Davies, P. J., McKenzie, J. A., Palmer-Julson, A., et al., 1991
Proceedings of the Ocean Drilling Program, Initial Reports, Vol. 133

18. SITE 826[1]

Shipboard Scientific Party[2]

HOLE 826A

Date occupied: 8 October 1990

Date departed: 10 October 1990

Time on hole: 15 hr, 32 min

Position: 19°13.530′S, 150°0.597′E

Bottom felt (rig floor; m, drill-pipe measurement): 437.0 m

Distance between rig floor and sea level (m): 11.66

Water depth (drill-pipe measurement from sea level, m): 425.3

Total depth (rig floor; m): 687.0

Penetration (m): 250.0

Number of cores (including cores with no recovery): 18

Total length of cored section (m): 156.5

Total core recovered (m): 7.1

Core recovery (%): 4.5

Oldest sediment recovered:
Depth (mbsf): 233.0
Nature: bioclastic foraminifer rudstone
Age: middle Miocene

Principal results: Site 826 occurs in 424 m of water on the northwestern margin of the Marion Plateau, at a position ~1.5 nmi south of Site 816. The location defines a lagoonal site immediately behind the (?)Miocene barrier reef drilled at Site 816. The drilling objective was not to establish the stratigraphy at the site but to penetrate postulated lagoonal sequences so as to obtain faunas with which to date Sites 816 and 826. After establishing the mud line, the hole was washed to 98.5 mbsf. Thereafter, the hole was rotary cored to a depth of 250 mbsf.

Sediments recovered at Site 826 included muds immediately above the lagoonal sequence at 98.5 mbsf and dolomitized skeletal packstones, rudstones, and minor boundstones between 98.5 mbsf and termination depth. Two lithostratigraphic units were identified:

Unit I: depth, 98–250 mbsf; age, middle Miocene. The unit is composed of partially to completely dolomitized bioclastic rudstone and minor coralgal boundstone. Benthic foramanifers are common in some sections, so that accurate dates will be obtained from shore-based studies of the sediments. Such dates will have a substantial impact on the interpretation at Site 816 and the middle Miocene sea-level history of the Marion Plateau.

Note that no physical properties or chemical analyses, logging, or paleomagnetic sampling were conducted at the site.

BACKGROUND AND SCIENTIFIC OBJECTIVES

Site 826 occurs along the northern margin of the Marion Plateau ~250 km east of the Australian mainland (see Fig. 1, "Introduction" chapter, this volume). The Marion Plateau lies directly east of the central Great Barrier Reef and covers an area of ~77,000 km^2. It is bounded along its northern margin by the Townsville Trough and along its eastern margin by the Cato Trough. The present plateau surface forms a deeper water extension of the Australian continental shelf with water depths ranging from 100 m along the western border to 500 m along the eastern margin. At the present time reef growth is restricted to Marion Reef on the northeastern corner and Saumarez Reef at the southeastern extremity of the Plateau (Davies et al., 1989).

Little detailed subsurface structure and facies distribution information exists for the Marion Plateau (Mutter and Karner, 1980). During the early Tertiary, the Marion Plateau (Fig. 1, "Site 815" chapter, this volume) formed a marginal plateau separated from the continent by a series of half grabens. Basement beneath the plateau is a planated surface that dips gently to the northeast; the basement surface is steeply downfaulted into the Townsville and Cato troughs. The slope sequences on the northern and eastern margins of the plateau are both onlapping and progradational. Small reef complexes overlie some of these progradational sequences along the northern margin.

Basement was completely transgressed during the (?)Miocene with the resulting development of a carbonate platform (MR1 in Fig. 1, "Site 815" chapter, this volume). The top of this platform is thought to currently lie at ~450–500 m depth. Shelf edge barrier reefs (Fig. 2A, "Site 815" chapter, this volume) and platform reefs separated by lagoons and interreef areas (Fig. 2B, "Site 815" chapter, this volume) can be identified over the northeastern two thirds of the platform (Fig. 3, "Site 815" chapter, this volume). Barrier reefs formed a distinct rimmed margin only along the northern edge of the plateau (Fig. 3, "Site 815" chapter, this volume). A second and later phase of reef development has been identified in the south of the plateau (Fig. 3, "Site 815" chapter, this volume) and at a topographic level considerably lower than the top of the first growth phase. A third phase of growth occurs as small discrete reefal areas, whereas a fourth and even more restricted phase lasts to the present day at Marion and Saumarez reefs.

