12. SOUTHEASTERN ATLANTIC LEG 40 CALCAREOUS NANNOFOSSILS

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INTRODUCTION

This report deals with the study of the calcareous nannofossil content of the six southeastern Atlantic Sites 360 to 365 drilled during DSDP Leg 40 (Figure 1).

Calcareous nannofossils were recovered from all sites; they range in age from Lower Cretaceous (Aptian) to Quaternary and represent an almost complete sequence of the biostratigraphic units for this time interval. All the stratigraphic stages, except for part of the Turonian and the Cenomanian, are represented in the sedimentary record of the investigated sites.

The light microscope was used to examine the 1329 smear slides of the cores sampled. Use of the scanning electron microscope was only made to check the structure of some problematic lower Eocene nannofossils from Site 361 and to illustrate some upper Cretaceous forms.

Of the three authors, F. Proto Decima studied Sites 361, 362, 362A, 363, and 365, F. Medizza Site 364, and L. Todesco Site 360. Discussions and conclusions on biostratigraphic and taxonomic problems were worked out jointly.

Table 1 lists in alphabetical order the nannofossil genera and species considered in this report.

BIOSTRATIGRAPHY

Cretaceous

The Lower Cretaceous zonation used in this report is that proposed by Thierstein (1971, 1973).

For the subdivision and age determination of the Upper Cretaceous the results of Cepek and Hay (1969), Martini (1969, 1976), Bukry and Bramlette (1970), Manivit (1971), Perch-Nielsen (1972, 1977), and Roth (1973) were considered.

The biostratigraphic distribution of the Cretaceous cores, the events used to fix the boundaries of the zones, and their correlation with the stratigraphic stages and absolute age are summarized in Table 2.

The recognized biozones and their definition are listed as follows in stratigraphic order from older to younger.

Chiastozygus litterarius Zone

Definition: Interval from the last occurrence of *Nannoconus colomii* and/or the first occurrence of *Chiastozygus litterarius* and/or *Rucinolithus irregularis* to the first occurrence of *Parhabdolithus angustus* and/or *Lithastrinus floralis*.

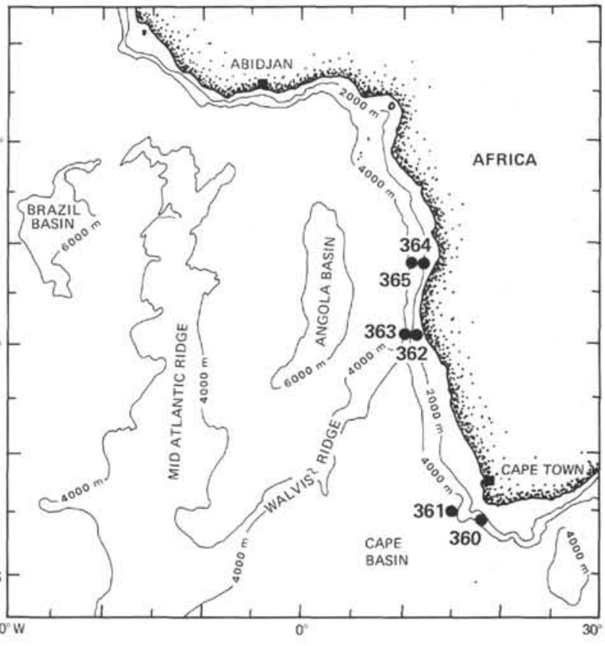


Figure 1. *Location of Leg 40 Sites 360-365.*

Author: Thierstein (1971, 1973).
Age: Lower Aptian.

The lower boundary of this zone was not recovered on Leg 40. The poorly preserved nannofossil associations of the lower part of Site 361 were referred to this zone on the concurrence of *Micrantholithus hoschulzii*, *M. obtusus*, and *Chiastozygus litterarius*. They represent the oldest nannofloras recovered in Leg 40.

Parhabdolithus angustus Zone

Definition: Interval from the first occurrence of *Parhabdolithus angustus* and/or *Lithastrinus floralis*, to the first occurrence of *Prediscosphaera cretacea*.
Author: Manivit (1971), modified Thierstein (1973).
Age: Upper Aptian-lower Albian.

Prediscosphaera cretacea Zone

Definition: Interval from the first occurrence of *Prediscosphaera cretacea* to the first occurrence of *Eiffellithus turriseiffeli*.
Author: Thierstein (1971, 1973).
Age: Lower Albian to middle Albian.

Eiffellithus turriseiffeli Zone

Definition: Interval from the first occurrence of *Eiffellithus turriseiffeli* to the first occurrence of *Lithraphidites alatus*.

TABLE 1
Selected Nannofossil Species Considered in This Report

CENOZOIC

Amaurolithus amplificus (Bukry and Percival, 1971) Gartner and Bukry, 1975 (Plate 5, Figure 8)
Amaurolithus delicatus Gartner and Bukry, 1975 (Plate 5, Figures 3-7)
Amaurolithus primus (Bukry and Bramlette, 1971) Gartner and Bukry, 1975 (Plate 5, Figures 7-11)
Amaurolithus tricorniculatus (Gartner, 1967) Gartner and Bukry, 1975 (Plate 5, Figure 9)
Angulolithina arca Bukry, 1973 (Plate 5, Figure 14)
Aspidorhabdus stylifer (Lohmann, 1902) Boudreaux and Hay, 1969
Blackites spinulus (Levin, 1965) Roth, 1970
Braarudosphaera bigelowii (Gran and Braarud, 1935) Deflandre, 1947
Campylosphaera dela (Bramlette and Sullivan, 1961) Hay and Mohler, 1967 (Plate 10, Figure 3)
Campylosphaera eodela Bukry and Percival, 1971 (Plate 10, Figure 2
Catinaster calyculus Martini and Bramlette, 1963
Catinaster coalitus Martini and Bramlette, 1963
Ceratolithus acutus Gartner and Bukry, 1974 (Plate 4, Figures 5, 8, 10, 11)
Ceratolithus cristatus Kamptner, 1954 (Plate 4, Figure 12)
Ceratolithus rugosus Bukry and Bramlette, 1968 (Plate 4, Figures 1-4, 6, 7, 9)
Chiasmolithus altus Bukry and Percival, 1971
Chiasmolithus bidens (Bramlette and Sullivan, 1961) Hay and Mohler, 1967
Chiasmolithus californicus (Sullivan, 1964) Hay and Mohler, 1967 (Plate 10, Figure 7)
Chiasmolithus consuetus (Bramlette and Sullivan, 1961) Hay and Mohler, 1967
Chiasmolithus danicus (Brotzen, 1959) Hay and Mohler, 1967
Chiasmolithus expansus (Bramlette and Sullivan, 1961) Gartner, 1970
Chiasmolithus gigas (Bramlette and Sullivan, 1961) Radomski, 1968
Chiasmolithus grandis (Bramlette and Riedel, 1954) Radomski, 1968 (Plate 11, Figure 7)
Chiasmolithus oamaruensis (Deflandre, 1954) Hay, Mohler and Wade, 1966
Chiasmolithus solitus (Bramlette and Sullivan, 1961) Locker, 1968
Chiphragmalithus acanthodes Bramlette and Sullivan, 1961
Chiphragmalithus calathus Bramlette and Sullivan, 1961
Coccolithus crassus Bramlette and Sullivan, 1961 (Plate 10, Figure 9)
Coccolithus cribellum (Bramlette and Sullivan, 1961) Stradner, 1962 (Plate 10, Figure 11)
Coccolithus eopelagicus (Bramlette and Riedel, 1954) Bramlette and Sullivan, 1961
Coccolithus magnicrassus Bukry, 1971 (Plate 10, Figure 12)
Coccolithus miopelagicus Bukry, 1971
Coccolithus pelagicus (Wallich, 1877) Schiller, 1930
Coronocyclus nitescens (Kamptner, 1964) Bramlette and Wilcoxon, 1967 (Plate 2, Figure 4)
Cricolithus jonesii Cohen, 1965 (Plate 1, Figures 6, 7)
Cruciplacolithus staurion (Bramlette and Sullivan, 1961) Gartner, 1971
Cruciplacolithus tenuis (Stradner, 1961) Hay and Mohler, 1967 (Plate 10, Figure 1)
Cyclicargolithus abisectus (Müller, 1970) Bukry, 1973 (Plate 2, Figure 5)
Cyclicargolithus floridanus (Roth and Hay, 1967) Bukry, 1971 (Plate 2, Figure 3)
Cyclicargolithus pseudogammation (Bouche, 1962) Bukry, 1973
Cyclicargolithus reticulatus (Gartner and Smith, 1967) n. comb.
Cyclococcolithus formosus Kamptner, 1963
Cyclococcolithus gammation (Bramlette and Sullivan, 1961) Sullivan, 1964
Cyclococcolithus kingii Roth, 1970

TABLE 1 – *Continued*

Cyclococcolithus leptoporus (Murray and Blackmann, 1898) Kamptner, 1954 (Plate 1, Figure 22)
Cyclococcolithus macintyrei Bukry and Bramlette, 1969 (Plate 2, Figure 6)
Cyclolithella robusta (Bramlette and Sullivan, 1961) Stradner, 1969 (Plate 10, Figure 4)
Dictyococcites bisectus (Hay, Mohler and Wade, 1966) Bukry and Percival, 1971
Dictyococcites scrippsae Bukry and Percival, 1971
Discoaster adamanteus Bramlette and Wilcoxon, 1967
Discoaster asymmetricus Gartner, 1969 (Plate 6, Figure 2; Plate 9, Figure 2)
Discoaster barbadiensis Tan Sin Hok, 1927
Discoaster berggrenii Bukry, 1971 (Plate 7, Figures 1-3)
Discoaster bifax Bukry, 1971
Discoaster binodosus Martini, 1958
Discoaster bollii Martini and Bramlette, 1963 (Plate 9, Figure 4)
Discoaster braarudii Bukry, 1971
Discoaster brouweri Tan Sin Hok. 1927 (Plate 6, Figure 3)
Discoaster calcaris Gartner, 1967 (Plate 6, Figures 4, 5)
Discoaster challengeri Bramlette and Riedel, 1954 (Plate 9, Figure 5)
Discoaster cruciformis Martini, 1958
Discoaster deflandrei Bramlette and Riedel, 1954 (Plate 9, Figures 3, 6)
Discoaster delicatus Bramlette and Sullivan, 1961
Discoaster diastypus Bramlette and Sullivan, 1961 (Plate 11, Figures 5, 6)
Discoaster distinctus Martini, 1958
Discoaster druggii Bramlette and Wilcoxon, 1967 (Plate 6, Figures 8, 9)
Discoaster elegans Bramlette and Sullivan, 1961
Discoaster exilis Martini and Bramlette, 1963 (Plate 8, Figure 5)
Discoaster formosus Martini and Worsley, 1971
Discoaster hamatus Martini and Bramlette, 1963 (Plate 6, Figure 6)
Discoaster intercalaris Bukry, 1971
Discoaster kugleri Martini and Bramlette, 1963
Discoaster lautus Boudreaux and Hay, 1967
Discoaster lenticularis Bramlette and Sullivan, 1961
Discoaster lodoensis Bramlette and Riedel, 1954
Discoaster loeblichii Bukry, 1971 (Plate 9, Figures 7, 8)
Discoaster mirus Deflandre, 1954
Discoaster mohleri Bukry and Percival, 1971
Discoaster moorei Bukry, 1971 (Plate 7, Figures 5-8)
Discoaster multiradiatus Bramlette and Riedel, 1954 (Plate 11, Figure 4)
Discoaster neorectus Bukry, 1971 (Plate 6, Figure 7; Plate 9, Figure 9)
Discoaster nephados Hay, 1967
Discoaster nobilis Martini 1961
Discoaster nonaradiatus Bramlette and Sullivan, 1961
Discoaster pentaradiatus Tan Sin Hok, 1927 (Plate 8, Figure 4)
Discoaster perplexus Bramlette and Riedel, 1954
Discoaster pseudovariabilis Martini and Worsley, 1971 (Plate 7, Figure 9); Plate 8, Figure 2)
Discoaster quintueramus Gartner, 1969 (Plate 7, Figure 4)
Discoaster saipanensis Bramlette and Riedel, 1954
Discoaster salisburgensis Stradner, 1961
Discoaster saundersii Hay, 1967
Discoaster septemradiatus (Klumpp, 1953) Martini, 1958
Discoaster signus Bukry, 1971
Discoaster sublodoensis Bramlette and Sullivan, 1961
Discoaster subsurculus Gartner, 1967
Discoaster surculus Martini and Bramlette, 1963 (Plate 8, Figure 1)
Discoaster tamalis Kamptner, 1967
Discoaster tanii Bramlette and Riedel, 1954
Discoaster tanii nodifer Bramlette and Riedel, 1954 (Plate 12, Figure 12)
Discoaster trinidadensis Hay, 1967
Discoaster variabilis Martini and Bramlette, 1963 (Plate 7, Figures 10-14)
Discoaster variabilis decorus Bukry, 1971 (Plate 7, Figures 15-16; Plate 9, Figure 10)
Discoaster wemmelensis Achutan and Stradner, 1969
Discoaster sp. 1 (Plate 11, Figure 3; Plate 12, Figures 9-11)

TABLE 1 – *Continued*

Discoaster spp. (Plate 6, Figure 1; Plate 8, Figure 3; Plate 9, Figure 1)
Discoasteroides kuepperi (Stradner, 1959) Bramlette and Sullivan, 1961 (Plate 11, Figures 1, 2)
Discoasteroides megastypus Bramlette and Sullivan, 1961
Ellipsolithus distichus (Bramlette and Sullivan, 1961) Sullivan, 1964
Ellipsolithus macellus (Bramlette and Sullivan, 1961) Sullivan, 1964 (Plate 10, Figure 10)
Emiliania annula (Cohen, 1964) Bukry, 1975 (Plate 1, Figures 14, 15)
Emiliania ovata Bukry, 1973 (Plate 1, Figures 8, 9, 13)
Ericsonia cava (Hay and Mohler, 1967) Perch-Nielsen, 1969
Ericsonia fenestrata (Deflandre and Fert, 1954) Stradner, 1968
Ericsonia obruta Perch-Nielsen, 1971
Ericsonia subdisticha (Roth and Hay, 1967) Roth, 1969
Ericsonia subpertusa Hay and Mohler, 1967
Fasciculithus involutus Bramlette and Sullivan, 1961 (Plate 12, Figure 7)
Fasciculithus janii Perch-Nielsen, 1971 (Plate 12, Figure 1)
Fasciculithus pileatus Bukry, 1973 (Plate 12, Figures 3, 6)
Fasciculithus tympaniformis Hay and Mohler, 1967
Gephyrocapsa caribbeanica Boudreaux and Hay, 1967 (Plate 1, Figures 2, 5)
Gephyrocapsa oceanica Kamptner, 1943 (Plate 1, Figures 1, 3, 4)
Helicosphaera ampliaperta Bramlette and Wilcoxon, 1967 (Plate 2, Figure 1)
Helicosphaera carteri (Wallich, 1877) Kamptner, 1954 (Plate 2, Figure 2)
Helicosphaera compacta Bramlette and Wilcoxon, 1967
Helicosphaera euphratis Haq, 1966
Helicosphaera intermedia Martini, 1965 (Plate 1, Figure 25)
Helicosphaera lophota (Bramlette and Sullivan, 1961) Jafar and Martini, 1975
Helicosphaera obliqua Bramlette and Wilcoxon, 1967
Helicosphaera perchnielsenae (Haq, 1971) Martini, 1975
Helicosphaera recta (Haq, 1966) Jafar and Martini, 1975
Heliscosphaera reticulata Bramlette and Wilcoxon, 1967
Helicosphaera sellii (Bukry and Bramlette, 1969) Jafar and Martini, 1975 (Plate 1, Figures 23, 24)
Helicosphaera seminulum (Bramlette and Sullivan, 1961) Jafar and Martini, 1975
Heliolithus kleinpellii Sullivan, 1964 (Plate 10, Figure 8)
Heliolithus riedelii Bramlette and Sullivan, 1961
Isthmolithus recurvus Deflandre, 1954
Lanternithus minutus Stradner, 1962
Markalius inversus (Deflandre, 1954) Bramlette and Martini, 1964 (Plate 10, Figure 5)
Micrantholithus attenuatus Bramlette and Sullivan, 1961
Minilitha convallis Bukry, 1973 (Plate 1, Figure 21)
Nannotetrina cristata (Martini, 1958) Perch-Nielsen, 1971 (Plate 12, Figure 8)
Nannotetrina fulgens (Stradner, 1960) Stradner 1969
Nannotetrina pappii (Stradner, 1959) Perch-Nielsen, 1971
Neochiastozygus chiastus (Bramlette and Sullivan, 1961) Perch-Nielsen, 1971
Neochiastozygus concinnus Martini, 1961) Perch-Nielsen, 1971
Neochiastozygus distentus (Bramlette and Sullivan, 1961) Perch-Nielsen, 1971
Neochiastozygus junctus (Bramlette and Sullivan, 1961) Perch-Nielsen, 1971
Neococcolithes dubius (Deflandre, 1954) Black, 1967
Neococcolithes protenus (Bramlette and Sullivan, 1961) Perch-Nielsen, 1971
Peritrachelina joidesa Bukry and Bramlette, 1968
Pontosphaera discopora Schiller, 1925
Pontosphaera japonica (Takayama, 1967) n. comb.
Pontosphaera multipora (Kamptner, 1948) Roth, 1970 (Plate 1, Figure 19)
Pontosphaera ovata (Levin and Joerger, 1967) n. comb.
Pontosphaera pectinata (Bramlette and Sullivan, 1961) Proto Decima, Roth and Rodesco, 1975
Pontosphaera plana (Bramlette and Sullivan, 1961) Haq, 1971
Pontosphaera vigintiforata (Kamptner, 1948) n. comb.

TABLE 1 – *Continued*

Prinsius bisulcus (Stradner, 1963) Hay and Mohler, 1967
Reticulofenestra coenura (Reinhardt, 1966) Roth, 1970
Reticulofenestra hillae Bukry and Percival, 1971
Reticulofenestra lockeri Müller, 1970
Reticulofenestra oamaruensis (Deflandre, 1954) Stradner, 1968
Reticulofenestra pseudoumbilica (Gartner, 1967) Gartner, 1969 (Plate 2, Figure 8)
Reticulofenestra umbilica (Levin, 1965) Martini and Ritzkowski, 1968
Rhabdosphaera clavigera Murray and Blackman, 1898 (Plate 5, Figures 1, 2)
Rhabdosphaera inflata Bramlette and Sullivan, 1961
Rhabdosphaera perlonga (Deflandre, 1952) Bramlette and Sullivan, 1961
Rhabdosphaera procera Martini, 1969
Rhabdosphaera tenuis Bramlette and Sullivan, 1961
Rhomboaster cuspis Bramlette and Sullivan, 1961 (Plate 12, Figures 13-15)
Scapholithus fossilis Deflandre, 1954
Scyphosphaera amphora Deflandre, 1942 (Plate 3, Figure 5)
Scyphosphaera apsteinii Lohmann, 1902 (Plate 3, Figures 1, 8)
Scyphosphaera globulosa Kamptner 1955 (Plate 3, Figures 3, 4)
Scyphosphaera intermedia Deflandre, 1942 (Plate 3, Figures 6, 7)
Scyphosphaera pulcherrima Deflandre, 1942 (Plate 3, Figure 2)
Sphenolithus abies Deflandre, 1954 (Plate 1, Figure 17)
Sphenolithus anarrhopus Bukry and Bramlette, 1969
Sphenolithus belemnos Bramlette and Wilcoxon, 1967
Sphenolithus capricornutus Bukry and Percival, 1971
Sphenolithus ciperoensis Bramlette and Wilcoxon, 1967
Sphenolithus delphyx Bukry, 1973
Sphenolithus dissimilis Bukry and Percival, 1971
Sphenolithus distentus (Martini, 1965) Bramlette and Wilcoxon, 1967
Sphenolithus heteromorphus Deflandre, 1953 (Plate 1, Figures 10-12)
Sphenolithus moriformis (Brönnimann and Stradner, 1960) Bramlette and Wilcoxon, 1967 (Plate 1, Figure 16)
Sphenolithus neoabies Bukry and Bramlette, 1969
Sphenolithus orphanknollii Perch-Nielsen, 1971 (Plate 12, Figures 4, 5)
Sphenolithus predistentus Bramlette and Wilcoxon, 1967
Sphenolithus pseudoradians Bramlette and Wilcoxon, 1967
Sphenolithus radians Deflandre, 1952
Sphenolithus spiniger Bukry, 1971 (Plate 12, Figure 2)
Syracosphaera histrica Kamptner, 1941 (Plate 1, Figure 20)
Thoracosphaera operculata Bramlette and Martini, 1964
Thoracosphaera saxea Stradner, 1961 (Plate 2, Figure 7)
Toweius craticulus Hay and Mohler, 1967 (Plate 10, Figure 5)
Toweius eminens (Bramlette and Sullivan, 1961) Perch-Nielsen 1971
Transversopontis latus Müller, 1970
Tribrachiatus contortus (Stradner, 1958) Bukry, 1972
Tribrachiatus orthostylus Shamrai, 1963
Triquetrorhabdulus carinatus Martini, 1965
Triquetrorhabdulus inversus Bukry and Bramlette, 1969
Triquetrorhabdulus rugosus Bramlette and Wilcoxon, 1967 (Plate 5, Figure 12)
Umbilicosphaera mirabilis Lohmann, 1902 (Plate 1, Figure 18)
Zygodiscus sigmoides Bramlette and Sullivan, 1961
Zygrhablithus bijugatus (Deflandre, 1954) Deflandre, 1959
Zygrhablithus simplex Bramlette and Sullivan, 1961

MESOZOIC

Ahmuellerella octoradiata (Gorka, 1957) Reinhardt, 1966 (Plate 15, Figure 14)
Ahmuellerella sp. aff. *octoradiata* (Gorka, 1957) Reinhardt, 1966 (Plate 15, Figure 15)
Arkhangelskiella cymbiformis Vershina, 1959
Arkhangelskiella specillata Vershian, 1959
Biscutum constans (Gorka, 1957) Black, 1959 (Plate 15, Figure 1)
Braarudosphaera africana Stradner, 1961 (Plate 15, Figure 2)

TABLE 1 – *Continued*

Braarudosphaera bigelowii (Gran and Braarud, 1935) Deflandre 1947
Braarudosphaera discula Bramlette and Riedel, 1954
Broinsonia enormis (Shumenko, 1968) Manivit, 1971 (Plate 14, Figure 4)
Broinsonia lata (Noel, 1969) Noel, 1970 (Plate 15, Figure 3)
Broinsonia parca (Stradner, 1963) Bukry, 1969 (Plate 14, Figure 10)
Broinsonia signata (Noel, 1969) Noel, 1970
Chiastozygus cuneatus (Lyulyeva, 1967) Cepek and Hay, 1969
Chiastozygus litterarius (Gorka, 1957) Manivit, 1971
Corollithion achylosum (Stover, 1966) Thierstein, 1971
Corollithion signum Stradner, 1963
Crepidolithus thiersteinii Roth, 1973
Cretarhabdus conicus Bramlette and Martini, 1964
Cretarhabdus coronadventis Reinhardt, 1966 (Plate 14, Figure 8)
Cretarhabdus crenulatus Bramlette and Martini, 1964 emend. Thierstein, 1971 (Plate 16, Figure 2)
Cretarhabdus loriei Gartner, 1968
Cretarhabdus schizobrachiatus (Gartner, 1968) Bukry, 1969
Cretarhabdus surirellus (Deflandre, 1954) Reinhardt, 1970
Cribrosphaerella ehrenbergii (Arkhangelsky, 1912) Deflandre, 1952 (Plate 14, Figure 1)
Cruciellipsis chiastia (Worsley, 1971) Thierstein, 1972 (Plate 14, Figure 2)
Cylindralithus coronatus Bukry, 1969
Cylindralithus gallicus (Stradner, 1963) Bramlette and Martini, 1964
Cylindralithus serratus Bramlette and Martini, 1964
Cyclagelosphaera margerellii Noel, 1965
Diazomatolithus lehmanii Noel, 1965
Discorhabdus ignotus (Gorka, 1957) Perch-Nielsen, 1968
Eiffellithus anceps (Gorka, 1957) Reinhardt and Gorka, 1967 (Plate 15, Figure 17)
Eiffellithus eximius (Stover, 1966) Perch-Nielsen, 1968
Eiffellithus trabeculatus (Gorka, 1957) Reinhardt and Gorka, 1967
Eiffellithus turriseiffeli (Deflandre, 1954) Reinhardt, 1965
Gartnerago obliquum (Stradner, 1963) Reinhardt, 1970 (Plate 14, Figure 11)
Gartnerago striatum (Stradner, 1963) Forchheimer, 1972
Hayesites albiensis Manivit, 1971
Kamptnerius magnificus Deflandre, 1959 (Plate 14, Figure 12)
Lithastrinus grilli Stradner, 1962 (Plate 16, Figure 1)
Lithastrinus floralis Stradner, 1962 (Plate 16, Figures 7, 9)
Lithraphidites carniolensis Deflandre, 1963
Lithraphidites quadratus Bramlette and Martini, 1964 (Plate 13, Figures 8, 15, 16)
Lucianorhabdus cayeuxii Deflandre, 1959
Manivitella pemmatoidea (Deflandre, 1965) Thierstein, 1971 (Plate 14, Figure 7)
Markalius circumradiatus (Stover, 1966) Perch-Nielsen, 1968
Markalius inversus (Deflandre, 1954) Bramlette and Martini, 1964
Marthasterites furcatus (Deflandre, 1954) Deflandre, 1959
Micrantholithus hochschulzii (Reinhardt, 1966) Thierstein, 1971
Micrantholithus obtusus Stradner, 1963
Microrhabdulus decoratus Deflandre, 1959 (Plate 13, Figure 1)
Microrhabdulus stradneri Bramlette and Martini, 1964 (Plate 13, Figure 2; Plate 14, Figure 9)
Micula mura (Martini, 1961) Bukry, 1973 (Plate 13, Figures 5, 11-13)
Micula pyramida (Gardet, 1955) Thierstein, 1974
Micula staurophora (Gardet, 1955) Stradner, 1963 (Plate 13, Figures 7, 14)
Nannocomus truittii Broennimann, 1955 (Plate 16, Figures 3-6)
Parhabdolithus angustus (Stradner, 1963) Stradner, Adamiker and Maresch, 1968
Parhabdolithus asper (Stradner, 1963) Manivit, 1971 (Plate 14, Figures 3, 6)
Parhabdolithus embergeri (Noel, 1958) Stradner, 1963 (Plate 16, Figure 10)
Parhabdolithus splendens (Deflandre, 1953) Noel, 1969 (Plate 15, Figures 8, 16)
Podorhabdus albianus Black, 1967
Podorhabdus decorus (Deflandre, 1954) Thierstein, 1972
Podorhabdus dietzmannii (Reinhardt, 1965) Reinhardt, 1967
Prediscosphaera cretacea (Arkhangelsky, 1912) Gartner, 1968 (Plate 15, Figures 5, 9)
Prediscosphaera spinosa (Bramlette and Martini, 1964) Gartner, 1968
Reinhardtites anthoporus (Deflandre, 1959) Perch-Nielsen, 1968
Reinhardtites fenestratus (Worsley, 1971) Thierstein, 1972 (Plate 15, Figure 4)
Rucinolithus hayi Stover, 1966
Rucinolithus irregularis Thierstein, 1972
Rucinolithus sp. aff. *R. magnus* Bukry, 1975 (Plate 16, Figures 11, 12)
Stephanolithion laffittei Noel, 1970
Tegumentum stradneri Thierstein, 1972 (Plate 15, Figure 13)
Tetralithus aculeus (Stradner, 1961) Gartner, 1968
Tetralithus gothicus Deflandre, 1959 (Plate 13, Figure 3)
Tetralithus malticus Worsley, 1971
Tetralithus obscurus Deflandre, 1959
Tetralithus premurus Bukry, 1973 (Plate 13, Figures 4, 6)
Tetralithus quadratus Stradner, 1961
Tetralithus trifidus (Stradner, 1961) Bukry, 1973 (Plate 15, Figures 10, 11)
Tranolithus exiguus Stover, 1966 (Plate 14, Figure 5)
Tranolithus gabalus Stover, 1966
Tranolithus orionatus Stover, 1966 (Plate 15, Figure 6)
Vagalapilla matalosa (Stover, 1966) Thierstein, 1973 (Plate 15, Figure 7)
Vagalapilla stradneri Thierstein, 1972
Watznaueria barnesae (Black, 1959) Perch-Nielsen, 1968 (Plate 16, Figure 8)
Watznaueria biporta Bukry, 1969
Watznaueria britannica (Stradner, 1963) Reinhardt, 1964
Watznaueria oblonga Bukry, 1969
Watznaueria ovata Bukry, 1969 (Plate 15, Figure 12)
Zygodiscus diplogrammus (Deflandre, 1954) Gartner, 1968
Zygodiscus elegans Gartner, 1968
Zygodiscus spiralis Bramlette and Martini, 1964

Author: Thierstein (1971), Roth (1973).
Age: Upper Albian.

The upper limit of this zone was not detected in Leg 40. The *Lithraphidites alatus* and *Corollithion exiguum* zones, that should correspond to the Cenomanian and lower Turonian, were not recognized. Cenomanian and lower Turonian are therefore assumed to be absent at Sites 363 and 364. Another possibility would be the absence of Cenomanian and lower Turonian markers for ecological reasons.

Micula staurophora Zone

Definition: Interval from the first occurrence of *Micula staurophora* to the first occurrence of *Marthasterites furcatus.*
Author: Manivit (1971).
Age: Upper Turonian to lower Coniacian.

Marthasterites furcatus Zone

Definition: Interval from the first occurrence of *Marthasterites furcatus* to the first occurrence of *Broinsonia parca.*
Author: Cepek and Hay (1969), modified Perch-Nielsen (1977).
Age: Coniacian and Santonian.

This zone was recognized in Leg 40 at Sites 363 and 364, but a coring gap prevents establishing here the true ranges of *M. furcatus* and *B. parca.*

TABLE 2
Cretaceous Coccolith Zonation Used for Leg 40 Sites 361, 363, and 364

AGE			BIOHORIZONS	ZONE	SITE		
m. y.	STAGE		FIRST OCCURRENCE ↳ LAST OCCURRENCE ↱		361	363	364
65			Micula mura ↳	Micula mura		18/2 - 19cc	
	MAASTRICHTIAN		Lithraphidites quadratus ↳	Lithraphidites quadratus		20/1	
70			Tetralithus trifidus ↱	Arkhangelskiella cymbiformis		20/2 - 21/1	11/1 - 13/1
			Tetralithus trifidus ↳	Tetralithus trifidus		21/2 - 22cc	13/2 - 14cc
75	CAMPANIAN		Broinsonia parca ↳	Eiffellithus eximius		23/2 - 24cc	15/1 - 16cc
80	SANTONIAN		Marthasterites furcatus ↳	Marthasterites furcatus		25	17/1 - 23/3
85	CONIACIAN		Micula staurophora ↳	Micula staurophora			23/4
90	TURONIAN		Corollithion exiguum ↳	Corollithion exiguum			
95	CENOMANIAN		Lithraphidites alatus ↳	Lithraphidites alatus			
100	ALBIAN	U	Eiffellithus turriseiffeli ↳	Eiffellithus turriseiffeli		26 - 34/3	24/2 - 33cc
105		M L	Prediscosphaera cretacea ↳	Prediscosphaera cretacea	26	34cc - 38/2	34/1 - 41/2
110	APTIAN	U	Parhabdolithus angustus ↳	Parhabdolithus angustus	27/3 - 32/2	39 - 40	41/3 - 42cc
		L	Chiastozygus litterarius ↳	Chiastozygus litterarius	32/6 - 49/3		
115	BARREMIAN			Micrantholithus hoschulzii			

Eiffellithus eximius Zone

Definition: Interval from the first occurrence of *Broinsonia parca* to the first occurrence of *Tetralithus trifidus*.

Author: Roth (1973), modified this paper.

Age: Campanian.

This stratigraphic interval was subdivided by Bukry (1973) and Roth (1973) in *Eiffellithus eximius* (= *E. augustus* of Bukry) Zone, from the first *Broinsonia parca* to the last *Eiffellithus eximius*, and *Broinsonia parca* Zone from the last *Eiffellithus eximius* to the first *Tetralithus trifidus*. At Sites 363 and 364 the last occurrence of *Eiffellithus eximius* is above the first occurrence of *Tetralithus trifidus*. Thus the zone defined by Bukry and Roth as *Broinsonia parca* Zone is not applicable.

Tetralithus trifidus Zone

Definition: Interval from the first to the last occurrence of *Tetralithus trifidus*.

Author: Bukry and Bramlette (1970).

Age: Upper Campanian to lower Maestrichtian.

Arkhangelskiella cymbiformis Zone

Definition: Interval from the last occurrence of *Tetralithus trifidus* to the first occurrence of *Lithraphidites quadratus*.

Author: Perch-Nielsen (1972), modified Martini (1976).

Age: Lower to middle Maestrichtian.

Lithraphidites quadratus Zone

Definition: Interval from the first occurrence of *Lithraphidites quadratus* to the first occurrence of *Nephrolithus frequens* in high latitudes or *Micula mura* in low latitudes.

Author: Cepek and Hay (1969).

Age: Middle Maestrichtian.

Micula mura Zone

Definition: Interval from the first occurrence of *Micula mura* to the last occurrence of *Arkhangelskiella cymbiformis* and other Cretaceous species (Cretaceous extinction plane).

Author: Martini (1969).

Age: Upper Maestrichtian.

Tertiary-Quaternary

The subdivision of the Tertiary and Quaternary part of the stratigraphic sequences, the events on which they are based, and the age assignments of the cores sampled are reported in Tables 3A and 3B. The zonation used is very close to the standard zonation of Martini (1971). Where they seemed more reliable, some zones or subzones were replaced by those of Bukry (1973, 1975). Some minor changes in respect to Martini's zonation are also determined by the application of a different species nomenclature.

The correlations between Martini's standard zonation, the Bukry zones and subzones, and the zonation used in this report are shown in Tables 4A and 4B. In similar zonal correlations of the literature, the zones are often compared without consideration of their definitions which results in incorrect correlations. For instance, the Oligocene *Sphenolithus prdistentus*, *S. distentus*, and *S. ciperoensis* zones of Bukry have different definitions compared with the zones of the same names of Martini, and do not represent the same stratigraphic intervals.

Reference is made to Tables 3A and 3B for zonal sequences and boundaries used in this report. Some remarks on the major differences in comparison with the Martini and Bukry zonations are made in the following.

Lower Paleocene was recovered in Leg 40 at Sites 361, 363, and 364, but in none of them could the fine biostratigraphic subdivision of Martini be applied. It had to be replaced by a *Cruciplacolithus tenuis* Zone extending from the Cretaceous extinction plane to the first occurrence of *Fasciculithus tympaniformis*.

The use of the *Discoaster nobilis* Zone of Bukry instead of the *Heliolithus riedelii* Zone of Martini was preferred because the appearance of *H. riedelii* occurs in Site 363 before the first discoasters in the *Heliolithus kleinpellii* Zone. *H. riedelii* is very common in the *Discoaster nobilis* Zone at Site 363.

The lower Eocene nannofloras are characterized by the sudden appearance and rapid evolution of the "*Tribrachiatus*" group of which *Rhomboaster cuspis* Bramlette and Sullivan (= *Marthasterites bramlettei* Brönnimann and Stradner, 1960) represents the first stage. The *Tribrachiatus contortus* Zone as used here is thus the same as the *Marthasterites contortus* Zone of Martini. Bukry uses for the lower boundary of this zone the first occurrence of *Discoaster diastypus*. At Sites 361 and 363 *Rhomboaster cuspis* and *Discoaster diastypus* occur first at the same level. Instead at Site 364, and in some land sections such as the Lodo Formation (Bramlette and Sullivan, 1961), and the Pederobba and Possagno sections (Proto Decima, 1966; Proto Decima et al., 1975), the first *Discoaster diastypus* occur slightly above the *Rhomboaster cuspis* appearance.

Bukry's zonation was employed for the subdivision of the middle Eocene. The *Nannotetrina fulgens* Zone as used in this report is the same as the *Nannotetrina quadrata* Zone of Bukry and much more extended than the *Chiphragmalithus alatus* Zone of Martini. The absence of *Rhabdosphaera gladius* in the investigated sections prevents recognition of the *Discoaster tanii nodifer* Zone of Martini. The first appearance of *Reticulofenestra umbilica* is here considered more reliable than the last occurrence of *Chiasmolithus solitus*. The range of this latter species overlaps at Site 360 with *Chiasmolithus oamaruensis*.

