✓ U.S. Geological Survey. [Reports - Open file series]

OPEN FILE REPORT

TM
cr
TWANAL

Preliminary description and interpretation of cores and radiographs from Clear Lake, Lake County, California: Core 7

by

John D. Sims and Michael J. Rymer

1975

259079

This report is preliminary and has not been edited or reviewed for conformity with Geological Survey standards

Report No. 75-144

259079

CONTENTS

Text

Appendices

INTRODUCTION

Clear Lake, California is located in the California Coast Ranges about 120 km north of San Francisco and is the largest freshwater lake wholly within California. The lake basin is tectonically controlled (Anderson, 1936; Brice, 1953, Sims and Rymer, 1974) and the area seismically active (Coffman and von Hake, 1973).

Interest in this lake was stimulated by hypotheses developed from a study of sediments in Van Norman Reservoir after the 1971 San Fernando earthquake (Sims, 1973). During this study three zones of deformational structures were found in the 1 m-thick sequence of sediments exposed over about 2 km^2 of the reservoir bottom. These zones were correlated with moderate earthquakes that shook the San Fernando area in 1930, 1952, and 1971. Results of this study, coupled with the experimental formation of deformational structures similar to those from Van Norman Reservoir, led to a search for similar structures in Pleistocene and Holocene lakes and lake sediments in other seismically active areas. Clear Lake, California was chosen specifically because of its location near the San Andreas fault and the San Francisco-Oakland urban complex, and the probability of obtaining an uninterrupted sediment record from the present into Pleistocene time. Eight 12 to 15 cm diameter continuous cores were taken from the lake sediments (fig. 1) as part of a study of earthquake induced structures in sediments and the tectonic framework of the Clear Lake basin. The eight cores range in length from 13.87 m to 113.09 m (Table 1).

SUMMARY OF DATA

Core 7 is from the part of Clear Lake known as the Highlands Arm, and was taken on 2-4 Nov. 1973. Depth of water at the site is 12.8 m. The core is

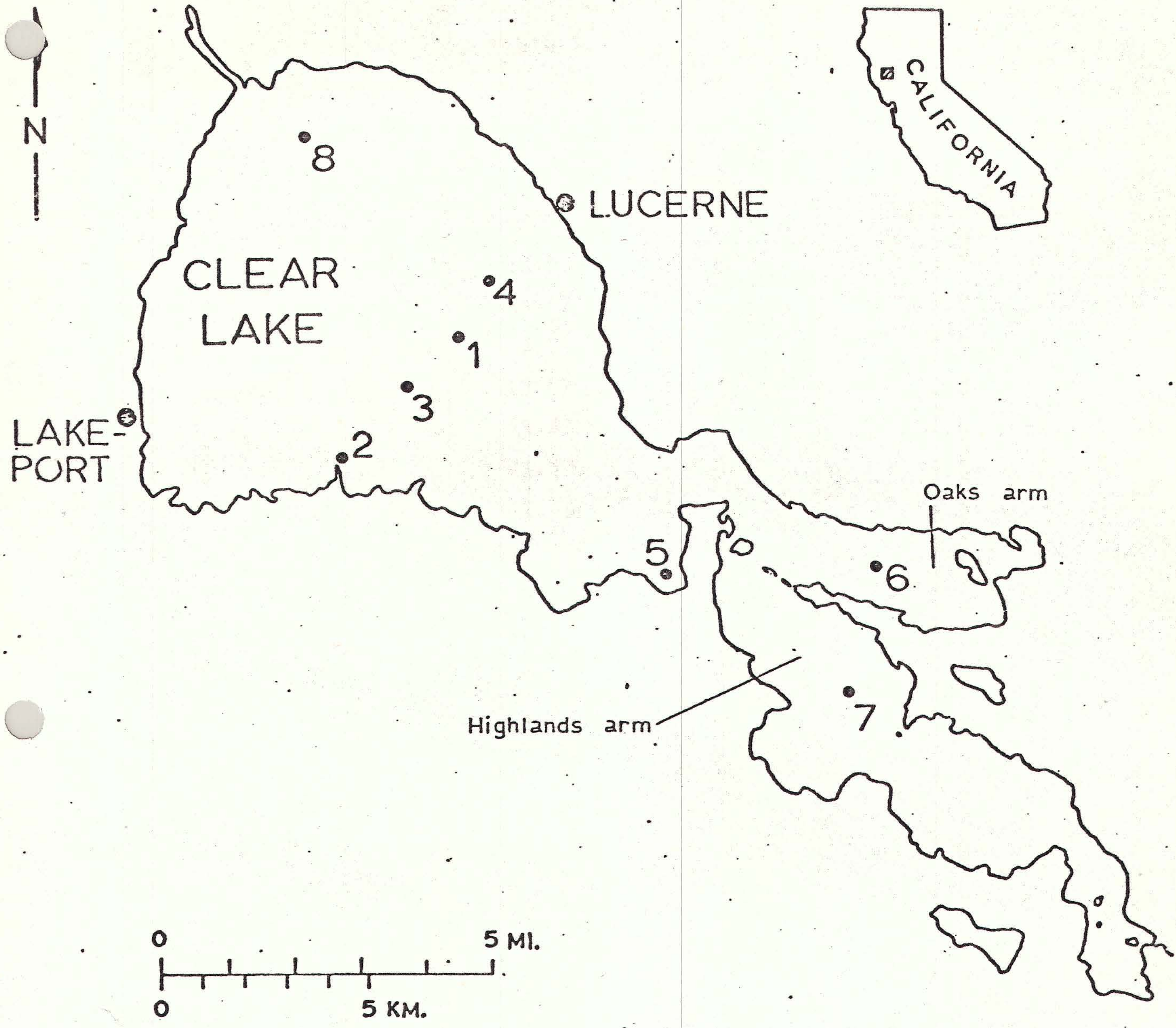


Figure 1. Map showing location of Core 7 in Clear Lake, California. Other numbered core sites in the lake are the subjects of separate reports.

Table 1.

Core	Length (m)	Recovery (%)
1	52.58	35.0
2	13.87	88.0
3	69.04	96.0
4	113.09	92.0
5	23.47	94.0
6	23.47	99.0
7	41.45	94.9
8	22.10	99.6

27.43 m long and consists of 674 cm of fine, very dark greyish brown to very dark brown (10YR3/2 to 10YR2/2) sapropelic mud (gyttja) overlying a complexly interbedded sequence of peat, mud, clay, and volcanic ash (fig. 2). Peat and peat-rich mud comprise about 45 percent of Core 7. Fibrous, brown peat; the type most commonly found near the shallow edges of bays and open marshes (Rigg and Gould, 1957; and Cohen, 1973). The sedimentary environment represented by the peat-dominated sequence is one of open marsh having < 2 m water depth (David Adam, personal communication, 1974). Clear Lake, including the arm from which this core was taken is fault bounded (Sims and Rymer, 197~~3~~4). Sediments below Slug 9 were deposited in an open marsh and are overlain by sediments deposited in an open lake environment. This strongly suggests rapid tectonic movement after about 10,000 to 11,000 yr. B.P. (fig. 2). Prior to about 11,000 yr. B.P. more gradual subsidence of the Highlands Arm of Clear Lake occurred, probably as a consequence of volcanic eruptions in the Clear Lake Volcanic Field. Radiocarbon age determinations (table 2, fig. 2) were made on 14 samples to determine approximate timing of sedimentologic and volcanic events.

