter 0.40 mm.

Robulus lucidus (Cushman)
Pl. 21, figs. 2a−b
Robulus lucidus (Cushman), Asano, 1951, Inst. of Geol. and Paleo., Tohoku Univ., Sendai, Japan, pt. 15, p. 5, figs. 21−22.

This species is present in most of the Lower Z assemblages, and in only one locality in Upper Z.

Dimensions: Diameter 0.40 mm.

Robulus melvilli Cushman and Renz
Pl. 21, figs. 4a−b
Robulus melvilli Cushman and Renz, 1948, Geol. Soc. Am. Memoir 32, p. 159, pl. 3, fig. 11.

This form is well developed in Panay.

Dimensions: Diameter 0.62 mm.

Genus Saracenaria Defrance, 1824

Saracenaria Italica Defrance

Cristellaria Italica Defrance Cushman, 1921, U.S. Nat. Mus., Bull. 100, vol. 4, p. 252, pl. 51, fig. 2.

Saracenaria Italica Defrance, LeRoy, 1941, Col. School of Mines Quart., vol. 36, no. 1, pt. 1, p. 28, pl. 1, figs. 53−54; pt. 2, p. 76, pl. 7, figs. 21−24; 1944, vol. 39, no. 3, pt. 1, p. 21, pl. 1, fig. 24; pt. 2, p. 81, pl. 2, fig. 12.

This species is present in most of the Lower Z assemblages, and in only one locality in Upper Z.

Dimensions: Diameter 0.40 mm.

Lagenonodosaria cf. L. spinicosta (d’Orbigny)

Pl. 21, fig. 5

Lagenonodosaria spinicosta (d’Orbigny), LeRoy, 1941, Col. School of Mines Quart., vol. 36, no. 1, pt. 1, p. 29, pl. 2, figs. 38−39.

This species is present in most of the Lower Z assemblages, and in only one locality in Upper Z.

Dimensions: Diameter 0.40 mm.

Differs from LeRoy’s described figure in having a longer neck and the costae in the last chamber are confined to the basal half.

Dimensions: Length 0.70 mm.; Diameter 0.35 mm.
Family nonionidae

Genus nonion Montfort, 1808

NONION BOUEANUM (d’Orbigny)

Pl. 21, figs. 6a-b
Nonion boueanum (d’Orbigny), Cushman, 1939, U.S. Geol. Survey Prof. Paper 191, p. 12, pl. 3, figs. 8a-b.—LeRoy, 1941, Col. School of Mines Quart., vol. 36, no. 1, pt. 2, p. 78, pl. 1, figs. 13-14.

The living species has a widespread occurrence in the Panay Pliocene. The fossil form has been recorded from the central and southern Europe in the upper Oligocene to the Pliocene.

Dimensions: Length 0.35 mm.; Width 0.28 mm.
Locality: P-FF#27, B.M. Paleo. Coll. No. SF-1580.

NONION ELONGATUM (d’Orbigny)

Pl. 21, figs. 7 a-b
Nonion elongatum (d’Orbigny), Cushman, 1939, U.S. Geol. Surv. Prof. Paper 191, p. 11, pl. 3, figs. 4 a, b.

This species may be differentiated from N. boueanum d’Orbigny in having a more rounded periphery and the sutures not as prominently limbate.

Dimensions: Average length 0.46 mm.; Average width 0.33 mm.
Locality: P-FF#8, B.M. Paleo. Coll. No. SF-1582.

Genus elphidium Montfort, 1808

ELPHIDIDIUM CRATICULATEM (Fichtel and Moll)

Pl. 21, figs. 9 a-b

This species occurs in the Philippines from upper Neogene to Recent. It is typically a Recent species of the Indo-Pacific.

Dimensions: Length 0.58 mm.; Width 0.46 mm.
Locality: P-FF#8, B.M. Paleo. Coll. No. SF-1587.

ELPHIDIDIUM aff. CRATICULATEM
(Fichtel and Moll) LeRoy

Pl. 21, figs. 8 a-b
Elphidium aff. craticulatum (Fichtel and Moll) LeRoy, 1939, Col. School of Mines Quart., vol. 39, no. 3, pt. 1, p. 24, pl. 8, figs. 36-37.

Chambers not as numerous as in the typical E. craticulatum (F. & M.). Several specimens, including an immature form have been recorded from both formations.

