INTRODUCTION

The closely spaced coring of most of the Leg 40 sites offered the opportunity to study Paleogene benthic foraminifers from an area where heretofore almost no information existed. There was also the opportunity to tie in the distribution of the benthic foraminifers with that of the planktonic foraminifers and the calcareous nannoplankton, and thus evaluate their stratigraphic and ecologic significance. Further, it became possible to compare the Cape Basin, Walvis Ridge, and Angola Basin benthic assemblages and to confront them with known age equivalent faunas from other areas, such as New Zealand, the Caribbean, the Gulf Coast, the Caucasus, and the Alpine Mediterranean region, in particular with the recently described fauna of the Possagno section in Northern Italy (Table 10). It was also important to find out whether the Cape Basin fauna shows distinct boreal, Austral/New Zealand province affinities, as do the planktonic foraminifers.

With the studies in this volume on the Neogene benthic foraminifers of Sites 360 and 362 by Cameron, on the Upper Cretaceous of Sites 363 and 364 by Beckmann, and on the Lower Cretaceous of Sites 363 and 364 by Scheibnerová, the inclusion of the Paleogene allows one to trace the benthic foraminifer distribution throughout those sections of all sites where these faunas occurred.

Paleogene benthic foraminifers were investigated from the following Leg 40 sites (Figure 1):

Site 360: Samples 26-1, 136-139 cm (lower Miocene-upper Oligocene to 50, CC (middle Eocene)
Site 361: Samples 1, CC (upper Eocene) to 11, CC (Paleocene)
Site 362A: Samples 2, CC (upper Oligocene to 12-1, 108-110 cm (lower Eocene)
Site 363: Samples 2, CC (upper Oligocene) to 17, CC (lower Paleocene)
Site 364: Samples 7, CC (middle Eocene) to 10, CC (lower Paleocene)

Much of the preparation for this study was done onboard ship on core-catcher samples. To obtain a more complete faunal picture, one or more additional samples were subsequently selected from each core of Sites 360, 363, and 364.

Core 9 of Site 363 straddles the Eocene-Oligocene boundary. It therefore received special attention. Across this boundary, a total of eight samples from Section 3 and the upper part of Section 4 were investigated to determine exactly the boundary on the basis of planktonic foraminifers. The boundary lies in

Section 3 between 84 and 98 cm. The benthic foraminifers on this restricted interval (Section 3, and the upper part of Section 4 representing some 2.5 m) show numerous first and last occurrences and eight species were found restricted to it.

The taxa recognized in Sites 360, 361, 362A, 363, and 364 are plotted on Tables 1-5 where their ranges are also compared with planktonic foraminifer zones and ages. The ranges are also readily compared with the calcareous nannoplankton zones by means of the zonal correlation charts of the site chapters.

Table 6 shows the species present in all three basins, and Tables 7, 8, and 9 those restricted to the Cape Basin, Walvis Ridge, and Angola Basin, respectively. Tables 10 and 12 plot the species present in the Paleocene and those restricted to the Eocene and Oligocene.

A considerable amount of Paleogene sediments in the Leg 40 sites have been more or less strongly affected by calcium carbonate dissolution. How it affected the planktonic foraminifers at Sites 360, 361, 362A, 363, and 364 is shown by Toumarkine (this volume) on her fig. 2, 4, 6, 8, and 10.

It may be assumed that as bottom living forms the tests of the benthic foraminifers were not subject to
dissolution, but dissolution may have taken place during diagenesis of the sediments.

When evaluating the Paleogene benthic foraminifer species and their ranges presented in this paper, one has to keep in mind that the study is based on a rather limited amount of samples and sediment material.

### SOME OBSERVATIONS ON FAUNAL DISTRIBUTIONS

The benthic foraminifer fauna present in the Paleogene sections of Leg 40 contains species which are already well known from the literature. They are, e.g., recorded from the Lizard Springs and Navet formations of Trinidad, the Velasco Formation of Mexico, the Caucasus, Austria, and Northern Italy, and are thus very similar to those known from the Tethyan regions. Their presence in the southeast Atlantic is further proof for their worldwide distribution and stratigraphic significance.

Faunal assemblages of the kind presented in Leg 40 sediments were termed by Berggren and Aubert (1975) as “Velasco-type.” In contrast to the continental shelf “Midway-type,” they are deeper water faunas of the lower slope and abyssal plain.

Many of the species listed on Table 6, present in the Cape Basin, on Walvis Ridge, and in the Angola Basin,
are common forms of no particular stratigraphic value. The extent of their long ranges may vary somewhat from site to site. To them belong Bolivinopsis spectabilis, Gyroidinoides soldani, Heterolepa ungeriana, Nonion havanense, and Oridorsalis umbonatus l.s. Others, some of which are mentioned below, have shorter ranges and are considered good index fossils.

Marked differences exist between the Paleocene benthic assemblages of Sites 361, 363, and 364. The discussion below indicates that they are apparently not so much the result of the different latitudes (35°S, 19°S, and 11°S), but rather of variations in depth and possibly other ecological factors. The greatest number of species was found at Site 363 on Walvis Ridge, where many are restricted to this site. Though this can in part be explained by the greater number of Paleocene samples from this site, we consider shallower water to be a more important factor. Toumarkine (this volume) indicates much better preservation for Site 363 Paleocene planktonic foraminifers than at Sites 361 and 364. This is probably related to the shallower depth of Site 363 during Paleocene, and in turn allowed for the development of a rich benthic fauna.