Six zones of deformed sediments were found between 890 cm and 1860 cm in the core (fig. 2 and part 2). The age of these sediments ranges from approximately 12,300 yr. B.P. to 26,000 yr. B.P. However, bioturbation of the sediments is extensive throughout, and may have completely obscured or rendered uninterpretable some sedimentologic features.

Of equally great importance is the preserved record of volcanic eruptions in this core. Twenty-nine ash beds or probable ash beds are preserved in this core (fig. 2). Most of the beds interpreted as ashes are clay units that have a mottled texture and are interpreted as altered basaltic, and andesitic or dacitic pyroclastic material which is common in

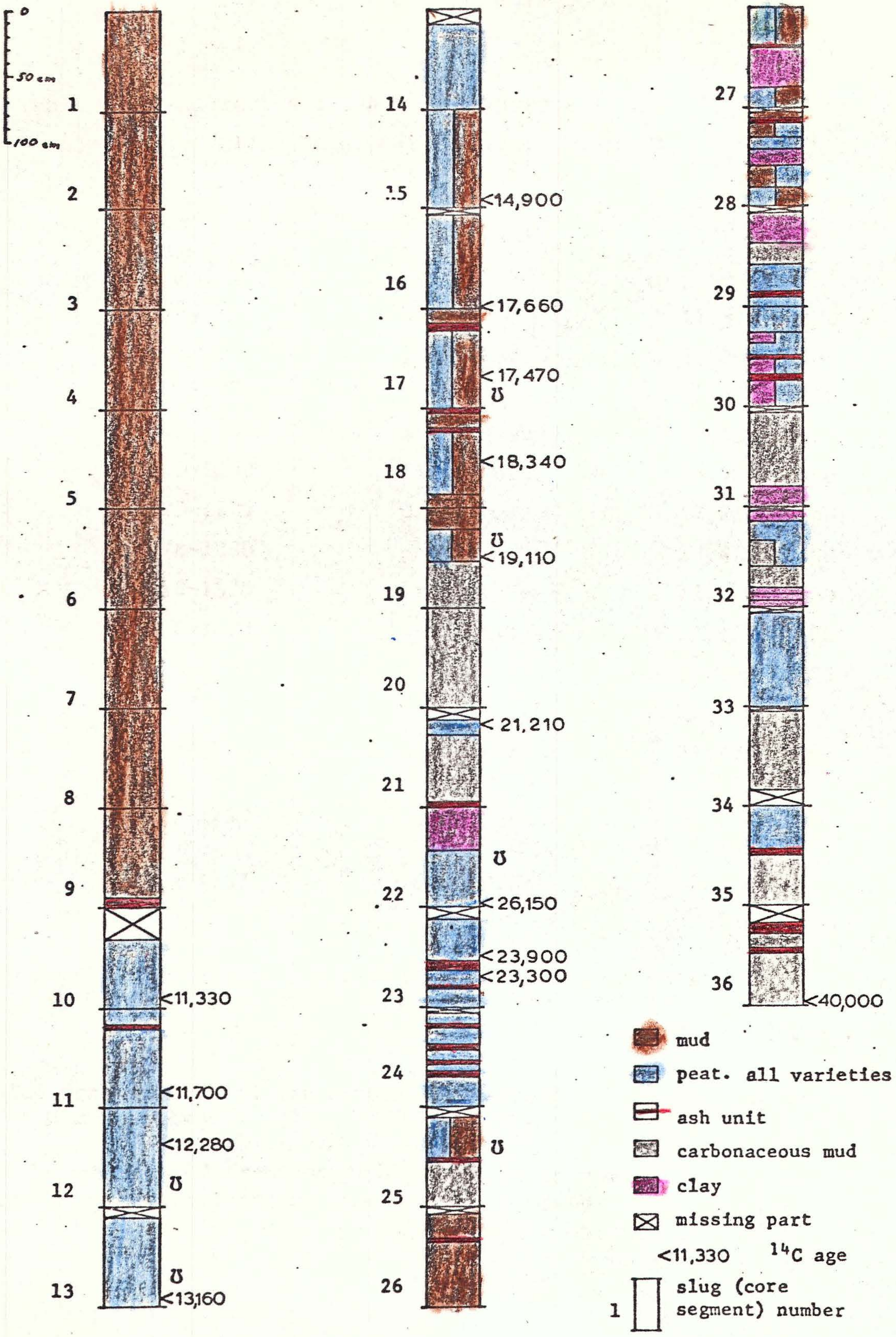


Figure 2. Generalized lithology of sediments from Core 7, Clear Lake, California. A vertical line within a slug represents interbedding of the respective lithologies. Probable earthquake induced structures are denoted by a (Ʊ) symbol.

Table 2. Radiocarbon dates from sediments in Core 7,
Clear Lake, California

Sample Number[1]	Sample depth (cm)	Material[2]	Conventional radiocarbon date (radiocarbon years B.P.)
I-7719[3]	763-771	peat	11,330 ± 330
W-3071	820-830	peaty mud	11,700 ± 250
W-3072	870-880	peat	12,280 ± 250
W-3073	980-1010	silty peat	13,160 ± 300
W-3063	1120-1130	clayey peat	14,900 ± 300
I-7756[3]	1225-1229	peaty mud	17,660 ± 340
W-3064	1276-1280	peaty mud	17,470 ± 300
W-3066	1320-1330	peat	18,340 ± 300
W-3068	1410-1420	peaty mud	19,110 ± 300
W-3069	1530-1540	peat	21,210 ± 400
W-3070	1670-1676	peat	26,150 ± 600
I-7[illegible]28[3]	1715-1720	carbonaceous mud	23,900 ± 640
I-7932[3]	1727-1733	carbonaceous mud	23,300 ± 600
I-7718[3]	2731-2737	peat	> 40,000

[1] Sample numbers with "I" prefix designate ^{14}C age determinations by James Buckley, Teledyne, Isotopes. Sample numbers with "W" prefix designate ^{14}C age determinations by Meyer Rubin, U.S. Geological Survey.

[2] All samples were pretreated for removal of carbonates but not for the removal of humic acids.

[3] Humic acids not removed from samples. Humic acids removed prior to ^{14}C-age determinations in all other samples.

in the Clear Lake Volcanic field (Carter Hearn, personal communication). The Clear Lake pyroclastic deposits are in part Late Pleistocene in age (Julie Donnally, personal communication). One of the ashes is easily identifiable as such because little alteration has occurred and the shards are still well preserved (fig. 2, core segment 17). The presence of another altered basic ash is inferred from ^{14}C-age determinations (fig. 2, core segment 23). ^{14}C-age determinations above and below this ash (23,900±640 and 23,300±600 respectively) give essentially the same date (Table 2); thus suggesting a geologically instantaneous deposition. Although younger than W-3070 (26,150±600) the dates are considered significant for the purpose for which they are used. The ^{14}C-age dates in Table 2 are from two different laboratories and contain discrepencies when placed in stratigraphic order. This is due primarily to the methods used in performing the determinations. The determinations performed in laboratories of the U.S. Geological Survey include pre-treatment of the samples to remove both carbonates and humic acids (Meyer Rubin, written communication, 1975) and those from the laboratories of Isotopes Inc. include a pre-treatment to remove carbonates only (James Buckley, written communication, 1974). Thus the inclusion of small amounts of humic acids or the growth of new organisms after the samples were obtained can result in a younger date. Because the samples were wet or water saturated and not refrigerated, there is a strong possibility that the lack of pre-treatment of the samples submitted to Isotopes Inc. include humic acids or newly grown organisms. However, there are no time reversals in the stratigraphically ordered samples from each laboratory. This suggests that the data are individually internally consistent but that the lack of removal of humic acids produced the time reversals in the combined data.

