



BioStratigraphics
Consulting Micropaleontology

8913 Complex Drive, Suite C
San Diego, CA 92123
Tel. (619) 560-4580
TWX: 910 335 2053 BIOSTRAT SDG

ARCO

NORTH ALEUTIAN SHELF COST NO. 1

JOB #05820107

CALCAREOUS NANNOFOSSIL REPORT

Received
DISTRICT
OIL AND GAS OFFICE

FEB 15 1993

Minerals Management Service
Alaska

Interpreted by:

E. Dean Milow

Biostratigrapher Consultant

A Unit of McClelland Engineers, Inc., Ventura Division



BioStratigraphics
Consulting Micropaleontology

8913 Complex Drive, Suite C
San Diego, CA 92123
Tel. (619) 560-4580
TWX: 910 335 2053 BIOSTRAT SDG

January 19, 1983

ARCO Exploration Company
P.O. Box 360
Anchorage, Alaska 99510

ATTENTION: Mr. David M. Hite

SUBJECT: Calcareous Nannofossil Analysis, ARCO
North Aleutian Shelf COST No. 1, Bering
Sea, Alaska.

BioStratigraphics submits this report detailing our interpretation of the calcareous nannofossil occurrences in the ARCO North Aleutian COST No. 1 from the Bering Sea.

A total of four hundred seventy-three (473) ditch, sidewall core and conventional core samples representing depths of 1380 feet to the total depth of 17,150 feet were examined in San Diego by BioStratigraphics.

If you have any questions on any of the enclosed material, give us a call.

Sincerely,

E. Dean Milow
Biostratigrapher Consultant

A. D. Warren
Senior Biostratigrapher
Manager

EDM:ADW/jam

CONTENTS

SUMMARY.....	2
INTRODUCTION.....	2
Scope.....	2
Format.....	3
DISCUSSION.....	4
Observations.....	4
Procedures.....	5
BIOSTRATIGRAPHIC RESULTS.....	5
CONCLUSIONS.....	7
REFERENCES.....	8
APPENDIX A.....	9
APPENDIX B.....	14

SUMMARY

The calcareous nannofossils present in the ditch, sidewall, and conventional core samples from the ARCO North Aleutian COST No. 1 indicate the well penetrated Oligocene strata between 4740 and 5550 feet and probable late Eocene strata around 10,659 feet.

INTRODUCTION

Scope

One hundred seventy-five (175) composited ninety-foot ditch samples representing a depth range of 1380 feet to the total depth of 17,150 feet were examined for calcareous nannofossils. In addition, one hundred fifty-three (153) sidewall core samples from 1450 to 13,340 feet and one hundred forty-five (145) conventional core samples from 3392.8 to 16,719.6 feet in this well were examined for calcareous nannofossils.

When each of the double sidewall core samples from the same depth reflected distinctly different lithologies, each lithology was treated as a separate sample.

A detailed microscopic analysis of these one hundred seventy-five samples forms the basis of this report.

Format

The following sections of this report include a synopsis of the observed frequency, diversity, condition and character of the calcareous nannofossils found in these samples. This is followed by an outline on the procedures used to prepare the samples for examination as well as the basis for the ages, zones, subzones, and abbreviations used in this report.

The results of the age determinations based on calcareous nannofossils along with pertinent remarks and taxa are listed below. The final section of this report contains our conclusions.

The appendices detail the results of calcareous nannofossil analysis of the core samples. Appendix A encompasses the sidewall core samples while Appendix B covers the conventional core samples.

DISCUSSION

Observations

Very rare to rare calcareous nannofossils were found in four ditch samples collected between 4740 to 5550 feet and one sidewall core at 10,659 feet. The nannofossil assemblages in these samples exhibit very limited diversity (one to four species) and moderately poor to good preservation.

Very poorly preserved calcareous nannofossils were observed in the no. 2 core sample at 4195.9 feet where they occur only as incomplete parts and fragments, too incomplete for any definitive identification.

The very limited diversity and rare occurrences of calcareous nannofossils at this well site suggest adverse environmental factors limited nanoplankton production and accumulation throughout the time of sediment deposition at this site. Preservational factors may also have controlled the presence or absence of calcareous nannofossils in the strata penetrated by this well.