The presence here of Neoflabellina jarvisi and N. semireticulata and their absence from the other sites, as
### TABLE 2
Distribution of Eocene to Paleocene Benthic Foraminifers in Site 361

<table>
<thead>
<tr>
<th>Depth Below Sea Floor in Meters</th>
<th>Core</th>
<th>Interval (cm)</th>
<th>Species</th>
</tr>
</thead>
<tbody>
<tr>
<td>31.5 - 41.0</td>
<td>1</td>
<td>CC</td>
<td></td>
</tr>
<tr>
<td>60 - 69.5</td>
<td>2</td>
<td>CC</td>
<td></td>
</tr>
<tr>
<td>98 - 107.5</td>
<td>3</td>
<td>CC</td>
<td></td>
</tr>
<tr>
<td>136 - 145.5</td>
<td>4</td>
<td>CC</td>
<td></td>
</tr>
<tr>
<td>174 - 183.5</td>
<td>5</td>
<td>CC</td>
<td></td>
</tr>
<tr>
<td>202.5 - 212</td>
<td>6</td>
<td>CC</td>
<td></td>
</tr>
<tr>
<td>231 - 240.5</td>
<td>7</td>
<td>CC</td>
<td></td>
</tr>
<tr>
<td>250 - 259.5</td>
<td>8</td>
<td>CC</td>
<td></td>
</tr>
<tr>
<td>259.5 - 269</td>
<td>9</td>
<td>CC</td>
<td></td>
</tr>
<tr>
<td>269 - 278.5</td>
<td>10</td>
<td>CC</td>
<td></td>
</tr>
<tr>
<td>278.5 - 288</td>
<td>11</td>
<td>CC</td>
<td></td>
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</table>

### TABLE 3
Distribution of Upper Oligocene to Lower Eocene Benthic Foraminifers in Hole 362A

<table>
<thead>
<tr>
<th>Depth Below Sea Floor in Meters</th>
<th>Core</th>
<th>Section</th>
<th>Interval (cm)</th>
<th>Species</th>
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<tr>
<td>796 - 805.5</td>
<td>2</td>
<td>CC</td>
<td>CC</td>
<td></td>
</tr>
<tr>
<td>834 - 843.5</td>
<td>3</td>
<td>CC</td>
<td>CC</td>
<td></td>
</tr>
<tr>
<td>872 - 881.5</td>
<td>4</td>
<td>CC</td>
<td>CC</td>
<td></td>
</tr>
<tr>
<td>910 - 919.5</td>
<td>5</td>
<td>CC</td>
<td>CC</td>
<td></td>
</tr>
<tr>
<td>929 - 938.5</td>
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<td>CC</td>
<td>CC</td>
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<td>948 - 957.5</td>
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<td></td>
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<td>967 - 976.5</td>
<td>8</td>
<td>CC</td>
<td>CC</td>
<td></td>
</tr>
<tr>
<td>995.5 - 1005</td>
<td>9</td>
<td>CC</td>
<td>CC</td>
<td></td>
</tr>
<tr>
<td>1024 - 1033.5</td>
<td>10</td>
<td>CC</td>
<td>CC</td>
<td></td>
</tr>
<tr>
<td>1062 - 1071.5</td>
<td>11</td>
<td>88-89</td>
<td>CC</td>
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<tr>
<td>1071.5 - 1081</td>
<td>12</td>
<td>104-105</td>
<td>CC</td>
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<tr>
<td></td>
<td>12</td>
<td>108-110</td>
<td>CC</td>
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### TABLE 2 – Continued

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<td>MIDDLE EOCENE</td>
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<td>LOWER EOCENE</td>
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### TABLE 3 – Continued

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<td>OLIGOCENE</td>
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<tr>
<td></td>
<td>EOCENE</td>
</tr>
</tbody>
</table>

787
TABLE 4
Distribution of Upper Oligocene to Lower Paleocene Benthic Foraminifers in Site 363

<table>
<thead>
<tr>
<th>Depth Below Sea Floor (m)</th>
<th>Interval (cm)</th>
<th>Sample</th>
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</thead>
<tbody>
<tr>
<td>50 - 59.5</td>
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<td>CC</td>
</tr>
<tr>
<td>69 - 78.5</td>
<td>3, 4</td>
<td>CC</td>
</tr>
<tr>
<td>88 - 102</td>
<td>5</td>
<td>CC</td>
</tr>
<tr>
<td>126 - 133.5</td>
<td>6</td>
<td>CC</td>
</tr>
<tr>
<td>164 - 173.5</td>
<td>8</td>
<td>CC</td>
</tr>
<tr>
<td>183 - 192.5</td>
<td>9, 10</td>
<td>CC</td>
</tr>
<tr>
<td>202 - 211.5</td>
<td>10</td>
<td>CC</td>
</tr>
<tr>
<td>221 - 230.5</td>
<td>11</td>
<td>CC</td>
</tr>
<tr>
<td>240 - 259</td>
<td>12</td>
<td>CC</td>
</tr>
<tr>
<td>259 - 268.5</td>
<td>13</td>
<td>CC</td>
</tr>
<tr>
<td>278 - 287.5</td>
<td>14</td>
<td>CC</td>
</tr>
<tr>
<td>297 - 306.5</td>
<td>15</td>
<td>CC</td>
</tr>
<tr>
<td>306.5 - 316</td>
<td>16</td>
<td>CC</td>
</tr>
<tr>
<td>316 - 325.5</td>
<td>17</td>
<td>CC</td>
</tr>
</tbody>
</table>