For the upper Eocene, Oligocene, and Miocene the zonation used corresponds to the standard zonation of Martini. The *Sphenolithus predistentus* Zone as defined by Bukry (1973) is not present at Sites 362A and 363 and also not in some land sections, where the ranges of *Reticulofenestra umbilica* and *Sphenolithus distentus* are overlapping. In the upper Miocene the first occurrence of *Amaurolithus primus* and *A. delicatus* was considered as in Bukry's zonation to subdivide the *Discoaster quinqueramus* Zone.

For the Pliocene and Pleistocene the zonation used is a compromise between the zonations of Martini and Bukry. The *Emiliania ovata* Zone corresponds to the

TABLE 3A
Pleistocene-Middle Oligocene Coccolith Zonation Used for Leg 40 Sites 360, 361, 362, 362A, 363, and 364

AGE			BIOHORIZONS	ZONE		SITE				
M.Y.	EPOCH		FIRST LAST			360	361	362 362A	363	364
	PLEISTOCENE		Emiliania ovata	Emiliania huxleyi/ Gephyrocapsa oceanica				1		1/1 - 1/6
			Discoaster brouweri	Emiliania ovata				2 - 5/4 5/6 - 10/3		1cc
	PLIOCENE	U	Reticulofenestra pseudoumbilica	Discoaster brouweri				10/6 - 11/2		2/2 - 2cc
		L	Amaurolithus primus, A. delicatus, A. tricorniculatus	Reticulofenestra pseudoumbilica				11/3 - 13/6		3/1 - 3/2
			Ceratolithus rugosus	Ceratolithus rugosus						3/3 - 3/6
5			Ceratolithus acutus	Amaurolithus tricorniculatus	Ceratolithus acutus	1/1 - 2/6		13cc - 14/6		3cc
	MIOCENE	U	Discoaster quinqueramus		Triquetrorhabdulus rugosus	2cc - 3/3		14cc - 19/2		
			Amaurolithus primus	Discoaster quinqueramus	Amaurolithus primus	3/4 - 10/3		19/3 - 24/3		
			Discoaster quinqueramus Discoaster berggrenii		Discoaster berggrenii	10cc - 12cc		24/4 - 26/3		4/2 - 4/4
10			Discoaster hamatus	Discoaster calcaris		13/1 - 14/2		26/4 - 29/4		4/5
			Discoaster hamatus	Discoaster hamatus		14/4 - 15cc		29/5 - 31/3	1/1 top - 1/1 (11 - 12)	4/6 - 4cc
		M	Catinaster coalitus	Catinaster coalitus		16/2 - 17cc		31/4 - 32/1		
			Discoaster kugleri	Discoaster kugleri		18/2 - 20/4		32/2 - 33/5		
			Sphenolithus heteromorphus	Discoaster exilis		20cc - 21/3		33/6 - 34	1/2 (9 - 10) - 1/4 (9 - 10)	
15			Helicosphaera ampliaperta	Sphenolithus heteromorphus				35 - 36/2		
		L	Sphenolithus belemnos	Helicosphaera ampliaperta				36/3 - 37		5/3 - 5cc
			Sphenolithus heteromorphus Triquetrorhabdulus carinatus	Sphenolithus belemnos		21/5 - 24cc		38		
20			Discoaster druggii	Discoaster druggii				39 - 40	1/4 (101 - 103) - 1cc	
	OLIGOCENE	U	Sphenolithus ciperoensis Helicosphaera recta	Triquetrorhabdulus carinatus		25/1 - 28/2		41 - 43		
25			Sphenolithus distentus	Sphenolithus ciperoensis		28/3 - 29		44	2/2 - 3/2	
30			Sphenolithus ciperoensis	Sphenolithus distentus		30/2 - 32/3		2A - 3A	3/5 - 5/2	
		M	Reticulofenestra umbilica	Sphenolithus predistentus				4A - 5A/2	5/5 - 6/4	

NP 14 *Pseudoemiliania lacunosa* Zone of Martini. The name of the zone was changed because of the taxonomic revision by Bukry (1975). Because of the difficulty of recognizing *Emiliania huxleyi* in the light microscope, the *Gephyrocapsa oceanica* and *Emiliania huxleyi* zones were combined.

SITE 360
Cape Basin (lat 35°50.75'S, long 18°05.79'E, water depth 2949 m)

Abundant nannofossil assemblages ranging in age from the lower Pliocene *Ceratolithus acutus* Subzone to

TABLE 3B
Middle Oligocene-Paleocene Coccolith Zonation Used for Leg 40 Sites 360, 361, 362, 362A, 363, and 364

AGE			BIOHORIZONS		ZONE	SITE				
M.Y.	EPOCH		FIRST ↳ LAST ↱			360	361	362 362A	363	364
	OLIGOCENE	M	Sphenolithus ciperoensis	↳	Sphenolithus distentus	30/2 - 32/3		2A - 3A	3/5 - 5/2	
			Reticulofenestra umbilica	↱	Sphenolithus predistentus			4A - 5A/2	5/5 - 6/4	
35		L	Cyclococcolithus formosus	↱	Helicosphaera reticulata	32/4 - 32cc		5A/3 - 5Acc	6cc - 8/2	
			Discoaster saipanensis Discoaster barbadiensis	↱	Ericsonia subdisticha	33 - 35/3		6A/1 - 6A/4	8cc - 9/2	
40	EOCENE	U	Sphenolithus pseudoradians	→	Sphenolithus pseudoradians	35cc - 37/2	1/1 - 2/2	6A/5 - 8A	9/3	
			Isthmolithus recurvus	↳	Isthmolithus recurvus	37/3 - 39/2			9/4 - 10/2	
		M	Chiasmolithus oamaruensis	↳	Chiasmolithus oamaruensis	39/2 - 40cc	2cc		10/3	
45			Reticulofenestra umbilica	↳	Reticulofenestra umbilica	41 - 47cc		9A - 10A/1	10/4 - 10cc	
			Nannotetrina fulgens	↳	Nannotetrina fulgens	48 - 50cç	4cc - 5cc	10A/2 - 11A	11	7cc
		L	Discoaster sublodoensis	↳	Discoaster sublodoensis		6/1 - 7cc	12A	12	8/1 - 8/3
50			Tribrachiatus orthostylus	↱	Discoaster lodoensis		8/0 top		13/1	8/4
			Discoaster lodoensis	↳	Tribrachiatus orthostylus				13/2 - 13cc	8/5 - 8cc
			Tribrachiatus contortus	↱	Discoaster binodosus		8/0 (9 - 10) - 8/1		14/1 - 14/2	
			Rhomboaster cuspis	↳	Tribrachiatus contortus		8/2 - 8cc		14/3 - 14cc	9/1 - 9cc
55	PALEOCENE	U	Discoaster multiradiatus	↳	Discoaster multiradiatus		9/2		15/1 - 15/3	
			Discoaster nobilis	↳	Discoaster nobilis		9/3		15cc	
		M	Discoaster mohleri	↳	Discoaster mohleri					
			Heliolithus kleinpellii	↳	Heliolithus kleinpellii				16/1 - 17cc	10/1
			Fasciculithus tympaniformis	↳	Fasciculithus tympaniformis					10/2 - 10/5
60		L	Cretaceous extinction plane	↱	Cruciplacolithus tenuis		10/2		18/1 - 18/2 (39 - 40)	10/6 - 10cc
65	CRETACEOUS				Micula mura				18/2(42-44)-19	

the middle Eocene *Nannotetrina fulgens* Zone were encountered at this site. The stratigraphic distribution of the calcareous nannofossils and some additional information on the abundance and preservation of the assemblages are shown in Tables 5A, 5B, and 5C.

Discoasters are rare in the lower Pliocene and lower Oligocene, frequent in the remainder of the section, and particularly well preserved in the Miocene; the rosette *Discoaster barbadiensis*, however, is generally scarce in the upper Eocene. *Chiasmolithus oamaruensis* and

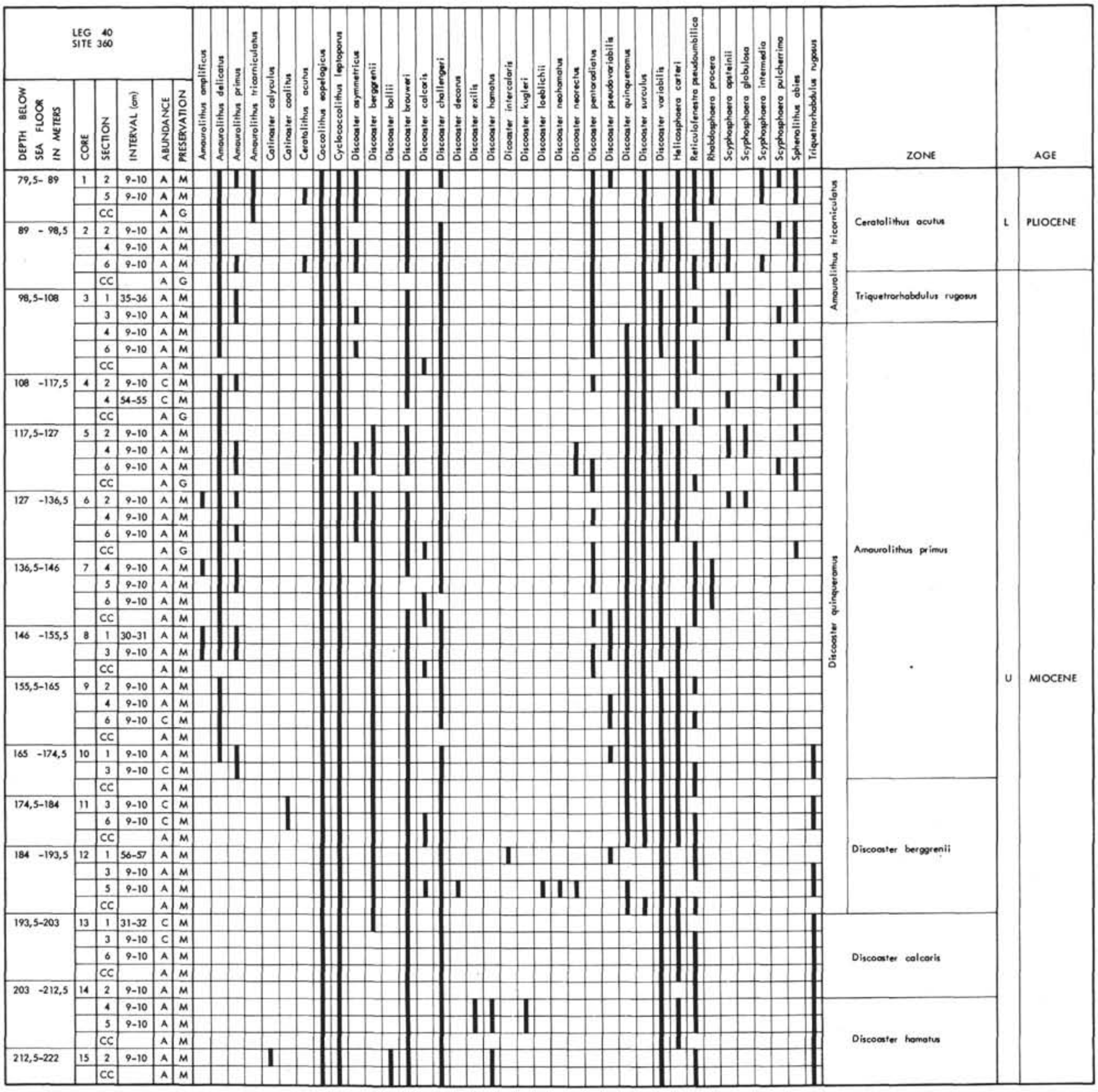
TABLE 4A
Correlation of the Pleistocene-Middle Oligocene Coccolith Zonation Used in This Report with the Standard Nannoplankton Zonation of Martini (1971) and the Nannoplankton Zones and Subzones of Bukry (1973, 1975)

AGE			ZONATION USED IN LEG 40		STANDARD NANNOPLANKTON ZONATION OF MARTINI (1971)		NANNOPLANKTON ZONES AND SUBZONES OF BURKY (1973, 1975)	
M.Y.	EPOCH							
	PLEISTOCENE		Emiliania huxleyi / Gephyrocapsa oceanica		NN21	E. huxleyi	E. huxleyi	
					NN20	G. oceanica	G. oceanica	C. cristatus
								E. ovata
			Emiliania ovata		NN19	P. lacunosa	C. doronicoides	G. carribeanica
								E. annula
	PLIOCENE	U	Discoaster brouweri		NN18	D. brouweri	D. brouweri	C. macintyrei
					NN17	D. pentaradiatus		D. pentaradiatus
					NN16	D. surculus		D. surculus
								D. tamalis
		L	Reticulofenestra pseudoumbilica		NN15	R. pseudoumbilica	R. pseudoumbilica	D. asymmetricus
			Ceratolithus rugosus		NN14	D. asymmetricus	C. tricorniculatus	S. neoabies
					NN13	C. rugosus		C. rugosus
			Amaurolithus tricorniculatus	C. acutus	NN12	C. tricorniculatus		C. acutus
5	MIOCENE	U		T. rugosus				T. rugosus
			Discoaster quinqueramus	Amaurolithus primus	NN11	D. quinqueramus	D. quinqueramus	C. primus
				Discoaster berggrenii				D. berggrenii
10			Discoaster calcaris		NN10	D. calcaris	D. neohamatus	D. neorectus
								D. bellus
			Discoaster hamatus		NN 9	D. hamatus	D. hamatus	C. calyculus
		M						H. kamptneri
			Catinaster coalitus		NN 8	C. coalitus	C. coalitus	
			Discoaster kugleri		NN 7	D. kugleri	D. exilis	D. kugleri
			Discoaster exilis		NN 6	D. exilis		C. miopelagicus
15			Sphenolithus heteromorphus		NN 5	S. heteromorphus	S. heteromorphus	
		L	Helicosphaera ampliaperta		NN 4	H. ampliaperta	H. ampliaperta	
			Sphenolithus belemnos		NN 3	S. belemnos		
20			Discoaster druggii		NN 2	D. druggii	S. belemnos	
							T. carinatus	D. druggii
			Triquetrorhabdulus carinatus		NN 1	T. carinatus		D. deflandrei
	OLIGOCENE	U						C. abisectus
25			Sphenolithus ciperoensis		NP25	S. ciperoensis	S. ciperoensis	D. bisectus
30		M	Sphenolithus distentus		NP24	S. distentus		C. floridanus
			Sphenolithus predistentus		NP23	S. predistentus	S. distentus	
							S. predistentus	

TABLE 4B
Correlation of the Middle Oligocene-Paleocene Coccolith Zonation Used in This Report with the Standard Nannoplankton Zonation of Martini (1971) and the Nannoplankton Zones and Subzones of Bukry (1973, 1975)

AGE			ZONATION USED IN LEG 40	STANDARD NANNOPLANKTON ZONATION OF MARTINI (1971)		NANNOPLANKTON ZONES AND SUBZONES OF BUKRY (1973, 1975)	
M.Y.	EPOCH						
	OLIGOCENE	M	Sphenolithus distentus	NP24	S. distentus	S. ciperoensis	C. floridanus
			Sphenolithus predistentus	NP23	S. predistentus	S. distentus S. predistentus	
35		L	Helicosphaera reticulata	NP22	H. reticulata	H. reticulata	R. hillae
			Ericsonia subdisticha	NP21	E. subdisticha		C. formosus C. subdistichus
40	EOCENE	U	Sphenolithus pseudoradians	NP20	S. pseudoradians	D. barbadiensis	I. recurvus
			Isthmolithus recurvus	NP19	I. recurvus		
			Chiasmolithus oamaruensis	NP18	C. oamaruensis		C. oamaruensis
45		M	Reticulofenestra umbilica	NP17	D. saipanensis	R. umbilica	D. saipanensis D. bifax
			Nannotetrina fulgens	NP16	D. tani nodifer	N. quadrata	C. staurion C. gigas
				NP15	C. alatus		D. strictus
			Discoaster sublodoensis	NP14	D. sublodoensis	D. sublodoensis	R. inflata D. kuepperi
50		L	Discoaster lodoensis	NP13	D. lodoensis	D. lodoensis	
			Tribrachiatus orthostylus	NP12	M. tribrachiatus	T. orthostylus	
			Discoaster binodosus	NP11	D. binodosus	D. diastypus	D. binodosus
			Tribrachiatus contortus	NP10	M. contortus		T. contortus
55	PALEOCENE	U	Discoaster multiradiatus	NP 9	D. multiradiatus	D. multiradiatus	C. eodela C. bidens
			Discoaster nobilis	NP 8	H. riedelii	D. nobilis	
		M	Discoaster mohleri	NP 7	D. gemmeus	D. mohleri	
			Heliolithus kleinpellii	NP 6	H. kleinpellii	H. kleinpellii	
			Fasciculithus tympaniformis	NP 5	F. tympaniformis	F. tympaniformis	
60		L	Cruciplacolithus tenuis	NP 4	E. macellus	C. tenuis	
				NP 3	C. danicus		
				NP 2	C. tenuis		
				NP 1	M. inversus		
65	CRETACEOUS						

TABLE 5A
Distribution of Pliocene-Upper Miocene Calcareous Nannofossils at Site 360

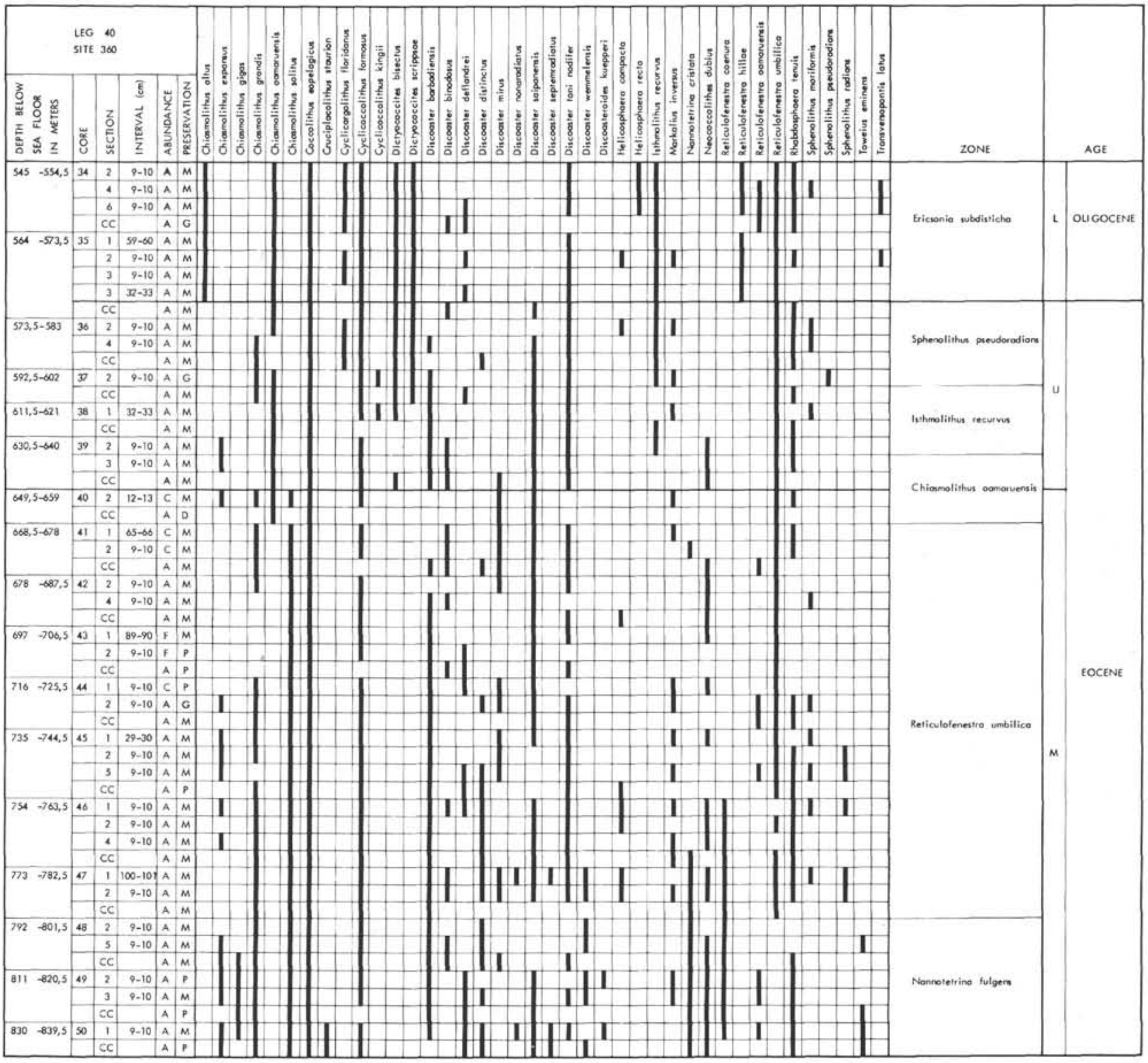


Isthmolithus recurvus are very abundant in Cores 34, 35, and 36 of upper Eocene and lower Oligocene age; *Neococcolithes dubius* is very frequent in the middle Eocene part of the sequence. The abundance here of these forms, which are extremely rare or absent in tropical waters, and the general scarcity of the genus *Sphenolithus* and *Discoaster barbadiensis*, furnish indications of temperate water conditions. The range of *Chiasmolithus oamaruensis* in this sequence differs from that of the Mediterranean regions and is the same as known for New Zealand. Characteristic is the total absence of near shore indicators such as *Braarudosphaera*, *Micrantholithus*, *Pemma*. In the middle/lower Oligocene the abundance of the holococcolith *Zygrhablithus bijugatus* seems to suggest a basin less than 1000 meters deep.

In the Oligocene the absence of *Sphenolithus ciperoensis* prevents separating the *Sphenolithus distentus* and *Sphenolithus predistentus* zones. A detailed zonation was not possible for the lower Miocene. *Sphenolithus belemnos* and *S. heteromorphus* have their last occurrence at the same level (Core 21, Section 6); the *Helicosphaera ampliaperta* and *Sphenolithus heteromorphus* zones cannot be recognized therefore and are probably missing. A sedimentary gap between the lower and middle Miocene is therefore possible.

The Miocene-Pliocene boundary by means of paleomagnetic correlations is dated at 5.2 m.y. (Ryan, Cita, et al., 1974), the first *Ceratolithus acutus* at 4.9 m.y. Thus the Miocene-Pliocene boundary at this site, according to nannoplankton is placed in Core 3. The

TABLE 5B
Distribution of Middle Miocene-Lower Oligocene Calcareous Nannofossils at Site 360



DEPTH BELOW SEA FLOOR IN METERS	CORE	SECTION	INTERVAL (cm)	ABUNDANCE	PRESERVATION	ZONE	AGE	
545 -554,5	34	2	9-10	A	M	Ericsonia subdisticha	L	OLIGOCENE
		4	9-10	A	M			
		6	9-10	A	M			
		CC		A	G			
564 -573,5	35	1	59-60	A	M			
		2	9-10	A	M			
		3	9-10	A	M			
		3	32-33	A	M			
		CC		A	M	Sphenolithus pseudoradians	U	EOCENE
573,5-583	36	2	9-10	A	M			
		4	9-10	A	M			
		CC		A	M			
592,5-602	37	2	9-10	A	G			
		CC		A	M	Isthmolithus recurvus		
611,5-621	38	1	32-33	A	M			
		CC		A	M			
630,5-640	39	2	9-10	A	M			
		3	9-10	A	M	Chiasmolithus oamaruensis		
		CC		A	M			
649,5-659	40	2	12-13	C	M		M	
		CC		A	D			
668,5-678	41	1	65-66	C	M	Reticulofenestra umbilica		
		2	9-10	C	M			
		CC		A	M			
678 -687,5	42	2	9-10	A	M			
		4	9-10	A	M			
		CC		A	M			
697 -706,5	43	1	89-90	F	M			
		2	9-10	F	P			
		CC		A	P			
716 -725,5	44	1	9-10	C	P			
		2	9-10	A	G			
		CC		A	M			
735 -744,5	45	1	29-30	A	M			
		2	9-10	A	M			
		5	9-10	A	M			
		CC		A	P			
754 -763,5	46	1	9-10	A	M			
		2	9-10	A	M			
		4	9-10	A	M			
		CC		A	M			
773 -782,5	47	1	100-101	A	M			
		2	9-10	A	M			
		CC		A	M			
792 -801,5	48	2	9-10	A	M	Nannotetrina fulgens		
		5	9-10	A	M			
		CC		A	M			
811 -820,5	49	2	9-10	A	P			
		3	9-10	A	M			
		CC		A	P			
830 -839,5	50	1	9-10	A	M			
		CC		A	P			

Oligocene-Miocene boundary falls between the last occurrence of *Helicosphaera recta* in Core 28, Section 3 and the first occurrence of *Discoaster druggii* in Sample 24, CC. The Eocene-Oligocene boundary, marked by the last occurrence of *Discoaster saipanensis* is placed in Core 35 between Section 3 and the core catcher. Frequent *Nannotetrina cristata* and *Chiasmolithus gigas*, suggesting a middle Eocene age, characterize the assemblages at the bottom of the site. Typical *Nannotetrina fulgens* are not present at this site.

SITE 361
Cape Basin (lat 35°03.97'S, long 15°26.91'E, water depth 4549 m)

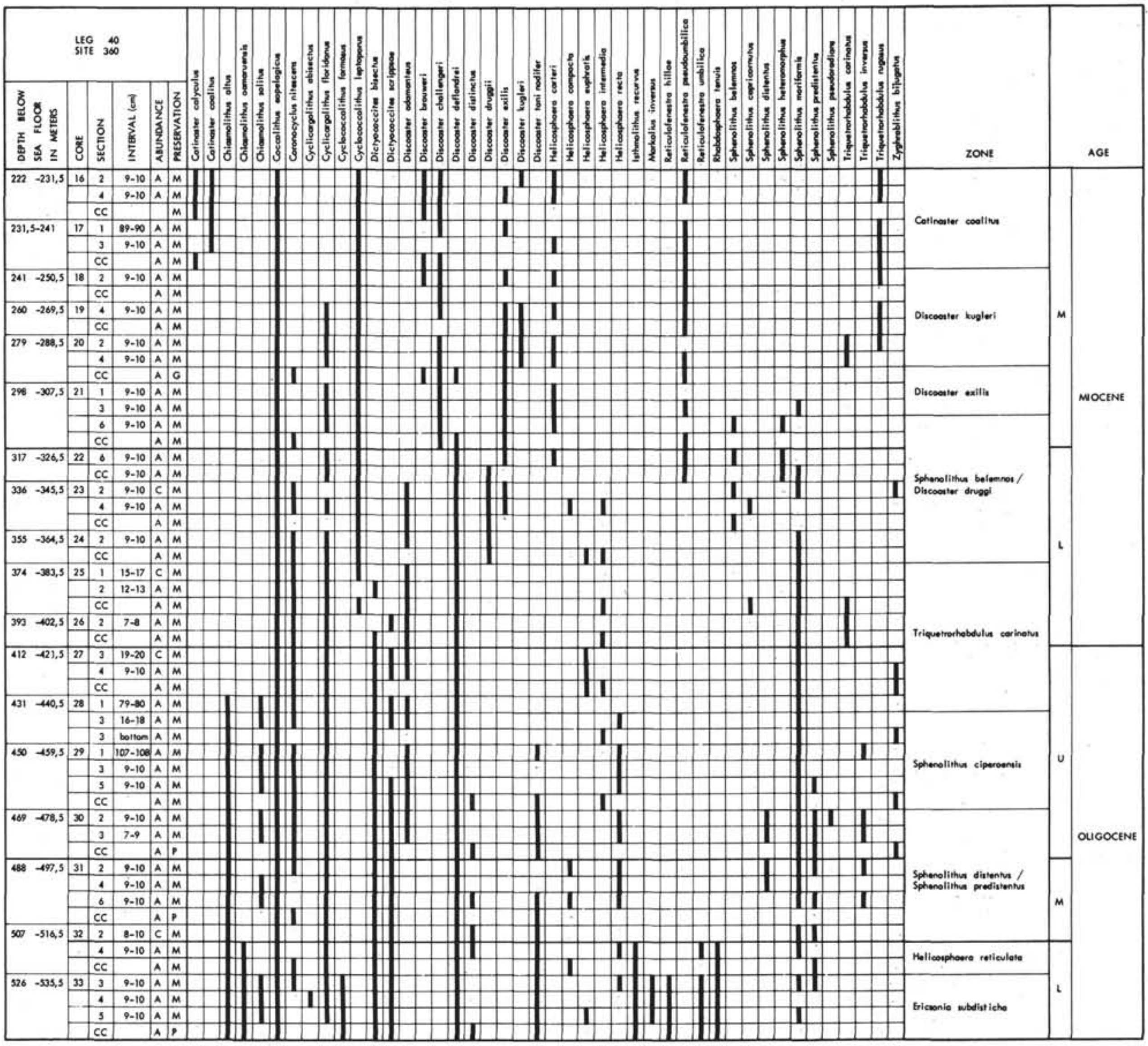
Nannofossil assemblages of upper Eocene to lower Paleocene and middle Albian to lower Aptian age occur at this site.

The stratigraphic distribution of the nannofossils and information on abundance and preservation of the assemblages are shown on Tables 6 and 7.

Poorly preserved upper Eocene nannofossils are present in Cores 1 and 2. The absence of *Sphenolithus pseudoradians* does not allow us to distinguish between the *Isthmolithus recurvus* and *Sphenolithus pseudoradians* zones.

Cores 3 and 4 are barren. Sample 4, CC to Core 7 contain moderately preserved middle Eocene assemblages. In Sample 4, CC and Core 5 the presence of *Rhabdosphaera inflata* above the first *Nannotetrina fulgens* and *Chiasmolithus gigas* and the abundance of *Discoaster sublodoensis* suggest mixed assemblages between the *Nannotetrina fulgens* and *Discoaster sublodoensis* zones. The middle-lower Eocene *Discoaster sublodoensis* Zone is present in Core 7. The

TABLE 5C
Distribution of Lower Oligocene-Middle Eocene Calcareous Nannofossils at Site 360



DEPTH BELOW SEA FLOOR IN METERS	CORE	SECTION	INTERVAL (cm)	ABUNDANCE	PRESERVATION	ZONE	AGE	
222 -231,5	16	2	9-10	A	M	Catinaster coalitus	M	MIOCENE
		4	9-10	A	M			
		CC			M			
231,5-241	17	1	89-90	A	M			
		3	9-10	A	M			
		CC		A	M			
241 -250,5	18	2	9-10	A	M	Discoaster kugleri		
		CC		A	M			
260 -269,5	19	4	9-10	A	M			
		CC		A	M			
279 -288,5	20	2	9-10	A	M			
		4	9-10	A	M			
		CC		A	G	Discoaster exilis		
298 -307,5	21	1	9-10	A	M			
		3	9-10	A	M			
		6	9-10	A	M	Sphenolithus belemnos / Discoaster druggi		
		CC		A	M			
317 -326,5	22	6	9-10	A	M		L	
		CC	9-10	A	M			
336 -345,5	23	2	9-10	C	M			
		4	9-10	A	M			
		CC		A	M			
355 -364,5	24	2	9-10	A	M			
		CC		A	M			
374 -383,5	25	1	15-17	C	M	Triquetrorhabdulus carinatus		
		2	12-13	A	M			
		CC		A	M			
393 -402,5	26	2	7-8	A	M			
		CC		A	M			
412 -421,5	27	3	19-20	C	M		U	OLIGOCENE
		4	9-10	A	M			
		CC		A	M			
431 -440,5	28	1	79-80	A	M			
		3	16-18	A	M			
		3	bottom	A	M	Sphenolithus ciperoensis		
450 -459,5	29	1	107-108	A	M			
		3	9-10	A	M			
		5	9-10	A	M			
		CC		A	M			
469 -478,5	30	2	9-10	A	M	Sphenolithus distentus / Sphenolithus predistentus		
		3	7-9	A	M			
		CC		A	P			
488 -497,5	31	2	9-10	A	M		M	
		4	9-10	A	M			
		6	9-10	A	M			
		CC		A	P			
507 -516,5	32	2	8-10	C	M			
		4	9-10	A	M	Helicosphaera reticulata	L	
		CC		A	M			
526 -535,5	33	3	9-10	A	M	Ericsonia subdisticha		
		4	9-10	A	M			
		5	9-10	A	M			
		CC		A	P			

interval top of Core 8 to Core 9, Section 2 represents a complete but strongly condensed sequence of lower Eocene to upper Paleocene nannoplankton zones. A problematic oval-shaped nannofossil (Plate 2, Figures 9-12) is frequent in the *Discoaster binodosus* Zone and, from present observations, seems to be limited to it. It was also found at Site 362 in a Pleistocene-Pliocene sample containing a reworked nannoflora of the *Discoaster binodosus* Zone. A very interesting evolution of the *Tribrachiatus* group is recorded in Core 8. A barren interval in the lower part of Core 9 separates the upper Paleocene from the lower Paleocene *Cruciplacolithus tenuis* Zone, present in Core 10, Section 2. Contamination from above and barren samples characterize the lower part of Core 10 and Core 11. Cores 12 to 25, which are not included in Table 7, contain very rare, small *Watznaueria* that only allow for a general Cretaceous dating. The *Prediscosphaera cretacea*, *Parhabdolithus angustus*, and *Chiastozygus litterarius* zones of middle Albian to lower Aptian age have been recognized in the poor nannoflora associations from Core 26 to the bottom of the hole. The concurrence of *Chiastozygus litterarius* and *Micrantholithus hoschulzii* from Core 33 down is indicative of the lower Aptian *Chiastozygus litterarius* Zone.