Table 3. Calculated Sedimentation Rates for Core 7 [1]

From	To	Thickness (cm)	Years	Rate (mm yr^{-1})
Top	I-7719	765	11,330	.68
Top	W-3071	825	11,700	.71
W-3071	W-3072	50	580	.86
W-3072	W-3073	120	880	1.36
W-3073	W-3063	130	1,740	.75
W-3063	I-7756	102	2,760	.37
W-3063	W-3064	153	2,570	.60
I-7756	W-3064	51	[2]	--
W-3064	W-3066	47	870	.54
W-3066	W-3068	90	770	1.17
W-3068	W-3069	120	2,100	.57
W-3069	W-3070	138	4,940	.28
W-3069	I-7928 and I-7932[3]	186	2,390	.79
W-3070	I-7928 and I-7932 [3]	48	[2]	--
I-7928 and I-7932 [3]	I-7718[4]	1,020	1,6400	.62
W-3070	I-7718[4]	1,064	1,3850	.79

[1] Data derived from Table 2.

[2] Stratigraphic reversal of dates. Subtraction of stratigraphically higher date from the stratigraphically lower one would yield a negative number.

[3] Samples I-7928 and I-7932 which are 13 cm apart are combined here as a single date.

[4] Sample I-7718 here assumed at 40,000 (see fig. 3).

A plot of ^{14}C-age versus depth (fig. 3) shows the consistency of the age dates from hole 7. These data are fitted with a straight line by linear regression. The equation of this line is 7 = 14.77x - 184.48 and has a correlation coefficient of r = 0.992. In figure 3, all ^{14}C-age dates from Core 7 are used and the minor variations due to sampling and analyatical errors are minimized. The line fit to the data now allows a prediction of sediment ages at given depths. These individual events may be approximately dated.

A tentative chronology of seismic and volcanic events is derived from the data in figures 2 and 3 (fig. 4). The positive identification of volcanic ashes and their approximate ages shown in figures 2 and 3 awaits more complete mineralogical and chemical data as well as the correlation with similar units in the other cores from Clear Lake. Deformational structures identified in Core 7 are also shown in figure 4. These structures are tentatively identified as being induced by earthquake events (Sims, 1973, 1974).

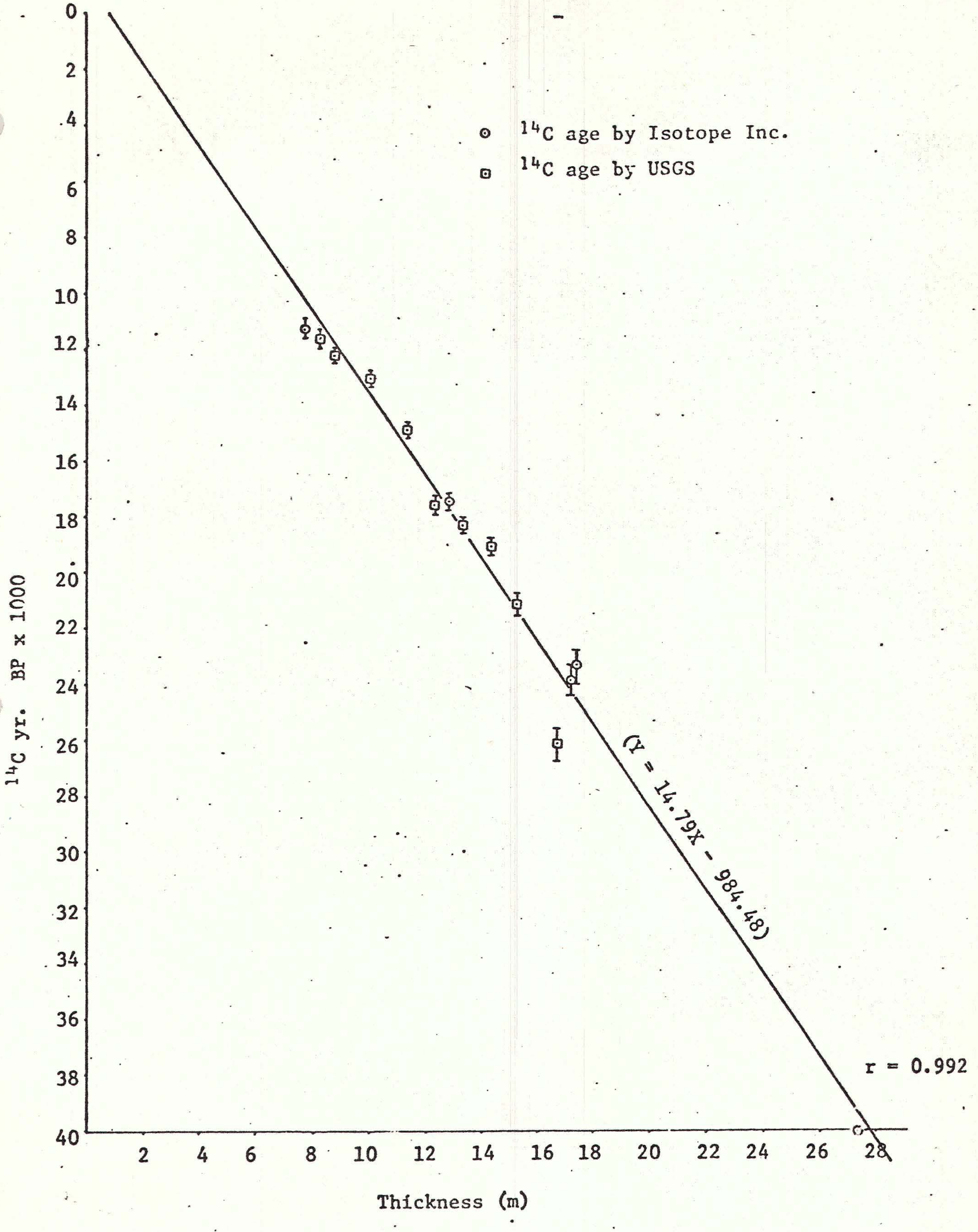


Figure 3. Plot of ^{14}C-age determinations and depth in Clear Lake Core 7. The line $y = 14.79x - 984.48$ is fitted to the data by linear regression. The correlation coefficient (r) is 0.992. Error limits on each ^{14}C-age shown by vertical bars.