Procedures

The samples were prepared for microscopic examination by standard nannofossil techniques. This involved the disaggregation by hydrogen peroxide and concentrating the nannofossils by settling and pipetting procedures on the resulting sediment suspension.

The age and zonation framework used in this report is based on the compilation of Bukry (1973, 1975) and Okada and Bukry (1980).

Frequency symbols used in this report are as follows: V = very rare (1-3 specimens per slide); R = rare (4-8 specimens per slide); F = few to frequent (9-200 specimens per slide); C = common (200-800 specimens per slide); A = abundant (about 900 or more per slide); ? = questionable occurrence or identification.

BIOSTRATIGRAPHIC RESULTS

In this section we present all the pertinent age determinations based on calcareous nannofossils, from the youngest to the oldest. Key species present in the various intervals are listed to lend support to the age determinations.

1380-4740'

Age. Indeterminate

Remarks. Barren or lacks identifiable calcareous nannofossils. Core #2 @ 4195.9' contains incomplete parts and fragments of calcareous nannofossils that are unidentifiable.

4740-5550'

Age. Possibly "mid" to "late" Oligocene

Zone. Possibly Sphenolithus predistentus to S. ciperoensis to late Oligocene

Remarks. Very rare to rare occurrences of a few species of calcareous nannofossils are scattered through this interval. They include: Coccolithus pelagicus with length/width ratios of centers greater than 1.29 @ 4740-4830' (VR), and 5460-5550' (R); Cyclicargolithus floridanus @ 5010-5100' (VR); Dictyococcites bisectus @ 4830-4920' (VR); D. scrippsae? @ 4830-4920' (VR, incomplete); D. sp. indet. @ 4740-4830' (VR, an aberrant D. scrippsae?, center smaller than usual); Reticulofenestra sp. aff. pseudoumbilica @ 4740-4830' (VR, centers etched and incomplete).

5550'plus/minus-10,659'SWC

Age. Indeterminate (possibly late Eocene to Oligocene by superposition)

Remarks. Barren of calcareous nannofossils.

plus/minus-10,659'SWC

Age. Probably late Eocene

Zone. Probably Discoaster barbadiensis

Remarks. Very rare occurrences of small specimens close to, if not identical with, Reticulofenestra reticulata were observed in the sidewall core sample at 10,659 feet. Because the more complete specimen does not maintain its typical optical characteristics on rotation under the microscope, the forms are tentatively assigned to this species as R. cf R. reticulata.

Stoppie
Prothomera
w variable
ranges -
July '71
p. 15

plus/minus-10,659'SWC-17,150'T.D.

Age. Indeterminate

Remarks. Barren of calcareous nannofossils.

CONCLUSIONS

The following summarizes the results of a calcareous nannofossil analysis of the samples from this well site.

1. 1380-4740': Age Indeterminate
2. 4740-5550': Possibly "mid" to "late" Oligocene
3. 5550'plus/minus-10,659': Age indeterminate, possibly Eocene to Oligocene by superposition.
4. plus/minus 10,659': Probable Late Eocene
5. plus/minus 10,659-17,150'T.D.: Age Indeterminate

REFERENCES

- Bukry, David, 1973. Low-latitude coccolith biostratigraphic zonation: In: Edgar, N.T., Saunders, J. B., et al., Volume XV. Washington, D.C.: U. S. Govt. Printing Office, pp. 685-703, text figs. 1-2, table 1.
- _____, 1975. Coccolith and silicoflagellate stratigraphy, Northwest Pacific Ocean, Deep Sea Drilling Project Leg 32; In: Larson, R.L., Moberly R., et al., Initial Reports of the Deep Sea Drilling Project, Volume XXXII. Washington, D.C.: U.S. Govt. Printing Office, pp. 677-701.
- Okada, Hisatake and Bukry, David, 1980. Supplementary modification and introduction of code numbers to the low-latitude coccolith biostratigraphic zonation (Bukry, 1973; 1975), Marine Micro-paleon., Vol. 5, No. 3, pp. 321-325.

APPENDIX A

Calcareous Nannofossil Analysis of
Sidewall Core Samples

SWC's @ 1450, 1480, 1545, 1640, 1762, 1874, and 1980'

Age. Indeterminate

Remarks. Barren of calcareous nannofossils.

SWC's @ 2116, 2174, 2220, 2332, 2370, 2456, and 2550'

Age. Indeterminate

Remarks. Barren of calcareous nannofossils.