well as the diversity of the higher evolved arenaceous species further support this supposition. The absence of nodosariids and polymorphinids in the Paleocene of Site 361 and the scarce benthic population indicates that Site 361 was deeper than Sites 363 and 364. The two species Aragonia velascoensis and A. ouezzenensis found in the Paleocene are restricted to Sites 363 and 364, respectively, and therefore seem to have different ecological distributions.

The Eocene and Oligocene assemblages are less characteristic than those of the Paleocene. They are largely composed of long-ranging species which are of little or no stratigraphic significance. Alabama dissonata can be considered an Eocene marker since the same range is also recorded in the Caribbean. Its presence in the Paleocene Sample 361-11, CC can be disregarded because this sample contains nanofossil evidence for contamination from above. Other characteristic Eocene species are Uvigerina chirana and Plectina dalmatina, known in the literature also as P. eocenica. The first appearance of Heterolepa grimsdalei seems to be a good middle Eocene indicator. Sample 361-6, CC, which also contains this species, is (Table 2) referred to the uppermost lower Eocene Globorotalia palmerae Zone equivalent. However, nanoplankton evidence places this in the Discocaster sublodoensis Zone which could either be uppermost lower or lowermost middle Eocene. The widely known group of Nuttallides truempyi does not cross the Eocene/Oligocene boundary. Of some interest in the Cape Basin Eocene could be the presence of the New Zealand species Dorothia biformis and Siphotextularia finlayi.

Planulina renzi and Karreriella hantkeniana are species restricted to the Oligocene of Leg 40 sites. They can be considered to be good stratigraphic markers in this interval. The first appears in the Globorotalia opima opima Zone of Sites 360 and 363. It is also present in the Caribbean Oligocene, and both species are found in the Oligocene of Northern Italy. Astrononion pusillum, a rare but characteristic species of New Zealand, occurs in the Oligocene of Sites 360 and 363.

Two species are described as new: Stainforthia ryani, which is fairly common in the middle Eocene of the Cape Basin Site 361 and Bandyella beckmanni which
ranges in Sites 360, 361, and 364 from the Paleocene to the upper Eocene. Recent representatives of Stainforthia are recorded from Antarctica and Sweden. The genus thus may be considered to indicate cold to temperate waters.

### ANNOTATED SPECIES LIST

#### Alabama dissonata (Cushman and Renz)

*Plate 4, Figures 10, 11*


#### Ammodiscus glabratus Cushman and Jarvis

*Plate 1, Figure 1*

*Ammodiscus glabratus* Cushman and Jarvis, 1928, Contrib. Cushman Lab. Foram. Res., v. 4, p. 86, pl. 12, fig. 6. Rather common at Site 360; rare at Site 362A.

#### Anomalina alazanensis spissiformis Cushman and Stainforth

*Plate 5, Figures 12, 13*


#### Anomalina capritata (Guembel)

*Plate 5, Figures 7, 8*


#### Anomalina pomplioides semicribrata Beckmann

*Plate 5, Figures 5, 6*

*Anomalina pomplioides* Galloway and Heminway, var. *semcribrata* Beckmann, 1953, Ecolog. Geol. Helv., v. 46, p. 400, pl. 27, fig. 3, text-fig. 24, 25. Tabulated in the range charts as *A. pomplioides*. Fairly common at Sites 360 and 363; scarce at Sites 361, 362A, and 364.

#### Anomalina? sp. 1

*Plate 5, Figures 14, 15*

Tabulated in the range charts either as *Anomalina* sp. 1 or *Anomalina?* sp. This indetermined species is scarce at Sites 360, 361, 363, and 364.

#### Aragonia aragonensis (Nuttall)

*Plate 3, Figure 20*

*Textularia aragonensis* Nuttall, 1930, J. Paleontol., v. 4, p. 280, pl. 23, fig. 16. Rare at Sites 360 and 362A.
### Distribution of Middle Eocene to Lower Paleocene Benthic Foraminifers in Site 364

**TABLE 5**

<table>
<thead>
<tr>
<th>DEPTH BELOW SEA FLOOR IN METERS</th>
<th>CORE</th>
<th>SECTION</th>
<th>INTERVAL (cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>245 - 254.5</td>
<td>7</td>
<td>CC</td>
<td></td>
</tr>
<tr>
<td>283 - 292.5</td>
<td>8</td>
<td>bottom</td>
<td></td>
</tr>
<tr>
<td>321 - 330.5</td>
<td>9</td>
<td>53-55</td>
<td></td>
</tr>
<tr>
<td>349.5 - 359</td>
<td>10</td>
<td>58-60</td>
<td></td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>56-62</td>
<td></td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>58-60</td>
<td></td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>CC</td>
<td></td>
</tr>
</tbody>
</table>

**LEG 40
SITE 364**

- **Aragonia ouezzanensis (Rey)**  
  (Plate 3, Figure 22)