Dimensions: Mature form—Length 0.46 mm.; Width 0.35 mm.

EXPLANATION OF PLATE 21

Panay Pliocene Fauna

Figs. 1 a-b—Robulus calcar (Linné) x 27. a, side view; b, apertural view.
2 a-b—Robulus lucidus (Cushman) x 14. a, side view; b, apertural view.
3 a-b—Robulus inornatus (d’Orbigny) x 18. a, side view; b, apertural view.
4 a-b—Robulus melvilli Cushman and Renz. x 36. a, side view; b, apertural view.
5—Lagenonodosaria cf. spincostă (d’Orbigny) x 36. Side view.
6 a-b—Nonion boueanum (d’Orbigny) x 27. a, side view; b, apertural view.
7 a-b—Nonion elongatum (d’Orbigny) x 27. a, apertural view; b, side view.
8 a-b—Elphidium aff. craticulateum (Fichtel and Moll) Le Roy x 18. a, side view; b, apertural view.
9 a-b—Elphidium craticulateum (Fichtel and Moll) x 14. a, side view; b, apertural view.
10 a-b—Elphidium striato-punctatum (Fichtel and Moll) Cushman and Leavitt x 18. a, side view; b, apertural view.
SAMANIEGO AND GONZALES: SMALLER FORAMINIFERA FROM PHILLIPINES
SAMANIEGO AND GONZALES: SMALLER FORAMINIFERA FROM PHILLIPINES
ELPHIDIIDUM DECIPiens (Costa)

Pl. 22, figs. 2 a-b

*Elphidium decipiens* (Costa), Cushman, 1939, *U. S. Geol. Survey Prof. Paper* 191, p. 48, pl. 12, figs. 22 a, b.

Specimens from the upper Pliocene of Panay are referable to this species. They show the distinct, beaded boss in the umbilical region, somewhat lobulate periphery, and longitudinally costate surface.

*Dimensions*: Maximum length 0.57 mm.; Maximum width 0.52 mm.


ELPHIDIIDUM HOKKAIDOENSE Asano

Pl. 22, fig. 1,


May be related to *E. decipiens* Costa, but it lacks the beaded boss in the umbilicus. Common in both formations.

*Dimensions*: Length 0.32 mm.; Width 0.26 mm.


ELPHIDIIDUM STRIATO-PUNCTATUM

(Fichtel and Moll) Cushman and Leavitt

Pl. 21, figs. 10 a-b


The Panay specimen is similar to the species illustrated by Cushman and Leavitt from the Red Sea. The typical form has a broad test in side view, broadly rounded periphery and numerous chambers.

*Dimensions*: Length 0.72 mm.; Width 0.60 mm.


Family HETEROHELICIDAE

Subfamily BOLIVINITINAE

Genus *Bolivinita* Cushman, 1927

*Bolivinita quadrilatera* (Schwager)

Pl. 22, fig. 9

*Bolivinita quadrilatera* (Schwager), LeRoy, 1941, *Col. School of Mines. Quart.,* vol. 36, no. 1, pt. 1, p. 31, pl. 1, figs. 99–100; pt. 2, p. 79, pl. 2, figs. 3, 4.

This widely distributed form is frequently encountered in the Panay material.

*Dimensions*: Average length 0.55 mm.; Width–0.26 mm.


Family BULIMINIDAE

Subfamily BULIMININAE

Genus *Bulimina* d’Orbigny, 1826

*Bulimina aculeata* d’Orbigny

Pl. 22, figs. 3 a-b

*Bulimina aculeata* d’Orbigny, Cushman and Parker, 1946, *U. S. Geol. Survey Prof. Paper* 210 D,

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**EXPLANATION OF PLATE 22**

Panay Pliocene Fauna.

Figs. 1—*Elphidium hokkaidoense* Asano. x72, side view.

2a-b—*Elphidium decipiens* Costa. x36. a, side view; b, apertural view.

3a-b—*Bulimina aculeata* d’Orbigny. x36. a, apertural view; b, side view.

4a-b—*Bulimina affinis* d’Orbigny. x27. a apertural view; b, side view.

5a-b—*Bulimina cf. alazanensis* Cushman. x54. a, apertural view; b, side view.

6—*Bulimina cf. gibba* Fornasini. x72, side view.