At the present time, the upper surface of Marion Plateau is being swept by moderately strong currents, such that only hemipelagic sediments are accumulating in restricted areas. This was not always the case, however; downlapping sequences along the northern margin of the plateau (Fig. 4, "Site 815" chapter, this volume) suggest that currents, probably the East Australia Boundary Current, have been operating for a substantial time.

Little is known about the tectonic history of the Marion Plateau or how it relates to that of the Queensland Plateau. It appears that at some time the carbonate factory of the Marion Plateau was closed down suddenly, presumably as a consequence of subsidence of the platform. Drilling at Site 826 was intended to help determine these relationships and will allow comparison with the history of the Queensland Plateau.

Site 826 occurs in ~425.4 m of water on the northern margin of the Marion Plateau on the southern edge of the Townsville Trough. The distribution of the site survey data is

[1] Davies, P. J., McKenzie, J. A., Palmer-Julson, A., et al., 1991. *Proc. ODP, Init. Repts.*, 133: College Station, TX (Ocean Drilling Program).

[2] Shipboard Scientific Party is as given in list of participants preceding the contents.

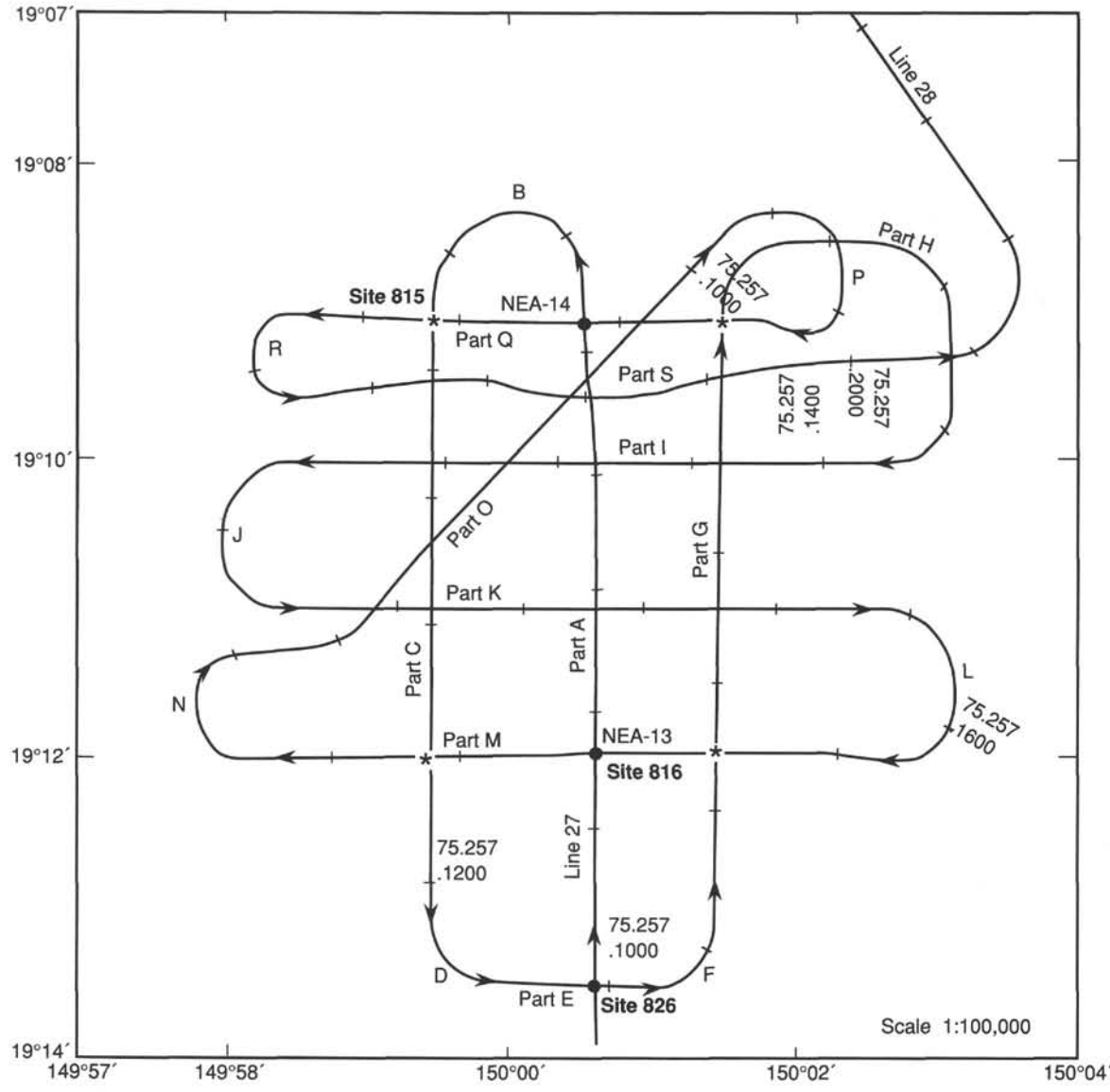

Figure 1. Site survey data for Site 826.

shown in Figure 1, and a seismic section along the site is shown in Figure 2.

Table 1 is a summary of coring results at 826.

The objectives defined for Site 826 are as follows:

1. To define the age and lithology of the lagoonal sequence immediately behind the Marion Plateau barrier reef.
2. To define the specific paleoenvironments of the lagoonal sediments.
3. To define the diagenetic signatures in the lagoonal sequence and to compare with diagenetic models developed for Pleistocene barrier reef systems of northeastern Australia.

OPERATIONS

Transit to Site 826

A decision was made to return to Site 816 (proposed Site NEA-13) to attempt penetration of the Miocene shallow-water carbonates again. As at Site 825, the time expired since previous operations at this site was more than a few weeks, thus a new beacon was required and the site was given a new number: Site 826.

The sea voyage to Site 826 began at 1918L (all times given in local time or L) 8 October and covered 187 nmi in 16.2 hr at an average speed of 11.4 kt. No seismic survey was conducted. A Datasonics beacon was dropped at 1306L, 9 October 1990.

Hole 826A

Hole 826A was located at 19°13.530′S, 150°0.597′E; the precision depth recorder (PDR) predicted a water depth of 424.2 m from sea level. Hole 826A was spudded at 1448L, 9 October. The RCB bottom-hole assembly (BHA) was used to punch-core the mud line; this 5.0-m core gave us a mud-line depth of 425.3 m from sea level. A 9-7/8-in. hole was washed from 0 to 98.5 mbsf, with a recovery of 0.31 m (Core 133-826A-2W). Cores 133-826A-3R through -18R were taken from 98.5 to 250.0 mbsf, with 156.5 m cored and 2.07 m recovered (4.52% recovery). Recovery was poor in the flowing silts and porous soft reefal limestone. The bit cleared the