From a paleoecological point of view, the abundance of *Isthmolithus recurvus* in the upper Eocene and *Neococcolithes dubius* in the middle and lower Eocene and in the upper Paleocene indicates temperate to cold water conditions for the Tertiary part of the section. The presence of barren intervals, heavily etched coccoliths, concentration of solution-resistant species, and the strong condensation of the lower Eocene sequence suggest deposition near the base of the carbonate compensation depth or a slow burying of organic remains. As far as the Cretaceous paleoecology of Site 361 is concerned, some conclusions can be drawn from the presence of *Micrantholithus hoschulzii*

TABLE 6
Distribution of Eocene-Paleocene Calcareous Nannofossils at Site 361

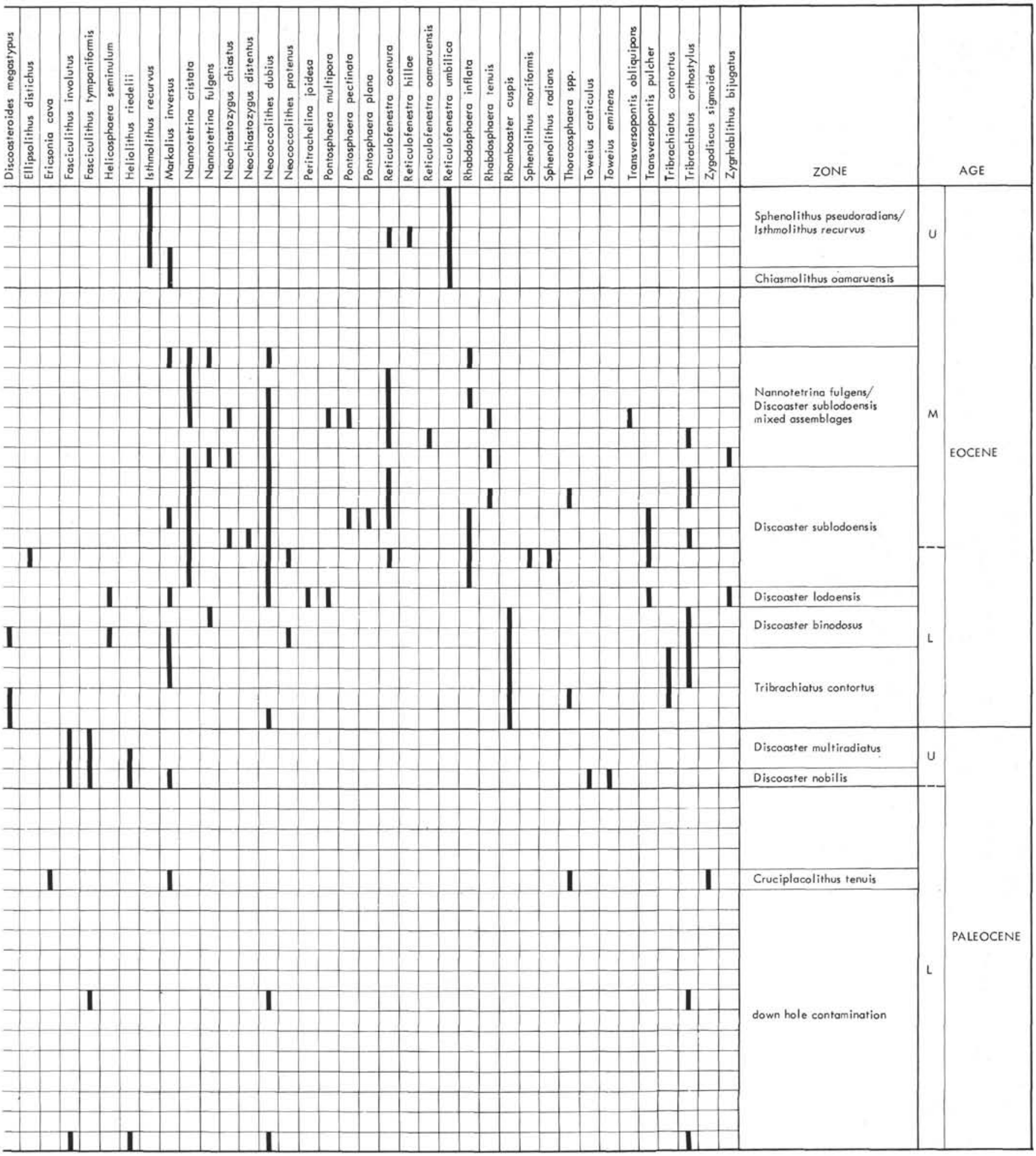
LEG 40 SITE 361 DEPTH BELOW SEA FLOOR IN METERS	CORE	SECTION	INTERVAL (cm)	ABUNDANCE	PRESERVATION	Blackites spinulus	Chiasmolithus californicus	Chiasmolithus consuetus	Chiasmolithus danicus	Chiasmolithus expansus	Chiasmolithus gigas	Chiasmolithus grandis	Chiasmolithus oamaruensis	Chiasmolithus solitus	Chiphragmalithus calathus	Coccolithus eopelagicus	Cruciplacolithus staurion	Cruciplacolithus tenuis	Cyclicargolithus floridanus	Cyclococcolithus formosus	Cyclococcolithus kingii	Cyclolithella robusta	Dictyococcites bisectus	Dictyococcites scrippsae	Discoaster barbadiensis	Discoaster binodosus	Discoaster delicatus	Discoaster diastypus	Discoaster distinctus	Discoaster elegans	Discoaster incomptus	Discoaster lenticularis	Discoaster lodoensis	Discoaster mirus	Discoaster mohleri	Discoaster multiradiatus	Discoaster nobilis	Discoaster nonaradiatus	Discoaster saipanensis	Discoaster salisburgensis	Discoaster septemradiatus	Discoaster sublodoensis	Discoaster tanii	Discoaster tanii nodifer	Discoasteroides kuepperi
31,5- 41	1	1	9-10	A	P											▮				▮			▮	▮							▮												▮	▮	
		3	9-10	A	P											▮				▮			▮	▮	▮	▮					▮									▮				▮	▮	
		CC		A	M								▮			▮				▮	▮		▮	▮		▮					▮									▮				▮	▮	
60 - 69,5	2	2	9-10	A	P											▮				▮			▮	▮	▮															▮						
		CC		A	P								▮	▮		▮			▮	▮			▮	▮					▮															▮		
98 -107,5	3	1	9-10																																										
		CC																																											
136 -145,5	4	1	46-47																																										
		CC		A	M							▮		▮	▮	▮			▮	▮					▮					▮			▮					▮	▮		▮	▮			
174 -183,5	5	1	9-10	C	P							▮		▮		▮																	▮					▮				▮			
		4	9-10	A	M							▮		▮		▮				▮					▮				▮				▮									▮			
		5	9-10	C	M					▮		▮		▮		▮				▮									▮	▮								▮	▮			▮			
		6	9-10	A	P					▮		▮		▮		▮				▮					▮				▮	▮			▮	▮								▮			▮
		CC		A	M						▮	▮		▮		▮	▮			▮					▮			▮	▮	▮			▮	▮				▮	▮			▮			▮
202,5-212	6	1	108-109	A	M					▮		▮		▮		▮				▮					▮				▮	▮			▮					▮	▮			▮			
		2	9-10	A	M					▮		▮		▮		▮				▮					▮				▮	▮			▮	▮				▮	▮			▮			
		3	9-10	A	M	▮				▮		▮		▮	▮	▮				▮									▮	▮												▮			
		CC		A	M			▮				▮		▮		▮				▮									▮	▮			▮					▮				▮			
231 -240,5	7	1	69-70	A	M					▮		▮		▮		▮				▮									▮	▮			▮	▮				▮			▮	▮			
		CC		A	M							▮		▮		▮													▮													▮			
250 -259,5	8	0	top	A	M					▮		▮		▮		▮											▮						▮												
		0	9-10	A	M									▮																															
		1	47-48	A	M			▮				▮				▮												▮								▮				▮					
		2	60-61	A	M																						▮	▮				▮				▮				▮					
		5	91-92	A	M																					▮		▮								▮				▮					
		6	8-10	A	P																					▮	▮	▮				▮			▮	▮				▮					
		CC		A	M									▮														▮								▮	▮			▮					
259,5-269	9	2	top	A	P		▮															▮					▮									▮	▮								
			9-10	A	P																	▮					▮					▮			▮	▮									
		3	12-13	A	P		▮															▮										▮			▮		▮								
		4	9-10																																										
		5	9-10																																										
		6	9-10																																										
		CC																																											
269 -278,5	10	2	9-10	A	M				▮									▮																											
		3	9-10																																										
		4	top	R	M																															▮				▮					
		4	9-10																																										
		5	9-10																																										
		6	9-10																																										
		CC		C	P											▮																				▮	▮	▮							
278,5-288	11	1	52-54																																										
		2	9-10																																										
		3	9-10																																										
		4	9-10																																										
		5	9-10																																										
		6	9-10																																										
		CC		F	M																						▮									▮	▮								

which is considered a temperate species. Unusual associations with floods of *Cyclagelosphaera margerelii* were found in Samples 33-3 , 46 cm and in 37-1, 101 cm. According to Thierstein (1973) this species favored shallow water and platform conditions or a reducing marine environment. All the coccoliths present are solution-resistant species. This fact associated with the occurrence of many barren samples and the dark color (carbonaceous nature) of the sediments indicates bottom conditions unfavorable for coccolith preservation.

HOLES 362 AND 362A
Walvis Ridge (lat 19°45.45′S, long 10°31.95′E, water depth 1325 m)

Sites 362 and 362A, on the Abutment Plateau of the Walvis Ridge, together provide a stratigraphic sequence ranging from Pleistocene to lower Eocene. A

TABLE 6 – *Continued*



total of 56 cores was obtained, of which 44 were drilled at Site 362 and 12 in the complementary Site 362A. Calcareous nannofossils are abundant throughout the section. Their stratigraphic distribution and additional data on the abundance and preservation of the assemblages are shown in Tables 8A, 8B, and 9.

The upper part of the section from Core 1 to Core 5, Section 4 is referred to the combined Pleistocene *Emiliania huxleyi*/*Gephyrocapsa oceanica* zones and the *Emiliania ovata* Zone. The age of the interval Core 5, Section 6 to Core 10, Section 3 is lower Pleistocene or upper Pliocene. Discoasters are rare or even absent in some samples, *Gephyrocapsa* spp. are generally present. Core Catcher 9 contains very frequent reworked lower Eocene coccoliths of the *Discoaster binodosus* Zone; the oval-shaped nannofossils (Plate 2, Figures 9-12) found

TABLE 7
Distribution of Albian-Aptian Calcareous Nannofossils at Site 361

LEG 40 SITE 361						Biscutum constans	Braarudosphaera africana	Chiastozygus litterarius	Cretarhabdus conicus	Cretarhabdus crenulatus	Cretarhabdus loriei	Cretarhabdus surirellus	Cretarhabdus sp.	Cruciellipsis chiasta	Cyclagelosphaera margerelii	Diazomatolithus lehmanii	Discorhabdus ignotus	Hayesites albiensis	Lithastrinus floralis	Lithraphidites carniolensis	Manivitella pemmatoidea	Markalius circumradiatus	Micrantholithus hoschulzii	Micrantholithus obtusus	Nannoconus truittii	Parhabdolithus angustus	Parhabdolithus asper
DEPTH BELOW SEA FLOOR IN METERS	CORE	SECTION	INTERVAL (cm)	ABUNDANCE	PRESERVATION																						
905,5-915	26	2	9-10	C	P	▮							▮					▮	▮	▮	▮						
		5	9-10	A	P						▮		▮			▮		▮	▮	▮	▮						▮
		CC		C	M																						
953 -962,5	27	3	37-39	A	P					▮			▮						▮	▮	▮					▮	▮
1005,0-1010	28	CC		R	M																						
1029 -1038,5	29	6	9-10	A	M			▮	▮						▮					▮					▮		▮
1038,5-1048	30	CC		C	M				▮			▮					▮				▮					▮	
1048 -1057,5	31	2	9-10	A	P				▮								▮			▮	▮					▮	▮
		4	9-10	A	M	▮		▮	▮			▮		▮								▮					▮
		CC		A	M	▮						▮					▮				▮	▮				▮	▮
1057,5-1067	32	1	9-10	C	P				▮			▮									▮						▮
		2	50-51	A	M		▮			▮							▮			▮		▮				▮	▮
		6	11-12	A	P				▮														▮	▮			▮
		CC		C	P																			▮			▮
1067 -1076,5	33	2	35	C	P								▮		▮								▮	▮			▮
		3	27	A	M				▮	▮																	▮
			37-38	A	P																	▮					▮
			46	A	P										▮					▮							
1076,5-1086	34	2	40-41	C	P																		▮	▮			
		CC		C	P																			▮			
1086 -1095,5	35	1	143-145	F	M										▮								▮				
1095,6-1105	36	2	42-43	F	P								▮														
1105 -1114,5	37	1	101	A	M					▮					▮						▮						
		CC		C	P																						▮
1114,5-1124	38	2	75	C	P		▮	▮					▮														▮
1124 -1133,5	39	2	8-9	C	P																						▮
1143 -1152,5	40	3	60-61	C	P								▮														
1162 -1171,5	41	1	91-92	C	P																						▮
1181 -1190,5	42	6	45-46	A	P																						▮
1200 -1209,5	43	4	105-106	C	P																						▮
1219 -1228,5	44	2	bottom	F	P																						▮
1238 -1247,5	45	3	bottom	C	M																						▮
1257 -1266,5	46	CC	top	R	M																						
1266,5-1276	47	2	121-122	C	P																						
1285,5-1295	48	CC		F	M			▮															▮	▮			
1304,5-1314	49	3	118-120	C	P	▮																					

TABLE 7 – *Continued*

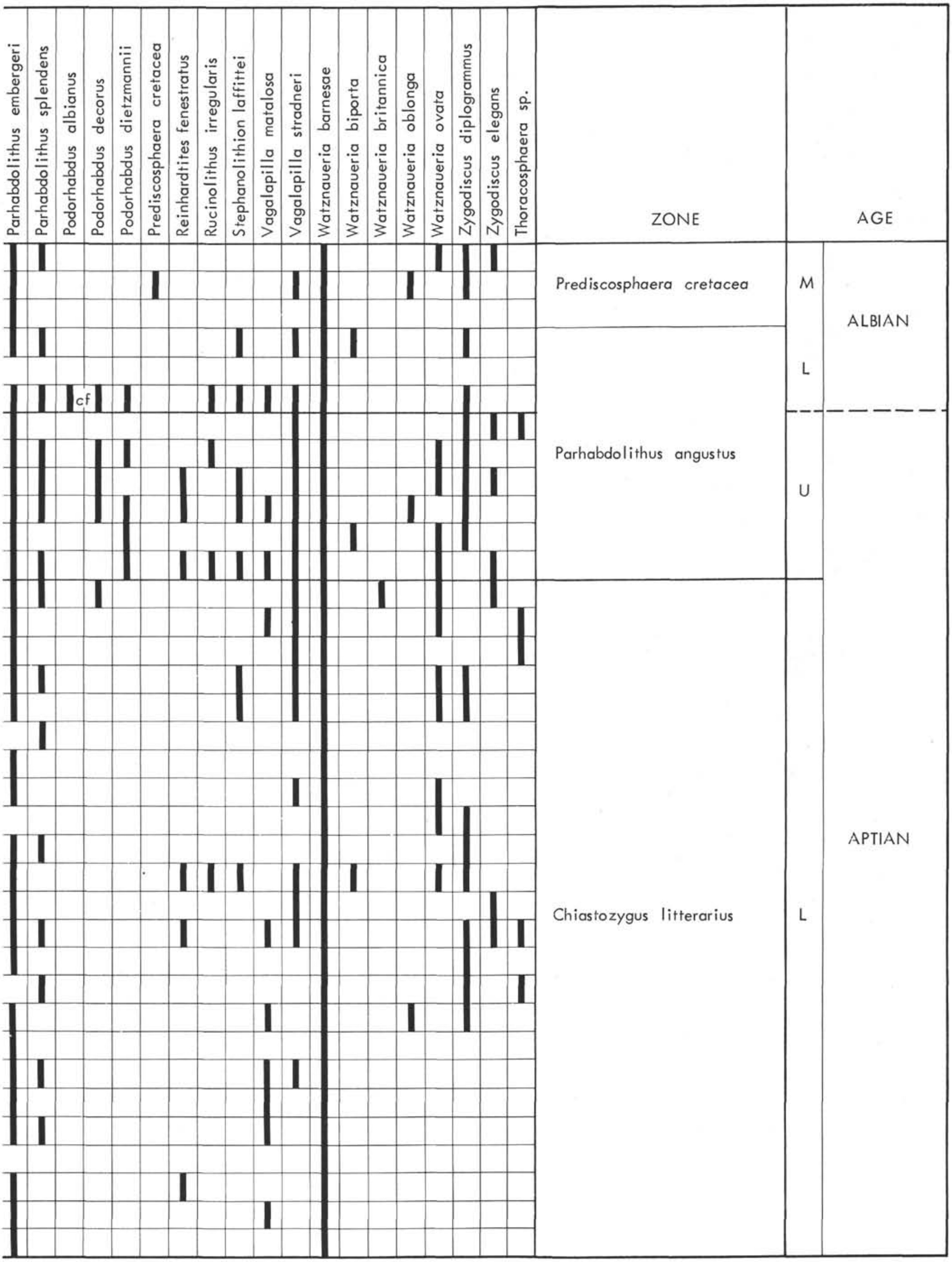
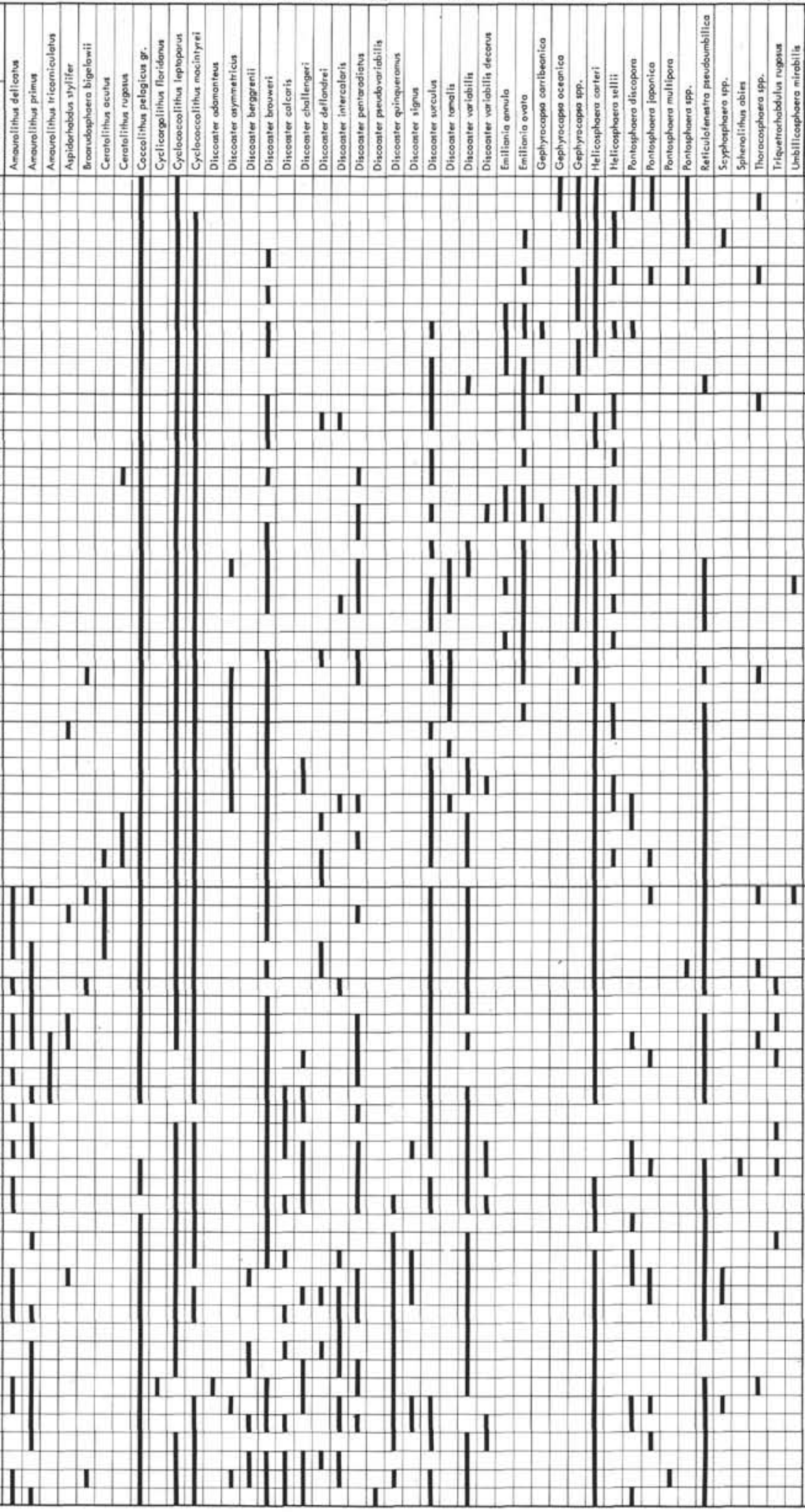


TABLE 8A
Distribution of Pleistocene-Upper Miocene Calcareous Nannofossils at Site 362

LEG 40
SITE 362

DEPTH BELOW SEA FLOOR IN METERS	CORE	SECTION	INTERVAL (cm)	ABUNDANCE	PRESERVATION	ZONE		AGE	
36 - 45,5	1	1	9-10	A	G	Emiliania huxleyi/ Gephyrocapsa oceanica			PLEISTOCENE
		3	9-10	A	M				
			CC	A	M				
45,5-55	2	1	84-85	A	M	Emiliania ovata			
			CC	A	P				
55 - 64,5	3	4	9-10	A	M				
			CC	A	G				
64,5- 74	4	1	9-10	A	M				
		3	9-10	A	M				
			CC	C	P				
74 - 83,5	5	1	9-10	A	M				
		4	9-10	A	P				
		6	9-10	A	M	?			PLEISTOCENE or PLIOCENE
83,5- 93	6	1	9-10	A	M				
			CC	A	M				
93 -102,5	7	2	9-10	A	M				
		5	9-10	A	M				
102,5-112	8	1	9-10	A	M				
		4	9-10	A	M				
			CC	A	M				
112 -121,5	9	2	9-10	A	M				
		5	9-10	A	M				
		6	9-10	A	M				
			CC	A	M				
121,5-131	10	2	9-10	A	M				
		3	9-10	A	M				
		6	9-10	A	P	Discoaster brouweri		U	PLIOCENE
			CC	A	P				
131 -140,5	11	1	9-10	A	M				
		2	9-10	A	P				
		3	35-36	A	M	Reticulofenestra pseudoumbilica		L	
		4	9-10	A	M				
		6	9-10	A	M				
			CC	A	M				
140,5-150	12	3	9-10	A	M				
			CC	A	M				
150 -159,5	13	1	9-10	A	M				
		4	9-10	A	M				
		6	9-10	A	M				
			CC	A	M	Ceratolithus acutus	Amaurolithus tricorniculatus		
159,5-169	14	1	9-10	A	M				
		3	9-10	A	M				
		6	9-10	A	M				
			CC	A	G				
178,5-188	15	4	9-10	A	M	Triquetrorhabdulus rugosus		U	MIOCENE
			CC	A	M				
197,5-207	16	1	9-10	A	M				
			CC	A	M				
216,5-226	17	1	9-10	A	M				
		6	9-10	A	M				
			CC	A	M				
235,5-245	18	3	9-10	A	M				
		6	9-10	A	M				
			CC	A	M				
245,5-254	19	1	9-10	A	M				
		2	9-10	A	M				
		3	9-10	A	M	Amaurolithus primus	Discoaster quinqueramus		
		6	9-10	A	M				
			CC	A	M				
273,5-283	20	1	9-10	A	M				
		3	9-10	A	M				
		5	9-10	A	M				
			CC	A	M				
292,5-302	21	1	9-10	A	M				
		3	9-10	A	M				
		6	9-10	A	M				
			CC	A	G				
311,5-321	22	2	9-10	A	M				
		4	9-10	A	M				
			CC	A	M				
330,5-340	23	3	9-10	A	P				
		6	9-10	A	M				
			CC	A	M				



in the same zone of Site 361 are also present. The assemblages in Core 10, Section 6 to Core 11, Section 2 are typical of the lower part of the upper Pliocene *Discoaster brouweri* Zone, with common *Discoaster asymmetricus* and *D. tamalis* present. Part of the lower Pliocene seems to be missing. A continuous sedimentary sequence was recovered from the lowermost Pliocene *Ceratolithus acutus* Subzone down to the lower-middle Eocene *Discoaster sublodoensis* Zone. A sharp change in the nannoflora assemblages takes place in the middle and lower Oligocene *Sphenolithus distentus*, *Sphenolithus predistentus*, and

Helicosphaera reticulata zones (Sample 3A, CC to Core 5A). Normal nannoplankton associations are here replaced by very rich *Braarudosphaera* horizons. Living braarudosphaeras are abundant in coastal waters and very rare in the open ocean. Their skeletal remains are absent from the deep oceanic sediments, and in many land sections their frequency increases toward the shallowing of the basins. Their significance from the ecological point of view therefore is that of a near-shore indicator. Nevertheless *Braarudosphaera* layers, as already known from the Oligocene of the South Atlantic and Indian oceans, are associated with open sea planktonic assemblages. In the Oligocene of Hole 362A, no indications are present for a shallowing of the basin. The ratio of planktonic to benthic foraminifers still remains very high, and no shallow-water forms are present among the rare benthic foraminifers. Thus the significance of these *Braarudosphaera* layers is not yet clearly understood: they are probably the result of periodic blooms connected with unusual oceanic conditions.

The last occurrence of *Discoaster barbadiensis* is in Core 7A, Section 3. *Discoaster saipanensis* ranges somewhat higher: it is present in all the sections of this core and particularly frequent in Sample 7A-2, 125-126 cm. It was also observed in Sample 6A-5, 119-120 cm, but none was found in the other examined samples of this core. The Eocene/Oligocene boundary is therefore placed in Core 6A between Sections 5 and 4. The *Chiasmolithus oamaruensis* Zone was not recognized, but it could be present in the uncored interval between Cores 8 and 9. A normal sequence of middle Eocene to uppermost lower Eocene nannoplankton assemblages was recovered from Core 9A down, but nannofossils there are poorly preserved, apparently because of diagenetic processes that affected the sediments. The presence of *Discoaster sublodoensis* in Core 12A, below the first *Nannotetrina fulgens*, indicates this nominal middle-lower Eocene zone.

Cool to temperate water conditions are suggested for the Pleistocene by the frequency of *Coccolithus pelagicus* and for the Pliocene and upper to middle Miocene by the general scarcity of discoasters. The fairly common sphenoliths in the lower/middle Miocene and Oligocene indicate more temperate conditions during this time. Discoasters are also more abundant in the lower Miocene. A great reduction in the frequency of chiasmoliths was observed in the Eocene and Oligocene of this site compared with the Cape Basin Site 360. This can indicate warmer water conditions connected with the lower latitude position of this site.

SITE 363
Walvis Ridge (lat 19°38.75'S, long 09°02.80'E, water depth 2248 m)

Nannofossil assemblages ranging from upper Miocene to Lower Cretaceous were encountered at this site.

The stratigraphic distribution of the nannofossils and additional data on the abundance and preservation of the assemblages are shown in Tables 10 and 11.

Breaks in the Miocene sedimentation are recorded in Core 1. Abundant, well to moderately preserved Oligocene coccoliths are present in a continuous sequence from Cores 2 to 8. Diagnostic species of *Sphenolithus* and other markers allow us to recognize almost all Oligocene biozones. Unusual ooze intervals, predominantly composed of *Braarudosphaera*, correlate well with identical horizons in Site 362A in the middle and lower Oligocene. The Eocene/Oligocene boundary based on the last occurrence of *Discoaster saipanensis* is placed in the upper part of Core 9 and is characterized by continuous sedimentation. In the fairly complete Eocene and Paleocene sequence the preservation is poorer in the Eocene because of recrystallization, becoming better in the Paleocene. The Cretaceous/Tertiary boundary is placed at Sample 18-2, 40 cm. The lowermost Paleocene contains abundant *Thoracosphaera* and common *Braarudosphaera* which are typical for Danian sediments. *Cruciplacolithus tenuis*, however, is present until the Cretaceous boundary; thus the oldest known Tertiary nannofossil associations are not present at this site.

Sample 18-2, 41 cm to Core 25 represent a continuous sequence of Upper Cretaceous nannofossil zones from upper Maestrichtian to Santonian/Coniacian. Preservation is good in the upper Maestrichtian *Micula mura* Zone, moderate to good in Cores 20 to 25 with some scattered only poorly preserved samples. Core 25 is referred to the Santonian/Coniacian *Marthasterites furcatus* Zone.

Below this core nannofloras become sparse and generally poorly preserved. *Braarudosphaera* and *Nannoconus* of the *truitti* group are present in this part of the sequence. An upper Albian age is inferred for Cores 26 to 34 based on the presence of *Eiffellithus turriseiffeli* and the absence of younger markers. The only specimen of *Micula staurophora* found in Sample 26-2, 94-95 cm, suggesting a Turonian age for this sample, is more likely the result of contamination from above. The Cenomanian marker *Lithraphidites alatus* was not observed at this site. It could, however, be absent for ecological reasons and the possibility for a younger age of the upper part of this interval cannot entirely be excluded. Nevertheless, an Albian age seems more probable, leaving a gap in the sedimentary sequence corresponding to the Cenomanian and Turonian.

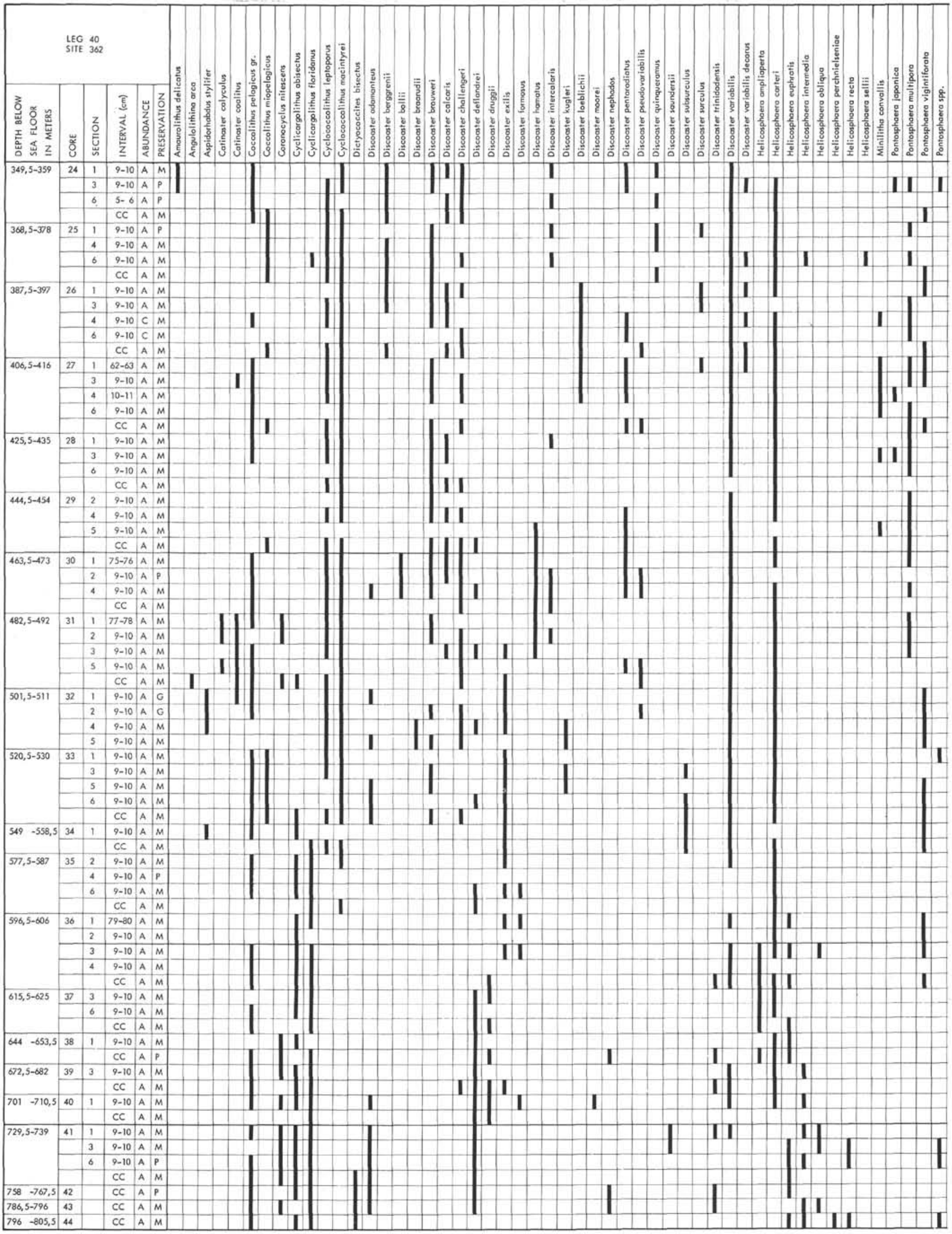
Cores 35 to 38, situated below the first occurrence of *Eiffellithus turriseiffeli* and above that of *Prediscosphaera cretacea*, are referred to the lower/middle Albian *Prediscosphaera cretacea* Zone.

Core 39 no longer contains *Prediscosphaera cretacea* and, based on some questionable specimens of *Parhabdolithus angustus*, is tentatively referred to the nominal zone of upper Aptian/lower Albian age.

Core 40 only contains *Watznaueria* and *Parhabdolithus embergeri* and cannot, therefore, be dated.

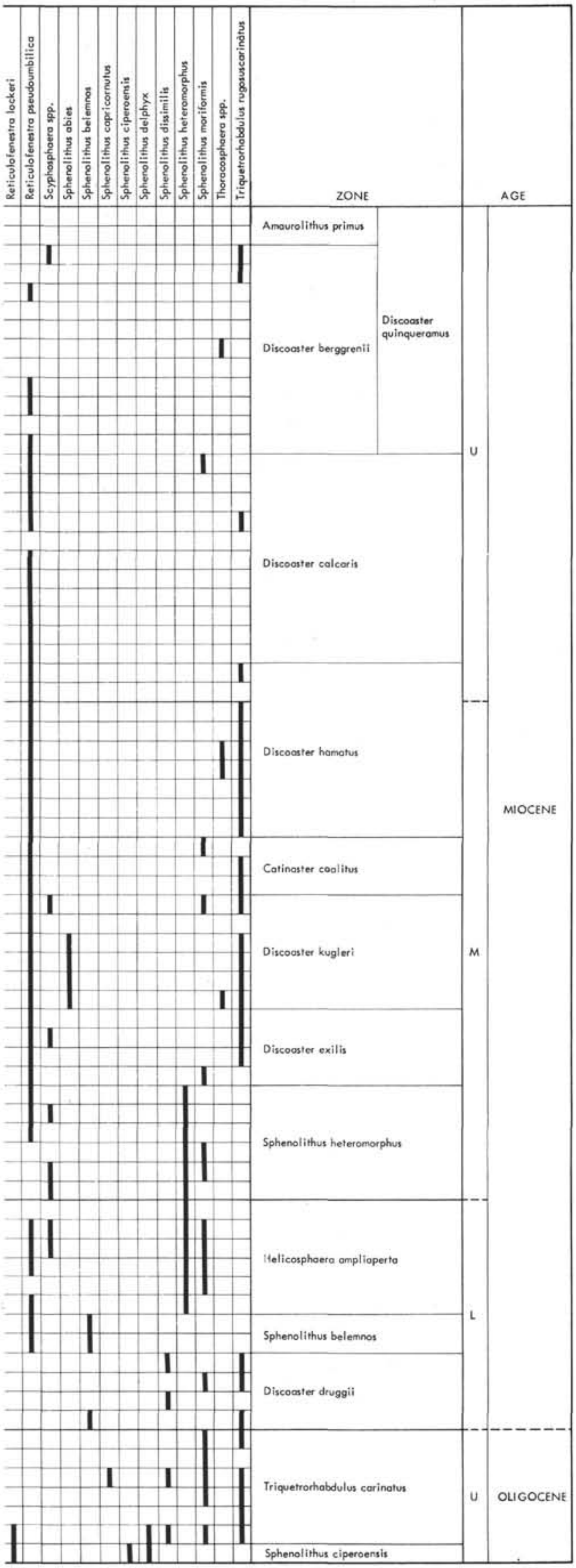
From a paleoecologic point of view, rather warm-water conditions are assumed for the Paleogene. This is based on the more abundant sphenoliths and more scarce chiasmoliths when compared with the Cape Basin Sites 360 and 361. The presence of *Braarudo-*

TABLE 8B
Distribution of Upper Miocene-Upper Oligocene Calcareous Nannofossils at Site 362



DEPTH BELOW SEA FLOOR IN METERS	CORE	SECTION	INTERVAL (cm)	ABUNDANCE	PRESERVATION
349,5-359	24	1	9-10	A	M
		3	9-10	A	P
		6	5- 6	A	P
			CC	A	M
368,5-378	25	1	9-10	A	P
		4	9-10	A	M
		6	9-10	A	M
			CC	A	M
387,5-397	26	1	9-10	A	M
		3	9-10	A	M
		4	9-10	C	M
		6	9-10	C	M
			CC	A	M
406,5-416	27	1	62-63	A	M
		3	9-10	A	M
		4	10-11	A	M
		6	9-10	A	M
			CC	A	M
425,5-435	28	1	9-10	A	M
		3	9-10	A	M
		6	9-10	A	M
			CC	A	M
444,5-454	29	2	9-10	A	M
		4	9-10	A	M
		5	9-10	A	M
			CC	A	M
463,5-473	30	1	75-76	A	M
		2	9-10	A	P
		4	9-10	A	M
			CC	A	M
482,5-492	31	1	77-78	A	M
		2	9-10	A	M
		3	9-10	A	M
		5	9-10	A	M
			CC	A	M
501,5-511	32	1	9-10	A	G
		2	9-10	A	G
		4	9-10	A	M
		5	9-10	A	M
520,5-530	33	1	9-10	A	M
		3	9-10	A	M
		5	9-10	A	M
		6	9-10	A	M
			CC	A	M
549 -558,5	34	1	9-10	A	M
			CC	A	M
577,5-587	35	2	9-10	A	M
		4	9-10	A	P
		6	9-10	A	M
			CC	A	M
596,5-606	36	1	79-80	A	M
		2	9-10	A	M
		3	9-10	A	M
		4	9-10	A	M
			CC	A	M
615,5-625	37	3	9-10	A	M
		6	9-10	A	M
			CC	A	M
644 -653,5	38	1	9-10	A	M
			CC	A	P
672,5-682	39	3	9-10	A	M
			CC	A	M
701 -710,5	40	1	9-10	A	M
			CC	A	M
729,5-739	41	1	9-10	A	M
		3	9-10	A	M
		6	9-10	A	P
			CC	A	M
758 -767,5	42		CC	A	P
786,5-796	43		CC	A	M
796 -805,5	44		CC	A	M

TABLE 8B – *Continued*



sphaera and the abundance of *Thoracosphaera* in the lowermost Paleocene could indicate neritic or upper bathyal conditions. Warm-water conditions are also suggested for the upper Maestrichtian on the presence of *Micula mura.*

SITE 364
Angola Basin (lat 11°34.32'S, long 11°58.30'E, water depth 2248 m)

Coccolith assemblages ranging from Holocene to Lower Cretaceous occur in the section of this discontinuously cored site. The stratigraphic distribution of the calcareous nannofossils and the abundance and preservation of the assemblages are shown in Tables 12-14.