- **Aragonia velascoensis (Cushman)**  
  (Plate 3, Figure 21)

- **Astronion pusillum Hornbrook**  

- **Bandyella beckmanni Proto Decima and Bolli, n. sp.**  
  (Plate 3, Figure 12)
  Test small, short, spindle-shaped. Initial part frequently pointed, rounded in some specimens. Chambers triserially arranged similar to Bulimina, rapidly increasing, inflated and overlapping. Sutures depressed. Aperture subterminal, slightly eccentric, Pleurostomella-like. It differs from the similar Bulimina (Destinobulimina) salisburgensis Hillebrandt, from the Paleocene of Austria, in having a complete triserial arrangement and more inflated chambers. The new species is placed in Bandyella because this is the only genus that includes a triserial chamber arrangement and a Pleurostomella-like aperture. It lacks, however, the biserial and uniserial final stage characteristic for Bandyella. Rare at Sites 360, 361, and 364, from the Paleocene to the upper Eocene.
  Dimension of holotype: 0.8 mm.
  Type locality: Angola Basin, South Atlantic, 11°34’S, 11°58’E.
  Type sample: DSDP Leg 40, Site 364, Core 10, Section 1, 58-60 cm.
  Type stratum: Middle Paleocene, Helicoceras kleinpellii Zone.
  Name: The species is named for Jean-Pierre Beckmann, Geological Institute ETH, Zürich.

- **Bolivina antegressa Subbotina**  
  (Plate 3, Figure 2)

- **Bolivina striatocarinata Cushman**  

- **Bolivinopsis spectabilis (Grzybowski)**  
  (Plate 1, Figure 3)
TABLE 5 – Continued

<table>
<thead>
<tr>
<th>ZONE</th>
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<tbody>
<tr>
<td>based on planktonic Foraminifera</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>AGE</th>
</tr>
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<tbody>
<tr>
<td>MIDDLE EOCENE</td>
</tr>
<tr>
<td>LOWER EOCENE</td>
</tr>
<tr>
<td>UPPER PALEOCENE</td>
</tr>
<tr>
<td>MIDDLE PALEOCENE</td>
</tr>
<tr>
<td>LOWER PALEOCENE</td>
</tr>
</tbody>
</table>

**Bulimina alazanensis Cushman**  
(Plate 2, Figure 10)  
*Bulimina alazanensis* Cushman, 1927, J. Paleontol., v. 1, p. 161, pl. 25, fig. 4. Fairly common at Site 363 in the lower Oligocene.

**Bulimina alsatica Cushman and Parker**  
(Plate 2, Figures 11, 12)  
*Bulimina alsatica* Cushman and Parker, 1937, Contrib. Cushman Lab. Foram. Res., v. 13, p. 4, fig. 6, 7. Rare at Site 361.

**Bulimina impendens Parker and Bermudez**  
(Plate 2, Figures 11, 12)  
*Bulimina impendens* Parker and Bermudez, 1937, J. Paleontol., v. 11, p. 514, pl. 58, fig. 7, 8. Rather common at Site 363.

**Bulimina jarvisi Cushman and Parker**  
(Plate 2, Figure 13)  

**Bulimina macilenta Cushman and Parker**  
(Plate 2, Figure 14)  
*Bulimina macilenta* Cushman and Parker, 1947, USGS Prof. Paper 210-D, p. 98, pl. 23, fig. 3. Rare at Site 361.

**Bulimina semicostata Nuttall**  
(Plate 2, Figure 14)  
*Bulimina semicostata* Nuttall, 1930, J. Paleontol., v. 4, p. 285, pl. 23, fig. 15, 16. Common at Sites 360 and 363, rare at Site 361.

**Bulimina trinitatensis Cushman and Jarvis**  
(Plate 2, Figures 15, 16)  
*Bulimina trinitatensis* Cushman and Jarvis, 1928, Contrib. Cushman Lab., v. 4, p. 102, pl. 14, fig. 12. Common at Site 363, rare at Site 364.

**Bulimina tuxpanensis Cole**  
(Plate 2, Figure 16)  

**Bulimina velascoensis (Cushman)**  
(Plate 2, Figure 17)  
*Bulimina velascoensis* Cushman, 1925, Contrib. Cushman Lab. Foram. Res., v. 1, p. 20, pl. 3, fig. 7. Rare at Site 364.

**Cassidulina havanensis Cushman and Bermudez**  
(Plate 3, Figure 19)  
*Cassidulina havanensis* Cushman and Bermudez, 1936, Contrib. Cushman Lab. Foram. Res., v. 12, p. 36, pl. 6, fig. 11. Rare at Site 363.

**Charltonia florealis (White)**  
(Plate 4, Figures 17, 18)  
*Gyroidina florealis* White, 1928, J. Paleontol., v. 2, p. 293, pl. 40, fig. 3. Fairly common at Sites 363 and 364.