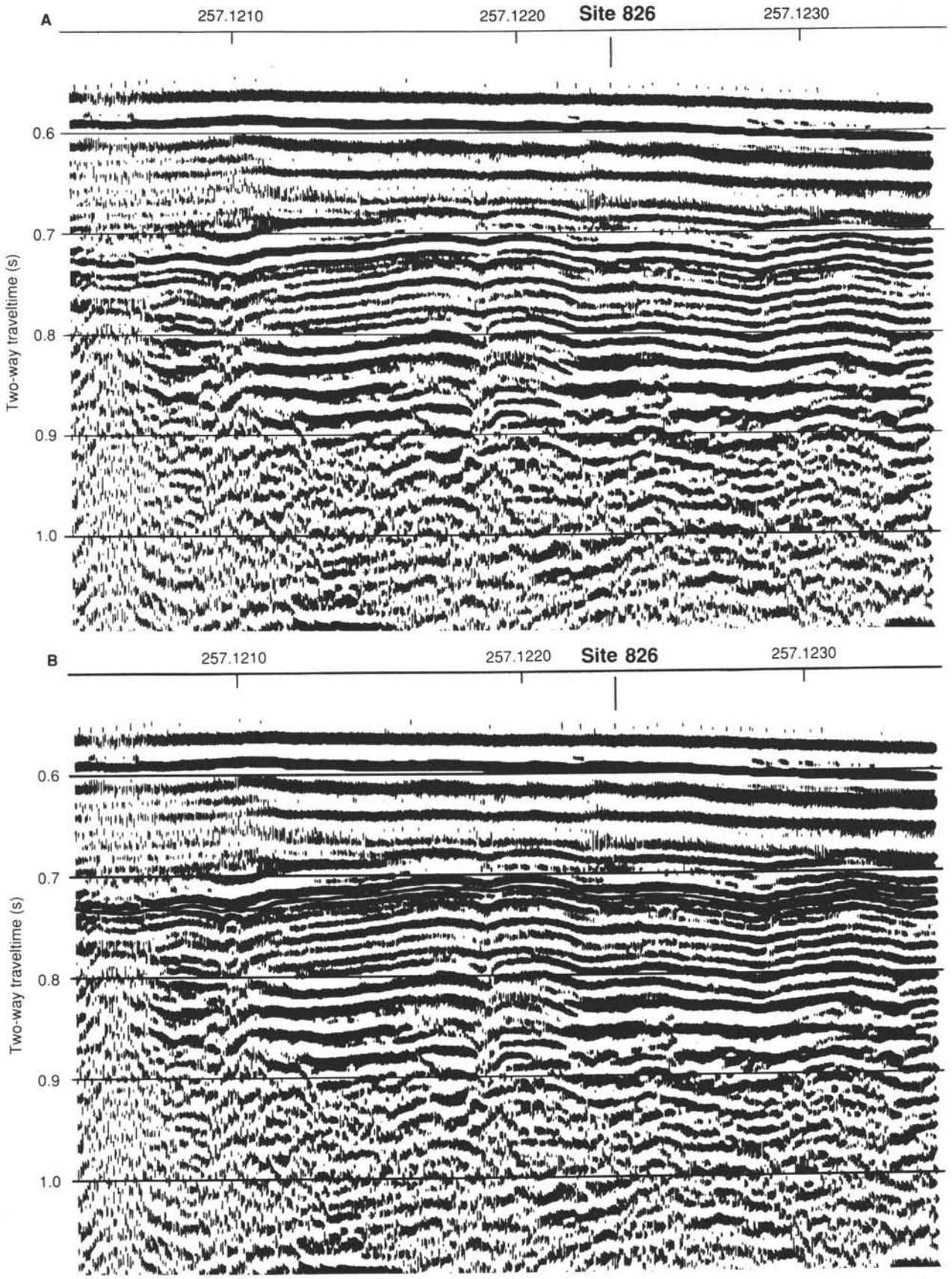

Figure 2. BMR seismic Line 75/027, Part E, showing seismic character of sequences in the vicinity of Site 826. **A.** Uninterpreted section. **B.** Interpreted section.