7—*Bulimina marginata* d’Orbigny. x72, side view.

8—*Bulimina cf. inflata* Seguenza. x72, side view.

9—*Bolivinita quadrilatera* (Schwager) x18, side view.

10—*Bolivina aea* (Seguenza) x36, side view.

11—*Bolivina subangularis* Brady. x54. Side view.

12—*Bolivina subaenariensis* Cushman x36. side view.

13—*Bolivina subspinescens* Cushman. x72. Side view.
The species is common in the upper Neogene to Recent sediments in the Philippines.

Dimensions: Maximum length 0.56 mm.; Maximum diameter 0.37 mm.


**Bulimina affinis** d’Orbigny

Pl. 22, figs. 4 a-b


The Panay figured specimen is identical with Cushman’s figured species. Our specimens are probably the microspicular form which are somewhat broader and stouter in outline, also found in various parts of the Pacific.

Dimensions: Length 0.46 mm.; Diameter 0.32 mm.


**Bulimina cf. B. alazanensis** Cushman

Pl. 22, figs. 5 a-b


May also be related to the New Zealand species *B. brenneri* Finlay, of the Hutchinsonsonian-Awamoa and Gumbel’s *B. truncana*.

Dimensions: Length 0.38 mm.; Diameter 0.26 mm.


**Bulimina cf. B. gibba** Fornasini

Pl. 22, fig. 6

*Bulimina gibba* Fornasini, Cushman and Parker, 1946 *U. S. Geol. Survey Prof. Paper* 210 D, p. 125, pl. 29, figs. 1-5.

A few specimens found in the lower assemblages are referable to this species.

Dimensions: Length 0.24 mm.; Diameter 0.16 mm.


**Bulimina cf. B. inflata** Seguenza

Pl. 22, fig. 8


Our specimens resemble closely Cushman and Parker’s figures except for the costae which do not reach the upper portion of the last 2 chambers on the apertural side, and the smaller size of the test.

Dimensions: Average length 0.28 mm.; Average diameter 0.22 mm.

Locality: P-FF≠8, B. M. Paleo. Coll. No. SF-1603.

**Bulimina marginata** d’Orbigny

Pl. 22, fig. 7

*Bulimina marginata* d’Orbigny, Cushman and Parker, 1946, *U. S. Geol. Survey Prof. Paper* 210 D, pp. 119-120, pl. 28, figs. 3-5.

The Panay specimens have been identified on the basis of the description and illustration given by Cushman. He comments that this species has a very variable form. The Panay form has undercut margins with tooth-like crenulations.

Dimensions: Length 0.30 mm.; Diameter 0.26 mm.


**Genus Bolivina** d’Orbigny 1839

**Bolivina alata** (Seguenza)

Pl. 22, fig. 10


This sharply keeled, compressed form is commonly found in Recent deposits of the Pacific region.
**Bolivina robusta** Brady

*Pl. 23, figs. 1 a–b*


The Panay species is typical and common in both formations. This form has been widely recorded from the Atlantic, Pacific, Indian and Antarctic Oceans.

**Dimensions:** Length 0.28 mm.; Width 0.18 mm.


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**Bolivina subaenariensis** Cushman

*Pl. 22, fig. 12*


This species is well represented in both the Ulian and Cabatuan formations.

**Dimensions:** Length 0.35 mm.; Width 0.10 mm.

**Locality:** P–FF ≠ 8, B.M. Paleo. Coll. No. SF–1620.

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**Bolivina subsinescens** Cushman

*Pl. 22, fig. 13*


Our specimen has shorter chambers and with granulations all over the test except for the last 2 chambers in which the granulation is confined to the basal half portion.

**Dimensions:** Length 0.32 mm.; Width 0.18 mm.

**Locality:** P–FF ≠ 9, B. M. Paleo. Coll. No. SF–1621.

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**Genus loxostomum** Ehrenberg, 1854

**Loxostoma karrerianum** (Brady)

*Pl. 23, figs. 2 a–b*


Common in most Pliocene sediments throughout the Philippines.

**Dimensions:** Length 0.52 mm.; Width 0.22 mm.

**Locality:** P–JH ≠ 8, B. M. Paleo. Coll. No. SF–1622.

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**Subfamily uvigerininae**

**Genus uvigerina** d’Orbigny, 1826

**Uvigerina crassa** Egger

*Pl. 23, fig. 3*


This species is common in the Panay assemblages, and has been observed in several localities.