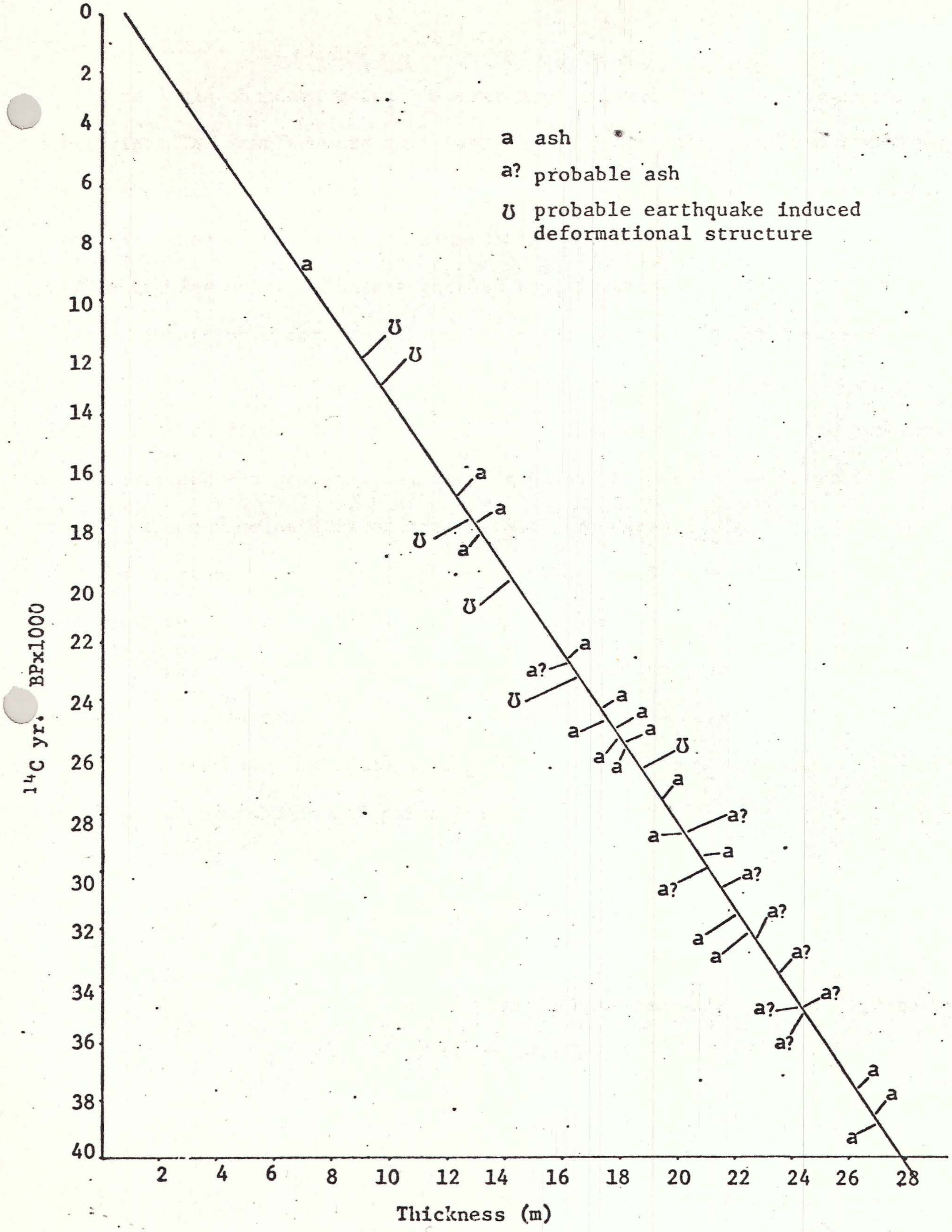


Figure 4. Plot of tentative chronology of ash beds and earthquake induced deformational structures in Clear Lake Core 7. See figure 3 for the data used to derive the age-thickness regression line shown above.

METHOD OF STUDY

Core 7 was obtained using an Ostenberg sampler with a barge mounted drill rig. The samples were retrieved and extruded into rigid plastic tubes which were sealed with plastic endcaps, and waxed to prevent moisture loss. For examination the plastic containers were cut open and the core cut in half lengthwise using a "cheese cutter" type instrument. Lithologic and other sedimentologic data were then recorded (see Part II for detailed descriptions). One-half of each core segment was photographed on color and black and white film. Then a one cm thick slice was taken from the center of the core segment and an x-ray radiograph made to study the internal structures and fine details of the visible structures.

The original x-ray radiographs were taken on 30 x 43 cm sheets of industrial x-ray film at 1:1 scale. Exposures to x-radiation ranged from 6 to 9 minutes at 45 to 55 KV and 3.5 ma. The prints from the radiographs in Part II of this paper are photographically reduced 3.7x from the originals.

After lengthwise splitting, samples were taken from one-half of the core for other sedimentologic and paleontologic studies as follows:

a) bulk mineralogy

b) cladocerae

c) diatoms

d) fine grain size analysis (<125 m diameter)

e) macro fossils

f) pollen

g) water content/organic carbon content

The remaining core half, resting in a rigid plastic half-round, was sealed in a polyethelane bag and retained for future use and reference.

These samples and the original radiographs may be examined by contacting:

John D. Sims
U.S. Geological Survey
Earthquake Tectonics Branch
345 Middlefield Road
Menlo Park, California 94025