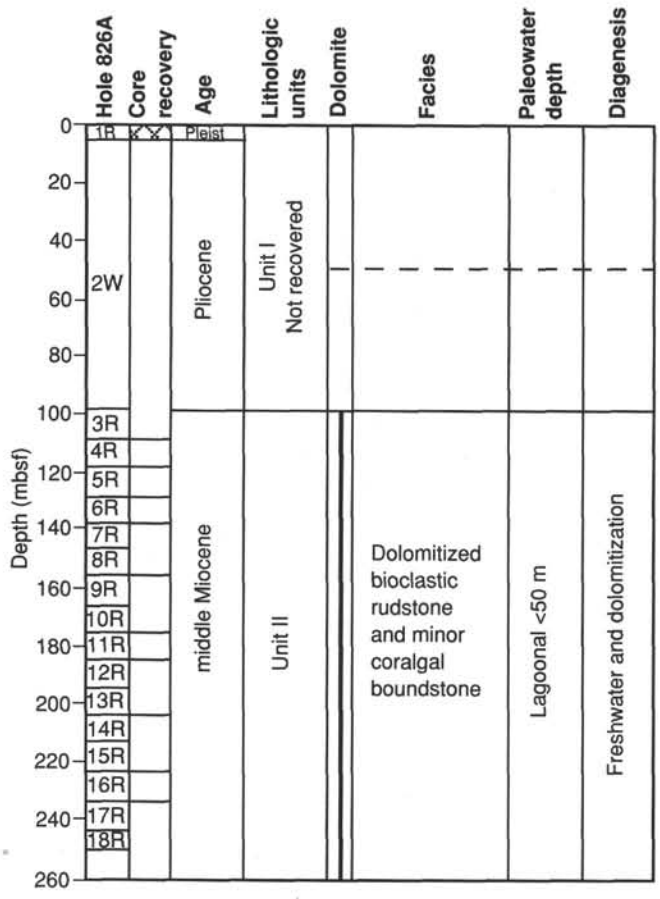

Figure 3. Lithostratigraphic column.

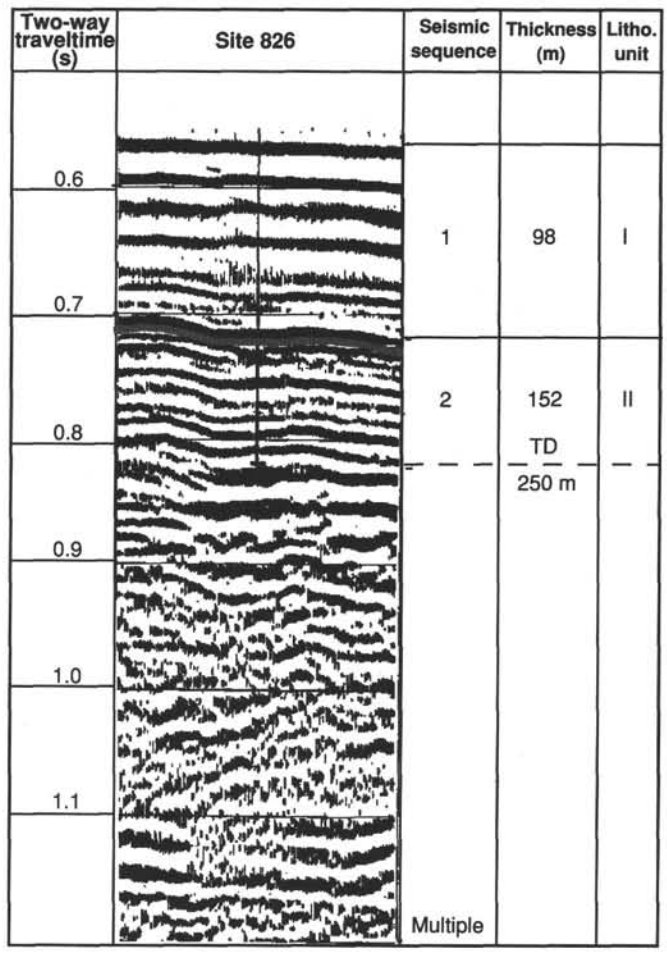

Figure 4. Correlation chart showing seismic sequences at Site 826 and their thickness and relationship to lithologic units, based on BMR seismic Line 75/027, Part E).

rotary table at 0354L, which terminated Hole 826A. The beacon was recalled and was on deck in 15 min., ending Site 826. Table 1 presents the coring summary for Site 826.

Transit to Townsville

The sea voyage to Townsville began at 0430L, 10 October and covered 197 nmi in 19.7 hr at an average speed of 10.1 kt. The first line was ashore at 0600L, 11 October 1990, ending Leg 133.

LITHOSTRATIGRAPHY

Site 826 is located on the northwestern corner of the Marion Plateau in 424 m of water and ~1.5 nmi south of Site 816 (Fig. 4, "Site 815" chapter, this volume). Our objective at this site was to sample the carbonate platform that had been cored at Site 816. Site 826 is located in a back-reef to lagoonal position. We had not recovered any age-diagnostic fauna in cores at Site 816, and our objective at this site was to sample lagoonal facies in an attempt to recover age-diagnostic faunas. After establishing the mud line, the hole was washed to 98.5 mbsf and rotary coring began. The hole then was drilled to 250 mbsf. Recovery rates were low: ranging from 0% to 5%.