Good to moderately preserved Quaternary assemblages with abundant *Helicosphaera carteri* and *Gephyrocapsa oceanica* are present in Core 1 (7.5-17 m). The upper part of Core 1 contains many reworked Upper Cretaceous and Paleogene forms. A peculiar association composed almost exclusively of *Helicosphaera carteri* is present in the core catcher of Core 1. This species is characteristic of tropical to subtropical areas.

Samples from Core 2 (34-46.5 m) are barren except for Sample 364-2-2, 9-10 cm and the core catcher which contain a poorly preserved upper Pliocene assemblage of the *Discoaster brouweri* Zone. Nannofloras are common to rare and contain reworked Upper Cretaceous and Cenozoic specimens.

Moderately well preserved lower Pliocene assemblages occur through Core 3 (64.5-74 m). The great abundance of discoasters, such as *D. brouweri* and *D. pentaradiatus*, suggests warm-water conditions. Reworked specimens are common in Sample 3-6, 9-10 cm and in the core catcher.

Core 4 (102.5-112 m) contains upper Miocene coccolith assemblages. Preservation is moderate to good. Discoasters are abundant and sphenoliths are common. Based on the presence of the name-giving species, Sample 4-6, 9-10 cm and the core catcher are referred to the *Discoaster hamatus* Zone.

Coccoliths are very rare in Core 5 (150-159.5 m) except for Sample 5-4, 9-10 cm that contains an upper lower Miocene assemblage. The concurrence of rare *Helicosphaera ampliaperta*, abundant *Sphenolithus heteromorphus*, common *Cyclococcolithus macintyrei*, and *Discoaster deflandrei* allows the assignment of this sample to the upper part of the *Helicosphaera ampliaperta* Zone.

Samples of Cores 6 (197.5-207 m) and 7 (245-254.5 m) are barren of calcareous nannofossils except for Sample 7, CC that contains a moderately preserved middle Eocene assemblage of the *Nannotetrina fulgens* Zone.

The lower Eocene *Discoaster sublodoensis*, *Discoaster lodoensis*, and *Tribrachiatus orthostylus* zones are condensed in Core 8 (283-295.5 m). Coccoliths are abundant, but have only a moderate to poor preservation. Only the core catcher of Core 8 contains abundant *Zygrhablithus bijugatus*, a shallow water indicator which is frequent at Site 362.

TABLE 9
Distribution of Middle Oligocene-Middle Eocene Calcareous Nannofossils at Site 362A

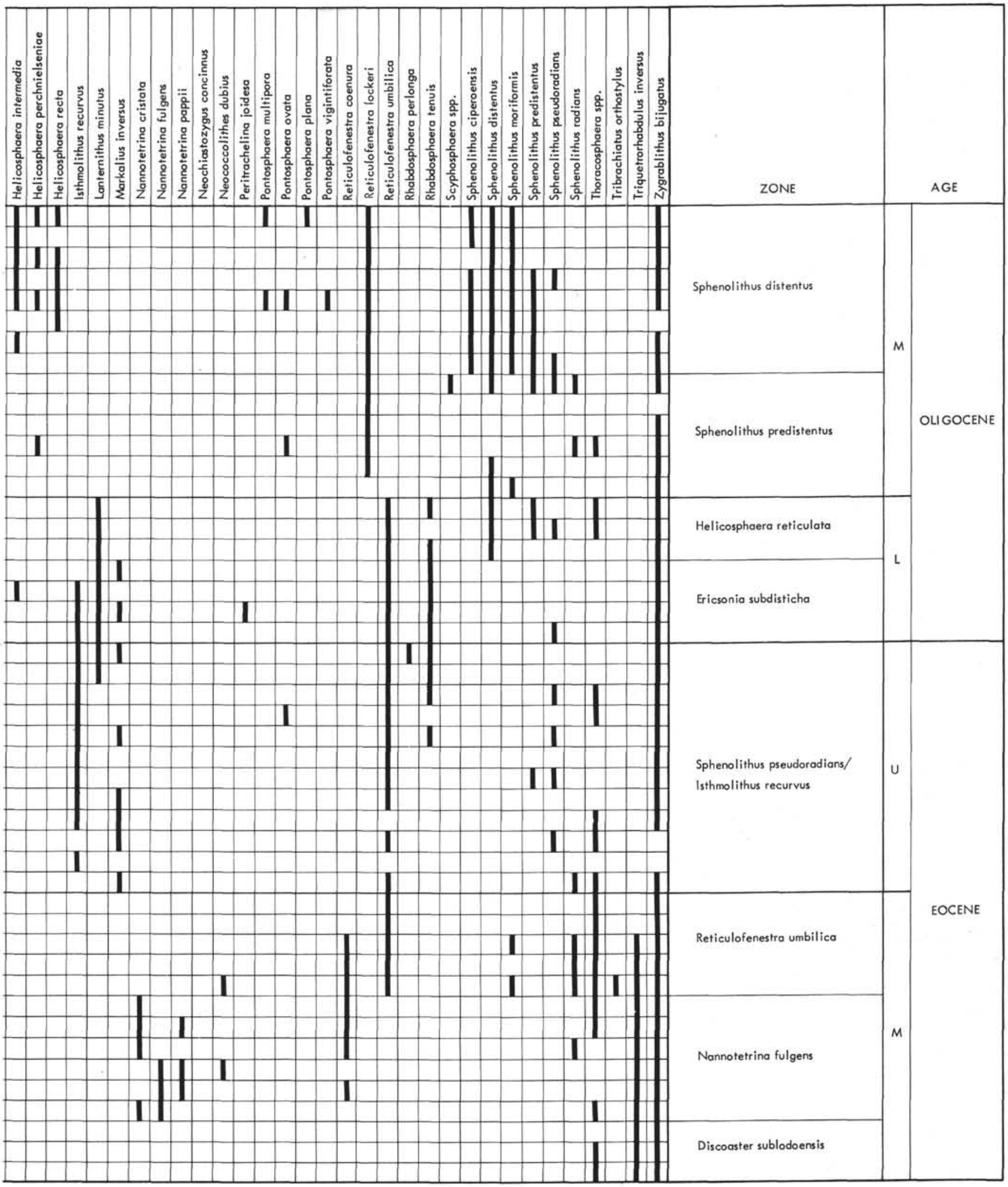
LEG 40
SITE 362A

DEPTH BELOW SEA FLOOR IN METERS	CORE	SECTION	INTERVAL (cm)	ABUNDANCE	PRESERVATION	Blackites spinulus	Braarudosphaera bigelowii	Campylosphaera dela	Chiasmolithus altus	Chiasmolithus expansus	Chiasmolithus grandis	Chiasmolithus gigas	Chiasmolithus oamaruensis	Chiasmolithus solitus	Coccolithus crassus	Coccolithus pelagicus gr.	Coronocyclus nitescens	Cyclicargolithus abisectus	Cyclicargolithus floridanus	Cyclicargolithus reticulatus	Cyclococcolithus formosus	Cyclococcolithus kingii	Dictyococcites bisectus	Dictyococcites scrippsae	Discoaster adamanteus	Discoaster barbadiensis	Discoaster bifax	Discoaster binodosus	Discoaster cruciformis	Discoaster deflandrei	Discoaster elegans	Discoaster lodoensis	Discoaster mirus	Discoaster saipanensis	Discoaster sublodoensis	Discoaster tanii	Discoaster tanii nodifer	Discoaster cf. wemmelensis	Ericsonia fenestrata	Ericsonia obruta	Ericsonia subdisticha	Helicosphaera compacta	Helicosphaera euphratis
796 -805,5	2	1	9-10	A	M											▮	▮	▮	▮				▮		▮					▮													▮
		6	9-10	A	M				▮							▮	▮	▮	▮			▮	▮		▮					▮													▮
			CC	A	M											▮	▮	▮	▮				▮						▮	▮													
834 -843,5	3	1	9-10	A	M											▮		▮	▮				▮	▮																			▮
		2	9-10	A	M				▮							▮	▮	▮	▮				▮		▮					▮													▮
		4	9-10	A	P											▮		▮	▮				▮							▮													
		6	9-10	A	M				▮									▮	▮				▮	▮						▮													▮
			CC	A	M		▮		▮							▮		▮	▮				▮																				▮
872 -881,5	4	1	9-10	A	M				▮								▮	▮	▮				▮	▮						▮							▮						▮
		2	31-32	A	M											▮		▮	▮				▮	▮						▮							▮					▮	
		4	14-15	A	M		▮						▮			▮		▮	▮				▮							▮													▮
		5	43-44	A	P		▮									▮		▮	▮				▮	▮						▮													▮
		6	77-78	A	M		▮											▮	▮				▮																				
910 -919,5	5	1	82-83	C	P		▮									▮			▮				▮	▮												▮							
		3	53-54	C	P		▮									▮			▮				▮	▮						▮													▮
		5	107-108	A	P		▮						▮			▮			▮				▮							▮						▮			▮	▮		▮	
		6	122-123	A	P		▮									▮			▮				▮	▮						▮						▮	▮			▮		▮	▮
929 -938,5	6	1	58-59	A	P				▮							▮			▮		▮		▮	▮						▮						▮	▮					▮	
		2	134-135	A	P											▮			▮		▮		▮	▮						▮							▮					▮	▮
		3	52-53	A	P	▮										▮			▮		▮		▮	▮						▮							▮					▮	
		4	28-29	A	P				▮							▮			▮		▮		▮	▮						▮							▮						
		5	119-120	A	M											▮			▮		▮		▮	▮				▮		▮				▮			▮						
		6	146-147	A	M											▮			▮		▮		▮	▮				▮		▮							▮					▮	
			CC	A	P											▮			▮		▮		▮	▮												▮	▮						
948 -957,5	7	1	141-142	A	M											▮			▮		▮		▮	▮						▮				▮			▮				▮	▮	
		2	125-126	A	M											▮			▮		▮		▮	▮						▮				▮		▮	▮					▮	
		3	99-100	A	P											▮			▮		▮		▮	▮		▮								▮		▮	▮					▮	
		5	122-123	A	M								▮			▮			▮		▮		▮	▮		▮								▮		▮	▮					▮	
			CC	A	M											▮			▮	▮			▮	▮		▮								▮		▮	▮					▮	
967 -976,5	8	1	77-78	A	P											▮			▮		▮		▮	▮		▮								▮									
		2	86-87	A	M								▮			▮			▮	▮	▮		▮	▮		▮				▮				▮		▮	▮					▮	
		4	41-42	C	P											▮			▮				▮	▮		▮								▮									
			CC	R	P											▮					▮		▮	▮												▮							
995,5-1005	9	1	107-109	C	P						▮					▮							▮	▮		▮								▮			▮						
		3	114-115	A	P						▮					▮			▮		▮		▮	▮		▮								▮			▮						
		4	13-14	C	P						▮					▮					▮			▮		▮								▮			▮						
			CC	C	P											▮					▮					▮								▮									
1024-1033,5	10	1	68-69	A	P										▮	▮			▮		▮					▮	▮			▮						▮	▮						
		2	128-129	C	P					▮	▮			▮		▮			▮		▮					▮										▮						▮	
		3	129-130	C	P	▮					▮	▮		▮	▮	▮					▮					▮										▮							
			CC	C	P						▮					▮										▮																	
1062-1071,5	11	1	88-89	C	P						▮			▮		▮										▮												▮					
			107-108	C	P						▮			▮												▮																	
			CC	C	P																					▮				▮								▮					
1071,5-1081	12	1	20-21	C	P			▮								▮										▮						▮			▮			▮					
			104-105	C	P						▮			▮		▮										▮					▮	▮	▮		▮								
			bottom	F	P						▮					▮										▮									▮			▮					

Lowermost Eocene and Paleocene assemblages are present in Cores 9 and 10 (321-359 m). The great abundance of discoasters and the poor preservation of placoliths suggest dissolution effects in this interval. The catcher of Core 9 contains nannofossils of the lower Paleocene *Cruciplacolithus tenuis* Zone.

Cores 11 and 12 (359-378 m) contain abundant but poorly preserved coccolith assemblages, which show

TABLE 9 – *Continued*



strong signs of dissolution. The species present suggest Upper Cretaceous Maestrichtian. Because of the absence of diagnostic species, an exact biostratigraphic assignment is difficult. However, the absence of *Micula mura* and *Lithraphidites quadratus* might suggest an *Arkhangelskiella cymbiformis* Zone age.

Cores 13 and 14 (397-435 m) are referred to the upper Campanian to lower Maestrichtian *Tetralithus trifidus*

TABLE 10
Distribution of Miocene-Paleocene Calcareous Nannofossils at Site 363

LEG 40 SITE 363						Braarudosphaera bigelowii	Campylosphaera dela	Campylosphaera eodela	Catinaster calyculus	Catinaster coalitus	Chiasmolithus altus	Chiasmolithus bidens	Chiasmolithus californicus	Chiasmolithus consuetus	Chiasmolithus expansus	Chiasmolithus gigas	Chiasmolithus grandis	Chiasmolithus oamaruensis	Chiasmolithus solitus	Chiphragmalithus acanthodes	Chiphragmalithus calathus	Coccolithus crassus	Coccolithus eopelagicus	Coccolithus miopelagicus	Coronocyclus nitescens	Cruciplacolithus staurion	Cruciplacolithus tenuis	Cyclicargolithus abisectus	Cyclicargolithus floridanus	Cyclococcolithus formosus	Cyclococcolithus leptoporus	Cyclococcolithus macintyrei	Cyclococcolithella robusta	Dictyococcites bisectus	Discoaster adamanteus	Discoaster barbadiensis	Discoaster calcaris	Discoaster challengeri	Discoaster deflandrei	Discoaster delicatus	Discoaster diastypus	Discoaster distinctus	Discoaster druggii	Discoaster exilis	Discoaster hamatus	Discoaster lenticularis	Discoaster lodoensis	Discoaster mohleri	Discoaster multiradiatus	Discoaster nobilis	Discoaster nonaradiatus	Discoaster perplexus	Discoaster pseudovariabilis	Discoaster saipanensis	Discoaster salisburgensis	Discoaster signus	Discoaster sublodoensis	Discoaster tanii	Discoaster tanii nodifer	Discoaster trinidadensis	Discoaster variabilis
DEPTH BELOW SEA FLOOR IN METERS	CORE	SECTION	INTERVAL (cm)	ABUNDANCE	PRESERVATION																																																								
31,0- 40,5	1	1	top	A	M					▮													▮						▮		▮	▮					▮	▮						▮	▮											▮					▮
			11-12	A	M				▮														▮						▮		▮	▮					▮	▮						▮	▮																▮
		2	9-10	A	M																		▮	▮					▮		▮	▮			▮			▮						▮									▮								
			58-60	A	M																		▮	▮	▮			▮	▮		▮	▮			▮			▮						▮									▮				▮					
		3	43-44	A	M																		▮					▮	▮		▮	▮			▮			▮						▮									▮									
		4	9-10	A	P																			▮				▮	▮			▮						▮						▮									▮									
			101-103	A	M																							▮	▮										▮				▮																	▮	
		5	9-10	A	P																							▮	▮										▮				▮																	▮	
			CC	A	M																			▮	▮			▮	▮					▮	▮				▮				▮																	▮	
50,0- 59,5	2	2	9-10	A	G																		▮		▮			▮	▮					▮					▮														▮									
		4	9-10	A	M																				▮			▮	▮					▮					▮																						
		5	9-10	A	G																							▮	▮					▮																											
			CC	A	G						▮												▮	▮	▮			▮	▮					▮	▮				▮													▮								▮	
69,0- 78,5	3	1	9-10	A	G																							▮	▮					▮																											
		2	9-10	A	G																							▮	▮					▮																											
		5	9-10	A	G																							▮	▮					▮																											
			CC	A	M																		▮		▮				▮					▮					▮																						
88,0- 97,5	4	1	109-110	A	M																							▮						▮																											
		3	19-20	A	M																								▮					▮																											
			CC	A	M						▮												▮		▮				▮					▮					▮																			▮	▮		
107 -116,5	5	2	9-10	A	G																							▮						▮																											
		5	9-10	A	M																							▮	▮					▮																											
			CC	A	M																							▮	▮					▮																											
126 -135,5	6	2	9-10	A	G																							▮						▮																											
		3	9-10	A	G																							▮						▮																											
		4	9-10	A	G	▮																						▮						▮																											
			CC	A	G																							▮						▮	▮				▮																			▮			
145 -154,5	7	1	24-25	A	M	▮																			▮				▮					▮																											
			CC	A	P	▮																												▮					▮																			▮			
164 -173,5	8	1	74-75	A	P	▮																	▮						▮					▮	▮				▮																			▮	▮		
		2	9-10	A	P	▮																	▮											▮					▮																			▮	▮		
			CC	A	M						▮												▮							▮				▮					▮			▮																▮	▮		
183 -192,5	9	2	9-10	A	M																		▮							▮				▮					▮			▮																	▮		
		3	9-10	A	M																		▮							▮				▮					▮			▮												▮					▮	▮		
			39-40	A	M																									▮				▮																				▮					▮	▮		
		4	5-7	A	G													▮												▮				▮					▮															▮					▮	▮		
			58-60	A	M																													▮																				▮					▮	▮		
			CC	A	P													▮							▮									▮																				▮						▮		
202 -211,5	10	1	9-10	A	M													▮					▮											▮		▮						▮												▮					▮	▮		
		2	9-10	A	M													▮					▮							▮				▮		▮																		▮						▮		
		3	9-10	A	M												▮	▮					▮							▮				▮		▮																		▮						▮		
		4	9-10	A	M												▮						▮																															▮						▮		
		5	9-10	A	M												▮						▮							▮				▮																				▮					▮	▮		
			CC	A	P												▮						▮													▮																		▮						▮		
221 -230,5	11	1	9-10	A	P												▮						▮													▮			▮															▮								
		2	9-10	A	P												▮																			▮																										
		4	9-10	A	M														▮																	▮																		▮								
		5	9-10	A	M																														|▮|																									
		6	9-10	A	P											▮	▮		▮					▮	▮	▮			▮							▮																		▮								
			CC	A	P												▮						▮						▮																							▮			▮								
240 -249,5	12	1	9-10	A	M												▮					▮	▮						▮											▮																	▮					
		2	9-10	A	M		▮								▮								▮													▮																					▮					
		3	9-10	A	M		▮								▮		▮		▮	▮		▮	▮		▮				▮							▮																					▮					
		5	9-10	A	M												▮					▮																																		▮					
		6	9-10	A	M												▮					▮														▮			▮								▮										▮					
			CC	A	P												▮					▮														▮											▮																
259 -268,5	13	1	69-71	A	P			▮									▮					▮			▮											▮					▮						▮																
		2	9-10	A	P			▮									▮					▮														▮					▮						▮																
		4	9-10	A	M	▮		▮									▮				▮	▮	▮		▮											▮					▮						▮																
		5	9-10	A	P																	▮														▮					▮						▮								▮							
278 -287,5	14	1	9-10	A	P																																			▮														▮							
		2	9-10	C	M																																			▮																					
		3	9-10	A	P								▮																											▮								▮						▮						
		4	9-10	A	M																																			▮					▮			▮													
		5	9-10	A	P																																		▮									▮													
			CC	A	M									▮									▮																▮	▮								▮	▮											
297 -306,5	15	1	9-10	A	M																																											▮												
		2	9-10	A	M									▮									▮																									▮												
		3	9-10	A	M							▮	▮	▮																		▮																▮												
			CC	A	M							▮	▮	▮													▮					▮															▮		▮											
306,5-316	16	1	101-102	A	G							▮	▮	▮													▮						▮																												
		2	9-10	A	P							▮																																																	
			CC	A	P	▮						▮		▮												▮						▮																												
316 -325,5	17	1	85-86	A	M	▮								▮												▮																																		
		2	9-10	A	P	▮																				▮																																		
			CC	A	M	▮																				▮																																		
325,5-335	18	1	70-72	A	G																					▮						▮																												
			98-100	A	M																					▮																																		
		2	39-40	A	P	▮																				▮																																		

TABLE 10 – *Continued*

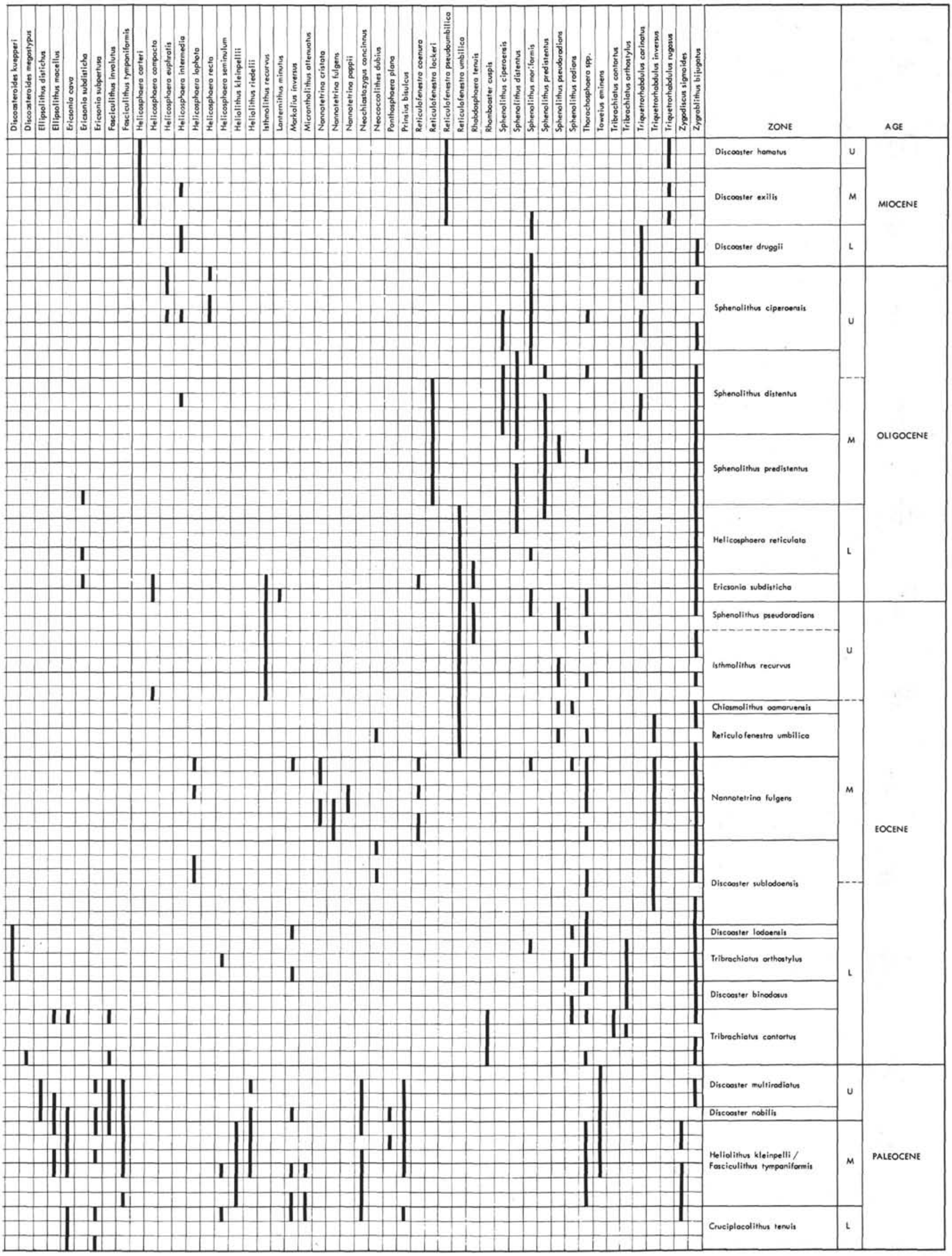


TABLE 11
Distribution of Maestrichtian-Aptian Calcareous Nannofossils at Site 363

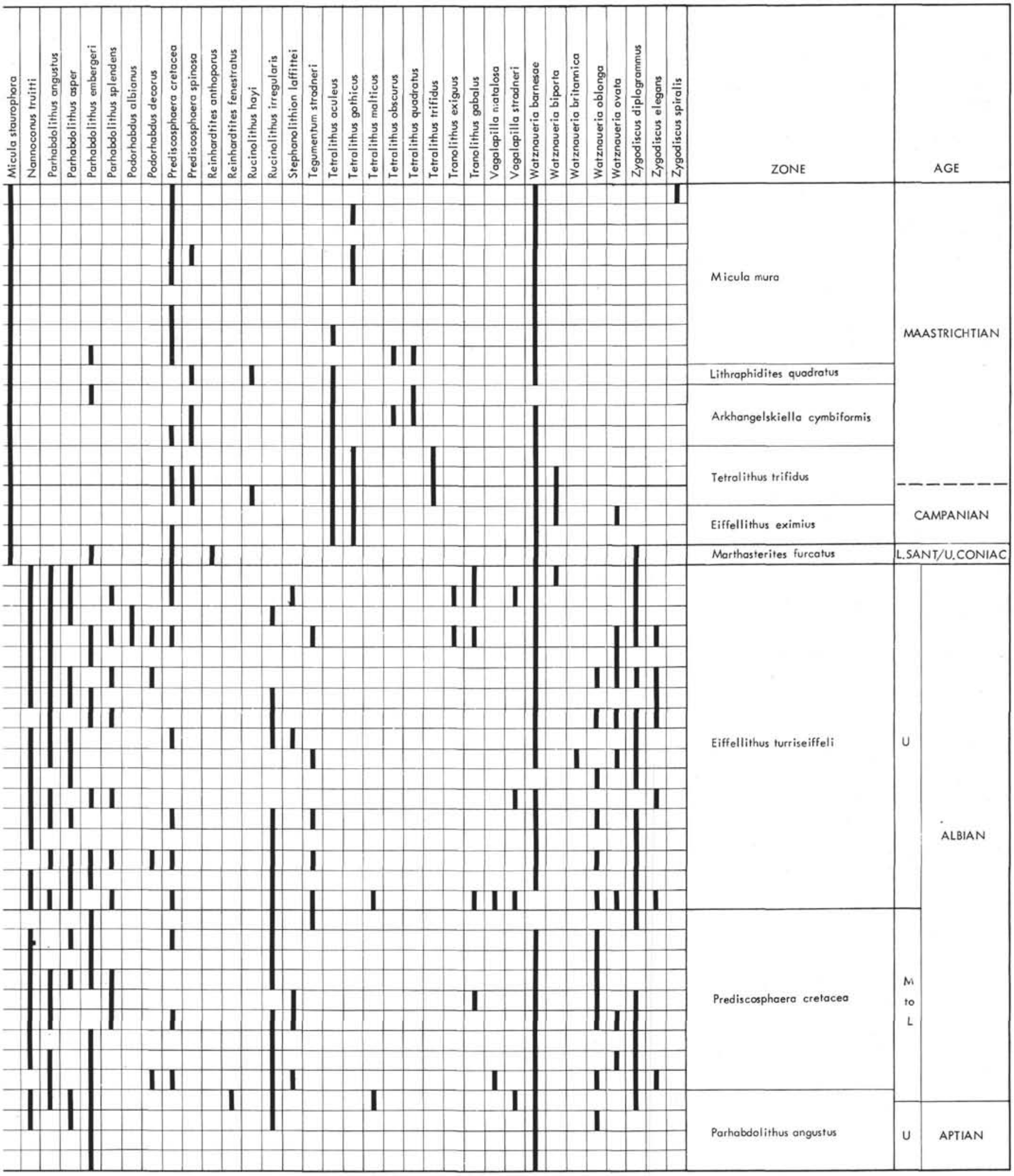
LEG 40 SITE 363						Arkhangelskiella cymbiformis	Biscutum constans	Braarudosphaera africana	Braarudosphaera bigelowii	Braarudosphaera discula	Broinsonia enormis	Broinsonia lata	Broinsonia parca	Ceratolithoides kamptneri	Chiastozygus litterarius	Corollithion exiguum	Cretarhabdus conicus	Cretarhabdus coronadventis	Cretarhabdus crenulatus	Cretarhabdus loriei	Cretarhabdus surirellus	Cribrosphaerella ehrenbergii	Cruciellipsis chiasta	Cyclagelosphaera margerelii	Cylindralithus gallicus	Cylindralithus serratus	Diazomatolithus lehmani	Discorhabdus ignotus	Eiffellithus anceps	Eiffellithus eximius	Eiffellithus trabeculatus	Eiffellithus turriseiffeli	Gartnerago obliquum	Hayesites albiensis	Kamptnerius magnificus	Lithastrinus floralis	Lithraphidites carniolensis	Lithraphidites quadratus	Manivitella pemmatoidea	Markalius circumradiatus	Marthasterites furcatus	Microrhabdulus decoratus	Micula mura
DEPTH BELOW SEA FLOOR IN METERS	CORE	SECTION	INTERVAL (cm.)	ABUNDANCE	PRESERVATION																																						
325,5-335	18	2	42-44	A	M	▮																▮			▮							▮						▮				▮	▮
		3	top	A	P	▮										▮									▮							▮						▮				▮	▮
		4	9-10	A	P	▮																																					▮
		5	9-10	A	M	▮													▮			▮			▮							▮						▮	▮			▮	▮
			CC	A	M	▮													▮			▮			▮							▮					▮	▮	▮			▮	▮
335 -344,5	19	2	9-10	A	M	▮																			▮																		▮
		3	9-10	A	M	▮																										▮											▮
		4	9-10	A	M	▮																▮			▮							▮										▮	▮
			CC	A	M	▮								▮								▮			▮							▮			▮				▮			▮	▮
344,5-354	20	1	39-40	A	M	▮																▮			▮							▮			▮			▮	▮			▮	
		3	9-10	A	M	▮																▮			▮																	▮	
			CC	A	M	▮																▮			▮				▮				▮		▮								
363,5-373	21	1	9-10	A	P	▮							▮				▮					▮			▮							▮							▮			▮	
		2	9-10	A	P	▮							▮						▮			▮								▮		▮										▮	
		4	6-7	A	M		▮				▮		▮				▮		▮			▮			▮	▮				▮		▮							▮			▮	
373 -382,5	22	1	71-72	A	M	▮							▮									▮				▮			▮	▮					▮				▮			▮	
382,5-392	23	2	9-10	A	P	▮							▮									▮								▮													
401,5-411	24	2	9-10	A	M								▮									▮				▮				▮									▮				
420,5-430	25	2	9-10	A	M																	▮			▮	▮				▮			▮						▮		▮		
439,5-449	26	2	94-95	A	M		▮			▮					▮																	▮				▮	▮		▮			▮	
458,5-468	27	1	9-10	C	M		▮	▮	▮						▮				▮		▮	▮	▮					▮				▮					▮		▮				
			CC	C	M			▮							▮																	▮			▮				▮				
477,5-487	28	2	105-106	A	M		▮	▮				▮			▮			▮	▮		▮	▮		▮			▮	▮			▮			▮		▮	▮		▮	▮			
			CC	A	M			▮	▮												▮															▮			▮				
496,5-506	29	1	74-75	C	P		▮	▮							▮									▮				▮			▮	▮				▮	▮		▮	▮			
		6	79-80	A	P		▮	▮																								▮							▮				
			CC	C	P																											▮											
515,5-525	30	1	27-28	A	P		▮												▮		▮							▮				▮		▮			▮						
			CC	C	M		▮	▮							▮						▮											▮					▮						
534,5-544	31	2	127-128	C	M			▮										▮														▮							▮				
		3	54-55	C	P										▮					▮												▮				▮	▮		▮				
553,5-563	32	2	37-38	C	P			▮			▮				▮						▮							▮				▮					▮		▮	▮			
			CC	R	P			▮	▮																		▮																
572,5-582	33	4	71-72	A	M		▮	▮										▮	▮									▮				▮				▮	▮		▮				
			CC	C	M			▮											▮																		▮						
591,5-601	34	3	41-42	A	M		▮	▮							▮			▮			▮							▮				▮	▮	▮		▮	▮		▮	▮			
			CC	C	M																▮						▮												▮				
610,5-620	35	3	146-147	F	M		▮	▮	▮												▮																▮						
			CC	F	P			▮																																			
629,5-639	36	1	72-73	C	M			▮	▮									▮		▮								▮									▮						
		3	106-107	C	M		▮	▮	▮												▮							▮									▮		▮				
648,5-658	37	2	83-84	C	P		▮	▮	▮						▮					▮	▮													▮		▮	▮						
		6	80-81	C	M		▮	▮	▮								▮		▮		▮		▮					▮						▮		▮			▮				
667,5-677	38	1	90-91	F	M		▮	▮	▮						▮		▮											▮						▮		▮	▮		▮				
		2	15-25	C	M		▮	▮	▮						▮			▮		▮	▮							▮									▮		▮				
686,5-696	39	2	95-96	C	M		▮	▮	▮						▮						▮		▮					▮															
		3	top	F	M				▮																																		
705,5-715	40	1		R	M																																▮						
			CC	R	M																																						

Zone except for Sample 364-13-1, 40-41 cm that is assigned to the lower Maestrichtian *Arkhangelskiella cymbiformis* Zone based on the absence of *Tetralithus trifidus*.

Cores 15 and 16 (463.5-511 m) yield assemblages that include *Broinsonia parca* and *Eiffellithus eximius* typical of the Campanian *Eiffellithus eximius* Zone. Nannofossils are generally abundant, their preservation is moderate to poor.

Cores 17 to 23, Sections 1-3 (530-648 m) recovered assemblages of the *Marthasterites furcatus* Zone which is considered Coniacian-Santonian. Based on the

TABLE 11 – *Continued*



absence of *Marthasterites furcatus*, Section 4A, 7-8 cm of Core 23 is assigned to the lower Coniacian-upper Turonian *Micula staurophora* Zone. The core catcher of Core 23 contains only rare nannofossils with *Eiffellithus turriseiffeli* and *Watznaueria barnesae* that do not allow for detailed biostratigraphic dating.