**Chrysalogonium tenucostatum Cushman and Bermudez**  
(Plate 1, Figure 16)  
*Chrysalogonium tenucostatum* Cushman and Bermudez, 1936, Contrib. Cushman Lab. Foram. Res., v. 12, p. 27, pl. 5, fig. 3-5. Scarce at Sites 360, 361, and 363.
### TABLE 6
Species Present in Cape Basin, Walvis Ridge and Angola Basin

<table>
<thead>
<tr>
<th>Species</th>
<th>Paleocene</th>
<th>Eocene</th>
<th>Oligocene</th>
</tr>
</thead>
<tbody>
<tr>
<td>Afalaminia dieritoi</td>
<td>L</td>
<td>M</td>
<td>U</td>
</tr>
<tr>
<td>Anomalina dieritoiensis pluvialis</td>
<td>L</td>
<td>M</td>
<td>U</td>
</tr>
<tr>
<td>Anomalina sp. 1</td>
<td>L</td>
<td>M</td>
<td>U</td>
</tr>
<tr>
<td>Buliminia specabilis</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Calpionella latonese</td>
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</tr>
<tr>
<td>Gavelinella beccoritoni</td>
<td>L</td>
<td>M</td>
<td>U</td>
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<tr>
<td>Gyrocladus globosa</td>
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<td></td>
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</tr>
<tr>
<td>Gavelinella davi</td>
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<tr>
<td>Gyrocladus soldani</td>
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<tr>
<td>Nonion havanense</td>
<td>L</td>
<td>M</td>
<td>U</td>
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<td>Nutumella incuspi</td>
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<td>Okelina japonica</td>
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<tr>
<td>Pleurostomella portulana</td>
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<tr>
<td>Pullenia coryelli</td>
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<td>Pullenia sp. 1</td>
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<tr>
<td>Tritaxilina pupa</td>
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### TABLE 8
Species Restricted to the Walvis Ridge

<table>
<thead>
<tr>
<th>Species</th>
<th>Paleocene</th>
<th>Eocene</th>
<th>Oligocene</th>
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</tr>
<tr>
<td>Buliminia specabilis</td>
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<td></td>
</tr>
<tr>
<td>Calpionella latonese</td>
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<td>Gavelinella beccoritoni</td>
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<td>Gyrocladus globosa</td>
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<td>Gavelinella davi</td>
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<td>Heterolepida ugeriana</td>
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<td>Nonion havanense</td>
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<td>Nutumella incuspi</td>
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<td>Okelina japonica</td>
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<td>Pleurostomella portulana</td>
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<td>Pullenia coryelli</td>
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<td>Pullenia sp. 1</td>
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<tr>
<td>Tritaxilina pupa</td>
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### TABLE 7
Species Restricted to the Cape Basin

<table>
<thead>
<tr>
<th>Species</th>
<th>Paleocene</th>
<th>Eocene</th>
<th>Oligocene</th>
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<tr>
<td>Buliminia striatula</td>
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<td>Buliminia alpifera</td>
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<tr>
<td>Buliminia macilenta</td>
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<tr>
<td>Clavulinella aff. anglica</td>
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<tr>
<td>Dorothia biformis</td>
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<tr>
<td>Karrerella beccora</td>
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<tr>
<td>Karrerella harkantapana</td>
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<td>Loxocladus drysppil</td>
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<td>Nodosaria longiptace</td>
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<td>Nodosaria sp. 1</td>
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<td>Praehelminia grata</td>
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<td>Rectivulina elegans</td>
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<td>Siphonodiscus finlayi</td>
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<td>Steindorffia rynpi</td>
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<td>Stilostorina curvicornina</td>
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<td>Tappanella selmeniti</td>
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<td>Urigerina chihara</td>
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<td>Urigerina cf. eocenica</td>
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<tr>
<td>Urigerina gallayrvy</td>
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</table>

Cibicidoides alleni (Plummer)
(Plate 5, Figures 18, 19)

Truncatulina allenii Plummer, 1926, Texas Univ. Bull. 2644, p. 144, pl. 10, fig. 4. Scarce at Site 363.

Cibicidoides aff. cooki (Cushman and Garrett)
(Plate 5, Figures 16, 17)

Cibicides cooki Cushman and Garrett, 1938, Contrib. Cushman Lab. Foram. Res., v. 14, p. 65, pl. 11, fig. 3. Rather common at Sites 360 and 363, scarce at Sites 361 and 362A.

Clavulinella aff. anglica (Cushman)
(Plate 1, Figure 11)

Pseudoclavulina anglica Cushman, 1936, Cushman Lab. Foram. Res., Spec. Publ., 6, p. 18, pl. 3, fig. 6. Rare at Site 362A.

Clavulinella cocoamensis (Cushman)
(Plate 1, Figure 12)

Pseudoclavulina cocoamensis Cushman, 1936, Cushman Lab. Foram. Res., Spec. Publ., 6, p. 18, pl. 3, fig. 6. Rare at Site 362A.