The hole intersected two lithologic units; the upper unit is a clayey ooze, while the lower unit contains dolomitized bioclastic rudstone and minor boundstone (Fig. 3).

Lithologic Units

Unit I (Cores 133-826A-1R through -2W; depth, 0–98.0 mbsf; age, (?)Pliocene to Pleistocene)

Unit I was recovered only in the top 3.5 mbsf while establishing the mud line and in Core 133-826A-2W. Although Core 133-826A-2W contains some of this unit, it represents the residue of ~90 m of washings. Core 133-826A-1R consists of 1 m of unlithified foraminifer bioclastic packstone that overlies 2.5 m of white-to-gray bioturbated clayey foraminifer nannofossil ooze. The upper part of Core 133-826A-2W is similar in lithology. This unit is the same as Unit I at Site 816, where it consists of a clayey ooze having varying proportions of nannofossils and foraminifers. The carbonate content of Unit I at Site 816 varies from 60% to 80%.

Unit II (Cores 133-826A-3R through -16R; depth, 98–250 mbsf; age, middle Miocene)

Unit II consists of partially to completely dolomitized bioclastic rudstone and minor coralgal boundstone. The rudstone consists of coralline algae (both as rhodoliths and fragments of articulated coralline algae), coral (including *Acropora* and *Millepora*), *Halimeda*, larger foraminifers ((?)*Operculina*, *Amphistegina*, and *Lepidocyclina*), bryozoans, mollusks, and rare echinoid fragments.

Rhodoliths, which form a minor component of this facies, are as much as 5 cm wide and tend to be spherical with laminar thalli. These rudstones vary from moderately to well cemented. They have both moldic and intraparticle porosities. Geopetal fabrics are rare.

All the coralgal boundstones are composed of small pieces, usually less than 3 cm wide that consist entirely of coral and

Table 1. Coring summary, Site 826.

Core no.	Date (Oct. 1990)	Time (UTC)	Depth (mbsf)	Length cored (m)	Length recovered (m)	Recovery (%)
Hole 826A						
1R	9	0505	0.0–5.0	5.0	5.00	100.0
2W	10	0645	5.0–98.5	93.5	0.82	(wash core)
3R	9	0710	98.5–108.2	9.7	0.00	0.0
4R	9	0725	108.2–117.8	9.6	0.37	3.9
5R	9	0740	117.8–127.5	9.7	0.29	3.0
6R	9	0805	127.5–137.2	9.7	0.15	1.5
7R	9	0835	137.2–146.8	9.6	0.11	1.1
8R	9	0900	146.8–156.5	9.7	0.00	0.0
9R	9	0925	156.6–166.1	9.5	0.12	1.3
10R	9	0950	166.1–175.4	9.3	0.00	0.0
11R	9	1035	175.4–185.0	9.6	0.55	5.7
12R	9	1115	185.0–194.3	9.3	0.14	1.5
13R	9	1155	194.3–204.0	9.7	0.00	0.0
14R	9	1230	204.0–213.7	9.7	0.19	2.0
15R	9	1310	213.7–223.4	9.7	0.00	0.0
16R	9	1355	223.4–233.0	9.6	0.17	1.8
17R	9	1440	233.0–242.7	9.7	0.00	0.0
18R	9	1525	242.7–250.0	7.3	0.00	0.0
		Coring totals		156.4	7.09	4.5
		Washing totals		93.5	0.82	
		Combined totals		249.9	7.91	

Note: times are given in Universal Time Coordinated or UTC, which is 10 hr later than local time or L.

coralline algae. Because of the small size of these fragments, we were unable to determine whether they are indicative of a more extensive facies that was not well sampled or whether they are simply a bioclastic component of the rudstones. This unit may correlate with the reef facies of Units II or III at Site 816.