In Cores 24 to 33 (672.5-853 m) richer nannofloras occur at different levels that could belong to the upper Albian *Eiffellithus turriseiffeli* Zone. Nannofossils are generally abundant, but are only moderately to poorly preserved. Overgrowth and fragmentation have affected some assemblages. The absence of

TABLE 12A
Distribution of Pleistocene-Paleocene Calcareous Nannofossils at Site 364

LEG 40 SITE 364						Amaurolithus delicatus	Amaurolithus primus	Angulolithina arca	Aspidorhabdus stylifer	Campylosphaera dela	Campylosphaera eodela	Ceratolithus acutus	Ceratolithus cristatus	Ceratolithus rugosus	Chiasmolithus bidens	Chiasmolithus californicus	Chiasmolithus consuetus	Chiasmolithus danicus	Chiasmolithus expansus	Chiasmolithus grandis	Chiasmolithus solitus	Chiphragmalithus acanthodes	Cricolithus jonesii	Coccolithus crassus	Coccolithus cribellum	Coccolithus eopelagicus	Coccolithus magnicrassus	Coccolithus pelagicus	Coronocyclus nitescens	Cruciplacolithus staurion	Cruciplacolithus tenuis	Cyclicargolithus floridanus	Cyclicargolithus pseudogammation	Cyclococcolithus formosus	Cyclococcolithus gammation	Cyclococcolithus leptoporus	Cyclococcolithus macintyrei	Cyclolithella robusta	Discoaster asymmetricus	Discoaster barbadiensis
DEPTH BELOW SEA FLOOR IN METERS	CORE	SECTION	INTERVAL (cm)	ABUNDANCE	PRESERVATION																																			
7,5- 17	1	1	13-14	F	M				▮																			▮								▮				
		2	9-10	A	M			▮	▮														▮					▮								▮				
		3	9-10	C	M				▮				▮										▮					▮								▮				
		4	9-10	A	M			▮	▮																			▮								▮				
		5	9-10	C	M																							▮								▮				
		6	9-10	A	M								▮										▮					▮								▮				
			CC	A	G				▮														▮					▮								▮				
36 - 45,5	2	2	9-10	R	P																							▮								▮				
			CC	C	M			▮	▮														▮					▮								▮	▮			
64,5- 74	3	1	33-34	A	G									▮														▮								▮	▮		▮	
		2	9-10	A	G				▮					▮									▮					▮								▮	▮		▮	
		3	9-10	A	G	▮			▮					▮									▮					▮								▮	▮		▮	
		4	9-10	A	G	▮								▮														▮								▮	▮		▮	
		5	9-10	C	G	▮			▮					▮									▮					▮								▮	▮		▮	
		6	9-10	C	G	▮	▮		▮					▮									▮					▮								▮	▮		▮	
			CC	A	G	▮	▮					▮																▮								▮	▮		▮	
102,5-112	4	2	9-10	C	M																		▮					▮								▮	▮			
		3	9-10	A	M																							▮								▮	▮			
		4	9-10	C	M																		▮					▮								▮	▮		▮	
		5	9-10	C	M																							▮								▮	▮		▮	
		6	9-10	A	M																							▮								▮	▮		▮	
			CC	A	M																							▮								▮	▮		▮	
150 -159,5	5	3	9-10	C	M																							▮	▮			▮				▮	▮			
			CC	R	P																							▮				▮								
197,5-207	6	1	9-10																																					
			CC																																					
245 -254,5	7	1	9-10																																					
			CC	A	M					▮									▮	▮	▮					▮				▮					▮	▮					▮
283 -292,5	8	1	9-10	A	M					▮										▮	▮			▮		▮								▮	▮						▮
		2	9-10	A	M					▮										▮	▮	▮		▮		▮	▮								▮						▮
		3	9-10	A	M					▮							▮			▮				▮	▮	▮	▮			▮					▮						▮
		4	9-10	A	M												▮			▮				▮	▮	▮	▮								▮						▮
		5	9-10	A	M					▮ cf							▮			▮				▮	▮	▮	▮								▮						▮
		6	· 9-10	C	M					▮ cf							▮							▮		▮	▮														▮
			CC	A	M					▮ cf							▮			▮				▮		▮	▮														▮
321 -330,5	9	1	17-18	C	M						▮				▮		▮									▮									▮						
		2	9-10	A	M						▮				▮	▮	▮									▮									▮						
		3	9-10	A	M						▮					▮	▮									▮															
		4	9-10	A	M						▮					▮	▮									▮															
			CC	A	M											▮	▮									▮															
349,5-359	10	1	39-40	A	P										▮	▮	▮	▮																				▮		
		2	9-10	A	P										▮	▮	▮	▮													▮							▮		
		3	9-10	A	P										▮	▮		▮ cf													▮							▮		
		4	9-10	C	P										▮	▮															▮									
		5	9-10	A	P											▮	▮														▮							▮		
		6	9-10	R	P																										▮							▮		
			CC	A	P											▮															▮							▮		

TABLE 12A –*Continued*

Discoaster berggrenii	Discoaster binodosus	Discoaster bollii	Discoaster brouweri	Discoaster calcaris	Discoaster challengeri	Discoaster cruciformis	Discoaster deflandrei	Discoaster diastypus	Discoaster druggii	Discoaster elegans	Discoaster exilis	Discoaster hamatus	Discoaster intercalaris	Discoaster lautus	Discoaster lenticularis	Discoaster lodoensis	Discoaster mirus	Discoaster mohleri	Discoaster moorei	Discoaster multiradiatus	Discoaster neorectus	Discoaster nobilis	Discoaster nonaradiatus	Discoaster pentaradiatus	Discoaster pseudovariabilis	Discoaster quinqueramus	Discoaster saipanensis	Discoaster salisburgensis	Discoaster sublodoensis	ZONE	AGE	
																														Emiliania huxleyi to Gephyrocapsa oceanica	PLEISTOCENE	
																														Emiliania ovata		
			█																											Discoaster brouweri	U	PLIOCENE
			█																													
			█																					█	█					Reticulofenestra pseudoumbilica	L	
			█																					█								
			█																█					█	█	R				Ceratolithus rugosus		
			█																					█	█	R						
R			█	█																				█	█	R						
R		█	█		█														█					█	█							
R			█	█	█								█						█					█		R				Ceratolithus acutus		
█			█		█														█					█		█				Discoaster berggrenii	U	MIOCENE
█			█		█														█					█		█						
█			█		█								█						█					█		█						
			█	█	█														█					█						Discoaster calcaris		
			█	█	█							█							█		█			█	█					Discoaster hamatus		
			█	█	█							█							█					█								
							█		█		█			█					█											Helicosphaera ampliaperta	L	
							█																									
											█						█						█				█		█	Nannotetrina fulgens	M	EOCENE
	█																						█				█		█	Discoaster sublodoensis	L	
	█					█										█							█				█		█			
	█					█										█											█		█			
						█										█														Discoaster lodoensis		
	█					█										█														Tribrachiatus orthostylus		
	█							█								█																
	█							█								█												█				
								█										█		█		█								Tribrachiatus contortus		
								█										█		█		█						█				
															█			█		█		█						█				
															█			█		█		█										
																		█		█		█						█				
																														Heliolithus kleinpelli	M	PALEOCENE
																														Fasciculithus tympaniformis		
																														Cruciplacolithus tenuis	L	

TABLE 12B
Distribution of Pleistocene-Paleocene Calcareous Nannofossils at Site 364

LEG 40 SITE 364																																							
DEPTH BELOW SEA FLOOR IN METERS	CORE	SECTION	INTERVAL (cm)	ABUNDANCE	PRESERVATION	Discoaster surculus	Discoaster tanii	Discoaster tanii nodifer	Discoaster sp. 1	Discoaster variabilis	Discoaster variabilis decorus	Discoasteroides kuepperi	Discoasteroides megastypus	Ellipsolithus distichus	Ellipsolithus macellus	Emiliania annula	Emiliania ovata	Ericsonia cava	Fasciculithus involutus	Fasciculithus janii	Fasciculithus pileatus	Fasciculithus tympaniformis	Gephyrocapsa oceanica	Gephyrocapsa spp.	Helicosphaera ampliaperta	Helicosphaera carteri	Helicosphaera intermedia	Helicosphaera sellii	Heliolithus kleinpellii	Markalius inversus	Minilitha convallis	Nannotetrina cristata	Nannotetrina fulgens	Neochiastozygus chiastus	Neochiastozygus distentus	Neochiastozygus junctus	Neococcolithes dubius	Neococcolithes protenus	Pontosphaera discopora
7,5-17	1	1	13-14	F	M																		▮	▮		▮													
		2	9-10	A	M																		▮	▮		▮													
		3	9-10	C	M																		▮	▮		▮													
		4	9-10	A	M																		▮	▮		▮													
		5	9-10	C	M																		▮	▮		▮													
		6	9-10	A	M																		▮	▮		▮													
		CC		A	G											▮	▮						▮	▮		▮													▮
36-45,5	2	2	9-10	R	P											▮	▮							▮		▮		▮											
		CC		C	M											▮	▮							▮		▮		▮											▮
64,5-74	3	1	33-34	A	G	▮					▮					▮	▮							▮		▮		▮											
		2	9-10	A	G	▮					▮					▮	▮							▮		▮		▮											
		3	9-10	A	G	▮					▮					▮	▮							▮		▮		▮											▮
		4	9-10	A	G	▮					▮					▮								▮		▮													
		5	9-10	C	G	▮				▮	▮					▮								▮		▮													
		6	9-10	C	G	▮				▮	▮					▮										▮													
		CC		A	G	▮				▮	▮					▮										▮													
102,5-112	4	2	9-10	C	M					▮																▮													
		3	9-10	A	M					▮	▮															▮													
		4	9-10	C	M	▮				▮	▮															▮					▮								▮
		5	9-10	C	M					▮																▮					▮								
		6	9-10	A	M					▮																▮					▮								▮
		CC		A	M					▮																▮													▮
150-159,5	5	3	9-10	C	M					▮															▮	▮	▮												
		CC		R	P					▮																	▮												
197,5-207	6	1	9-10																																				
		CC																																					
245-254,5	7	1	9-10																																				
		CC		A	M		▮	▮																								▮	▮						
283-292,5	8	1	9-10	A	M		▮	▮				▮																				▮						▮		
		2	9-10	A	M			▮				▮																									▮		
		3	9-10	A	M		▮					▮																											
		4	9-10	A	M		▮					▮																											
		5	9-10	A	M							▮																										▮	
		6	9-10	C	M							▮																										▮	
		CC		A	M							▮			▮																							▮	
321-330,5	9	1	17-18	C	M							▮	▮	▮	▮			▮																▮	▮				
		2	9-10	A	M									▮	▮			▮	▮															▮	▮	▮			
		3	9-10	A	M								▮	▮	▮			▮	▮											▮				▮		▮			
		4	9-10	A	M								▮	▮	▮			▮	▮															▮	▮	▮			
		CC		A	M				▮				▮	▮	▮			▮	▮			▮								▮				▮		▮			
349,5-359	10	1	39-40	A	P													▮	▮			▮							▮	▮				▮					
		2	9-10	A	P										▮			▮	▮	▮	▮	▮								▮				▮					
		3	9-10	A	P										▮			▮		▮	▮	▮								▮				▮					
		4	9-10	C	P													▮												▮				▮					
		5	9-10	A	P													▮		▮		▮								▮									
		6	9-10	R	P													▮																					
		CC		A	P													▮												▮									

TABLE 12B – *Continued*

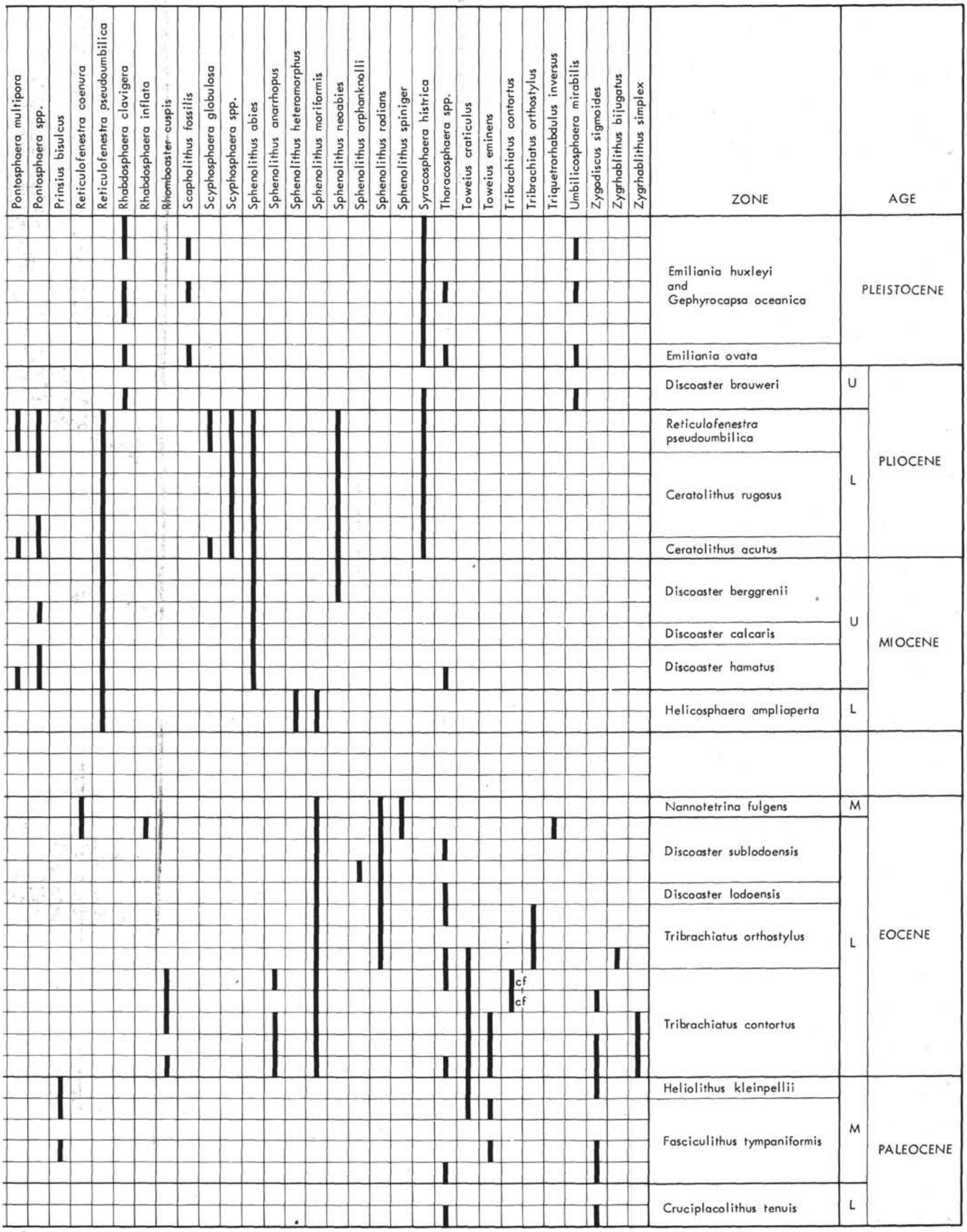


TABLE 13
Distribution of Maestrichtian-Coniacian Calcareous Nannofossils at Site 364

LEG 40 SITE 364						Ahmuellerella octoradiata	Arkhangelskiella cymbiformis	Arkhangelskiella specillata	Biscutum constans	Broinsonia enormis	Broinsonia parca	Chiastozygus cuneatus	Chiastozygus litterarius	Crepidolithus thiersteinii	Cretarhabdus conicus	Cretarhabdus coronadventis	Cretarhabdus crenulatus	Cretarhabdus schizobrachiatus	Cretarhabdus surirellus	Cribrospaerella ehrenbergii	Cylindralithus coronatus	Cylindralithus gallicus	Cylindralithus serratus	Discorhabdus ignotus	Eiffellithus anceps	Eiffellithus eximius	Eiffellithus trabeculatus	Eiffellithus turriseiffeli	Gartnerago obliquum	Kamptnerius magnificus	Lithastrinus grillii	Lithastrinus floralis	Lithraphidites carniolensis	Licanorhabdus cayeuxii	Manivitella pemmatoidea	Markalius circumradiatus	Markalius inversus	Marthasterites furcatus
DEPTH BELOW SEA FLOOR IN METERS	CORE	SECTION	INTERVAL (cm)	ABUNDANCE	PRESERVATION																																	
359 -368,5	11	1	top	A	P		▮															▮															▮	
		1	bottom	A	P		▮															▮																
		CC		A	P		▮															▮														▮		
368,5-378	12	3	9-10	A	P		▮										▮			▮			▮															
		CC		A	P						▮						▮			▮		▮	▮					▮									▮	
397 -406,5	13	1	40-41	A	P		▮				▮						▮			▮		▮																
		2	9-10	A	P															▮								▮							▮			
425,5-435	14	1	95-96	A	P	▮	▮				▮						▮	▮		▮		▮			▮	cf ▮		▮						▮				
		3	9-10	A	M	▮	▮				▮				▮		▮	▮		▮		▮			▮			▮							▮			
		4	9-10	A	P	▮	▮				▮				▮		▮			▮		▮	▮		▮	cf ▮		▮		▮					▮			▮
		CC		A	M	▮	▮				▮			▮			▮	cf ▮		▮		▮	▮		▮	▮		▮		▮					▮			
463,5-473	15	1	58-59	A	P			▮			▮						▮			▮		▮	▮		▮										▮			
		CC		A	P			▮			▮			▮			▮			▮		▮	▮		▮	▮									▮	▮		
501,5-511	16	3	9-10	A	P			▮			▮			▮					▮	▮		▮	▮		▮	▮			▮						▮			
		CC		A	P			▮			▮						▮					▮				▮		▮							▮			
530 -539,5	17	1	9-10	A	M					▮							▮			▮			▮		▮	▮			▮	▮					▮			▮
		6	9-10	A	M							▮	▮				▮			▮						▮			▮						▮			▮
549 -558	18	3	9-10	A	P																					▮		▮										▮
		CC		A	P												▮									▮		▮										▮
568 -577,5	19	3	33-34	A	M	▮				▮		▮				▮	▮			▮			▮		▮	▮		▮	▮			▮			▮			▮
		CC		A	M												▮									▮					▮	▮			▮			▮
577,5-587	20	2	9-10	A	M					▮						▮	▮			▮			▮		▮	▮		▮	▮	▮	▮		▮		▮	▮		▮
		CC		A	P					▮		▮				▮	▮			▮			▮			▮		▮	▮			▮			▮	▮		▮
596,5-601	21	1	9-10	A	P	▮				▮		▮					▮		▮	▮			▮		▮	▮		▮	▮						▮	▮		▮
		4	5-6	A	P							▮				▮	▮			▮			▮		▮	▮		▮	▮			▮	▮		▮			▮
		CC		A	P					▮		▮					▮			▮			cf ▮			cf ▮				▮					▮			▮
615,5-625	22	2	12-13	C	P												▮								▮	cf ▮						▮						▮
		4	8-9	C	P				▮	▮		▮				▮	▮														▮	▮			▮	▮		▮
		CC		A	M	▮			▮			▮					▮		▮				cf ▮	▮		▮		▮	▮							▮		▮
644 -653,5	23	1	54-55	A	P							▮				▮	▮				▮				▮						▮		▮		▮	▮		▮
		2	9-10	A	M	▮											▮										▮	▮	▮		▮	▮			▮	▮		▮
		3	9-10	A	M																							▮	▮									▮
		4 ·	7-8	A	M											▮												▮	▮			▮			▮			

Lithraphidites alatus does not permit to distinguish between upper Albian and Cenomanian. If this Cenomanian marker should be absent for ecological reasons, Cenomanian sediments could be present in the upper part of the interval.

Cores 34 to 41-2, 139-141 cm (872-1007 m) contain coccoliths of the lower to middle Albian *Prediscosphaera cretacea* Zone. The lower part of Core 41, Section 3-6 and core catcher, and Core 42 (1007-1033.5 m) yield only poorly preserved assemblages of the *Parhabdolithus angustus* Zone. This zone ranges from upper Aptian to lower Albian, but the presence in these cores of *Hayesites albiensis* suggests a lower Albian age for this interval.

Core 43 (1033.5-1043 m) is barren of calcareous nannofossils.

SITE 365

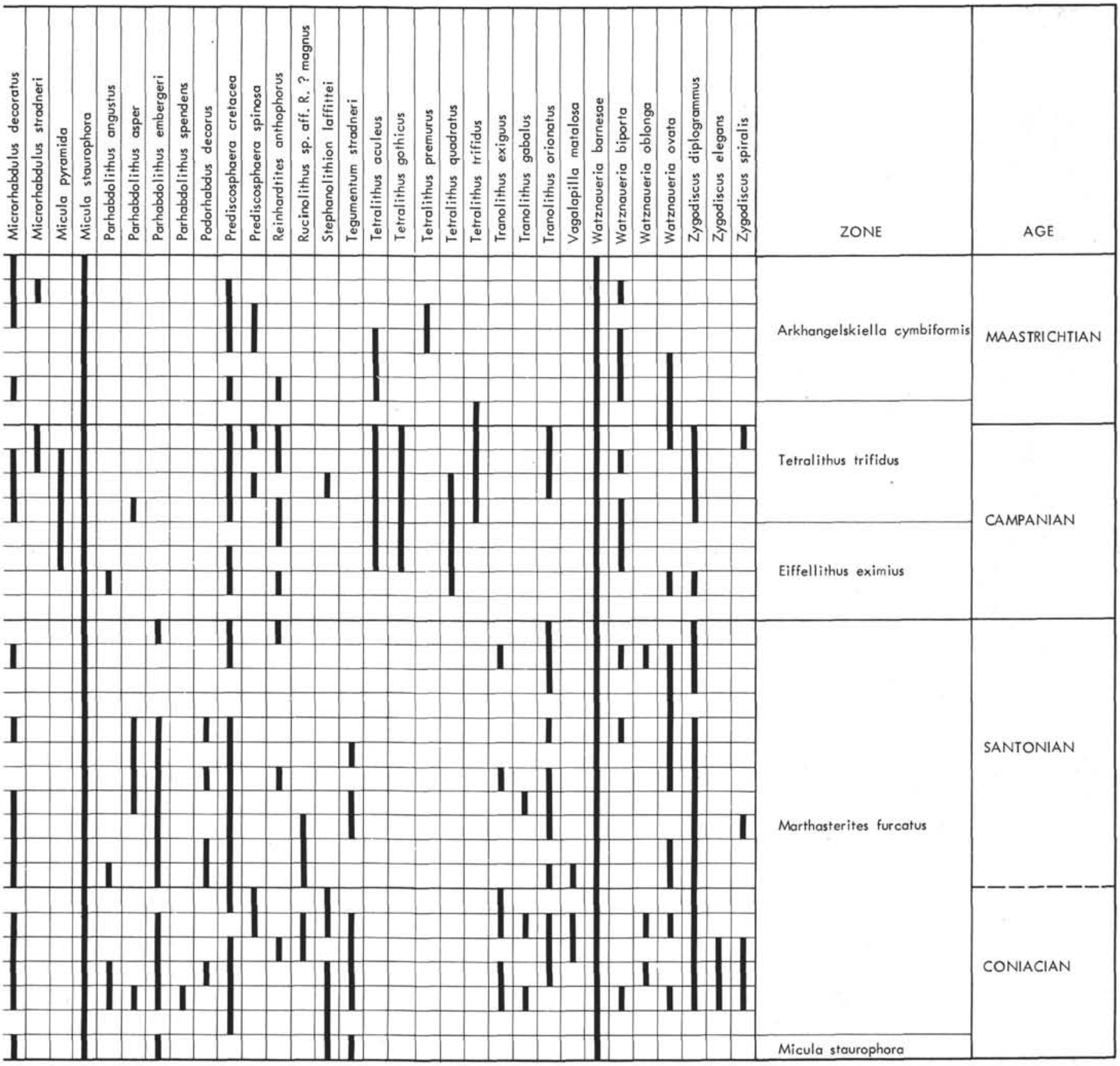
Angola Basin (lat 11°39.10'S, long 11°53.72'E, water depth 3018 m)

Only the first three cores of this site contain calcareous nannofossils

In Core 1 (225 to 234.5 m below sea floor) some samples are barren, some contain diatoms, silicoflagellates, Radiolaria, and Quaternary coccoliths which could represent down-hole contamination. In Core 1, Section 6 and in the core catcher the moderate to poorly preserved nannofossils with *Marthasterites furcatus* are of Santonian/Coniacian age.

Core 2, together with barren samples, contains assemblages of probably upper Albian age in Section 3, while those of the core catcher seem to be younger,

TABLE 13 – *Continued*



probably post-Santonian, by the presence of *Micula staurophora* and the absence of the solution-resistant *Lithastrinus floralis*.

Sections 1 to 3 of Core 3 are barren of calcareous nannofossils. Two core-catcher samples of this core were examined. The light colored one contains abundant, moderately preserved nannofloras of upper Albian age. The dark one contains abundant coccolith fragments which suggest strong dissolution effects.

Core 4 does not contain any preserved coccoliths, except for some rare *Watznaueria*, but small fragments are abundant in the core-catcher sample.

The remaining part of the section, Cores 5-7, are barren of calcareous nannofossils.

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TABLE 14
Distribution of Albian Calcareous Nannofossils at Site 364

LEG 40 SITE 364						Ahmuellerella sp. aff. octoradiata	Biscutum constans	Braarudosphaera africana	Braarudosphaera bigelowii	Broinsonia enormis	Broinsonia lata	Broinsonia signata	Chiastozygus litterarius	Corollithion achylosum	Corollithion signum	Cretarhabdus conicus	Cretarhabdus coronadventis	Cretarhabdus crenulatus	Cretarhabdus loriei	Cretarhabdus surirellus	Cruciellipsis chiasta	Cylindralithus coronatus	Cyclagelosphaera margerelii	Discorhabdus ignotus	Eiffellithus trabeculatus	Eiffellithus turriseiffeli	Gartnerago striatum	Hayesites albiensis	Lithastrinus floralis	Lithraphidites carniolensis	Manivitella pemmatoidea	Markalius circumradiatus	Microrhabdulus decoratus	Nannoconus truittii	Parhabdolithus angustus	Parhabdolithus asper	Parhabdolithus embergeri	Parhabdolithus splendens	Podorhabdus albianus	Podorhabdus decorus	Prediscosphaera cretacea	Prediscosphaera spinosa	Reinhardtites fenestratus	Rucinolithus hayi
DEPTH BELOW SEA FLOOR IN METERS	CORE	SECTION	INTERVAL (cm)	ABUNDANCE	PRESERVATION																																							
672,5-682	24	2	11-12	R	P																					▮			▮						▮									
		CC		A	P		▮			▮								▮							▮	▮			▮	▮	▮				▮	▮	▮	▮	▮		▮	▮		
701 -710,5	25	1	118-119	C	P																					▮			▮		▮				▮						▮			
		4	92-93	C	P								▮					▮						▮		▮			▮						▮	▮	▮	▮			▮			
		5	top	R	P																					▮			▮															
		5	84-85	R	P																					▮			▮															
		6	105-106	C	P														▮							▮			▮		▮						▮				▮			
710,5-720	26	1	142-143	A	P	▮	▮			▮			▮												▮	▮			▮		▮		▮				▮	▮			▮			
		2	136-137	C	P		▮						▮											▮	▮	▮			▮								▮	▮						
		3	54-56	C	P		▮						▮													▮			▮	▮	▮	▮	▮			▮	▮	▮			▮			
		3	70-71	A	P	▮	▮						▮					▮	▮					▮	▮	▮			▮						▮		▮	▮	▮		▮			
		3	146-148	A	P	▮	▮						▮				▮		▮					▮		▮				▮	▮		▮			▮	▮		▮		▮			
		4	72-73	A	P	▮	▮						▮				▮	▮							▮	▮			▮	▮							▮	▮	▮		▮			
		5	65-66	A	P								▮					▮						▮	▮	▮			▮	▮	▮		▮				▮	▮			▮			
		6	46-47	A	P	▮	▮						▮					▮						▮		▮			▮				▮		▮		▮	▮	▮		▮			
		CC		A	P	▮	▮					▮	▮					▮	▮					▮		▮			▮						▮	▮	▮	▮	▮		▮			
720,0-729,5	27	2	top	C	P		▮					▮	▮					▮						▮		▮			▮	▮			▮		▮	▮	▮	▮	▮		▮			
		2	143-144	C	P		▮			▮		▮	▮											▮	▮	▮				▮									▮		▮			
		3	37-38	A	P		▮																	▮		▮			▮							▮	▮	▮	▮		▮			
		3	70-71	C	M		▮			▮	▮		▮					▮						▮		▮	▮			▮							▮		▮		▮	▮		
		5	84-85	A	P		▮			▮			▮	▮		▮	▮	▮				▮		▮	▮	▮				▮	▮		▮		▮	▮	▮	▮			▮			
748,5-758	28	1	61-62	A	M		▮						▮				▮	▮						▮		▮				▮	▮		▮		▮			▮	▮		▮			
		2	42-43	A	P								▮					▮						▮		▮			▮		▮		▮		▮		▮				▮	▮		
		3	104-105	C	P		▮			▮			▮	▮			▮	▮			▮			▮		▮	▮			▮	▮				▮	▮	▮	▮	▮		▮	▮		
		4	19-20	C	M	▮	▮			▮		▮				▮		▮	▮					▮	▮	▮				▮		▮			▮	▮		▮			▮			
		CC		C	P	▮	▮	▮		▮			▮					▮	▮		▮				▮	▮	▮			▮					▮	▮	▮	▮	▮		▮			
767,5-777	29	1	72-73	A	P					▮		▮	▮					▮						▮		▮	▮		▮	▮	▮						▮				▮	▮		
		2	3-4	A	M		▮	▮																▮		▮					▮				▮						▮			
		3	21-22	A	M	▮		▮					▮					▮	▮		▮			▮		▮				▮	▮					▮		▮	▮		▮			
		4	13-14	A	M	▮	▮	▮		▮			▮					▮			▮				▮	▮				▮	▮				▮	▮	▮	▮	▮		▮			
786,5-796	30	1	33-34	A	M		▮	▮			▮	▮	▮		▮	▮	▮	▮		▮	▮			▮	▮	▮	▮		▮	▮	▮				▮	▮			▮	▮		▮		▮
		2	121-122	C	M		▮			▮								▮			▮			▮	▮	▮	▮			▮					▮			▮			▮	▮		
		3	108-109	C	M		▮	▮					▮								▮					▮				▮	▮			▮	▮		▮	▮	▮		▮	▮		
		CC		C	M		▮	▮				▮	▮				▮			▮	▮			▮	▮	▮				▮	▮			▮	▮	▮		▮		▮	▮			▮
805,5-815	31	1	60-61	A	M		▮	▮										▮	▮					▮	▮	▮		▮			▮	▮		▮	▮	▮		▮			▮	▮		
824,5-834	32	4	91-92	A	M	▮	▮														▮			▮		▮				▮	▮			▮	▮	▮	▮	▮			▮			
		CC		A	M	▮	▮										▮	▮					▮	▮	▮	▮			▮					▮		▮	▮	▮						
843,5-853	33	3	75-76	A	M		▮	▮					▮			▮	▮	▮						▮	▮	▮				▮	▮				▮	▮	▮	▮			▮			
		4	51-52	C	M	▮	▮	▮				▮						▮						▮					▮	▮					▮	▮	▮	▮						
		5	141-142	R	P																																▮							
		CC		C	M		▮	▮					▮					▮	▮		▮			▮	▮	▮				▮	▮			▮	▮	▮	▮	▮			▮			
872 -881,5	34	1	109-110	C	M	▮	▮										▮							▮		▮ cf										▮	▮	▮			▮			
		2	86-87	A	M	▮	▮	▮								▮	▮	▮						▮						▮	▮			▮	▮	▮	▮	▮	▮		▮		▮	
		3	87-88	A	M	▮	▮	▮				▮					▮	▮						▮					▮	▮	▮			▮	▮	▮	▮				▮			
891 -900,5	35	1	16-17	A	M	▮	▮	▮			▮	▮		▮			▮				▮			▮						▮	▮			▮	▮	▮	▮				▮		▮	
		2	78-79	A	M	▮	▮			▮						▮	▮	▮			▮			▮	▮	▮ cf		▮		▮	▮	▮		▮		▮	▮	▮	▮		▮	▮	▮	
		2	112-115	A	M	▮	▮	▮					▮				▮	▮	▮				▮	▮	▮	▮ cf		▮		▮	▮	▮			▮	▮	▮	▮			▮			▮
		3	67-68	A	M	▮	▮	▮				▮					▮	▮	▮	▮	▮							▮		▮	▮	▮		▮	▮	▮	▮		▮	▮	▮			
910 -919,5	36	CC		C	M			▮	▮																				▮					▮							▮			
929 -938,5	37	CC		C	M			▮					▮																▮					▮			▮				▮			
948 -957,5	38	CC		A	P			▮	▮							▮		▮											▮						▮	▮	▮				▮			
967 -976,5	39	2	122-123	A	M		▮			▮						▮		▮													▮				▮	▮	▮	▮			▮			
		3	67-68	A	M		▮	▮		▮	▮		▮			▮	▮	▮					▮	▮	▮			▮			▮	▮		▮	▮		▮	▮			▮			
		4	90-91	A	M		▮	▮		▮	▮		▮			▮	▮							▮	▮			▮	▮	▮	▮				▮		▮	▮			▮		▮	
		5	5-6	A	M		▮					▮	▮	▮		▮			▮	▮	▮			▮	▮			▮	▮	▮	▮	▮			▮	▮							▮	
		6	85-86	A	M		▮	▮						▮			▮		▮					▮							▮			▮	▮	▮		▮			▮			
		CC		A	M		▮									▮														▮	▮	▮			▮	▮	▮	▮			▮			
986 -995,5	40	2	30-31	A	M		▮	▮				▮		▮				▮			▮													▮	▮			▮			▮			
		3	121-122	A	M								▮					▮			▮			▮				▮		▮	▮	▮			▮	▮	▮	▮			▮			
		4	42-43	A	M	▮	▮					▮	▮	▮		▮	▮	▮	▮	▮	▮			▮				▮	▮	▮	▮	▮			▮	▮	▮	▮						
		5	13-14	A	M		▮	▮	▮				▮	▮			▮	▮	▮		▮			▮	▮				▮		▮					▮	▮	▮						
1005-1014,5	41	2	139-140	A	M			▮	▮				▮	▮		▮	▮	▮		▮				▮						▮					▮	▮	▮				▮			
		3	67-68	A	P		▮					▮	▮	▮			▮	▮		▮ cf				▮					▮	▮	▮				▮	▮		▮						
		4	31-32	C	P																										▮				▮	▮								
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1024-1033,5	42	2	17-18	C	P		▮										▮													▮	▮				▮	▮	▮							
		3	45-46	F	P					▮																			▮		▮				▮	▮	▮							
		4	75-76	A	P		▮																	▮					▮	▮					▮	▮	▮	▮						
		5	35-36	R	P		▮																												▮									
		6	32-33	F	P								▮					▮						▮						▮	▮				▮		▮							
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TABLE 14 – *Continued*

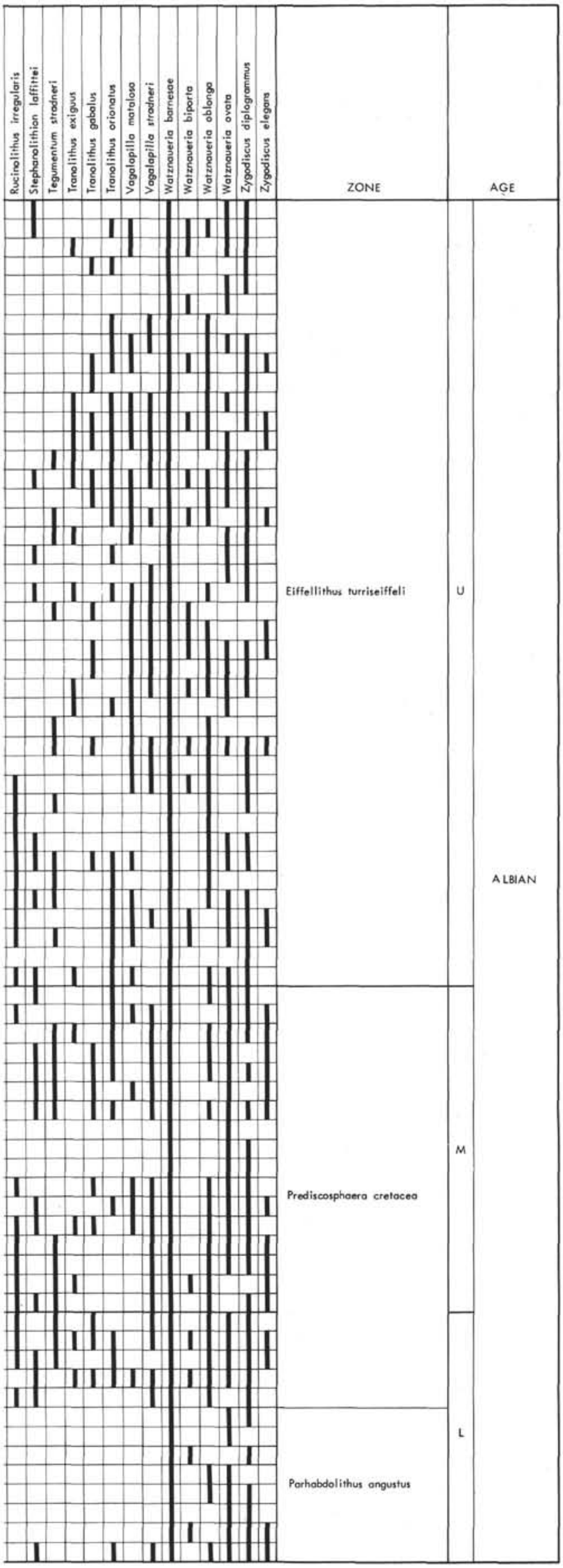

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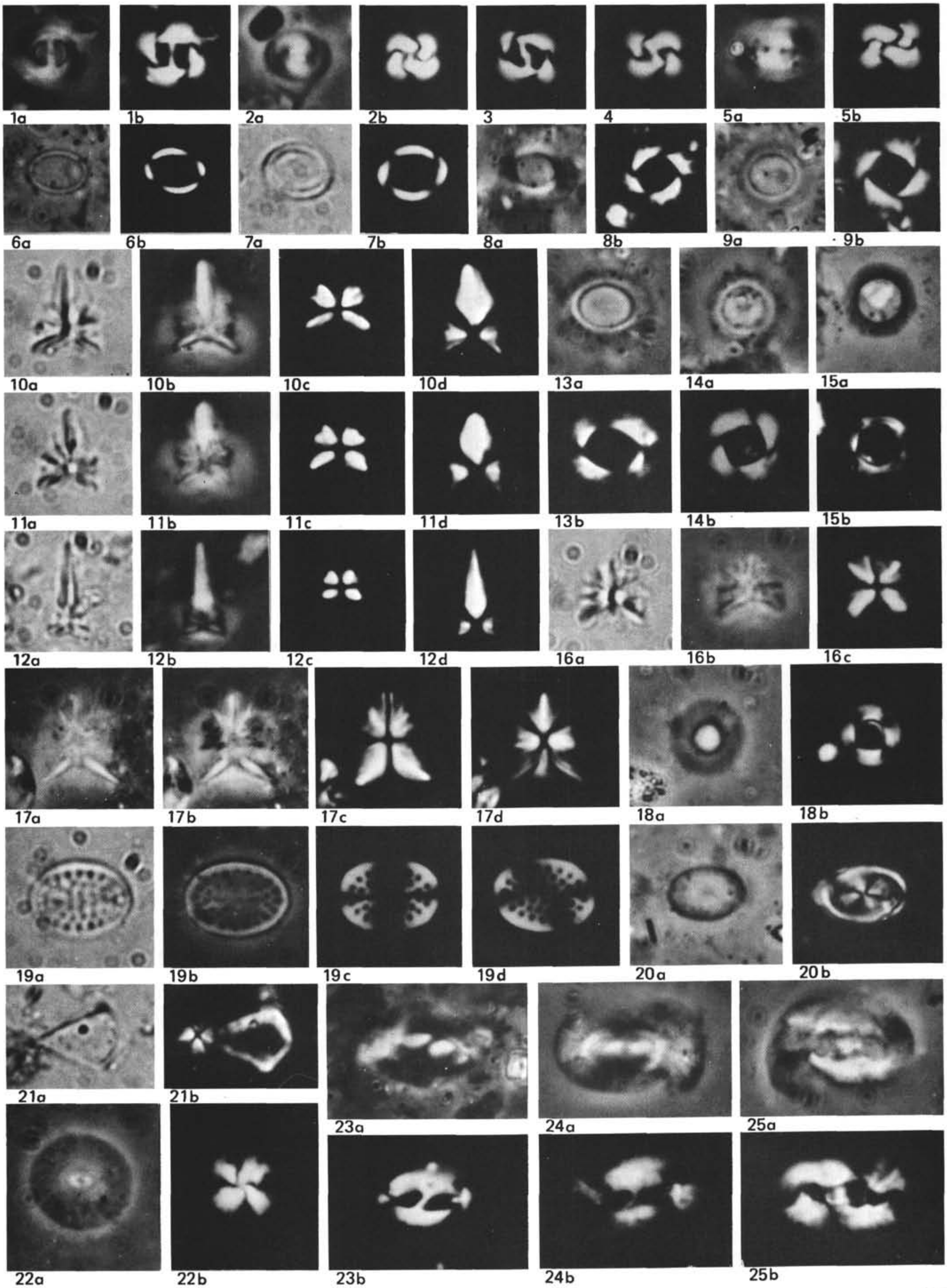
PLATE 1