**Dimensions:** Average length 0.34 mm.; Average width 0.31 mm.


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**Uvigerina hantkeni** Cushman and Edwards

*Pl. 23, fig. 5*

*Uvigerina hantkeni* Cushman and Edwards, LeRoy, 1941, *Col. School of Mines Quart.* vol. 36, no. 1, pt. 1, p. 36, pl. 2, figs. 5–6.

The Panay specimens have been described on the basis of the description and illustration given by LeRoy.

**Dimensions:** Length 0.58 mm.; Width 0.40 mm.

UVIGERINA MULTICOSTATA LeRoy

Pl. 23, fig. 4


Specimens referable to this species are frequently encountered. Stratigraphic range is long, occurring from Miocene to Pliocene.

**Dimensions:** Length 0.56 mm.; Width 0.29 mm.

**Locality:** P–FF ≠8, B. M. Paleo. Coll. No. SF–1630.

*Genus siphogenerina* Schlumberger, 1883

*Siphogenerina raphanus* (Parker and Jones var. costulata Cushman

Pl. 23, fig. 6


This Panay form agrees very closely with the figure and description of the species from the Recent and late Tertiary sediments of the East India region as well as from the Miocene of California.

**Dimensions:** Length 0.70 mm.; Width 0.29 mm.


Family **ELLIPSOIDINIDAE**

*Genus pleurostomella* Reuss, 1860,

*Pleurostomella alternans* Schwager

Pl. 24, fig. 2


Specimens of this species are frequent in the Panay assemblages. This form has also been recorded by Cushman from one station (Albatross) in the East coast of Mindanao.

**Dimensions:** Length 0.75 mm.; Width 0.22 mm.


Family **ROTALIIDAE**

Subfamily **ROTALIINAE**

*Genus eponides* Montfort, 1808

*Eponides praecintus* (Karrer)

*Eponides praecintus* (Karrer), LeRoy, 1944, *Col. School of Mines Quart.*, vol. 39, no. 3, pt. 1, p. 34, pl. 2, figs. 31–33.

Several specimens that typically represent this species are found in several assemblages of the Ulian formation. They appear to be identical to LeRoy’s form.

**Dimensions:** Diameter 0.96 mm.; Thickness 0.59 mm.


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**Explanation of Plate 23**

Panay Pliocene Fauna

Figs. 1a–b—*Bolivina robusta* Brady. x36. a, apertural view; b, side view.

2a–b—*Loxostoma karreriannum* (Brady) x36. a, apertural view; b, side view.

3—*Uvigerina crassa* Egger. x36. Side view.


5—*Uvigerina hankeni* Cushman and Edwards. x18. Side view.

6—*Siphogenerina raphanus* (Parker and Jones) var. costulata Cushman. x36. Side view.

7—*Epistomina* sp. A. x72. Dorsal view.

8a–b—*Eponides umbonatus* (Reuss) x18. a, dorsal view; b, ventral view.

9a–c—*Epistomina elegans* (d’Orbigny) x12. a, dorsal view; b, apertural view; c, ventral view.

10a–c—*Rotalia indopacifica* Thalman. x9. a, ventral view; b, apertural view; c, dorsal view.

11a–c—*Rotalia equatoriana* LeRoy. x36, a, dorsal view; b, apertural view; c, ventral view.
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SAMANIEGO AND GONZALES: SMALLER FORAMINIFERA FROM PHILIPPINES


**Eponides umbonatus (Reuss)**

Pl. 23, figs. 8 a–b


This species is persistent in the assemblages studied. The general characteristics agree with LeRoy’s illustrated specimen.

**Dimensions:** Diameter 0.38 mm.; Thickness 0.26 mm.


Genus *Rotalia* Lamarck, 1804

**Rotalia beccarii** (Linné) var. *tepida* Cushman


Specimens of this species are abundant in the Upper Z than in the Lower Z assemblages.

**Dimensions:** Diameter 0.26 mm.; Thickness 0.15 mm.


**Rotalia equatoriana** LeRoy

Pl. 23, figs. 11 a–c


Several specimens referable to this species are found in the assemblages. They agree with LeRoy’s figured specimens in general form.