SWC's @ 2664, 2763, 2863, 2920, 3020, 3142, and 3230'

Age. Indeterminate

Remarks. Barren of calcareous nannofossils.

SWC's @ 3298, 3412, 3500, 3580, 3726, 3832, and 3972'

Age. Indeterminate

Remarks. Barren of calcareous nannofossils.

SWC's @ 4014, 4074, 4230, 4318, 4462, 4600, and 4690'

Age. Indeterminate

Remarks. Barren of calcareous nannofossils.

SWC's @ 4810, 4867, 4912, 4963, 5041, 5104, and 5136'

Age. Indeterminate

Remarks. Barren of calcareous nannofossils.

SWC's @ 5148, 5200, 5306, 5335, 5468, 5512, and 5622'

Age. Indeterminate

Remarks. Barren of calcareous nannofossils.

SWC's @ 5642, 5680, 5724, 6190, 6588, 6671, and 6874'

Age. Indeterminate

Remarks. Barren of calcareous nannofossils.

SWC's @ 7040, 7154, 7563, 7771, 7824, 7900, and 7922'

Age. Indeterminate

Remarks. Barren of calcareous nannofossils.

SWC's @ 7993, 8041, 8073, 8082, 8084, 8120, and 8170'

Age. Indeterminate

Remarks. Barren of calcareous nannofossils.

SWC's @ 8277, 8313, 8351, 8404, 8461, 8578, and 8686'

Age. Indeterminate

Remarks. Barren of calcareous nannofossils.

SWC's @ 8818, 8891, 8919, 8924, 8964, 9051, and 9168'

Age. Indeterminate

Remarks. Barren of calcareous nannofossils.

SWC's @ 9237, 9320, 9446, 9577, 9620, 9637, and 9697'

Age. Indeterminate

Remarks. Barren of calcareous nannofossils.

SWC's @ 9767, 9814, 9852, 9895, 9940, 9973, and 10,000'

Age. Indeterminate

Remarks. Barren of calcareous nannofossils.

SWC's @ 10,050, 10,115, 10,136, 10,171, 10,192, 10,223,
and 10,311'

Age. Indeterminate

Remarks. Barren of calcareous nannofossils.

SWC's @ 10,462, 10,552, 10,595, and 10,622'

Age. Indeterminate

Remarks. Barren of calcareous nannofossils.

SWC @ 10,659'

Age. Probably late Eocene

Zone. Probably Discoaster barbadiensis

Remarks. Very rare small specimens, six to seven microns in size, representing Reticulofenestra cf. R. reticulata occur in this sidewall core sample. In certain orientations under the microscope, these specimens exhibit the optical characteristic of this species. However, on rotation, the central pseudo-isogyres disappear and the center shows a higher birefringence than usual. This phenomenon may be a function of overgrowth of the central sieve-plate on these specimens. If this difference is due

SWC @ 10,659' (Continued)

to preservational factors, then the specimens undoubtedly belong to this species. However, until this can be verified, the specimens are compared tentatively to this species.

SWC's @ 10,730, 10,829, 10,910, 11,059, 11,125, 11,177,
and 11,224'

Age. Indeterminate

Remarks. Barren of calcareous nannofossils.

SWC's @ 11,237, 11,365, 11,408, 11,463, 11,597, 11,626,
and 11,675'

Age. Indeterminate

Remarks. Barren of calcareous nannofossils.

SWC's @ 11,783, 11,844, 11,884, 11,910, 11,994, 12,025,
and 12,116'

Age. Indeterminate

Remarks. Barren of calcareous nannofossils.

SWC's @ 12,166, 12,221, 12,284, 12,347, 12,375, 12,439,
and 12,512'

Age. Indeterminate

Remarks. Barren of calcareous nannofossils.

SWC's @ 12,565, 12,635, 12,698, 12,754, 12,783, 12,865,
and 12,920'

Age. Indeterminate

Remarks. Barren of calcareous nannofossils.

SWC's @ 12,947a, 12,947b, 12,993, 13,113, 13,207, 13,261,
13,312, and 13,340'

Age. Indeterminate

Remarks. Barren of calcareous nannofossils.