Figures 1, 3, 4	*Gephyrocapsa oceanica* Kamptner. Sample 364-1 CC. 1a. Phase contrast. 1b, 3, 4. Cross-polarized light (×2800).
Figures 2, 5	*Gephyrocapsa caribbeanica* Boudreaux and Hay. Sample 364-1, CC. 2a, 5a. Phase contrast. 2b, 5b. Cross-polarized light (×2800).
Figures 6, 7	*Cricolithus jonesii* Cohen. 6a. Phase contrast; 6b. Cross-polarized light (×2800). Sample 364-1, CC. 7a. Transmitted light; 7b. Cross-polarized light (×2800). Sample 364-3, CC.
Figures 8, 9, 13	*Emiliania ovata* Bukry. 8a, 9a. Phase contrast; 8b, 9b. Cross-polarized light (×2800). Sample 364-1, CC. 13a. Phase contrast; 13b. Cross-polarized light (×2800). Sample 364-3-3, 9-10 cm.
Figures 10-12	*Sphenolithus heteromorphus* Deflandre. Sample 364-5-3, 9-10 cm. 10a- 12a. Transmitted light. 10b- 12b. Phase contrast. 10c- 12c. Long axis 0° to crossed nicols. 10d- 12d. Long axis 45° to crossed nicols (×2800).
Figures 14, 15	*Emiliania annula* (Cohen). Sample 364-3, CC. 14a, 15a. Phase contrast. 14b, 15b. Cross-polarized light (×2800).
Figure 16	*Sphenolithus moriformis* (Brönnimann and Stradner). Sample 364-5-3, 9-10 cm. 16a. Transmitted light. 16b. Phase contrast. 16c. Cross-polarized light (×2800).
Figure 17	*Sphenolithus abies* Deflandre. Sample 364-5-3, 9-10 cm. 17a, 17b. Phase contrast. 17c. Long axis 0° to crossed nicols. 17d. Long axis 45° to crossed nicols (×2800).
Figure 18	*Umbilicosphaera mirabilis* Lohmann. Sample 364-1-2, 9-10 cm. 18a. Phase contrast. 18b. Cross-polarized light (×2800).
Figure 19	*Pontosphaera multipora* (Kamptner). Sample 364-4-4, 9-10 cm. 19a. Transmitted light. 19b. Phase contrast. 19c. Long axis 0° to crossed nicols. 19d. Long axis 45° to crossed nicols (×2800).
Figure 20	*Syracosphaera histrica* Kamptner. Sample 364-1-2, 9-10 cm. 20a. Phase contrast. 20b. Cross-polarized light (×2800).
Figure 21	*Minilitha convallis* Bukry. Sample 364-4-6, 9-10 cm. 21a. Transmitted light. 21b. Cross-polarized light (×2800).
Figure 22	*Cyclococcolithus leptoporus* (Murray and Blackman). Sample 364-1-2, 9-10 cm. 22a. Phase contrast. 22b. Cross-polarized light (×2800).
Figures 23, 24	*Helicosphaera sellii* (Bukry and Bramlette). Sample 364-2, CC. 23a, 24a. Phase contrast. 23b, 24b. Cross-polarized light (×2800).
Figure 25	*Helicosphaera intermedia* Martini. Sample 364-5-3, 9-10 cm. 25a. Phase contrast. 25b. Cross-polarized light (×2800).

PLATE 1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21a
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22a
22b
23b
24b
25b

PLATE 2

Figure 1	*Helicosphaera ampliaperta* Bramlette and Wilcoxon. Sample 364-5-3, 9-10 cm. 1a. Phase contrast. 1b. Cross-polarized light (×2800).
Figure 2	*Helicosphaera carteri* (Wallich). Sample 364-4, CC. 2a. Phase contrast. 2b. Cross-polarized light (×2800).
Figure 3	*Cyclicargolithus floridanus* (Roth and Hay). Sample 364-5-3, 9-10 cm. 3a. Transmitted light. 3b. Phase contrast. 3c. Cross-polarized light (×2800).
Figure 4	*Coronocyclus nitescens* (Kamptner). Sample 364-5-3, 9-10 cm. 4a. Phase contrast. 4b. Cross-polarized light (×2800).
Figure 5	*Cyclicargolithus abisectus* (Müller). Sample 364-5-3, 9-10 cm. 5a. Phase contrast. 5b. Cross-polarized light (×2800).
Figure 6	*Cyclococcolithus macintyrei* Bukry and Bramlette. Sample 364-4, CC. 6a. Phase contrast. 6b. Cross-polarized light (×2800).
Figure 7	*Thoracosphaera saxea* Stradner. Sample 364-1-3, 9-10 cm. 7a. Transmitted light. 7b. Cross-polarized light (×2800).
Figure 8	*Reticulofenestra pseudoumbilica* (Gartner). Sample 364-4, CC. 8a. Phase contrast. 8b. Cross-polarized light (×2800).
Figures 9-12	Problematic calcareous nannofossil. Sample 361-8-0, 9-10 cm. 9,10. Scanning electron micrographs (×1500, ×6000). 11,12a. Transmitted light. 12b. Cross-polarized light (×1500, ×2800).

PLATE 2

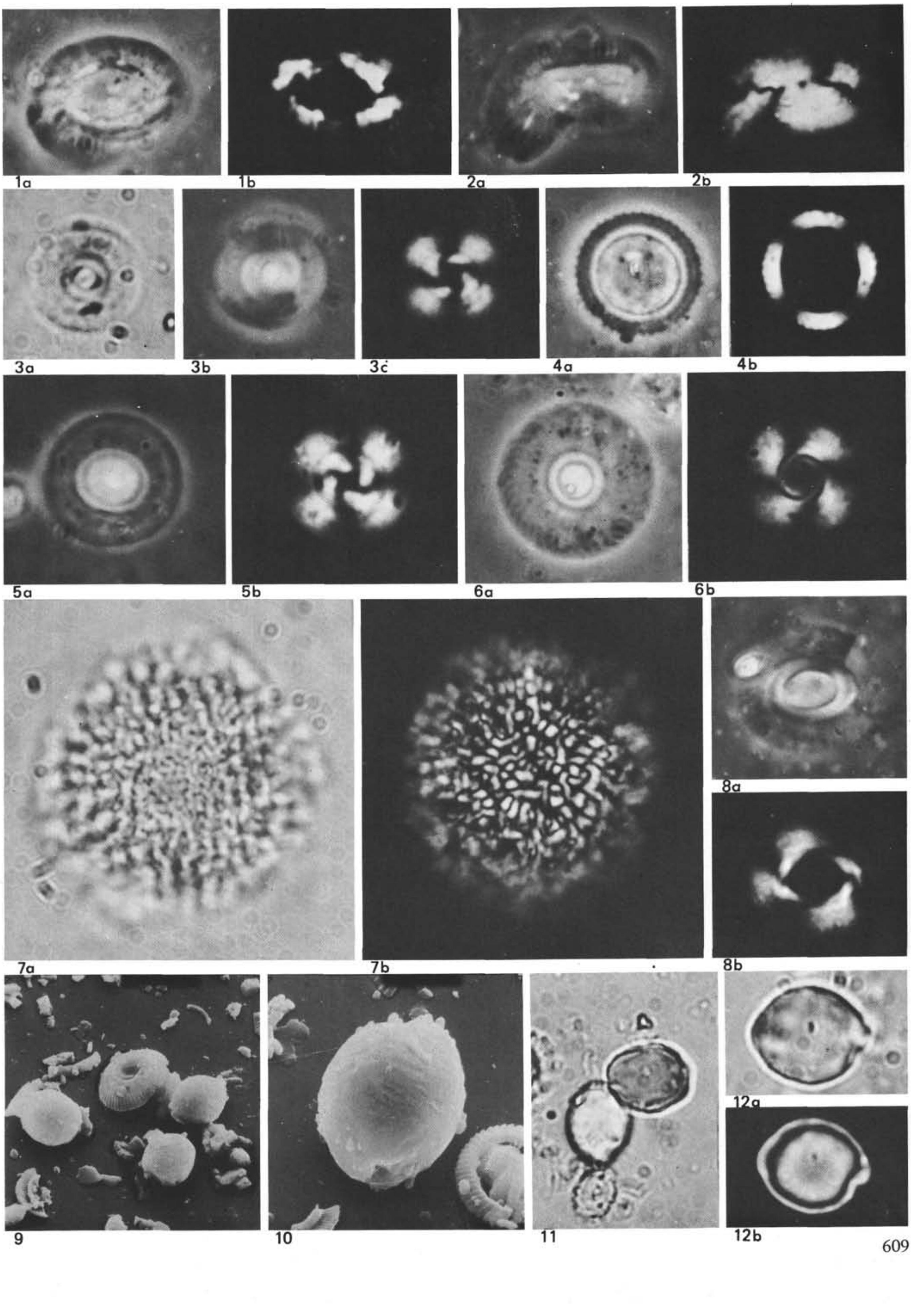


PLATE 3

Figures 1,8 *Scyphosphaera apsteinii* Lohmann.
1a, 2a. Transmitted light.
1b, 2b. Cross-polarized light (×2800).
1. Sample 364-4-6, 9-10 cm.
2. Sample 364-4, CC.

Figure 2 *Scyphosphaera pulcherrima* Deflandre. Sample 364-4-6, 9-10 cm.
2a. Transmitted light.
2b. Cross-polarized light (×2800).

Figures 3, 4 *Scyphosphaera globulosa* Kamptner.
3a, 4a. Transmitted light.
3b, 4b. Cross-polarized light (×2800).
3. Sample 364-3-1, 33-34 cm.
4. Sample 364-3, CC.

Figure 5 *Scyphosphaera amphora* Deflandre. Sample 364-3-1, 33-34 cm.
5a. Transmitted light.
5b. Cross-polarized light (×2800).

Figures 6, 7 *Scyphosphaera intermedia* Deflandre. Sample 364-3, CC.
6a, 7a. Transmitted light.
7b, 7c. Cross-polarized light.

PLATE 4

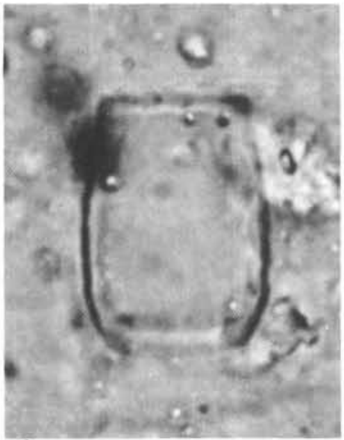
Figures 1-4, 6, 7, 9 *Ceratolithus rugosus* Bukry and Bramlette.
1a- 4a, 6a, 7a, 9a. Transmitted light.
1b, 2b, 3b, 3c. Phase contrast.
1c, 2c, 3d, 4b, 6b, 7b, 9b. Cross-polarized light (×2800).
1- 3, 6, 7. Sample 364-3-5, 9-10 cm.
4. Sample 364-3-1, 33-34 cm.
9. Sample 364-3-2, 9-10 cm.

Figures 5, 8, 10, 11 *Ceratolithus acutus* Gartner and Bukry. Sample 364-3-6, 9-10 cm.
5a, 8a, 10a, 11a. Transmitted light.
8b. Phase contrast.
5b, 8c, 10b, 11b. Cross-polarized light (×2800).

Figure 12 *Ceratolithus cristatus* Kamptner. Sample 364-1-3, 9-10 cm.
12a. Transmitted light.
12b. Phase contrast.
12c. Cross-polarized light (×2800).

(see p. 612)

PLATE 3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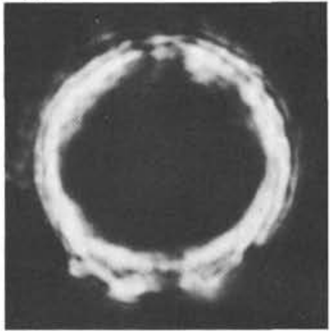
1b


2a


2b


3a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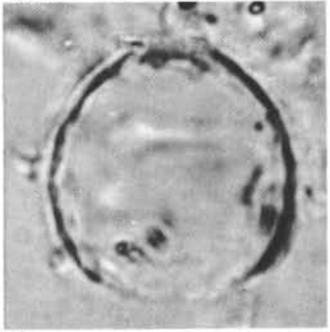
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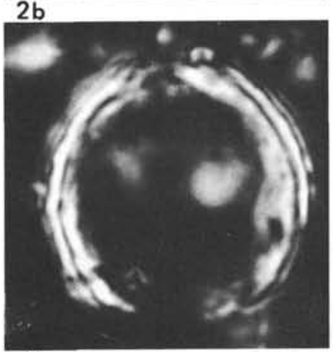
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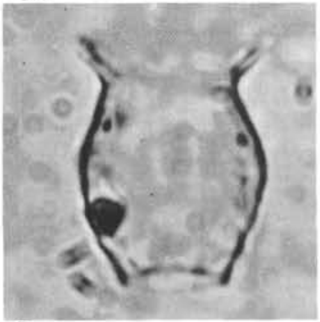
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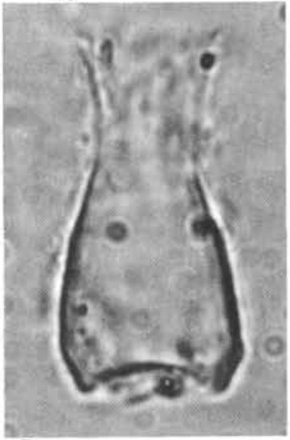
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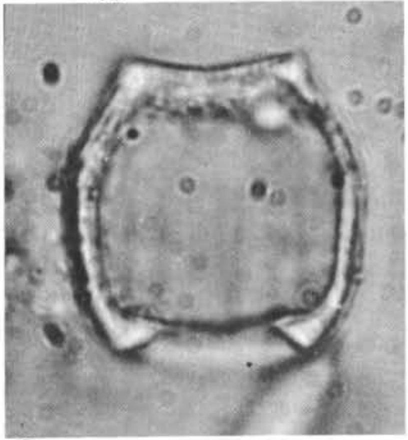
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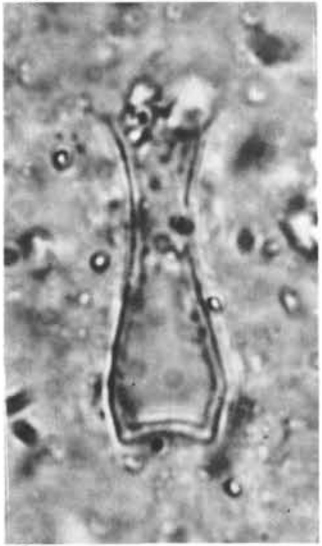
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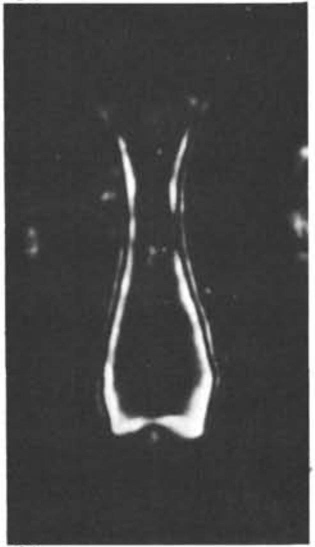
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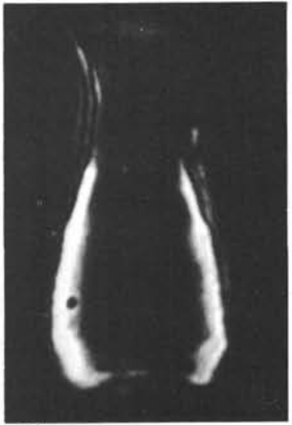
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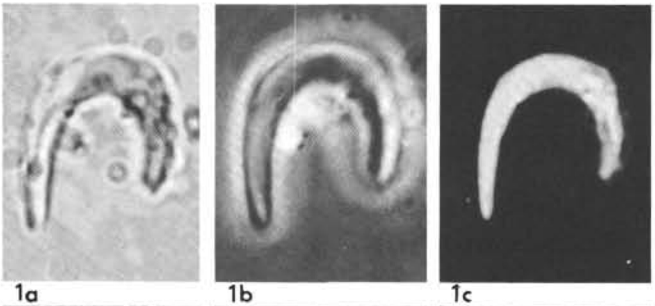
8b

PLATE 4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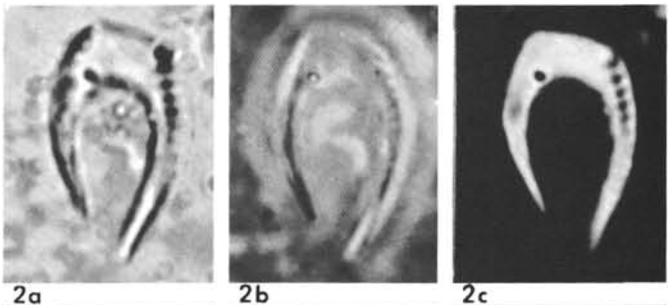
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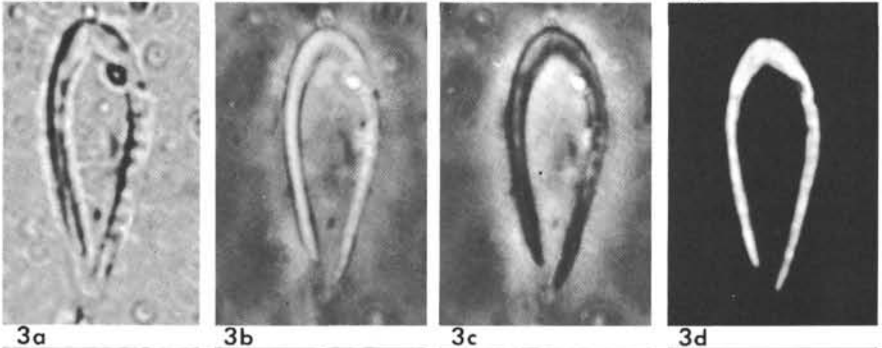
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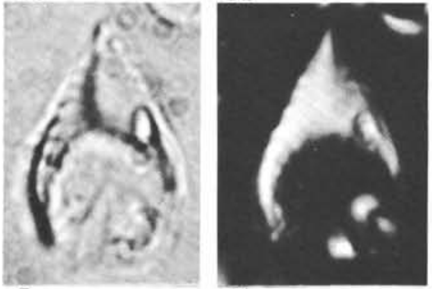
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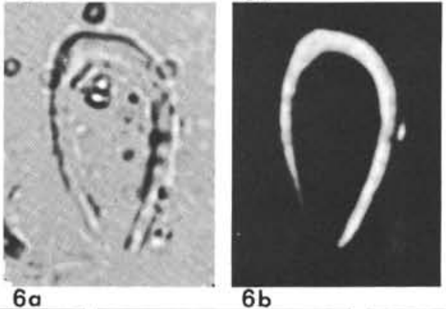
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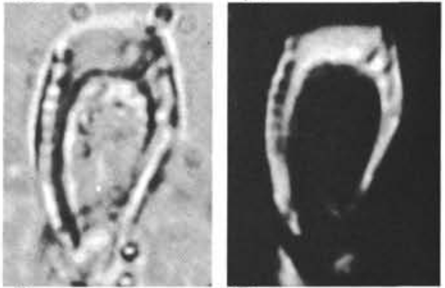
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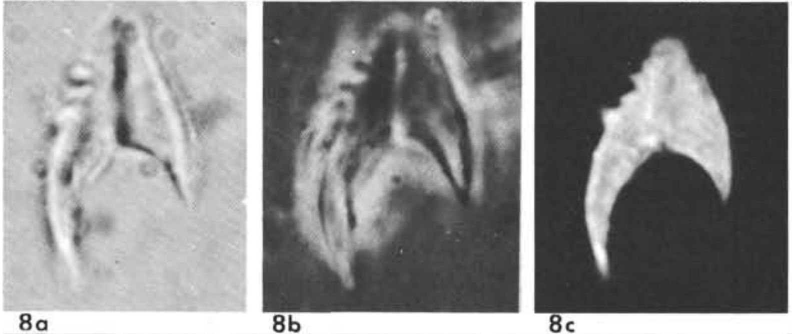
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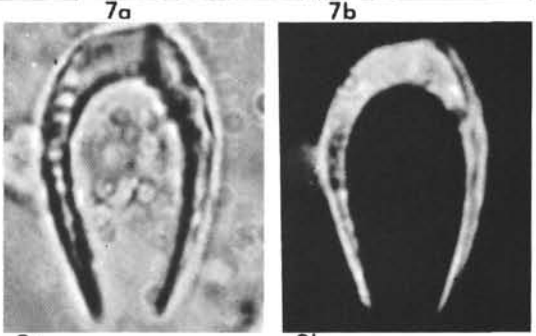
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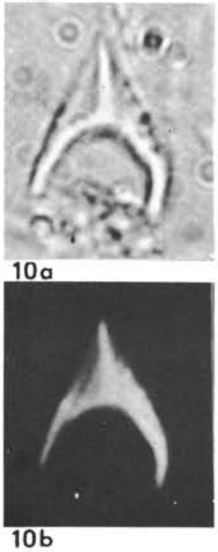
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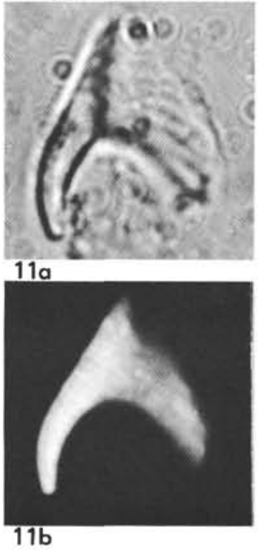
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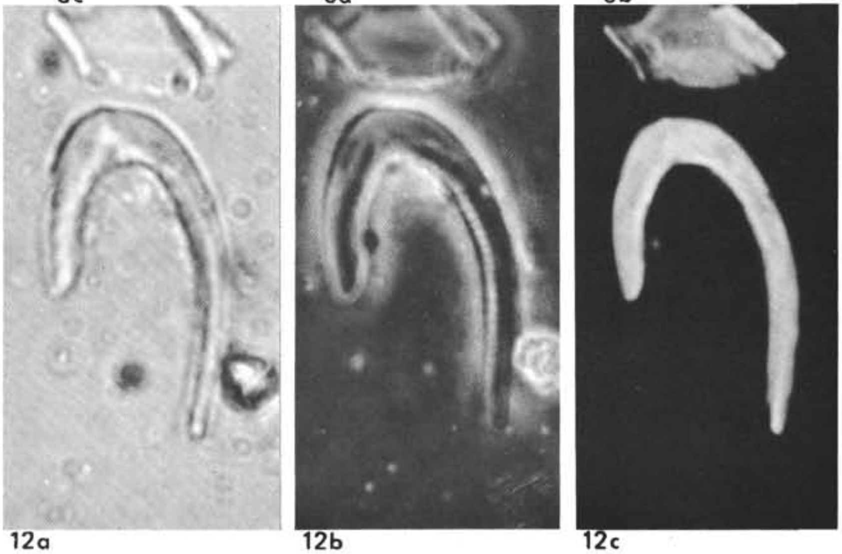
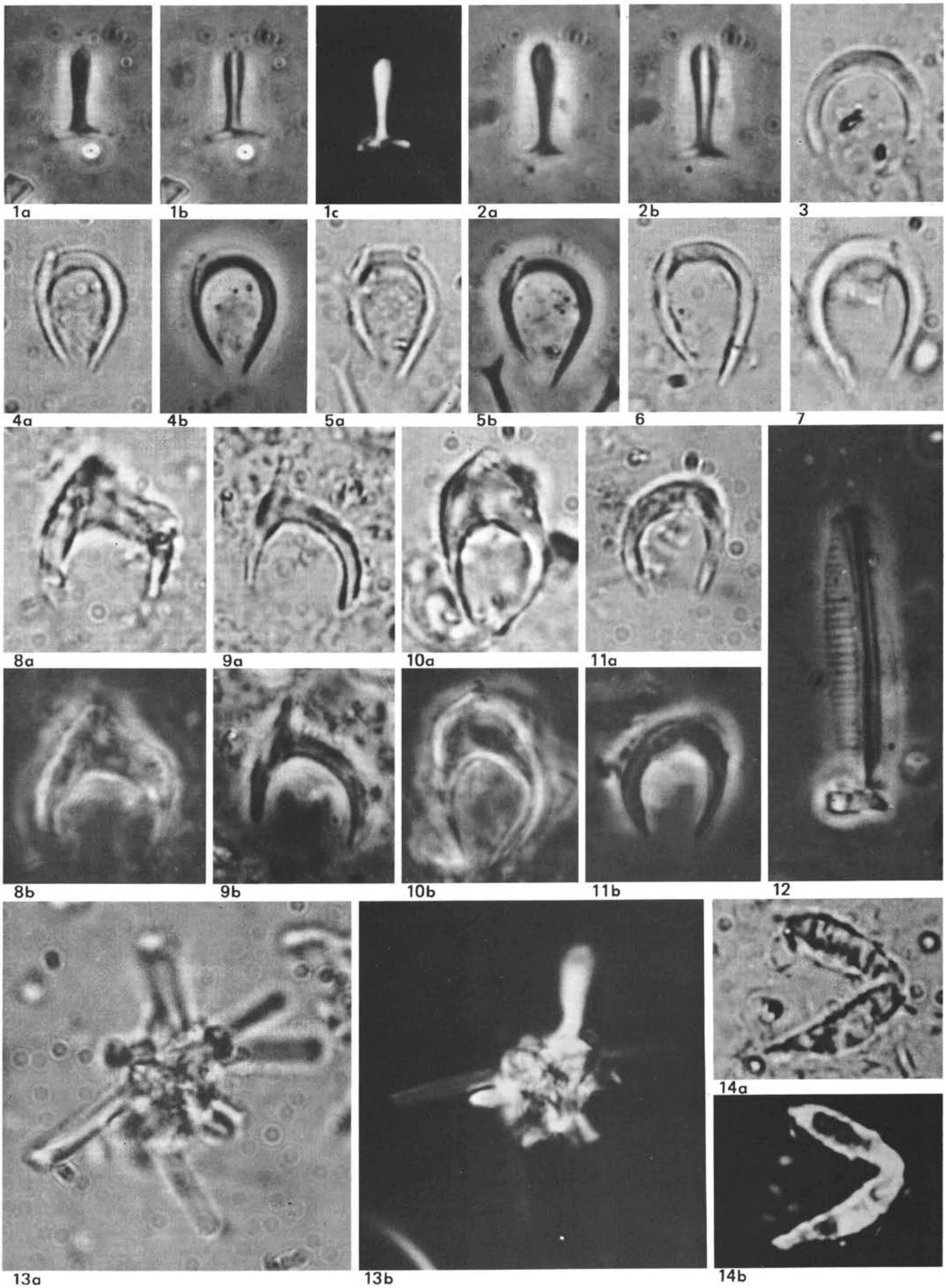

12a 12b 12c

PLATE 5

Figures 1, 2	*Rhabdosphaera clavigera* Murray and Blackman. 1a, 1b, 2a, 2b. Phase contrast. 1c. Cross-polarized light (×2800). 1. Sample 364-1-3, 9-10 cm. 2. Sample 364-1-2, 9-10 cm.
Figures 3-7	*Amaurolithus delicatus* Gartner and Bukry. Sample 364-3, CC. 3, 4a, 5a, 6, 7. Transmitted light. 4b, 5b. Phase contrast (×2800).
Figure 8	*Amaurolithus amplificus* (Bukry and Percival). Sample 360-7-4, 9-10 cm. 8a. Transmitted light. 8b. Phase contrast (×2800).
Figure 9	*Amaurolithus tricorniculatus* (Gartner). Sample 360-1-4, 9-10 cm. 9a. Transmitted light. 9b. Phase contrast (×2800).
Figures 10, 11	*Amaurolithus primus* (Bukry and Bramlette). Sample 360-7-4, 9-10 cm. 10a, 11a. Transmitted light. 10b, 11b. Phase contrast (×2800).
Figure 12	*Triquetrorhabdulus rugosus* Bramlette and Wilcoxon. Phase contrast (×2800). Sample 364-4-6, 9-10 cm.
Figure 13	Calcareous crystallites of unknown origin. Sample 364-8-1, 9-10 cm. 13a. Transmitted light. 13b. Cross-polarized light (×2800).
Figure 14	*Angulolithina arca* Bukry. Sample 364-3-5, 9-10 cm. 14a. Transmitted light. 14b. Cross-polarized light (×2800).

(see p. 614)

PLATE 5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13b
14a
14b

PLATE 6

Figure 1	*Discoaster* sp. Transmitted light (×2800). Sample 364-4-4, 9-10 cm.
Figure 2	*Discoaster asymmetricus* Gartner. Transmitted light (×2800). Sample 364-4-6, 9-10 cm.
Figure 3	*Discoaster brouweri* Tan Sin Hok. Transmitted light (×2800). Sample 364-3, CC.
Figures 4, 5	*Discoaster calcaris* Gartner. Sample 364-4-6, 9-10 cm. 4a, 5. Transmitted light. 4b. Phase contrast (×2800).
Figure 6	*Discoaster hamatus* Martini and Bramlette. Sample 364-4, CC. 6a. Transmitted light, low focus. 6b. Transmitted light, high focus (×2800).
Figure 7	*Discoaster neorectus* Bukry. Transmitted light (×2800). Sample 364-4-6, 9-10 cm.
Figures 8, 9	*Discoaster druggii* Bramlette and Wilcoxon. Sample 364-5-3, 9-10 cm. 9a. Transmitted light. 8, 9b. Phase contrast (×2800).

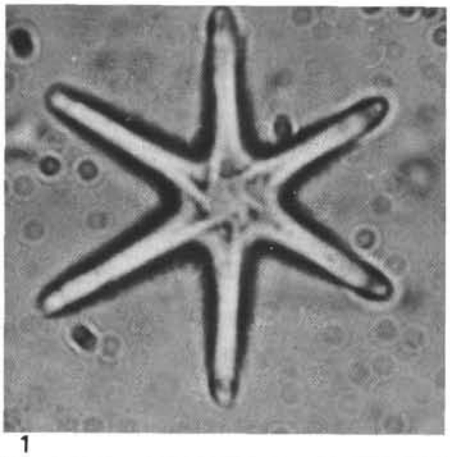
(see p. 616)

PLATE 7

Figures 1-3	*Discoaster berggrenii* Bukry. Transmitted light (×2800). Sample 364-4-4, 9-10 cm.
Figure 4	*Discoaster quinqueramus* Gartner. Transmitted light (×2800). Sample 364-3-5, 9-10 cm.
Figures 5-8	*Discoaster moorei* Bukry. 5. Phase contrast (×2800). 6- 8. Transmitted light (×2800). 5. Sample 364-5-3, 9-10 cm. 6- 8. Sample 364-4-6, 9-10 cm.
Figure 9	*Discoaster pseudovariabilis* Martini and Worsley. Sample 364-3-1, 33-34 cm. 9a, 9b. Phase contrast. 9c, 9d. Transmitted light (×2800).
Figures 10-14	*Discoaster variabilis* Martini and Bramlette. Transmitted light (×2800). 10, 13, 14. Sample 364-4-6, 9-10 cm. 11, 12. Sample 364-4-4, 9-10 cm.
Figures 15, 16	*Discoaster variabilis decorus* Bukry. Transmitted light (×2800). 15. Sample 364-3-5, 9-10 cm. 16. Sample 362-27-1, 62-63 cm.