### TABLE 9
Species Restricted to the Angola Basin

<table>
<thead>
<tr>
<th>Species</th>
<th>Paleocene</th>
<th>Eocene</th>
<th>Oligocene</th>
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</thead>
<tbody>
<tr>
<td>Aragonia ouezzaniense</td>
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<td>Buliminia velascoensis</td>
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<td>Buliminia alpifera</td>
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<td>Buliminia macilenta</td>
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<tr>
<td>Gyrocladus globosa</td>
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<tr>
<td>Gyrocladus soldani</td>
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<tr>
<td>Heterolepida cf. cocconensis</td>
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<td>Marssonella nacataensis</td>
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<td>Marssonella traubi</td>
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<td>Neoflabellina semistellatula</td>
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<td>Orthomalina harkantapana</td>
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<td>Pleurostomella obesa</td>
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<td>Praebulimina acmeae</td>
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<td>Triaxilla exigera</td>
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<td>Triaxilla cubanica</td>
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<td>Urigerina sp.</td>
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<td>Urigerina chihara</td>
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<td>Urigerina chihara</td>
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<tr>
<td>Urigerina acmeae</td>
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<td>Urigerina gallayrvy</td>
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<tr>
<td>Coryphostoma cf. limonense</td>
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</tbody>
</table>

Dorothia beloides Hillebrandt
(Plate 1, Figure 10)


Dorothia biformis Finlay

Dorothia brevis Cushman and Stainforth

792
Species Present in the Paleocene of the Cape Basin, Walvis Ridge, and Angola Basin

<table>
<thead>
<tr>
<th>Species</th>
<th>Cape Basin</th>
<th>Walvis Ridge</th>
<th>Angola Basin</th>
<th>Other Localities</th>
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<tr>
<td>Anomalina rossmanni</td>
<td>Site 360</td>
<td>Site 363</td>
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<tr>
<td>Anomalina velascoensis</td>
<td>Site 360</td>
<td>Site 363</td>
<td>Site 364</td>
<td>C L M P R V</td>
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<tr>
<td>Beulina trilatariata</td>
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<td>Site 363</td>
<td>Site 364</td>
<td>C L M P R V</td>
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<tr>
<td>Breithopella rossmanni</td>
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<td>Cibicides alleni</td>
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<td>Site 364</td>
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<td>Gavelinella rugosa</td>
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<td>Gavelinella veleensis</td>
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Species Restricted to the Eocene of Leg 40

<table>
<thead>
<tr>
<th>Species</th>
<th>Cape Basin</th>
<th>Walvis Ridge</th>
<th>Angola Basin</th>
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<td>Anarchoella glutubris</td>
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<td>Anarchoella argoarena</td>
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<td>Bulminata atlantica</td>
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<td>Bulminata maccienta</td>
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<td>Chrysalis tentaculatum</td>
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<td>Cleidoceras cocconeri</td>
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<td>Dorsithula birmiata</td>
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<td>Epsiprericthus subcomposite</td>
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<td>Karriera chrysicha</td>
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<td>Nodosaria sp. 1</td>
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<td>Orthostomina vanderbiltica</td>
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<td>Urgerina acostacostata</td>
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</tbody>
</table>

Fursenkoina ciperana (Cushman and Stainforth)


Gaudryina pseudocollinsi Cushman and Stainforth

(Plate 1, Figure 7)


Gaudryina pyramidata Cushman

(Plate 1, Figure 6)


Gavelinella beccariiformis (White)

(Plate 6, Figures 3, 4)

Rotalia beccariiformis White, 1928, J. Paleontol., v. 2, p. 287, pl. 39, fig. 2-4. Rare at Site 361, common at Sites 363 and 364.

Gavelinella dayi (White)

(Plate 6, Figures 1, 2)

Planulina dayi White, 1928, J. Paleontol., v. 2, p. 300, pl. 41, fig. 3. Rare at Sites 361 and 364, rather common at Site 363.

Gavelinella micro (Bermudez)

(Plate 6, Figures 5, 6)


Gavelinella rubiginosa (Cushman)

(Plate 6, Figures 7, 8)

TABLE 12  
Species Restricted to the Oligocene of Leg 40

<table>
<thead>
<tr>
<th>Species Represented</th>
<th>CAPE BASIN</th>
<th>WALVIS RIDGE</th>
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<tbody>
<tr>
<td></td>
<td>Site 360</td>
<td>Site 362 A</td>
</tr>
<tr>
<td><em>Gavelinella velascoensis</em> (Cushman)</td>
<td></td>
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</tr>
<tr>
<td><em>Anomalina velascoensis</em> Cushman, 1925, Contrib. Cushman Lab. Foram. Res., v. 1, p. 21, pl. 3, fig. 3. Rare at Sites 361 and 363.</td>
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<tr>
<td><em>Globocassidulina globosa</em> (Hantken)</td>
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<td>(Plate 3, Figures 23, 24)</td>
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<tr>
<td><em>Cassidulina globosa</em> Hantken, 1875, Ungar. Geol. Anst., Mitt. Jb., v. 4, p. 64, pl. 16, fig. 2. Rather common at Sites 360, 361, 362A, and 363.</td>
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<tr>
<td><em>Globocassidulina oblonga</em> (Reuss)</td>
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<tr>
<td><em>Glomospira charoides</em> (Jones and Parker)</td>
<td>(Plate 1, Figure 2)</td>
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<tr>
<td><em>Gyroidinoides globosa</em> (Hagenow)</td>
<td>(Plate 4, Figures 19, 20)</td>
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<td><em>Gyroidinoides octocamerata</em> (Cushman and Hanna)</td>
<td>(Plate 5, Figures 3, 4)</td>
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<tr>
<td><em>Gyroidinoides planulata</em> (Cushman and Renz)</td>
<td>(Plate 4, Figures 13, 14)</td>
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<tr>
<td><em>Gyroidinoides soldanii</em> (d’Orbigny)</td>
<td>(Plate 5, Figures 1, 2)</td>
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<tr>
<td><em>Gyroidinoides subangulata</em> (Plummer)</td>
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<tr>
<td><em>Rotalia soldanii</em> (d’Orbigny) var. subangulata Plummer, 1926, Univ. Texas Bull., 2644, p. 154, pl. 12, fig. 1. Searce at Sites 362A and 363.</td>
<td></td>
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</tr>
<tr>
<td><em>Heterolepa cf. cocoensis</em> (Cushman)</td>
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<td></td>
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</tbody>
</table>

Heterolepa *cocoensa* Cushman, 1868, Abb. K. Bayer Akad. Wiss., II cl., v. 10, II Abt., p. 650, pl. 2, fig. 87. Rare at Sites 360 and 361; common at Sites 362A and 363.