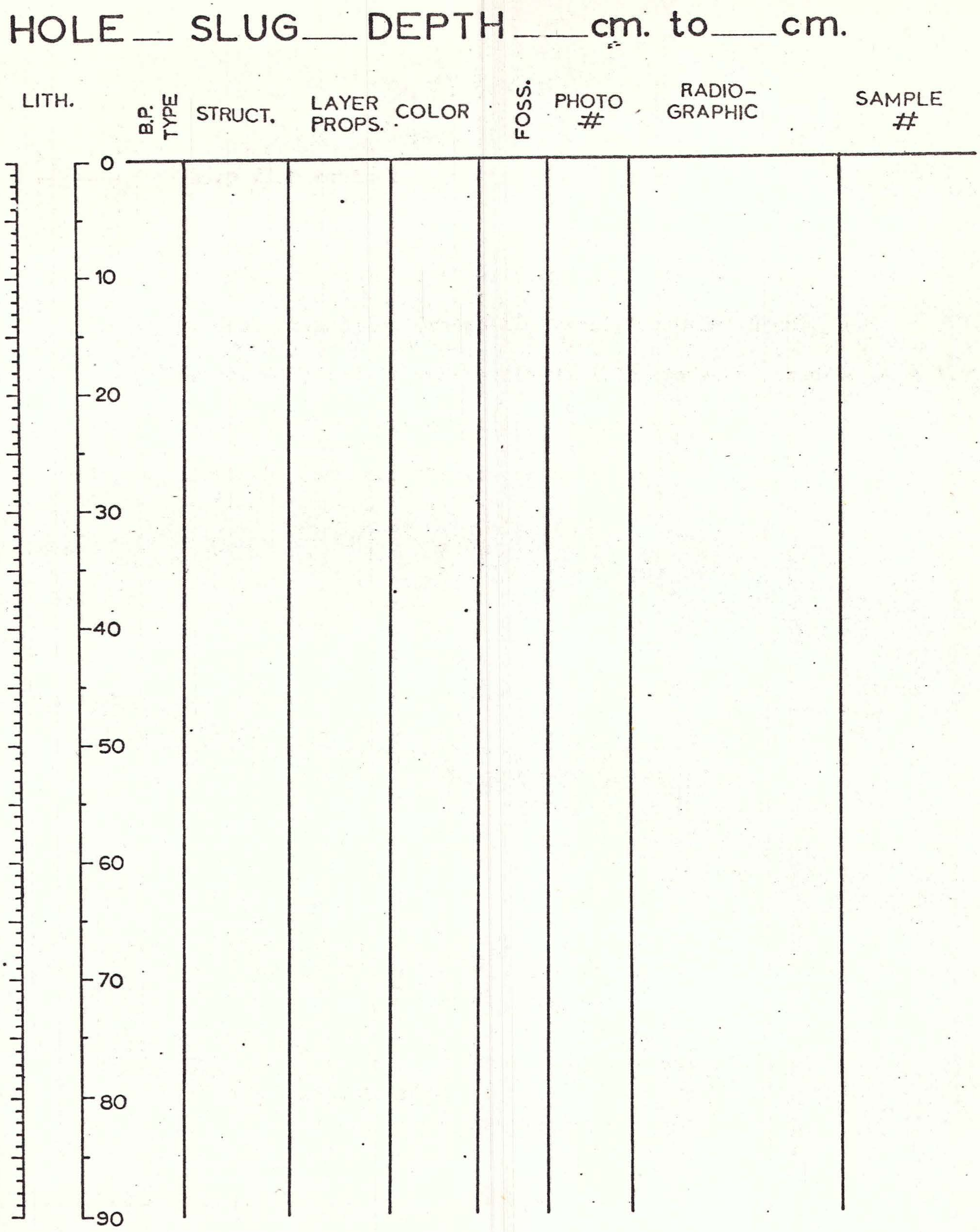
GRAPHIC NOTATIONS USED IN STRATIGRAPHIC DESCRIPTIONS

The stratigraphic descriptions of each core segment (slug) are contained on individual sheets in the format shown in fig. 5. The graphical notations used in the core descriptions and radiograph interpretations in Part II are modified from the methods of Bouma (1962). The conventions and symbols used follow: Those symbols marked* are also used in the column entitled Radiographic.

Lithology

XXXXXXXX	ash	▨	clayey silt
▤	clay	▨	silty clay
░	silt	▤	clayey sand
░	sand	▤	sandy mud
▒	gravel	▒	sandy silt
▨	peat	▒	sandy gravel
▓	mud	▦	clayey peat
▓	silty sand	▨	silty peat

D	material from sides of hole as a contaminant, generally at the top of a sample (debris).
v	vivianite, an iron phosphate present in the sediments.
▦▓	interlaminated strata; dominant lithology on left (in this example peat and mud)

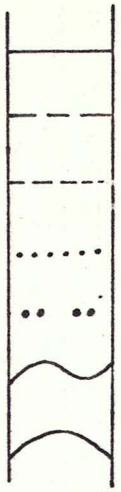


HOLE __ SLUG ___ DEPTH ___cm. to ___cm.

LITH.	B.P. TYPE	STRUCT.	LAYER PROPS.	COLOR	FOSS.	PHOTO #	RADIO-GRAPHIC	SAMPLE #

Figure 5. Form for stratigraphic descriptions of core segments (slugs) Column headings from left to right are Lithology, Bedding plane type, Bedding plane structures, Layer properties, Munsel Color designation, Fossil content, Photograph numbers, Radiographic interpretation, and Sample numbers.

Bedding Plane Type*



Sharp flat contact

distinct flat contact

transition (range of transition < 0.5 cm)

gradual transition (range of transition 0.5-1.0 cm)

transition gradual and hardly visible (range of transition > 1.0 cm)

undulating contact; gradations as above

irregular contact; gradations as above

Structure

graded bedding	....
load cast	~
earthquake induced structure*	Ʊ
fault*	///

Interval in which structure occurs*	⌶
indistinct structure*	( )
structure barely visible*	(( ))

Layer Properties

parallel lamination (< 0.5 cm thick)*:

coarse laminae predominate

---

fine laminae predominate

parallel lamination* < slightly disturbed / strongly disturbed

* Also used in column entitled Radiographic

parallel wavy lamination*	≈

(predominating thickness and degree of disturbance as noted above)

lenticular wavy lamination*	≂

(predominating thickness and degree of disturbance as noted above)

interval in which property occurs*	⌶
indistinct property*	( )

Color

Color designations are taken from the Munsell Soil Color Chart (Munsell, 1973). Conventions used are as follows:

$\frac{\text{10Y 5/4}}{\text{5YR 5/4}}$	distinct color break between between two units.
10Y 5/4/5YR 5/4	two colors present throughout the interval noted. First color is most prevalent and the right hand color is present as clots, belbs, or patches.
10Y 5/4 | 5YR 5/4	distinct interlamination throughout the interval noted.
10Y 5/4 (5YR 5/4)	oxidized color (unoxidized color) this notation is used only where partial oxidization of the sediments has occurred and the unoxidized color is readily apparent.

Fossils

fish scale*	⊜
fish bone*	∝

* Also used in column entitled Radiographic

gastropod*	
clam*	
root	
root level	
wood oriented parallel to bedding plane	▭
wood not parallel to bedding plane	▱
plant fragment parallel to bedding plane	▬
plant fragment not parallel to bedding plane	◆

Photograph Number

Numbers refer to the index number of both the color and black and white photos taken of the cut surface of the core segment.

Example: 7-1-1 refers to Core 7, Core segment 1, Photo 1.

There are 5 photos for each core segment in Core 7. Each photo covers approximately 20 cm of core segment length with overlap with adjacent photos.

These photos may be examined and copies made at the requestors expense by contacting:

John D. Sims
U.S. Geological Survey
Earthquake Tectonics Branch
345 Middlefield Road
Menlo Park, California 94025

* Also used in column entitled Radiographic

ERRATA

p. 18 - There is no page 18. An error in pagination occurred.

Radiographic

This column contains supplementary information derived from an analysis of information taken from x-ray radiographs. The notations used in this column are a combination of those marked by * under the headings Bedding Plane Type, Bedding Plane Properties, Layer Properties, and Fossils, plus some additional special symbols not previously used (list below):

granule - an x-ray opaque small body < 1 mm in diameter.

granule cluster - a regular to irregular shaped mass of granules.

pebble - a large (> 3 mm diameter) x-ray opaque body.

mottling - areas of low x-ray transparency of irregular shape and unknown origin.

bioturbation - animal burrows. The degree of sediment disturbance generally accompanies this note such as: heavy, slight, etc.

$\Delta\delta$ - a difference in x-ray transparency between stratigraphic subunits due to compositional, grain size or other physiochemical differences.

fractured - physical breaking of the indicated part of the sediment slice that usually occurred during sample preparation prior to x-ray inspection.

plastic - plastic chips derived from sawing the rigid plastic core container.

Sample Number

Three types of sample numbers are present and identify samples taken for specific tests or supplementary data. The specific use of the sample is identified, at the bottom of the page on which the number occurs.

1) Four digit numbers are reserved for bulk mineralogy, fine grain size analysis (fraction < 125 m diameter), fossil cladoceran, palynological examination, weight loss on drying, fossil diatoms and macrofossil content.

2) Four digits prefixed by "I" (example: I-7030). A radiocarbon date performed by Mr. James Buckley in the laboratories of Isotopes, Inc., Westwood, N.J. The absolute date and all pertinent data are listed at the bottom of the page on which the sample number occurs.