(see p. 617)

PLATE 6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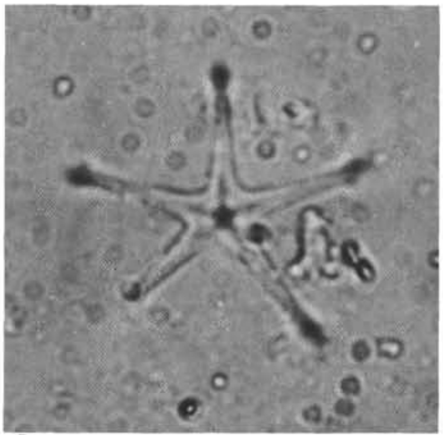
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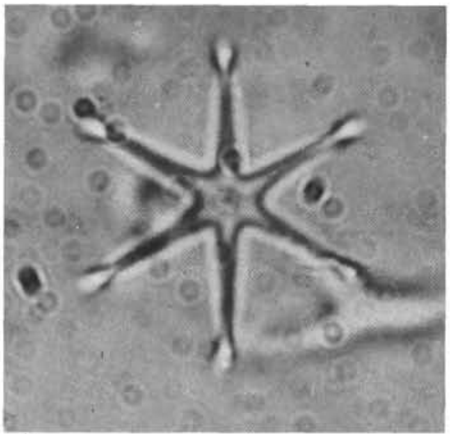
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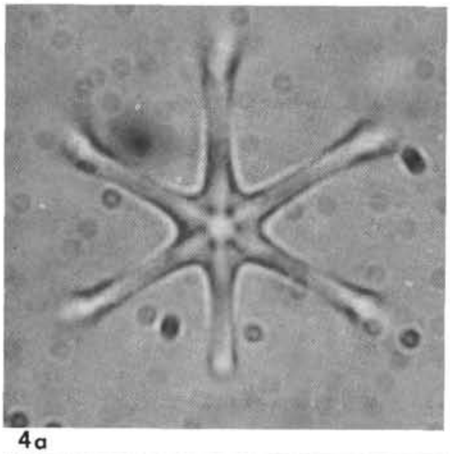
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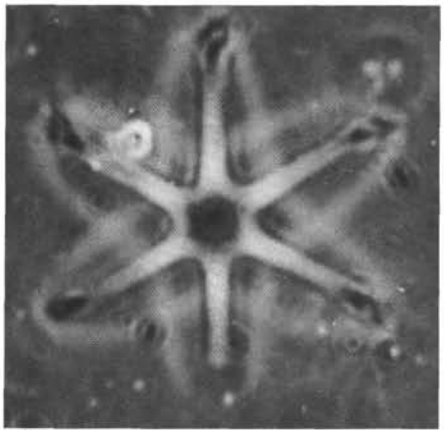
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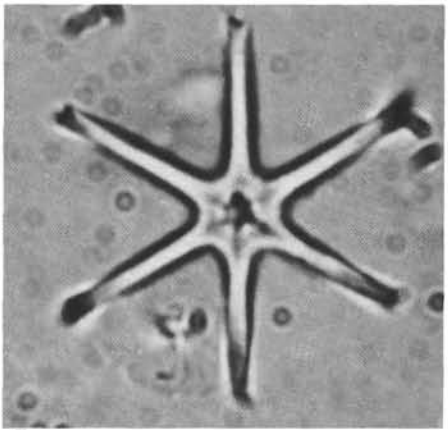
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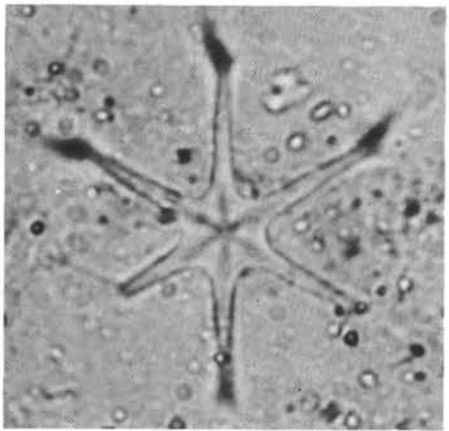
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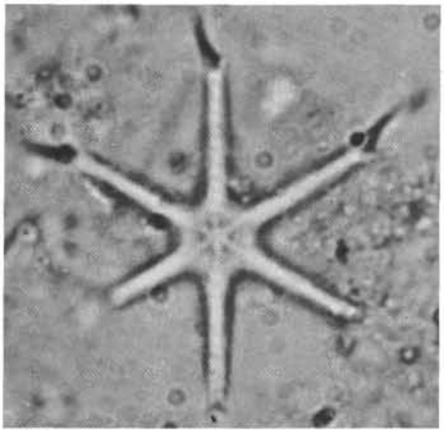
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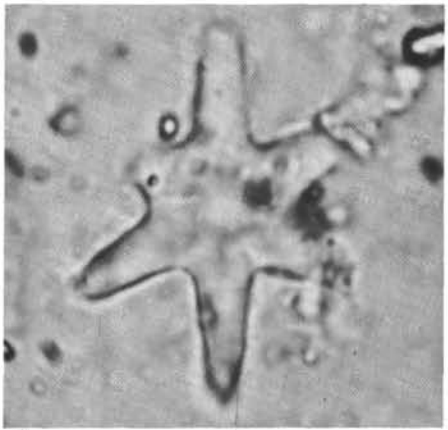
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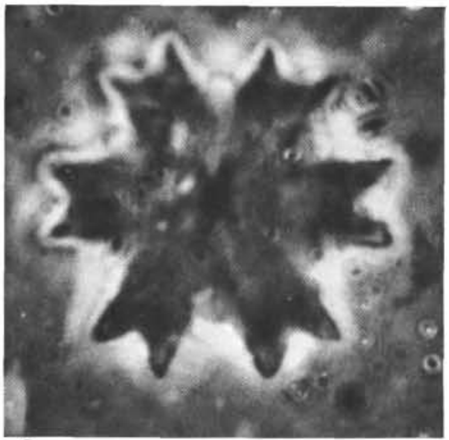
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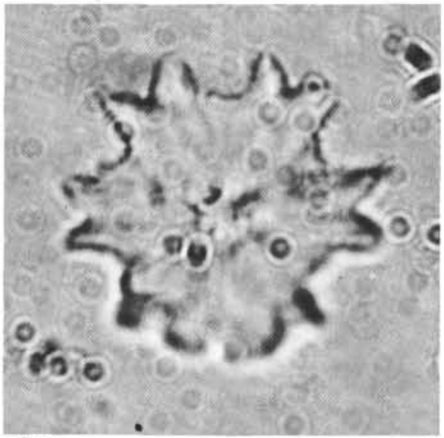
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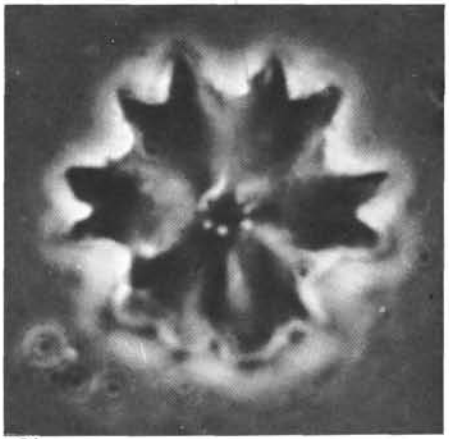
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PLATE 7


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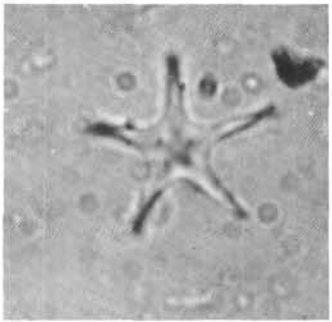
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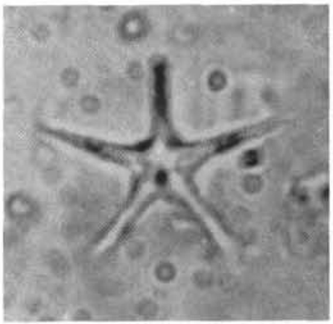
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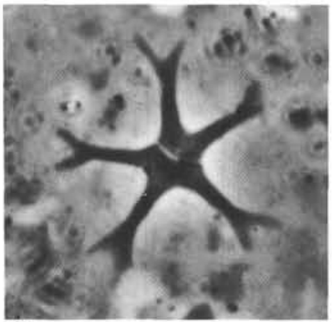
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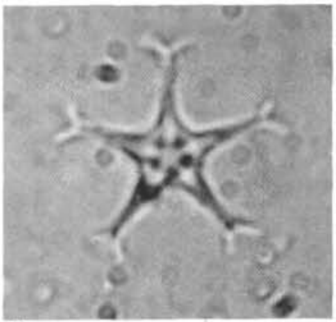
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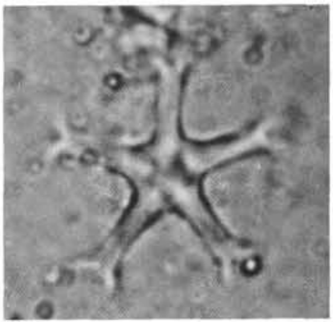
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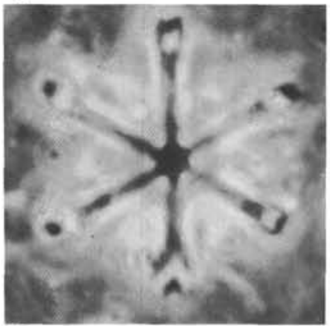
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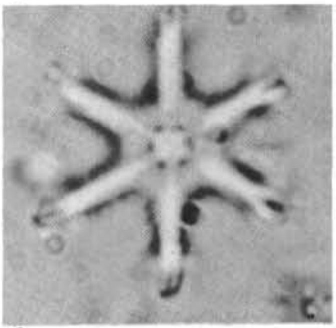
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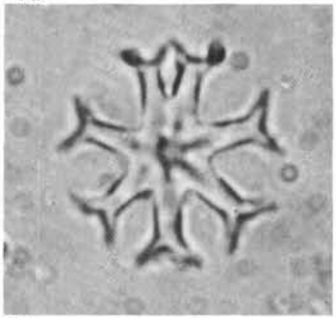
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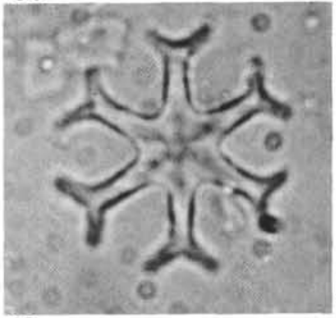
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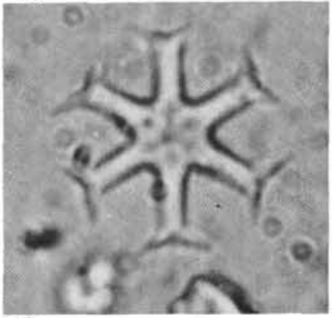
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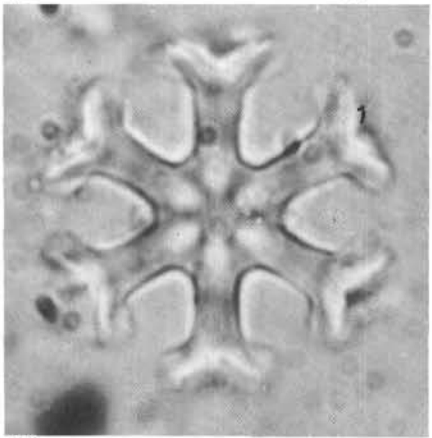
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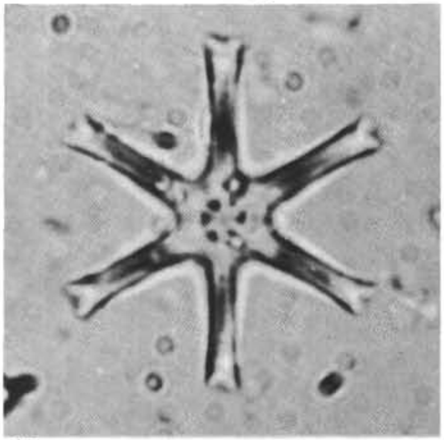
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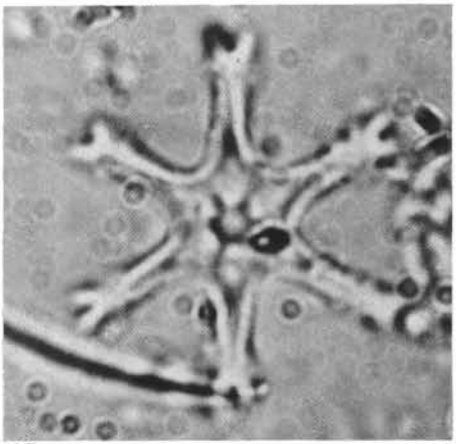
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PLATE 8

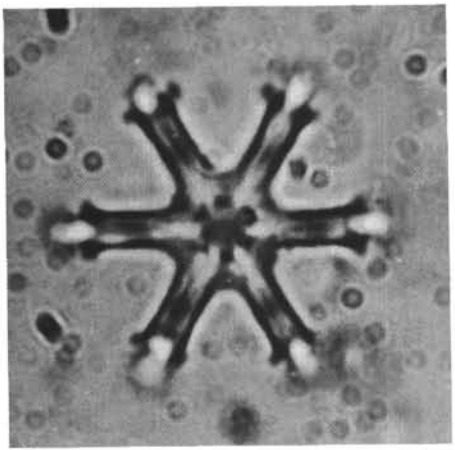
Figure 1	*Discoaster surculus* Martini and Bramlette. Sample 364-3-1, 33-34 cm. 1a. Transmitted light. 1b. Phase contrast (×2800).
Figure 2	*Discoaster pseudovariabilis* Martini and Worsley. Sample 364-3-5, 9-10 cm. 2a. Transmitted light. 2b. Phase contrast (×2800).
Figure 3	*Discoaster* sp. Sample 364-3-3, 9-10 cm. 3a. Transmitted light. 3b. Phase contrast (×2800).
Figure 4	*Discoaster pentaradiatus* Tan Sin Hok. Sample 364-3-5, 9-10 cm. 4a. Transmitted light. 4b, 4c. Phase contrast (×2800).
Figure 5	*Discoaster exilis* Martini and Bramlette. Sample 364-5-3, 9-10 cm. 5a, 5b. Transmitted light. 5c. Phase contrast (×2800).

PLATE 9

Figure 1	*Discoaster* sp. Sample 364-4, CC. 1a. Transmitted light. 1b. Phase contrast (×2800).
Figure 2	*Discoaster asymmetricus* Gartner. Sample 364-3-6, 9-10 cm. 2a. Transmitted light. 2b. Phase contrast (×2800).
Figures 3, 6	*Discoaster deflandrei* Bramlette and Riedel. Sample 364-5-3, 9-10 cm. 3. Transmitted light. 6. Phase contrast (×2800).
Figure 4	*Discoaster bollii* Martini and Bramlette. Transmitted light (×2800). Sample 364-4-6, 9-10 cm.
Figure 5	*Discoaster challengeri* Bramlette and Riedel. Sample 364-4-4, 9-10 cm. 5a. Transmitted light. 5b. Phase contrast (×2800).
Figures 7, 8	*Discoaster loeblichii* Bukry. Transmitted light (×2800). Sample 362-27-1, 62-63 cm.
Figure 9	*Discoaster neorectus* Bukry. Transmitted light (×2800). Sample 360-5-6, 9-10 cm.
Figure 10	*Discoaster variabilis decorus* Bukry. Transmitted light (×2800). Sample 362-27-1, 62-63 cm.

(see p. 620)

PLATE 8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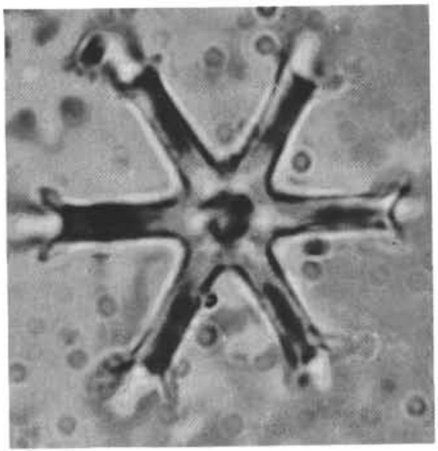
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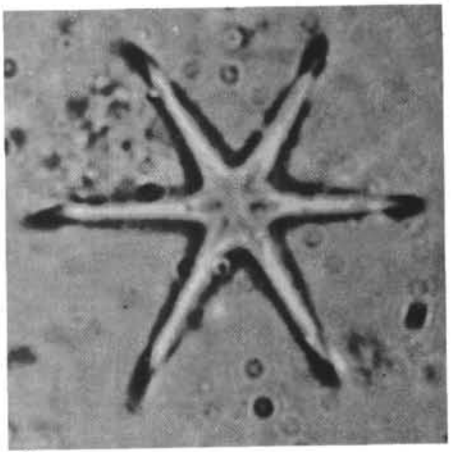
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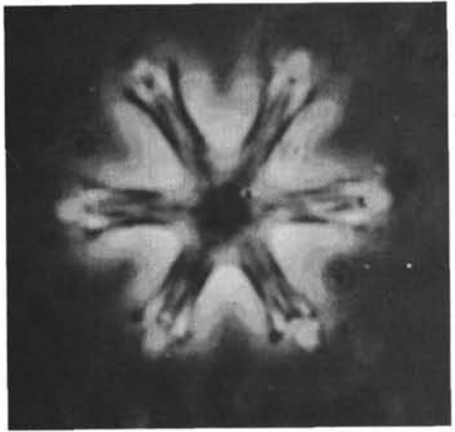
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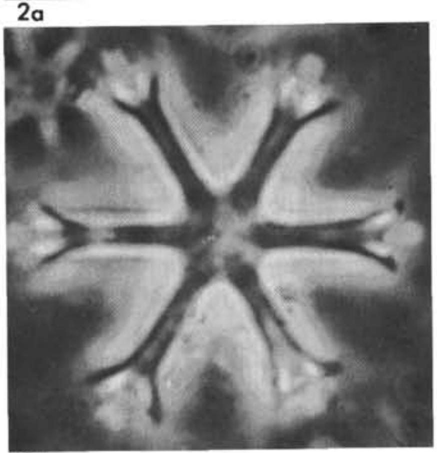
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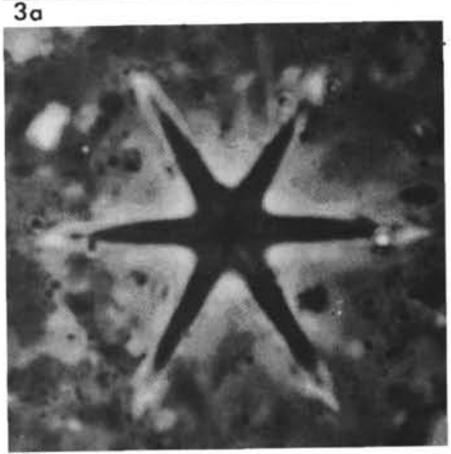
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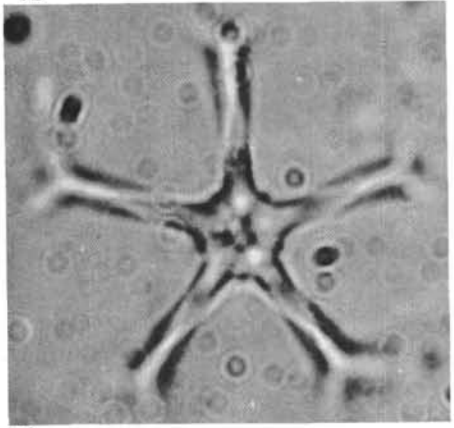
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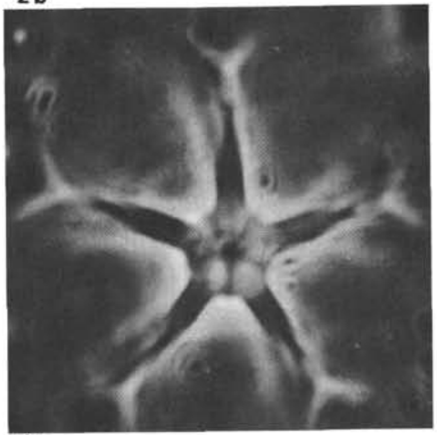
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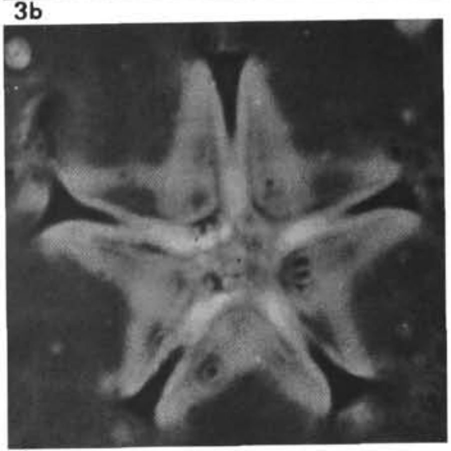
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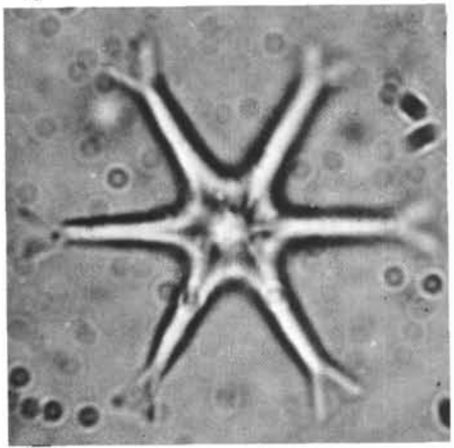
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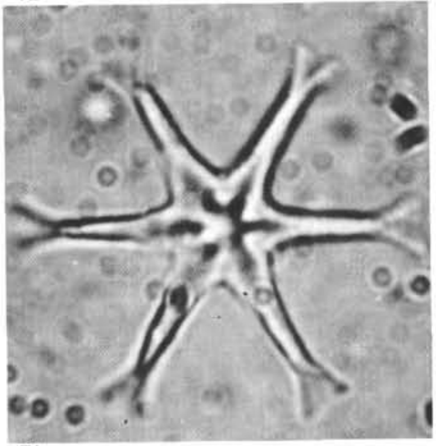
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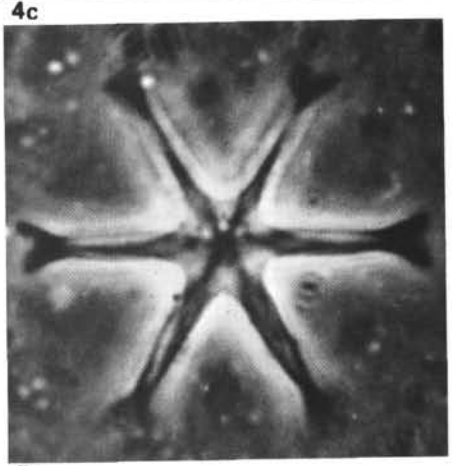
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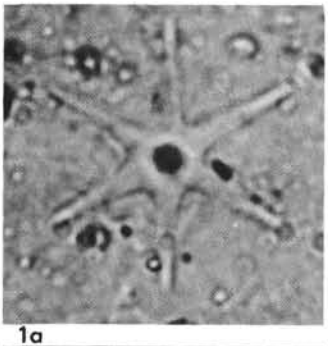
PLATE 9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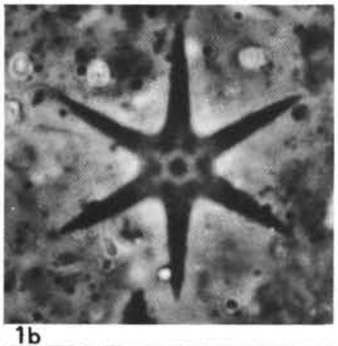
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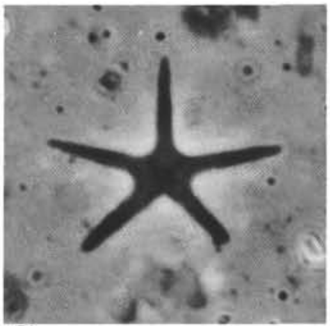
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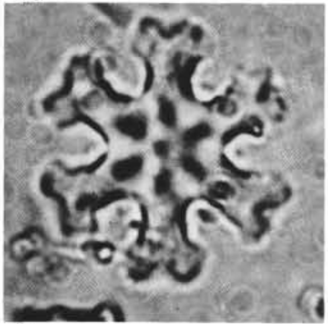
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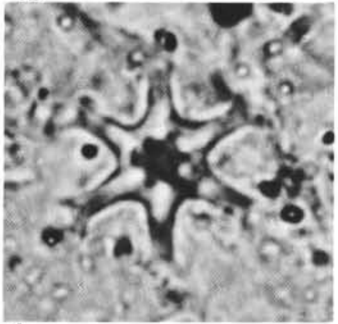
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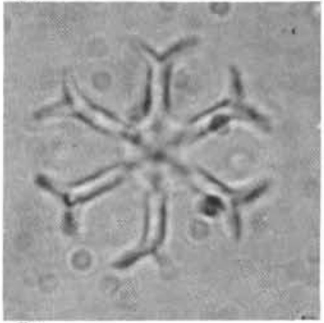
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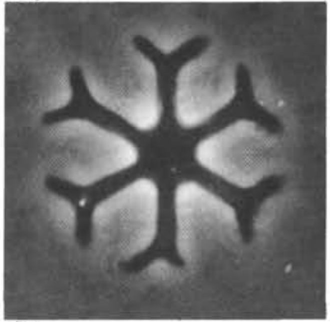
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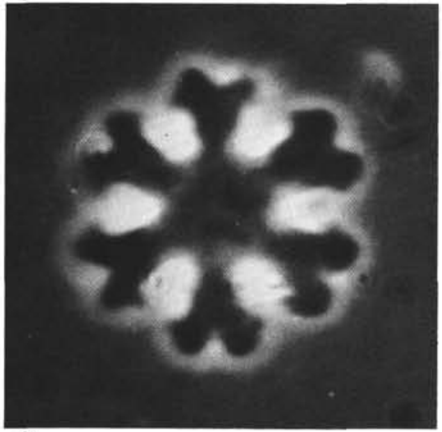
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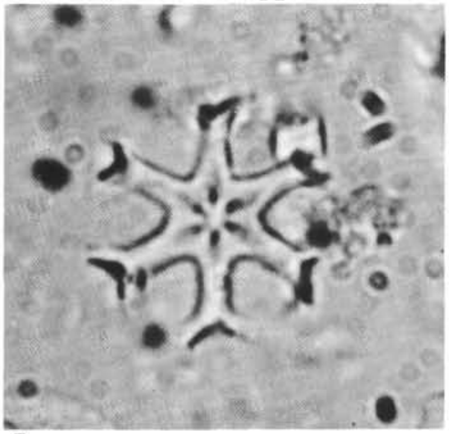
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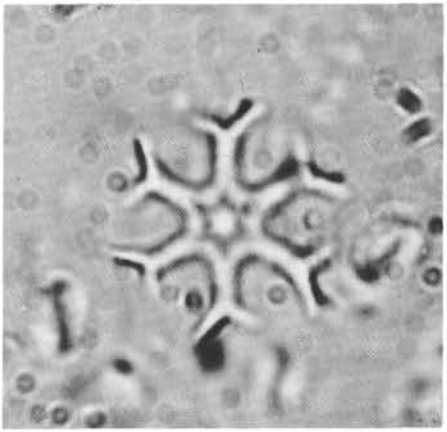
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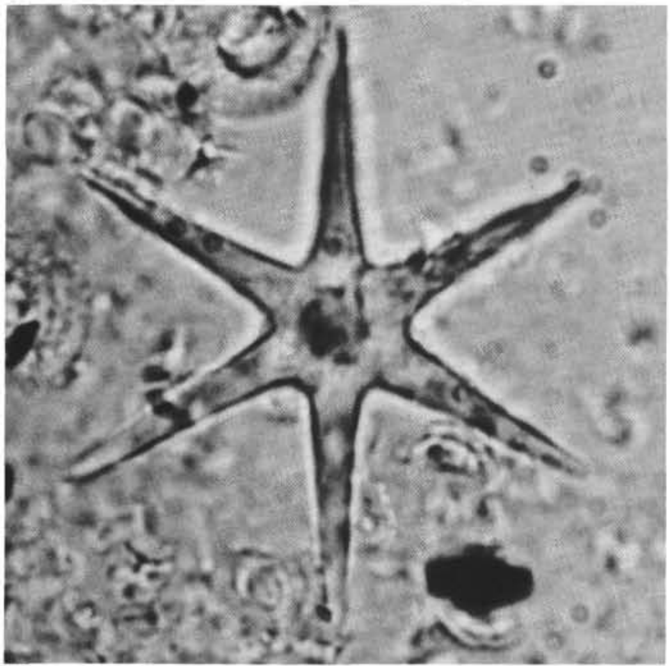
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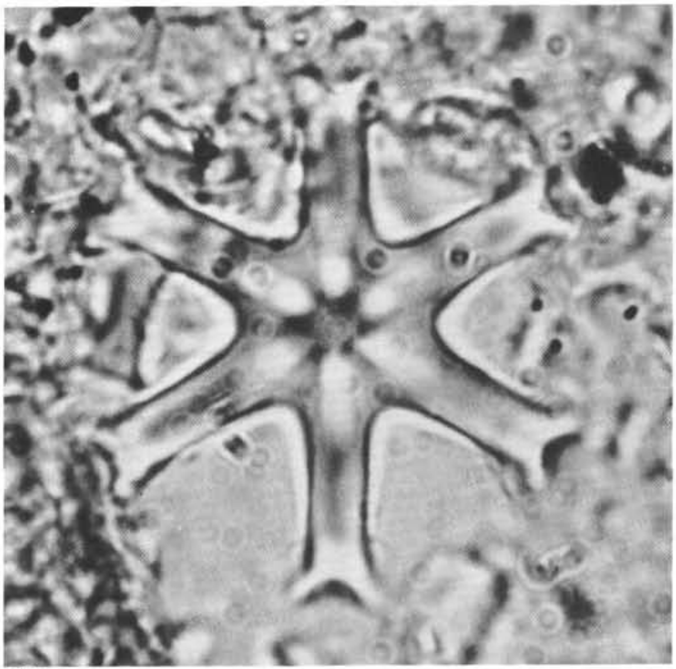
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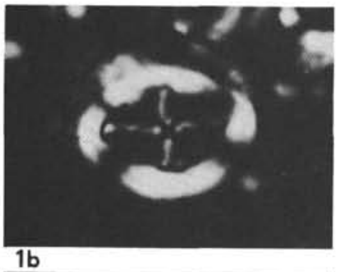
PLATE 10

Figure 1	*Cruciplacolithus tenuis* (Stradner). Sample 364-10-5, 9-10 cm. 1a. Transmitted light. 1b. Cross-polarized light (×2800).
Figure 2	*Campylosphaera eodela* Bukry. Sample 364-9, CC. 2a. Phase contrast. 2b. Cross-polarized light (×2800).
Figure 3	*Campylosphaera dela* (Bramlette and Sullivan). Sample 364-8-1, 9-10 cm. 3a. Phase contrast. 3b. Cross-polarized light (×2800).
Figure 4	*Cyclolithella robusta* (Bramlette and Sullivan). Sample 364-10-1, 39-40 cm. 4a. Phase contrast. 4b. Cross-polarized light (×2800).
Figure 5	*Markalius inversus* (Deflandre). Cross-polarized light (×2800). Sample 364-10-2, 9-10 cm.
Figure 6	*Toweius craticulus* Hay and Mohler. Cross-polarized light (×2800). Sample 364-9, CC.
Figure 7	*Chiasmolithus californicus* (Sullivan). Sample 364-10-2, 9-10 cm. 7a. Phase contrast. 7b. Cross-polarized light (×2800).
Figure 8	*Heliolithus kleinpellii* Sullivan. Sample 364-10-1, 39-40 cm. 8a. Phase contrast. 8b. Cross-polarized light (×2800).
Figure 9	*Coccolithus crassus* Bramlette and Sullivan. Sample 364-8-4, 9-10 cm. 9a. Phase contrast. 9b. Cross-polarized light (×2800).
Figure 10	*Ellipsolithus macellus* (Bramlette and Sullivan). Sample 364-9-4, 9-10 cm. 10a. Phase contrast. 10b. Cross-polarized light (×2400).
Figure 11	*Coccolithus cribellum* Bramlette and Sullivan. Sample 364-8-3, 9-10 cm. 11a. Transmitted light. 11b. Phase contrast. 11c. Cross-polarized light (×2800).
Figure 12	*Coccolithus magnicrassus* Bukry. Sample 364-8-4, 9-10 cm. 12a. Transmitted light. 12b. Phase contrast. 12c. Cross-polarized light (×2800).

(see p. 622)

PLATE 10


1a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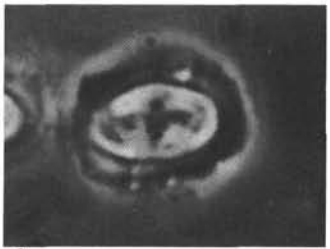
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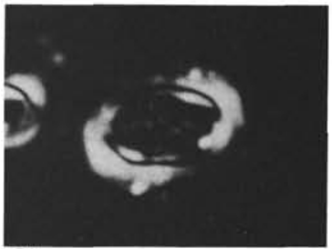
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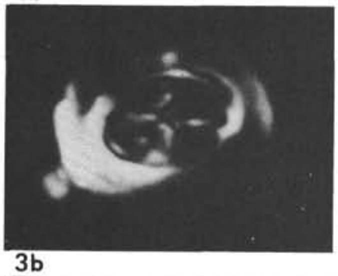
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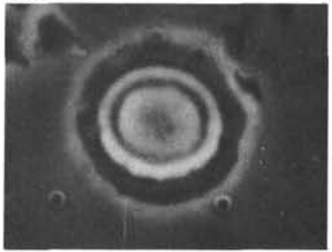
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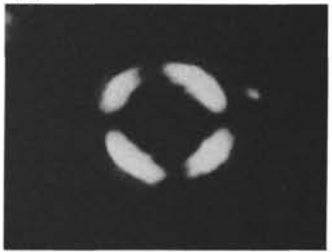
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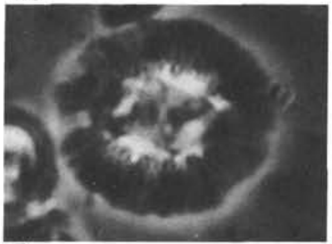
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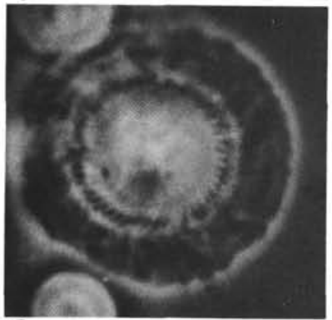
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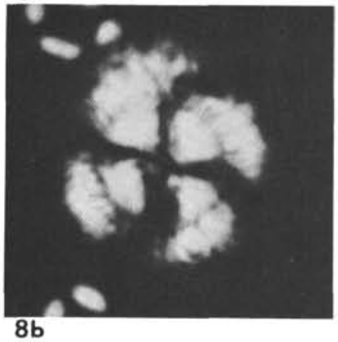
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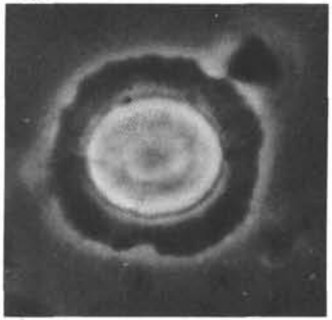
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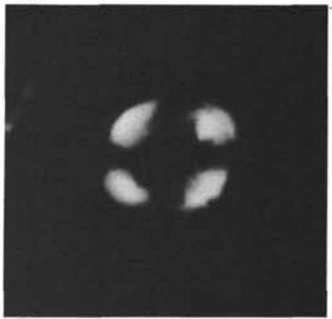
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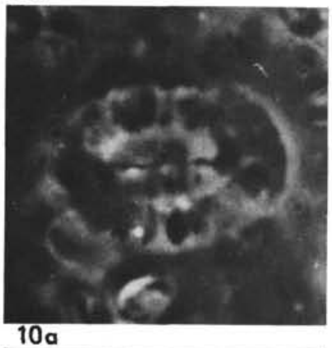
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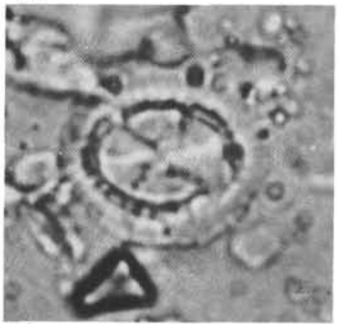
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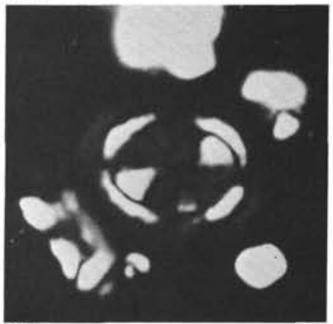
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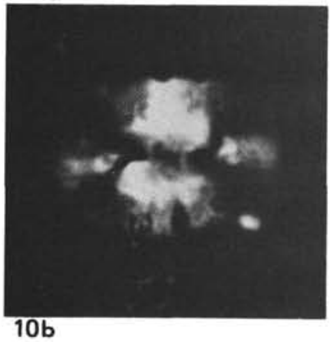
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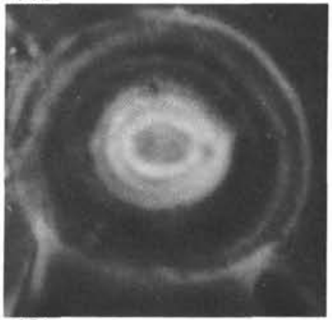
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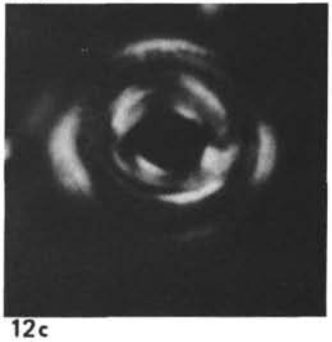
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PLATE 11

Figures 1, 2	*Discoasteroides kuepperi* (Stradner). 1a, 2a. Transmitted light. 1b, 2b. Cross-polarized light (×2800). 1. Sample 364-9-1, 17-18 cm. 2. Sample 364-9-2, 9-10 cm.
Figure 3	Discoaster sp. 1. Transmitted light (×2800). Sample 364-9, CC.
Figure 4	*Discoaster multiradiatus* Bramlette and Riedel. Sample 364-9-1, 17-18 cm. 4a. Transmitted light. 4b. Phase contrast (×2800).
Figures 5, 6	*Discoaster diastypus* Bramlette and Sullivan. 5, 6a. Transmitted light. 6b. Phase contrast (×2800). 5. Sample 364-9-1, 17-18 cm. 6. Sample 364-9-2, 9-10 cm.
Figure 7	*Chiasmolithus grandis* (Bramlette and Riedel). Sample 364-8-4, 9-10 cm. 7a. Transmitted light. 7b. Cross-polarized light (×2800).