Heterolepa *grisedaei* (Nuttall)  
(Plate 6, Figures 16, 17) |

*Cibicides grisedaei* Nuttall, 1930, J. Paleontol., v. 4, p. 291, pl. 25, fig. 7, 8, 11. Common at Site 360; scarce at Sites 361, 362A, 363, and 364.

Heterolepa *pygmea* (Hantken)  
(Plate 6, Figure 13) |


Heterolepa *reussi* (Silvestri)  
(Plate 6, Figures 9-12) |

*Truncatulina duiempiei* d’Orbigny, var. reussi Silvestri, 1906, Riv. 5, Paleontol., v. 12, p. 33. Rare at Sites 360, 362A, and 363.

Heterolepa *ungeriana* (d’Orbigny)  
(Plate 6, Figures 18, 19) |

*Rotalina ungeriana* d’Orbigny, 1864, Foram. Bassin Tert. Vienne, v. 157, pl. 8, fig. 16-18. Common at all sites.

Karreriella *baccata* (Schwager)  
*Gaudryina baccata* Schwager, 1866, Novara Exped., Geol. Theil., v. 2, p. 200, pl. 4, fig. 12. Searce at Site 360.

Karreriella *chapapotensis* (Cole)  

Karreriella *cubensis* Cushman and Bermudez  

Karreriella *hantkeniana* Cushman  

Karreriella *siphonella* (Reuss)  
*Gaudryina siphonella* Reuss, 1851, Z. Deut. Geol. Ges., v. 3, p. 78, pl. 5, fig. 40-42. Rare at Sites 360 and 362A.

Karreriella *subglabra* (Guembel)  
(Plate 1, Figure 9) |


Laticarinina *cf. bullbrooki* Cushman and Todd  

Loxostomoides *dupuyi* (Colom)  
(Plate 2, Figures 3, 4) |

*Rectobulimina dupuyi* Colom, 1954, Inst. Geol. Min. Espafia, Bol., v. 66, p. 181, pl. 7, fig. 5-10. Rare at Site 361.

Marssonella *nacataensis* (White)  
(Plate 1, Figure 15) |

*Textularia nacataensis* White, 1929, J. Paleontol., v. 2, p. 31, pl. 4, fig. 2. Searce at Site 363.
Marssonella trauhi Hagn.
Marssonella trauhi Hagn, 1956, Palaeontographica, Abt. A, v. 107, p. 118, pl. 9, fig. 20, text-fig. 5, 6. Scarce at Site 362A.

Neoflabellina jarvisi (Cushman)

Neoflabellina semireticulata (Cushman and Jarvis)
(Plate 1, Figure 18)

Nodosaria subnodosa (Guppy)
(Plate 3, Figure 18)

Nodosaria longiscata d’Orbigny
Nodosaria longiscata d’Orbigny, 1846, Foram. Bassin Tert. Vienne, p. 32, pl. 7, fig. 10-12. Rather common at Sites 360 and 361.

Nonion havanense Cushman and Bermudez
(Plate 4, Figures 1, 2)

Nutallides truempyi (Nuttall)
(Plate 3, Figures 1, 2)
Eponides truempyi Nuttall, 1930, J. Paleontol., v. 4, p. 287, pl. 24, fig. 9, 13, 14. Common at all sites.

Oridorsalis umbonatus (Reuss)
Rotalina umbonata Reuss, 1851, Z. Deut. Geol. Ges., v. 3, p. 75, pl. 5, fig. 35. Common at all sites.

Orthomorphina havanensis (Cushman and Bermudez)


Orthomorphina rohri (Cushman and Stainforth)
(Plate 1, Figure 17)

Osangularia pterophalina (Guembel)
(Plate 4, Figures 15, 16)

Osangularia plummerae Brotzen
Osangularia plummerae Brotzen, 1940, Sver. Geol. Unders., Avh., s.o., n. 435, p. 30, pl. 10, fig. 1, 2. Rare at Site 364.

Planulina ammoniphila (Guembel)
(Plate 3, Figures 5, 6)
Rotalia ammoniphila Guembel, 1868, Abh. k. Bayer. Akad. Wiss., II Cl. v. 10, II Abt., p. 652, pl. 2. Rather common at Sites 360, 361 and 362A.

Planulina renzi Cushman and Stainforth
(Plate 3, Figure 7)

Plectina dalmatina (Schubert)
(Plate 1, Figure 13)

Pleurostomella acuta Hancken
(Plate 3, Figure 9)

Pleurostomella alternans Schwager
(Plate 3, Figure 10)
Pleurostomella alternans Schwager, 1966, Novara Exped., Geol. Theil., v. 2, p. 238, pl. 6, fig. 79-80. Rare at Sites 360 and 363.