**Dimensions:** Diameter 0.44 mm.; Thickness 0.36 mm.


**Rotalia indica** LeRoy


This widely distributed form shows a close affinity to LeRoy’s specimens from the Miocene of Central Sumatra.

**Dimensions:** Diameter 0.32 mm.; Thickness 0.12 mm.

**Locality:** P–FF ≠ 8, B. M. Paleo. Coll. No. SF–1648.

**Rotalia indopacificia** Thalman

Pl. 23, figs. 10 a–c


Typical specimens of this species are found, though not widely distributed.

**Dimensions:** Maximum diameter 1.08 mm.; Maximum thickness 0.93 mm.


**Rotalia papillosa** Brady


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**Explanation of Plate 24**

Pannay Pliocene Fauna

Figs. 1a–c—*Rotalia cf. papillosa* Brady. x27. a, ventral view; b, apertural view; c, dorsal view.

2—*Pleurostomella alternans* Schwager. x27. Side view.

3a–c—*Globigerinoides* cf. *sacculus* (Brady) var. *immatura* LeRoy. x36.

4a–c—*Globigerinella acuilateralis* (Brady) x27. a, dorsal view; b, apertural view; c, ventral view.

5a–b—*Globorotalia crassa* (d’Orbigny) x36. a, dorsal view; b, ventral view.

6a–b—*Sphaeroidinella delethense* (Parker and Jones) x27.

7a–b—*Anomalina balthica* Schroeter. x27. a, apertural view; b, side view.

8a–c—*Cibicides wuellerstorfi* (Schwager) x36. a, dorsal view; b, apertural view; c, ventral view.
This species is referable to LeRoy's figured specimen from the late Tertiary of the Sangkoeirang Bay area, East Borneo.

**Dimensions**: Diameter 0.76 mm.; Thickness 0.38 mm.


**Rotalia cf. R. papillosa** Brady

Pl. 24, figs. 1 a–c


This species agrees in general character with Brady's figured specimen except that this Panay form is smaller and more globular in outline.

**Dimensions**: Diameter 0.80 mm.; Thickness 0.72 mm.


**Rotalia schroeteriana** Parker and Jones var. *inflata* Millett


The Panay specimens have been compared with this species as figured by Millett and appear to be very closely related. This species occurs in appreciable number in the Panay material.

**Dimensions**: Diameter 0.57 mm.; Thickness 0.36 mm.


**Subfamily Siphonininae**

**Genus Epistomina** Terquem, 1883

**Epistomina elegans** (d'Orbigny)

Pl. 23, figs. 9 a–c


The Panay specimens appear to be allied to this species. A number of this species are present in the assemblages studied.

**Dimensions**: Diameter 0.29 mm.; Thickness 0.16 mm.


**Epistomina sp. A**

Pl. 23, fig. 7

Specimens of this form were frequently encountered in the Lower Z assemblages.

Test very small, nearly biconvex, periphery acute, slightly keeled; three whorls visible on dorsal side; chambers distinct, five to seven in last whorl; sutures limbate dorsally and ventrally, flush with the surface, strongly oblique on the ventral side, radial and meeting at the center to form an umbonate mass; wall thin, very finely perforate, marked by an irregular pattern of dots and lines especially on the ventral side, aperture narrow on ventral side at base of last chamber.

**Dimensions**: Diameter 0.38 mm.; Thickness 0.18 mm.


**Family Amphisteginidae**

**Genus Amphistegina** d'Orbigny, 1826

**Amphistegina lessonii** d'Orbigny

*Amphistegina lessonii* d'Orbigny, LeRoy, 1941, *Col. School of Mines Quart.*, vol. 36, no. 1, pt. 1, p. 41, pl. 3, figs. 18–19.

Typical specimens of this species have been encountered in several localities.

**Dimensions**: Diameter from 0.36 to 0.98 mm.; Thickness from 0.38 to 0.56 mm.


**Family Globigerinidae**

**Subfamily Globigerininae**

**Genus Globigerina** d'Orbigny, 1826

**Globigerina bulloides** d'Orbigny


This well known form is present in appreciable numbers in the two formations.
Dimensions: Length 0.36 mm.

Globigerinoides Cushman, 1927
Globigerinoides rubra (d’Orbigny)


Specimens of this species are quite common in the assemblages studied.