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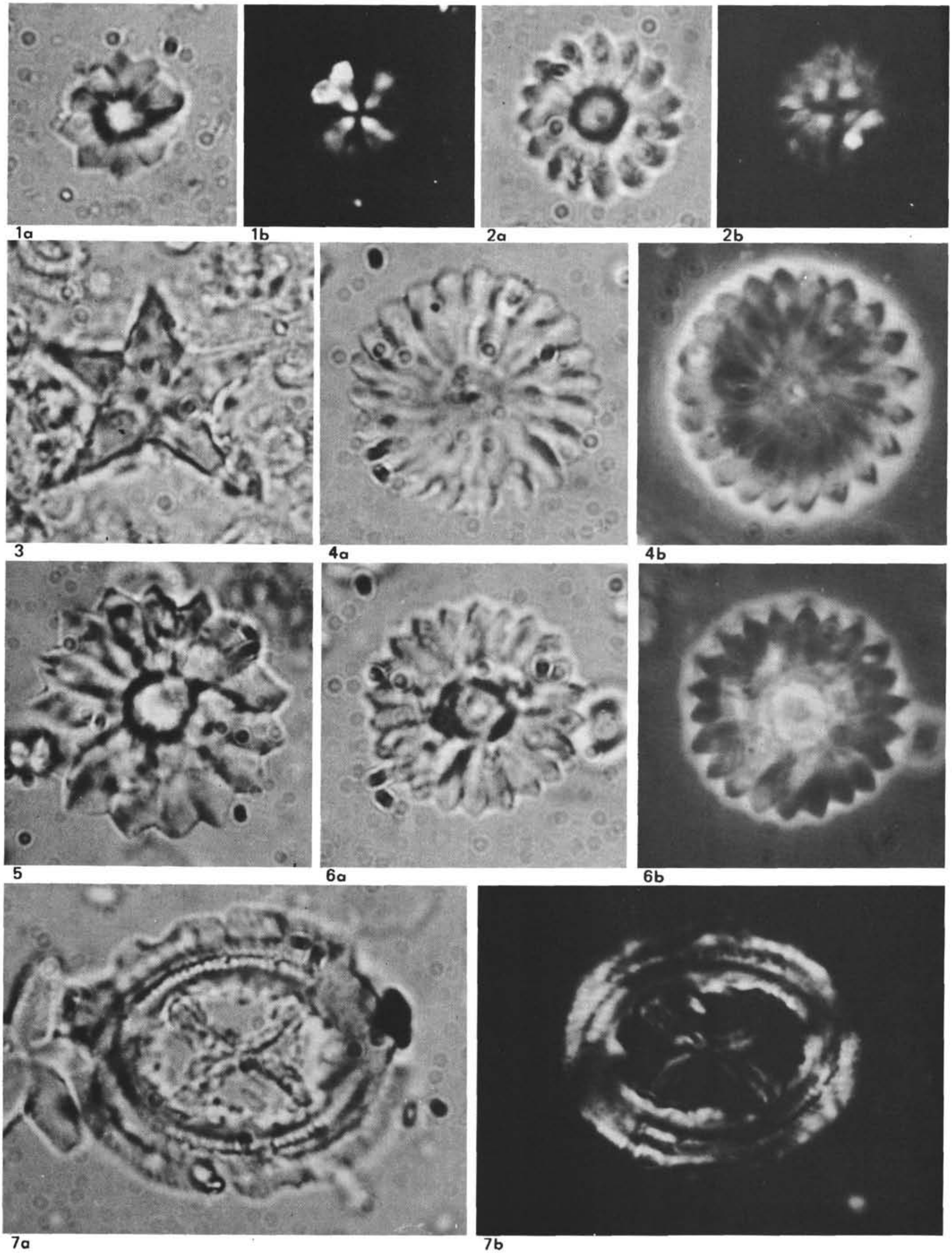
PLATE 11



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5 6a 6b

7a 7b

PLATE 12

Figure 1	*Fasciculithus janii* Perch-Nielsen. Sample 364-10-2, 9-10 cm. 1a. Transmitted light. 1b, 1c. Cross-polarized light (×2800).
Figure 2	*Sphenolithus spiniger* Bukry. Sample 364-8-1, 9-10 cm. 2a. Phase contrast. 2b. Long axis 0° to crossed nicols. 2c. Long axis 45° to crossed nicols (×2800).
Figures 3, 6	*Fasciculithus pileatus* Bukry. Sample 364-10-2, 9-10 cm. 3a, 3b. Transmitted light. 3c, 6, Cross-polarized light (×2800).
Figures 4, 5	*Sphenolithus orphanknollii* Perch-Nielsen. Sample 364-8-3, 9-10 cm. 5a. Transmitted light. 4a, 5b. Phase contrast. 4b, 5c. Long axis 45° to crossed nicols. 4c, 5d. Long axis 0° to crossed nicols (×2800).
Figure 7	*Fasciculithus involutus* Bramlette and Sullivan. Sample 364-10-1, 39-40 cm. 7a. Transmitted light. 7b. Long axis 0° to crossed nicols. 7c. Long axis 45° to crossed nicols (×2800).
Figure 8	*Nannotetrina cristata* (Martini). Transmitted light (×2800). Sample 364-7, CC.
Figures 9-11	*Discoaster* sp. 1. Sample 364-9, CC. 9, 10. Transmitted light (×2800). 11. Transmitted light (×2400).
Figure 12	*Discoaster tanii nodifer* Bramlette and Riedel. Transmitted light (×2800). Sample 364-7, CC.
Figures 13-15	*Rhomboaster cuspis* Bramlette and Sullivan. Sample 364-9-1, 17-18 cm. 13, 14. Transmitted light (×2800). 15. Transmitted light (×2400).

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PLATE 12

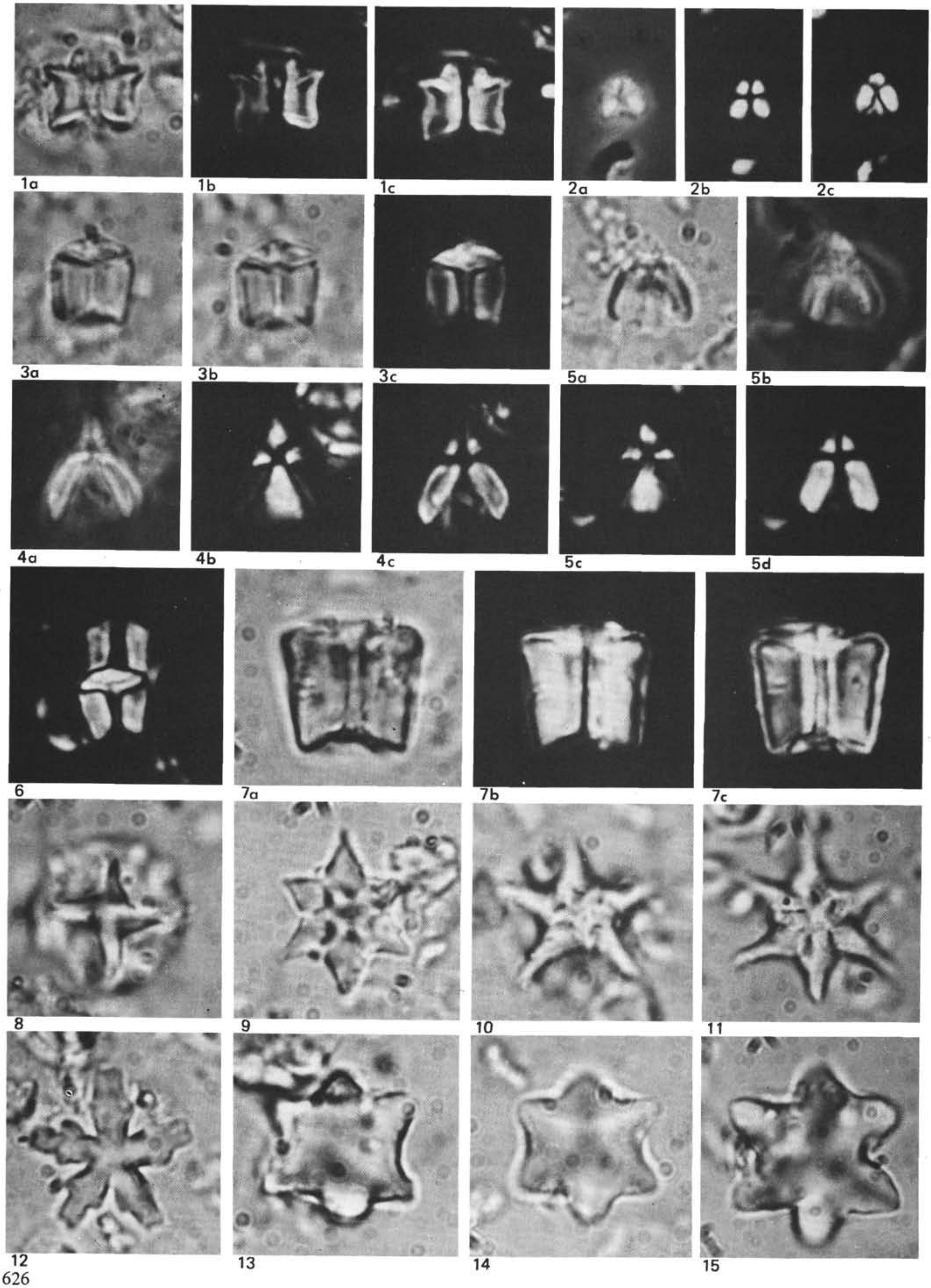
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PLATE 13

Figure 1	*Microrhabdulus decoratus* Deflandre. Sample 364-14-1, 95-96 cm. 1a. Transmitted light. 1b, 1c. Cross-polarized light (×2800).
Figure 2	*Microrhabdulus stradneri* Bramlette and Martini. Cross-polarized light (×2800). Sample 363-19-2, 58-60 cm.
Figure 3	*Tetralithus gothicus* Deflandre. Cross-polarized light (×2800). Sample 364-14-3, 9-10 cm.
Figures 4, 6	*Tetralithus premurus* Bukry. Sample 364-11, CC. 6a. Transmitted light. 4, 6b. Cross-polarized light (×2800).
Figures 5, 11-13	*Micula mura* (Martini). Sample 363-19-2, 58-60 cm. 5a. Phase contrast. 5b. Cross-polarized light (×2800). 11-13. Scanning electron micrographs (×5000).
Figures 7, 14	*Micula staurophora* (Gardet). 7a. Transmitted light. 7b. Cross-polarized light (×2800). Sample 364-11, CC. 14. Scanning electron micrographs (×5000). Sample 363-18-2, 45-46 cm.
Figures 8, 15, 16	*Lithraphidites quadratus* Bramlette and Martini. 8a. Phase contrast. 8b. Cross-polarized light (×2800). Sample 363-19-2, 58-60 cm. 15, 16. Scanning electron micrographs (×5000). Sample 363-18-2, 45-48 cm.
Figures 9, 10	Distal part of the stem of *Prediscosphaera cretacea* (Arkhangelsky). Scanning electron micrograph (×6000). Sample 363-19-2, 58-60 cm.

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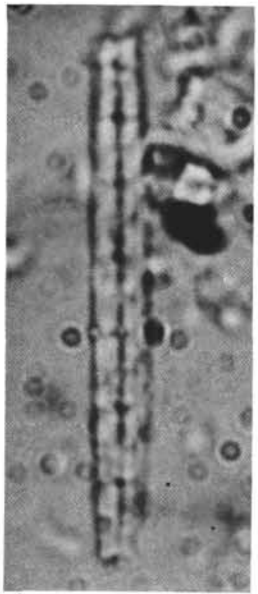
PLATE 13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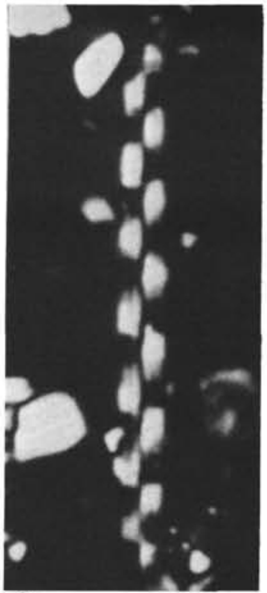
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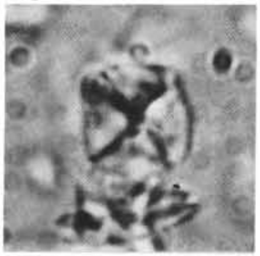
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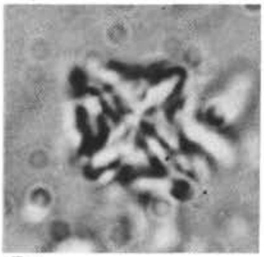
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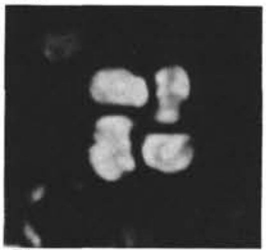
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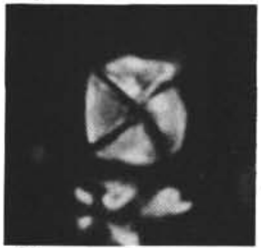
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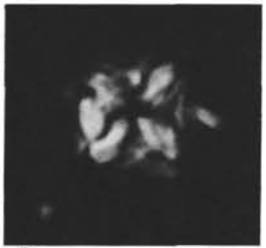
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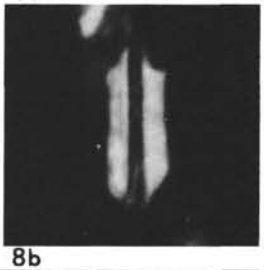
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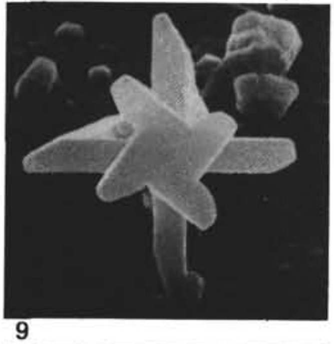
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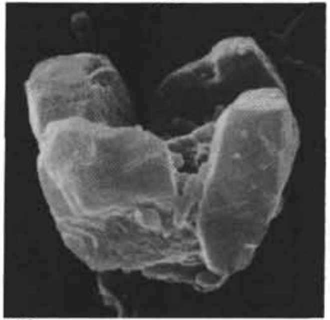
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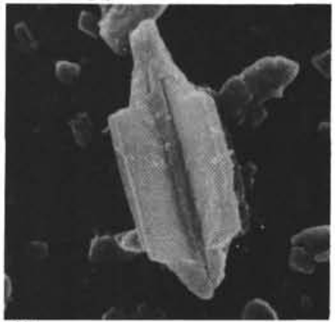
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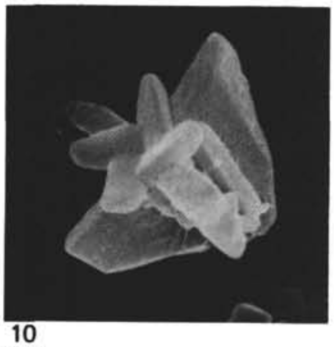
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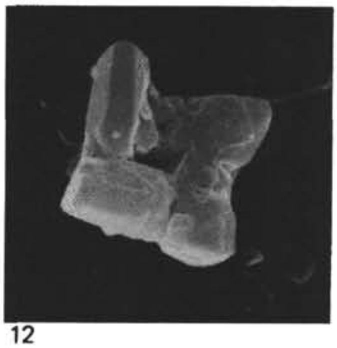
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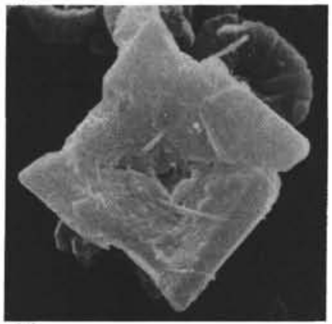
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PLATE 14

Figure 1	*Cribrosphaerella ehrenbergii* (Arkhangelsky). Sample 364-14-4, 9-10 cm. 1a. Transmitted light. 1b. Phase contrast. 1c. Cross-polarized light (×2800).
Figure 2	*Cruciellipsis chiastia* (Worsley). Cross-polarized light (×3500). Sample 364-40-2, 17-18 cm.
Figures 3, 6	*Parhabdolithus asper* (Stradner). 3a. Phase contrast. 3b. Cross-polarized light (×2800). Sample 364-32, CC. 6a. Phase contrast. 6b. Cross-polarized light (×3500). Sample 364-39, CC.
Figure 4	*Broinsonia enormis* (Shumenko). Sample 364-20-2, 9-10 cm. 4a. Phase contrast. 4b. Cross-polarized light (×2800).
Figure 5	*Tranolithus exiguus* Stover. Sample 364-23-2, 9-10 cm. 5a. Phase contrast. 5b. Cross-polarized light (×2800).
Figure 7	*Manivitella pemmatoidea* (Deflandre). Sample 364-34-3, 87-88 cm. 7a. Phase contrast. 7b. Cross-polarized light (×2800).
Figure 8	*Cretarhabdus coronadventis* Reinhardt. Sample 364-35-1, 16-17 cm. 8a. Phase contrast. 8b. Cross-polarized light (×2800).
Figure 9	*Microrhabdulus stradneri* Bramlette and Martini. Cross-polarized light (×2800). Sample 363-19-2, 58-60 cm.
Figure 10	*Broinsonia parca* (Stradner). Sample 364-14-1, 95-96 cm. 10a. Phase contrast. 10b. Cross-polarized light (×2800).
Figure 11	*Gartnerago obliquum* (Stradner). Sample 364-20-2, 9-10 cm. 11a. Phase contrast. 11b. Cross-polarized light (×2800).
Figure 12	*Kamptnerius magnificus* Deflandre. Sample 364-20-2, 9-10 cm. 12a. Transmitted light. 12b. Phase contrast. 12c. Cross-polarized light (×2800).

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PLATE 14

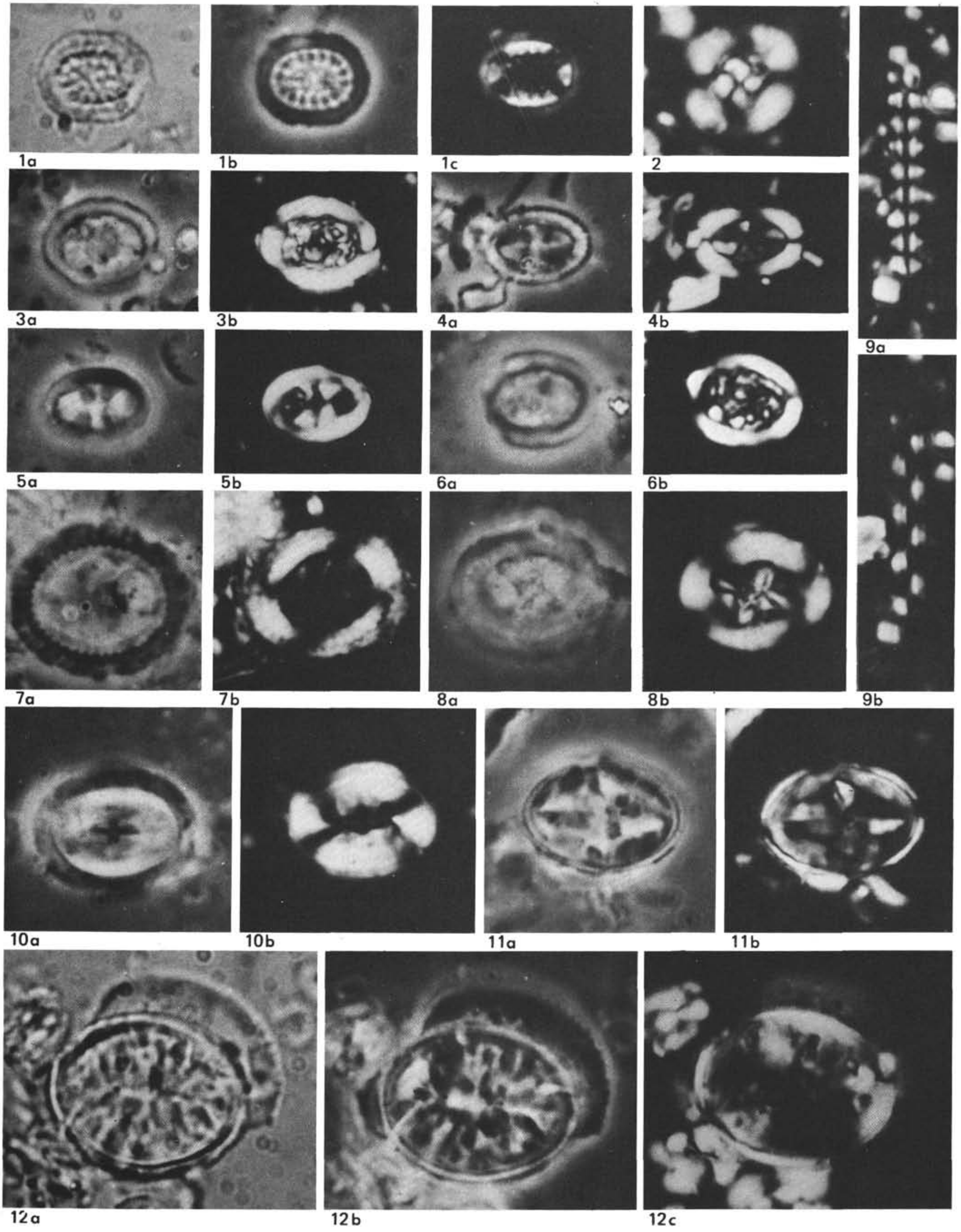
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PLATE 15

Figure 1	*Biscutum constans* (Gorka). Sample 364-35-2, 78-79 cm. 1a. Transmitted light. 1b. Phase contrast. 1c. Cross-polarized light (×2800).
Figure 2	*Braarudosphaera africana* Stradner. Sample 364-34-3, 67-68 cm. 2a. Transmitted light. 2b. Phase contrast. 2c. Cross-polarized light (×2800).
Figure 3	*Broinsonia lata* (Noel). Sample 364-35-1, 16-17 cm. 3a. Phase contrast. 3b. Cross-polarized light (×3500).
Figure 4	*Reinhardtites fenestratus* (Worsley). Sample 364-35-1, 16-17 cm. 4a, 4b. Phase contrast. 4c, 4d. Cross-polarized light (×3500).
Figures 5, 9	*Prediscosphaera cretacea* (Arkhangelsky). Sample 364-31-1, 60-61 cm. 5, 9c. Cross-polarized light. 9a. Transmitted light. 9b. Phase contrast (×3500).
Figure 6	*Tranolithus orionatus* (Reinhardt). Cross-polarized light (×3500). Sample 364-32, CC.
Figure 7	*Vagalapilla matalosa* (Stover). Sample 364-32, CC. 7a. Phase contrast. 7b. Cross-polarized light (×3500).
Figures 8, 16	*Parhabdolithus splendens* (Deflandre). 8a. Phase contrast. 8b. Cross-polarized light (×3500). Sample 364-40-2, 30-31 cm. 16a. Transmitted light. 16b. Phase contrast. 16c. Cross-polarized light (×2800). Sample 364-31-1, 60-61 cm.
Figures 10, 11	*Tetralithus trifidus* (Stradner). Sample 364-14-3, 9-10 cm. 10, 11a. Phase contrast. 11b. Cross-polarized light (×2800).
Figure 12	*Watznaueria ovata* Bukry. Sample 364-35-1, 16-17 cm. 12a. Phase contrast. 12b. Cross-polarized light (×2800).
Figure 13	*Tegumentum stradneri* Thierstein. Sample 364-40-2, 30-31 cm. 13a. Phase contrast. 13b, 13c. Cross-polarized light (×3500).
Figure 14	*Ahmuellerella octoradiata* (Gorka). Sample 364-14-3, 9-10 cm. 14a, 14b. Phase contrast. 14c. Cross-polarized light (×2800).
Figure 15	*Ahmuellerella* sp. aff. *A. octoradiata* (Gorka). Sample 364-32-4, 91-92 cm. 15a. Transmitted light. 15b. Phase contrast. 15c. Cross-polarized light (×3500).
Figure 17	*Eiffellithus anceps* (Gorka). Sample 364-14-4, 9-10 cm. 17a. Phase contrast. 17b, 17c. Cross-polarized light (×2800).

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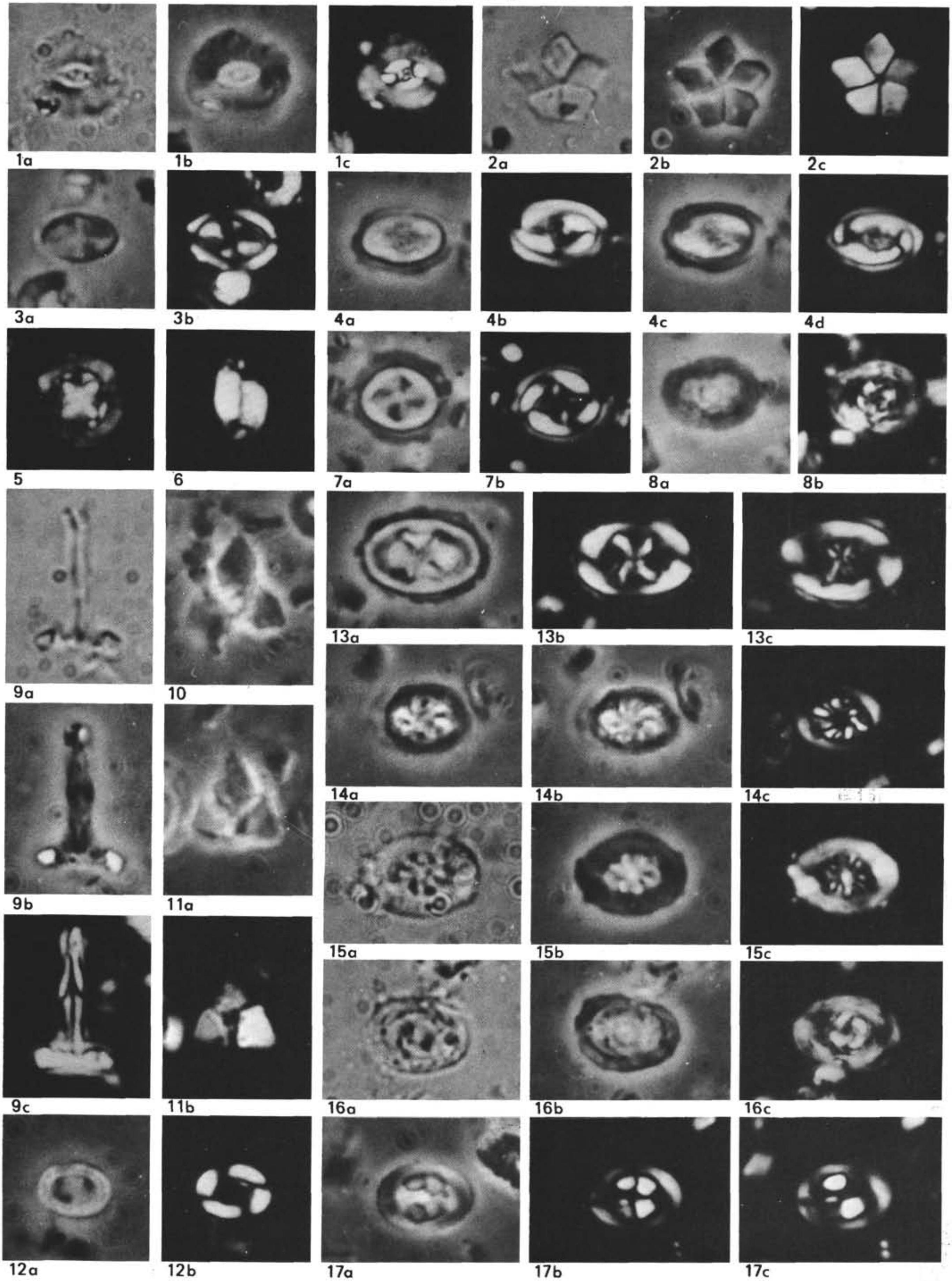
PLATE 15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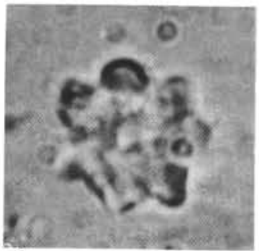
17a
17b
17c

PLATE 16

Figure 1	*Lithastrinus grillii* Stradner. Sample 364-23-2, 9-10 cm. 1a. Transmitted light. 1b. Phase contrast. 1c. Cross-polarized light (×2800).
Figure 2	*Cretarhabdus crenulatus* Bramlette and Martini. Sample 364-40-2, 30-31 cm. 2a. Phase contrast. 2b. Cross-polarized light (×2800).
Figures 3-6	*Nannoconus truittii* Brönnimann. 3, 4, 5a. Transmitted light. 5b, 6. Cross-polarized light (×2800). 3-5. Sample 364-31-1, 60-61 cm. 6. Sample 364-34-3, 87-88 cm.
Figures 7, 9	*Lithastrinus floralis* Stradner. Sample 364-34-3, 87-88 cm. 7a, 9a. Transmitted light. 7b. Phase contrast. 7c, 9b. Cross-polarized light (×2800).
Figure 8	*Watznaueria barnesae* Black. Sample 364-39, CC. 8a. Phase contrast. 8b. Cross-polarized light (×3500).
Figure 10	*Parhabdolithus embergeri* (Noel). Sample 364-34-3, 87-88 cm. 10a. Transmitted light. 10b. Phase contrast. 10c. Cross-polarized light (×2800).
Figures 11, 12	*Rucinolithus* sp. aff. *R.* ? *magnus* Bukry. Sample 364-22, CC. 11a, 12a. Transmitted light. 11b, 12b. Phase contrast (×2800).
Figure 13	*Microchabdulus stradneri* Bramlette and Martini. Cross-polarized light (X2800). Sample 364-14-1, 95-96 cm.

(see p. 634)

PLATE 16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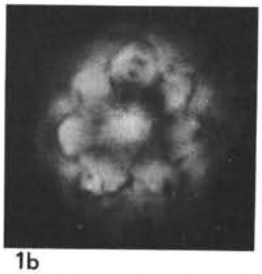
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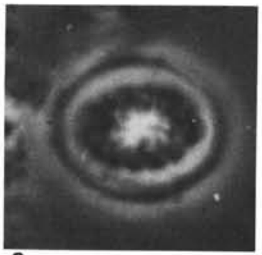
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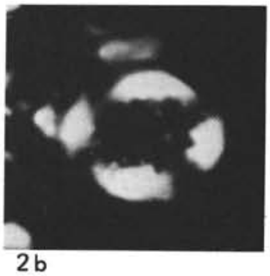
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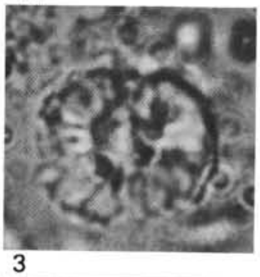
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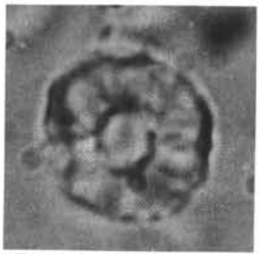
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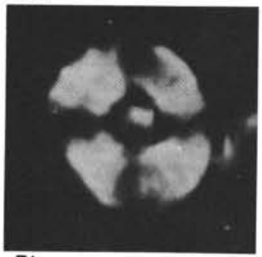
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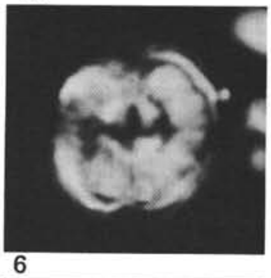
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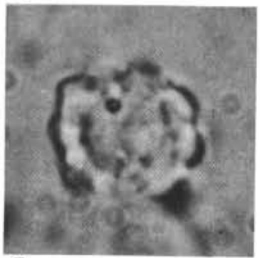
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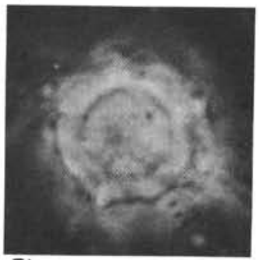
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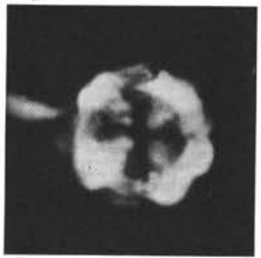
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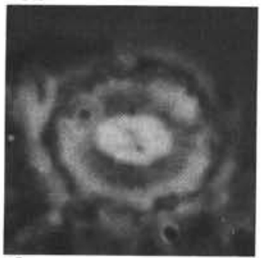
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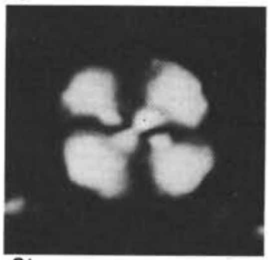
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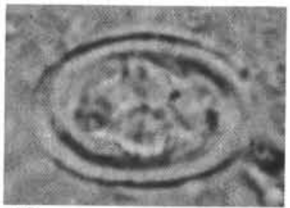
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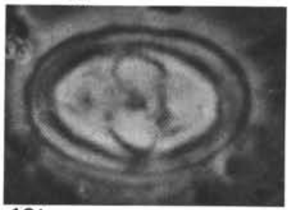
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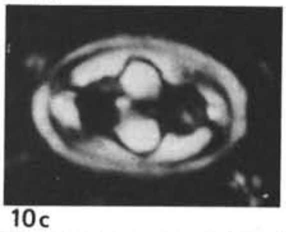
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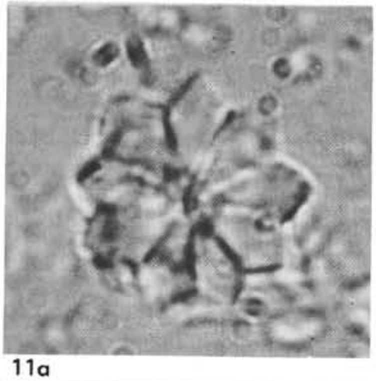
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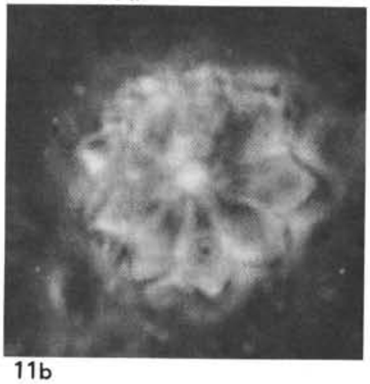
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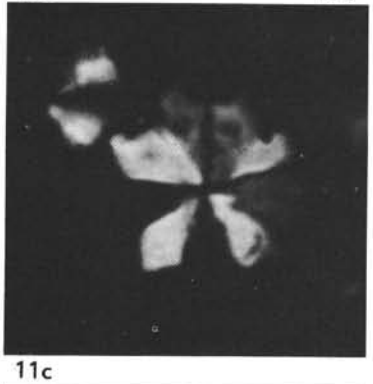
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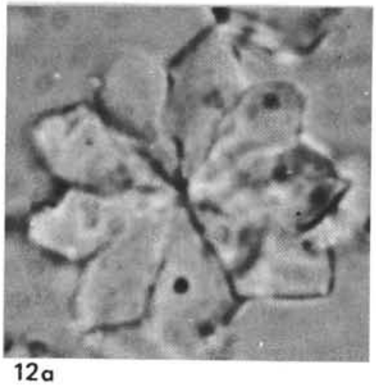
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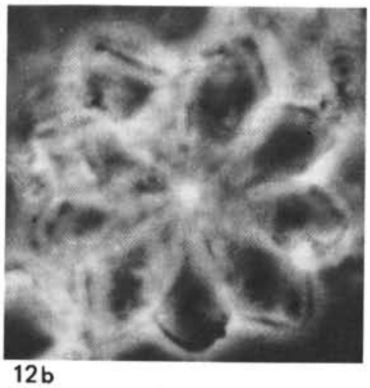
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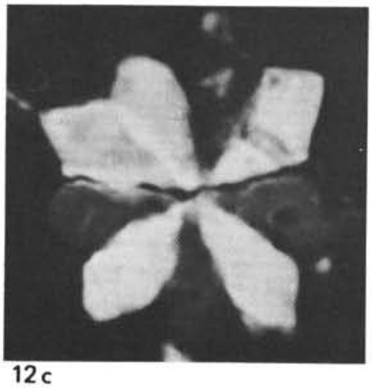
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