APPENDIX B

Calcareous Nannofossil Analysis of
Conventional Core Samples

Core #1 @ 3392.8'

Age. Indeterminate

Remarks. Barren of calcareous nannofossils.

Core #2 @ 4195.9, 4198.2, 4199.3, and 4199.4'

Age. Indeterminate

Remarks. Barren or contains unidentifiable calcareous nannofossil fragments or parts (Core #2 @ 4195.9').

Core #3 @ 5228.9, 5229.4, 5230.3, 5231.5, 5235.2, 5235.7, 5238.3, 5241.0, 5242.1, and 5245.1'

Age. Indeterminate

Remarks. Barren of calcareous nannofossils.

Core #4 @ 5971.5, 5972.6, 5974.3, 5976.8, 5979.9, 5982.4, 5985.6, 5987.7, 5991.6, and 5995.5'

Age. Indeterminate

Remarks. Barren of calcareous nannofossils.

Core #5 @ 6666.4 and 6667.1'

Age. Indeterminate

Remarks. Barren of calcareous nannofossils.

Core #6 @ 8047.1'

Age. Indeterminate

Remarks. Barren of calcareous nannofossils.

Core #7 @ 8056.3, 8060.4, 8063.4, 8065.8, 8066.8, 8069.9,
8073.9, 8077.7, 8079.1, 8080.7, 8083.8, 8084.5,
8087.9, 8091.8, and 8092.5'

Age. Indeterminate

Remarks. Barren of calcareous nannofossils.

Core #8 @ 8632.4, 8636.2, 8637.8, 8641.7, 8645.3, 8646.7,
8649.5, 8653.4, 8654.1, and 8655.8'

Age. Indeterminate

Remarks. Barren of calcareous nannofossils.

Core #9 @ 9255.4, 9257.6, 9262.0, and 9264.1'

Age. Indeterminate

Remarks. Barren of calcareous nannofossils.

Core #10 @ 9945.6, 9948.8, 9949.5, 9952.0, 9954.3,
9956.6, 9962.3, 9963.8, 9965.8, 9969.3, 9971.5,
9974.4, 9976.8, 9976.9, 9978.1, 9981.3, 9982.2,
and 9983.6'

Age. Indeterminate

Remarks. Barren of calcareous nannofossils.

Core #11 @ 10,326.0, 10,327.4, 10,328.9, 10,330.3, and
10,334.7'

Age. Indeterminate

Remarks. Barren of calcareous nannofossils.

Core #12 @ 10,731.2, 10,734.0, 10,735.8, 10,737.0,
10,738.9, and 10,739.5'

Age. Indeterminate

Remarks. Barren of calcareous nannofossils.

Core #13 @ 11,085.0, 11,089.4, 11,093.7, 11,098.1,
11,098.5, 11,100.7, 11,102.4, 11,103.4, and
11,109.4'

Age. Indeterminate

Remarks. Barren of calcareous nannofossils.

Core #14 @ 12,249.0, 12,251.1, 12,253.1, 12,255.8,
12,259.3, 12,260.8, 12,262.3, 12,262.6, 12,264.3,
12,265.1, 12,268.4, 12,269.4, and 12,269.7'

Age. Indeterminate

Remarks. Barren of calcareous nannofossils.

Core #15 @ 12,630.4, 12,632.1, 12,633.2, 12,635.3, and
12,637.5'

Age. Indeterminate

Remarks. Barren of calcareous nannofossils.

Core #16 @ 14,165.7, 14,167.9, 14,169.1, 14,177.0,
14,179.7, and 14,183.4'

Age. Indeterminate

Remarks. Barren of calcareous nannofossils.

Core #17 @ 15,347.7, 15,349.6, 15,349.9, 15,354.5,
15,358.8, 15,364.9, 15,366.1, 15,367.1, and
15,368.4'

Age. Indeterminate

Remarks. Barren of calcareous nannofossils.

Core #18 @ 16,006.8, 16,009.2, 16,011.9, 16,017.5,
16,020.7, 16,023.0, 16,025.3, 16,026.9, and
16,029.0'

Age. Indeterminate

Remarks. Barren of calcareous nannofossils.

Core #19 @ 16,701.2, 16,703.7, 16,705.2, 16,707.5,
16,714.6, 16,717.9, 16,716.2, and 16,719.6'

Age. Indeterminate

Remarks. Barren of calcareous nannofossils.