Pleurostomella incrassata Hanken
(Plate 3, Figure 11)
Pleurostomella incrassata Hanken, 1884, Math. u. naturw. Ber. Ung. v. 2, p. 146, pl. 1, fig. 4, 7. Rather common at Sites 360, 361, and 362A.

Pleurostomella nuttallii Cushman and Siegfus
(Plate 3, Figure 13)
Pleurostomella nuttallii Cushman and Siegfus, 1939, Contrib. Cushman Lab. Foram. Res., v. 15, p. 29, pl. 6, fig. 17, 18. Rather common at all sites.

Pleurostomella obesa Cushman and Bermudez

Pleurostomella obesa Cushman and Bermudez, 1937, Contrib. Cushman Lab. Foram. Res., v. 13, p. 16, pl. 1, fig. 61. Rare at Site 362A.

Praebulimina baumonti (Cushman and Renz)
(Plate 1, Figure 19)

Praebulimina grata (Parker and Bermudez)
(Plate 1, Figure 20)
Bulimina grata Parker and Bermudez, 1937, J. Paleontol., v. 11, p. 515, pl. 59, fig. 6. Scarce at Sites 360 and 361.

Pullenia coryelli White
(Plate 4, Figures 3, 4)
Pullenia coryelli White, 1929, J. Paleontol. v. 3, p. 56, pi. 5, fig. 22. Scarce at Sites 361, 363, and 364.

Pullenia eocenica Cushman and Siegfus
(Plate 4, Figures 7, 8)

Pullenia jarvisi Cushman
Pullenia jarvisi Cushman, 1936, Contrib. Cushman Lab. Foram. Res. v. 12, p. 77, pl. 13, fig. 6. Rare at Site 363.

Pullenia quinqueloba (Reuss)
(Plate 4, Figure 9)

Pullenia sp. 1
(Plate 4, Figures 5, 6)
This indetemined species is present at all sites. Rather common at Sites 360, 363, and 364; rare at Sites 361 and 362A. Tabulated as Pullenia sp. in Table 3.
**Rectuvigerina elegans** (Hantken)
*Dimorphina elegans* Hantken, 1875, Ungar. Geol. Amst. Mitt. Jb., v. 4, p. 63, pl. 7, fig. 9. Rare at Site 361.

**Remesella varians** (Glaessner)
*(Plate 1, Figure 14)*

**Textularia varians** Hantken, 1937, Probl. Paleontol., v. 2, 3, p. 366, pl. 2, fig. 15. Rather common at Site 363.

**Siphotextularia finlayi Hornibrook**

**Spiroplectammina dentata (Alth)**
*(Plate 1, Figure 4)*


**Spiroplectammina excolata (Cushman)**

**Stainforthia ryani Proto Decima and Bolli, n. sp.**
*(Plate 2, Figures 17, 18)*

Test small, stout, spindle-shaped. Circular in transverse section, tapering at both ends, with the greatest width about the middle of the test. Aperture loop-shaped, bordered by a narrow lip, terminal. Wall hyaline, finely perforate, surface smooth. Sutures distinct, depressed. Chambers inflated, overlapping, early stage triserial, biserial in the adult portion. The initial pointed end can have a distinct spine. Rather common in the middle Eocene of DSDP Leg 40 and 361.

**Stilostomella cf. consobrina (d’Orbigny)**

**Uvigerina acutocostata (Hagn)**
*Hopkinsina acutocostata* Hagn, 1956, Palaeontographica, Abt. A, v. 107, p. 311, pl. 13, fig. 13. Rare at Site 362A.

**Uvigerina biscrialis Cushman and Edwards**
*Uvigerina biscrialis* Cushman and Edwards, 1937, Contrib. Cushman Lab. Foram. Res., v. 13, p. 59, pl. 8, fig. 11, 12. Rare at Site 362A.

**Uvigerina chirana Cushman and Stone**
*(Plate 2, Figure 22)*


**Uvigerina elongata Cole**
*(Plate 2, Figures 20, 21)*


**Uvigerina cf. eocaena Guembel**

**Uvigerina aff. gallowayi Cushman**
*(Plate 2, Figure 23)*

**Uvigerina gallowayi** Cushman, 1929, Contrib. Cushman Lab. Foram. Res., v. 5, p. 94, pl. 10, fig. 33, 34. Rare at Site 360.

**Uvigerina spinicostata Cushman and Jarvis**
*(Plate 2, Figure 19)*

**Uvigerina spinicostata** Cushman and Jarvis, 1929, Contrib. Cushman Lab. Foram. Res., v. 5, p. 12, pl. 3, fig. 9, 10. Rather common at Sites 360 and 363.
Vulvulina haeringensis (Guembel)
(Plate I, Figure 5)


DEPOSITORY OF SPECIMENS
The specimens figured on Plates 1 to 6 are deposited at the Museum of Natural History, Basel, under the Numbers C 33829 to 33948.

ACKNOWLEDGMENTS
The authors wish to thank J. P. Beckmann for discussing general problems, and faunal distributions and their biostratigraphic significance, and for reading the manuscript.

REFERENCES


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PLATE 1

PALEogene BenthIC FORAMINifERS
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PLATE 5

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