3) Four digits prefixed by "W" (example: W-3030). A radiocarbon date performed by Mr. Meyer Rubin in the laboratories of the U.S. Geological Survey, Reston, VA. The absolute date and all pertinent data are listed at the bottom of the page on which the sample numbers occur.

Acknowledgements;

This project was in part financed by a grant from Lake County, California. We wish also to thank D. Adam, D. Peterson, G. Reed, D. Greenwood, I. Gassoway, P. Margolin and R. Wright for their assistance during the coring operations at Clear Lake.

REFERENCES

Anderson, C.A., 1936, Volcanic history of the Clear Lake area, California: Geol. Soc. America Bull., v. 47, p. 629-664.

Bouma, A.H., 1963, Sedimentology of some flysch deposits: Amsterdam, Elsevier Pub. Co., 168 p.

Brice, J.C., 1953, Geology of Lower Lake Quadrangle, California: Calif. Div. Mines, Bull. 166, 72 p.

Coffman, J.L. and von Hake, C.A., 1973, Earthquake history of the United States: U.S. Dept. of Commerce, Publication 41-1, 208 p.

Cohen, A.D., 1973, Petrology of some Holocene peat sediments from the Oketenokee swamp-marsh complex of Southern Georgia: Geol. Soc. America Bull., v. 84, p. 3867-3878.

Munsell Products, 1973, Munsell Soil Color Charts, 1973 edition, Baltimore, Md., Munsell Products.

Rigg, G.B. and Gould, H.R., 1957, Age of Glacier Peak eruption and chronology of post-glacial deposits in Washington and surrounding areas: Am. Jour. Science, v. 255, p. 341-363.

Sims, J.D., 1973, Earthquake-induced structures in sediments of Van Norman Lake, San Fernando, California: Science, v. 182, p. 161-163.

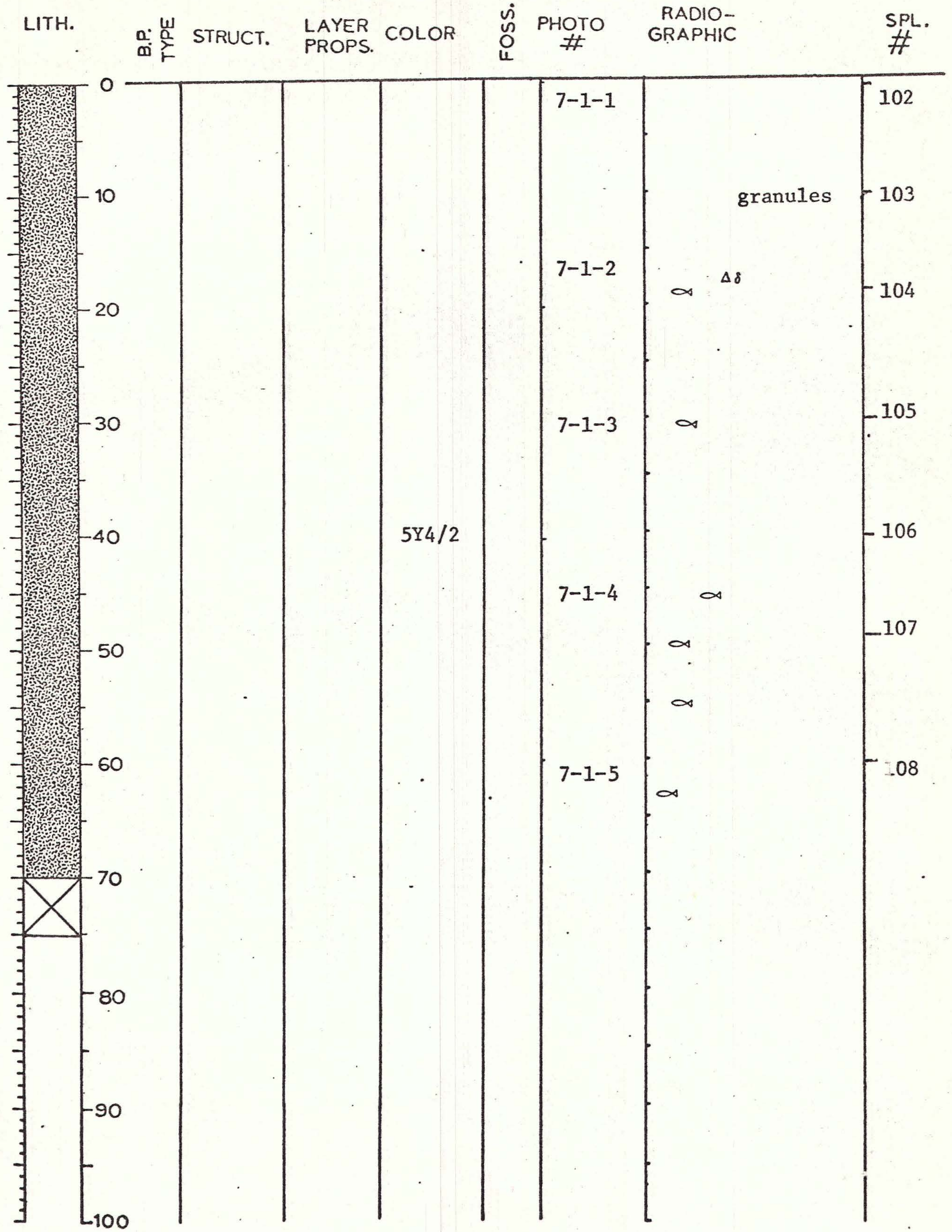
Sims, J.D., 1974, Determining earthquake recurrence intervals from deformational structures in young sediments, Internat. Symposium on Recent Crustal Movements 1974 in Switzerland, Abstracts, p. 81.

Sims, J.D. and Rymer, M.J., 1974, Gaseous springs in Clear Lake, California, and the structural control of the lake basin: Geol. Soc. America, Abstracts with Programs, v. 6, no. 3, p. 254.