Dimensions: Length 0.42 mm.

Globigerinoides cf. G. sacculiferus (Brady)
Var. immutata LeRoy

Pl. 24, figs. 3 a–c

Globigerinoides sacculiferus (Brady) var. immutata LeRoy, 1941, Col. School of Mines Quart., vol. 36, no. 1, pt. 2, p. 87, pl. 7, figs. 16–18.

This form occurs commonly with Globigerinoides rubra (d’Orbigny).

Dimensions: Length 0.39 mm.

Genus Globigerinella Cushman, 1927
Globigerinella aequilateralis (Brady)

Pl. 24, figs. 4 a–c

Globigerinella aequilateralis (Brady), LeRoy, 1944, Col. School of Mines Quart., vol. 39, no. 3, p. 91, pl. 4, figs. 13–14.

Specimens referable to this well known species are common.

Dimensions: Height 0.48 mm.; Width 0.38 mm.; Thickness 0.31 mm.

Subfamily Orbulininae
Genus Orbulina d’Orbigny, 1839

—LeRoy, 1941, Col. School of Mines Quart., vol. 36, no. 1, pt. 2, p. 118, pl. 1, fig. 17.

This species which is widely scattered throughout the world, is well represented in quite a number of the assemblages studied. The specimens are typical of the species.

Dimensions: Diameter 0.54 mm.

Subfamily Pulleniatinae
Genus Pulleytiina Cushman, 1927

Pulleytiina obliquiloculata (Parker and Jones)
Pulleytiina obliquiloculata (Parker and Jones), LeRoy, 1941, Col. School of Mines Quart., vol. 36, no. 1, pt. 1, p. 44, pl. 2, figs. 105–107; pl. 2, p. 87, pl. 4, figs. 16–17.—Boomgaard, 1949, Geol. Inst. Univ. of Utrecht, Holland, p. 143, pl. 14, figs. 6a–b.

Cushman reported this species from hundreds of stations. Brady found this species as pelagic although he did not discard benthonic environment as possible. This species is found in noticeable numbers in almost all the assemblages studied.

Dimensions: Diameter 0.42 mm.; Thickness 0.36 mm.

Genus Sphaeroidinella Cushman, 1927
Sphaeroidinella dehiscens (Parker and Jones)

Pl. 24, figs. 6 a–b

Sphaeroidinella dehiscens (Parker and Jones), LeRoy, 1941, Col. School of Mines Quart.,
Specimens showing very close affinity to this species are found in appreciable number in many of the assemblages.

**Dimensions:** Length 0.43 mm.; Width 0.34 mm.

**Locality:** P-FF ≠ 8, B. M. Paleo. Coll. No. SF-1674.

**Genus Globorotalia Cushman, 1927**

**Globorotalia crassa** (d’Orbigny)

Pl. 24, figs. 5a–b

**Pulvinulina canariensis** (d’Orbigny), Cushman, 1921, U. S. Nat. Mus. Bull. 100, vol. 4, p. 338, pl. 67, figs. 1a–c.

**Globorotalia crassa** (d’Orbigny), LeRoy, 1941, Col. School of Mines Quart., vol. 36, no. 1, pt. 2, p. 87, pl. 4, figs. 7–9.

In general character, the Panay specimens appear to be referable to this species. Specimens are found in limited numbers although of wide areal range.

**Dimensions:** Average diameter 0.26 mm.; Average thickness 0.15 mm.

**Locality:** P-FF ≠ 9, B. M. Paleo. Coll. No. SF-1675.

**Globorotalia crassa** Cushman and Stewart

**Pulvinulina crassa** (d’Orbigny), Cushman, 1921, U. S. Nat. Mus. Bull. 100, vol. 4, p. 338, pl. 67, figs. 3 a–c.

**Globorotalia crassa** Cushman and Stewart, Boomgaard, 1949, Geol. Inst., Univ. of Utrecht, Holland, p. 143, pl. 13, figs. 6 a b.

Cushman and Stewart found this species common in the Pacific and in some parts of California particularly in the Pliocene. This species is common in the Panay fauna.