BIOSTRATIGRAPHY

Calcareous Nannofossils

Calcareous nannofossils were recovered from two cores at Site 826. Core 133-826A-1R, taken at the mud line, yielded a poorly preserved late Pleistocene assemblage containing common *Pseudoemiliania lacunosa,* abundant *Gephyrocapsa oceanica,* and very abundant small *Gephyrocapsa* in the core-catcher sample. This assemblage suggests a probable age of 0.465–0.93 Ma. The second assemblage was recovered from the next core, which was washed down, and in which a green, hemipelagic mud yielded a poorly preserved early Pliocene assemblage older than 3.51 Ma, but younger than 5.26 Ma.

Planktonic Foraminifers

Sample 133-826A-2W-1, 63–65 cm, contains early Pliocene foraminifers (combined Zone N18–N19) such as *Globorotalia tumida tumida, Globoquadrina altispira, Globigerina nepenthes, and Globorotalia margaritae*. This sample ranges in age from 3.9 to 5.2 Ma.

Benthic Foraminifers

Sample 133-826A-2W-1, 63–65 cm, contains a well-preserved upper bathyal benthic foraminiferal assemblage that includes *Bulimina mexicana, Cibicidoides dutemplei, C. mundulus, C. pachyderma, C. subhaidingerii, Hoeglundina elegans, Hyalinea balthica, Sigmoilopsis schlumbergeri,* and *Sphaeroidina bulloides.*

Larger Benthic Foraminifers

Frequent-to-abundant larger benthic foraminifers occur in and below Sample 133-826A-2W-CC. Sample 133-826A-2W-CC contains abundant *Amphistegina,* frequent operculinid forms, and rare *Cycloclypeus*. The other samples are dominated by *Amphistegina*, with varying amounts of operculinid forms.

Lepidocyclina was first recorded in Sample 133-826A-12R-CC and was assigned to an age of middle Miocene or older.

SEISMIC STRATIGRAPHY

The stratigraphic section at Site 826 was divided into two seismic sequences of which only the lower one was cored. Both the sequences are described below and in the following section they are correlated with the lithostratigraphy encountered at the site. The seismic character of the site is illustrated in Figures 2 and 4.

Sequence 1 extends from the seafloor down 0.148–0.715 s (0–98 mbsf) at Site 826. The sequence onlaps sequence 2 and is characterized by continuous reflectors of variable amplitude and low frequency. The seismic character of the upper part of the sequence is obscured by a strong source pulse at the seafloor.

Sequence 2 occurs between 0.715 s and the bottom of the section at Site 826. The sequence is characterized by continuous, moderate to high amplitude and moderate to low frequency reflectors at Site 826.

Correlation With Lithostratigraphy of Site 826

Site 826 was not logged and thus the correlation between the seismic sequences and the lithostratigraphy encountered at the site have been based on an approximate time/depth curve that was derived from the sonic log at Site 816 (see Fig. 32, "Site 816" chapter, this volume).

Sequence 1

Interpretation

Sequence 1 corresponds to the interval above the carbonate bank that was cored at this site. Only the uppermost 5 m of this interval, which extends from the seafloor to 98 mbsf,

was recovered. This limited information suggests that the sediments in this interval are similar to those in Unit I at Site 816, ~1.5 nmi to the north, where they consist of clayey ooze with varying ratios of foraminifers and nannofossils. The carbonate content varies from 60% to 80%.

Sequence 2

Interpretation

Sequence 2 corresponds to lithologic Unit II and consists of bioclastic rudstone and minor boundstone, which form the top of an extensive, thick, early to middle Miocene carbonate platform.

REFERENCES

Davies, P. J., Symonds, P. A., Feary, D. A., and Pigram, C. J., 1989. The evolution of the carbonate platforms of northeast Australia. *In Carbonate Platform and Basin Development*. Soc. Econ. Paleontol. Mineral. Spec. Publ., 44:233–258.

Mutter, J. C., and Karner, G. D., 1980. The continental margin off northeast Australia. *In* Henderson, R. A., and Stephenson, P. J. (Eds.), *The Geology and Geophysics of Northeast Australia*. Geol. Soc. Aust. Queensland Div., 47–69.

Ms 133A-118

NOTE: All core description forms ("barrel sheets") and core photographs have been printed on coated paper and bound separately as Part 2 of this volume, beginning on page 813.