Appendix A

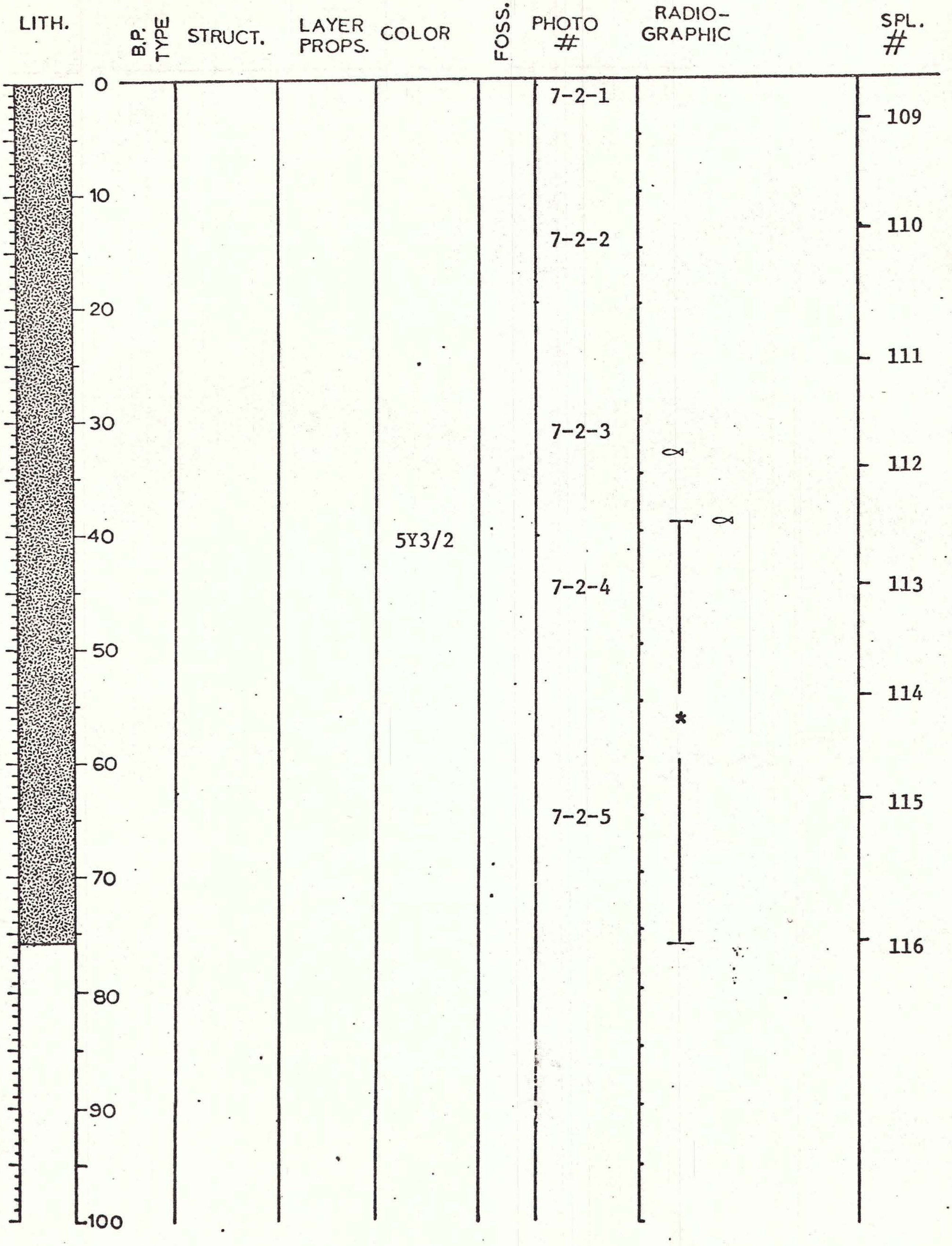
Graphical Logs

HOLE 7 SLUG 1 DEPTH 0 cm. to 76 cm.



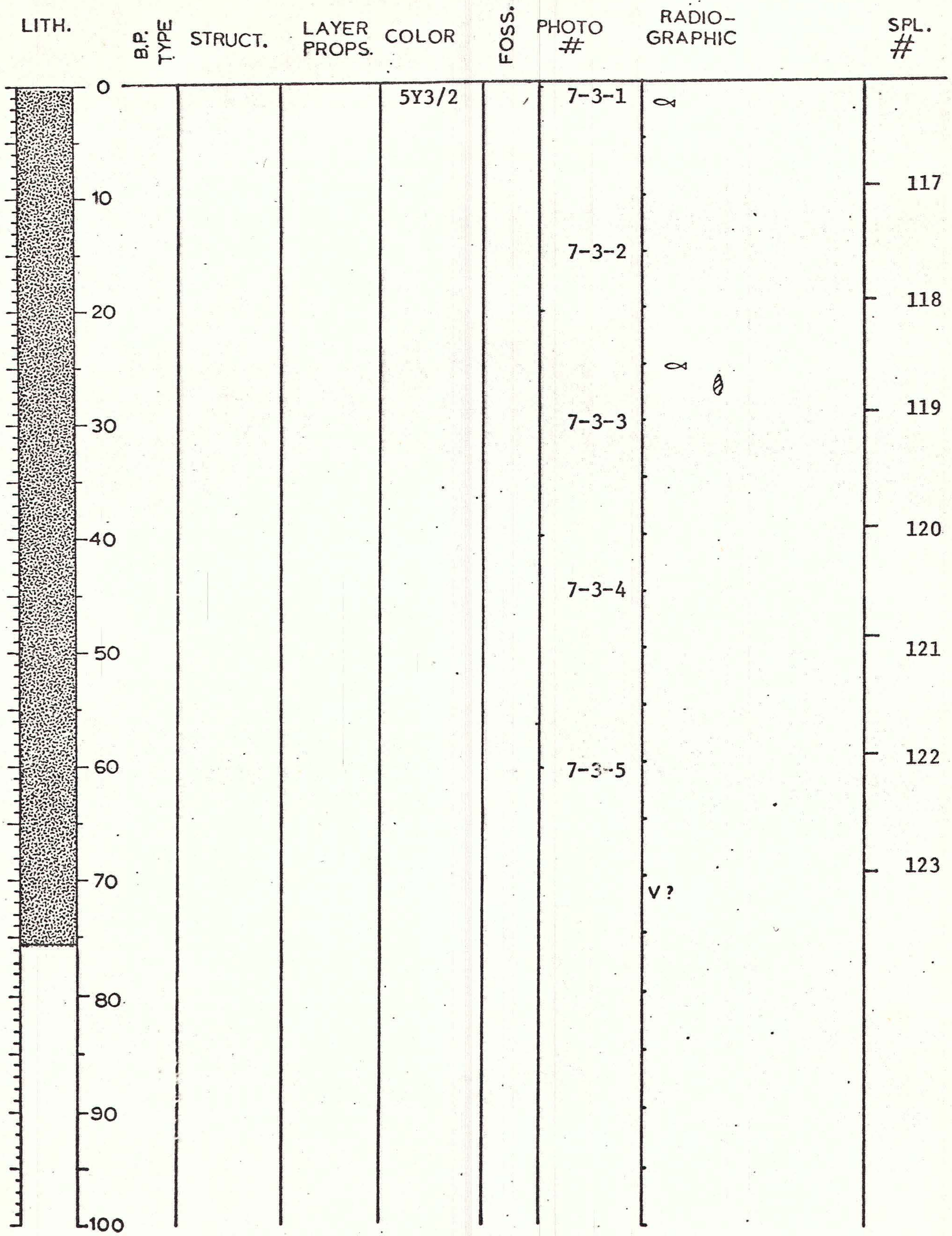
bioturbation throughout

HOLE 7 SLUG 2 DEPTH 76 cm. to 152 cm.