**Dimensions:** Diameter 0.35 mm.; Thickness 0.22 mm.

**Locality:** P-FF ≠ 7, B. M. Paleo. Coll. No. SF-1676.

**Globorotalia menardii** (d’Orbigny)


**Globorotalia menardii** (d’Orbigny), LeRoy, 1941, Col. School of Mines Quart., vol. 36, no. 1, pt. 2, p. 87, pl. 4, figs. 4–6; 1944, vol. 39, no. 3, p. 41, pl. 2, figs. 40–42.

Typically developed specimens of this species are recorded from several samples from both formations.

**Dimensions:** Diameter 0.36 mm. to 0.58 mm.; Thickness 0.24 mm. to 0.32 mm.

**Locality:** P-FF ≠ 7, B. M. Paleo. Coll. No. SF-1677.

**Family Anomalinaidae**

**Subfamily Anomalinae**

**Genus Anomalina d’Orbigny, 1826**

**Anomalina balthica** Schroeter

Pl. 24, figs. 7a–b


This wide-ranging species is present in many upper Neogene sediments in the Philippines. It occurs in most of the Panay assemblages.

**Dimensions:** Diameter 0.37 mm.; Thickness 0.07 mm.

**Locality:** P-FF ≠ 7, B. M. Paleo. Coll. No. SF-1678.

**Anomalina cf. a umbilicatula**

Heron-Allen and Earland


The Panay specimen is similar to this species reported by Heron-Allen and Earland from Falkland Islands in general characteristics. It may also be related to A. ammonoides Reuss but differs from it in being involute and bilaterally symmetrical.

**Dimensions:** Diameter 0.30 mm.; Thickness 0.20 mm.

**Locality:** P-FF ≠ 7, B. M. Paleo. Coll. No. SF-1681.
Subfamily **Cibicidesinae**

**Genus Cibicides** Montfort, 1808

**Cibicides wuellerstorfi** (Schwager)

Pl. 24, figs. 8 a–e


Very common in the late Tertiary deposits of the Indo-Pacific region.

Several specimens which appear to be closely related to this species but are more convex dorsally and ventrally and with more limbate sutures, are observed associated with the typical species.

**Dimensions**: Diameter 0.31 mm.; Thickness 0.18 mm.

**Locality**: P-FF ≠ 9, B. M. Paleo. Coll. No. SF–1687.

**Locality Description of Samples**

P-ET ≠ 3—At Maraget Creek ±1.5 kms. N of Km. 19, Sta. Barbara-Cabatuan Road. Grey, weathered clay.

P-ET ≠ 7—East of Km. 20, Tigum River. Blue clay.

P-ET ≠ 9—± 1.5 Km. from junction of Cabatuan-Januay road, and Cabatuan-Lucena road. Blue clay.

P-ET ≠ 10—± 5 kms. NE of Cabatuan. Blue clay.

P-ET ≠ 12—± 5.5 kms. NE of Cabatuan. Blue clay.

P-ET ≠ 17—± 3 kms. SE of Januay. Blue clay.

P-ET ≠ 14—± 1 km. west of Km. 30, Cabatuan-Januay road. Blue clay.

P-ET ≠ 16—± 100 kms. E of Kms. 31–32, Cabatuan-Januay Road. Blue clay, overlain by conglomerate.


P-FF ≠ 6—See Map.

P-FF ≠ 7—Blue sand and shale.

P-FF ≠ 8—Blue shale, with small amount of sandstone. 1 km. due W of Km. 44.5, Januay-Lambunao Road.

P-FF ≠ 9—3/4 km. due W of Km. 46.5, Januay-Lambunao Road.

P-FF ≠ 15—200 meters NW of Km. 44, Januay-Lambunao Road.

P-FF ≠ 17—1/2 km. due E of Km. 45.5, Januay-Lambunao Road.

P-FF ≠ 26—2.75 kms. due West of Km. 45, Januay-Lambunao Road.

P-FF ≠ 27—2.25 kms. due W of Km. 45.

P-FF ≠ 28—200 meters SE of P-FF ≠ 27.

P-FM ≠ 3—Blue clay and conglomerate, about 2 kms. SW of Lambunao, Central Panay.

P-FM ≠ 4—Structureless blue clay, weathering brown, about 2 kms. SW of Lambunao, about 1/4 km. E. and overlying P-FM ≠ 3.

P-FM ≠ 6—See Map.

P-JH ≠ 231—Blue grey sandstone from Tarao, Southwestern Iloilo.

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