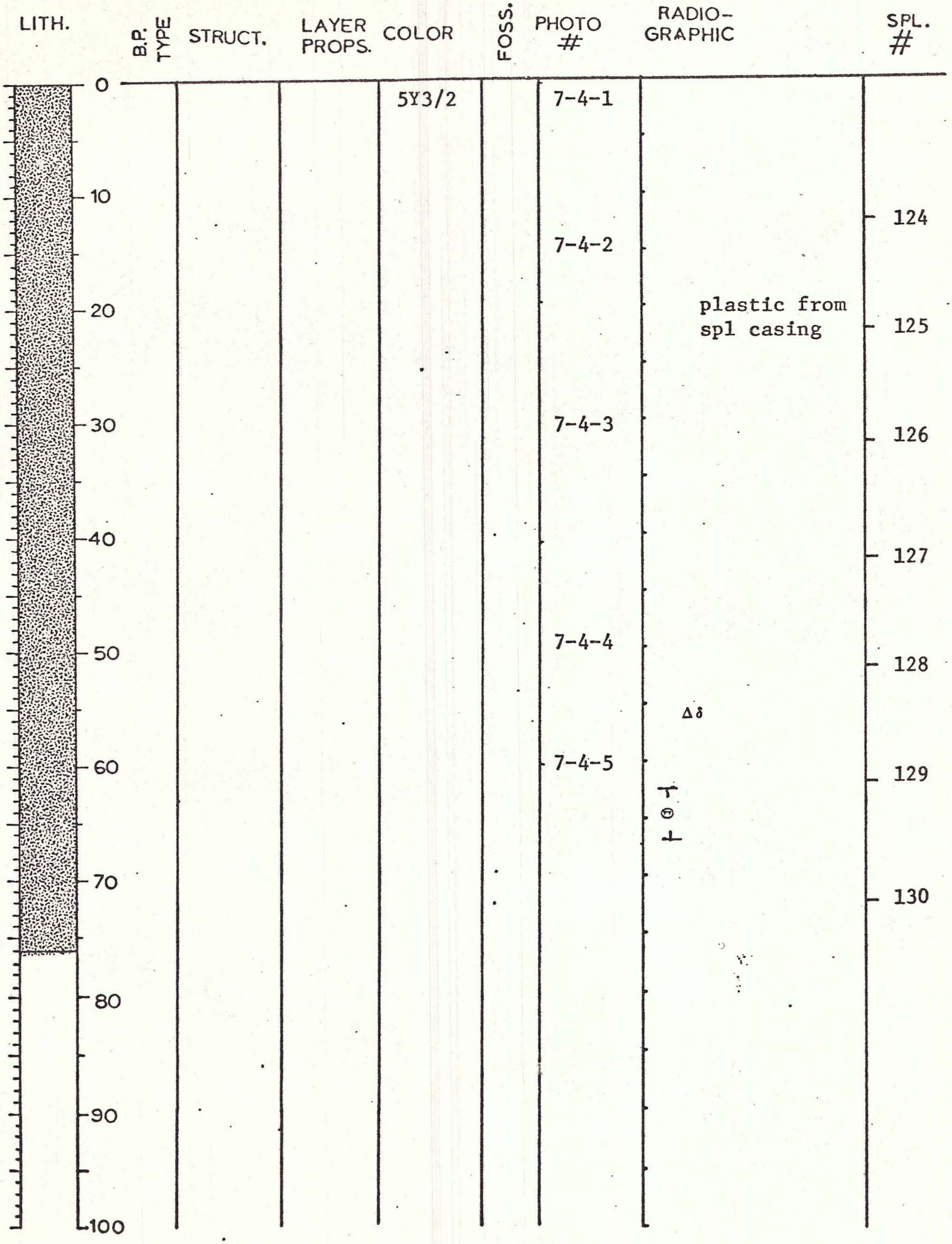
* scattered fish bones and scales throughout

HOLE 7 SLUG 3 DEPTH 152 cm. to 228 cm.



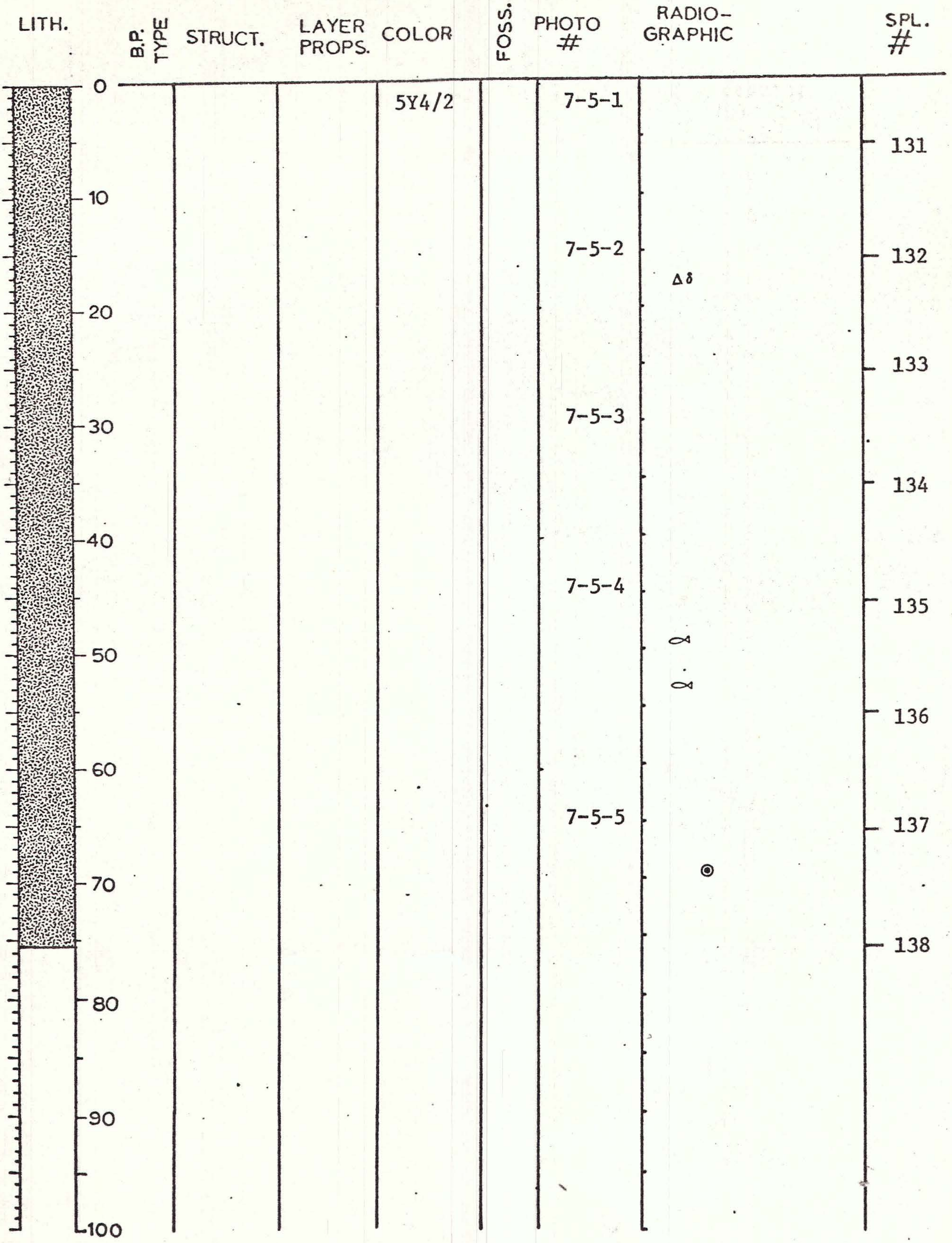
scattered fish bones, scales and teeth throughout

HOLE 7 SLUG 4 DEPTH 228 cm. to 305 cm.



scattered fish bones, scales and bioturbation throughout

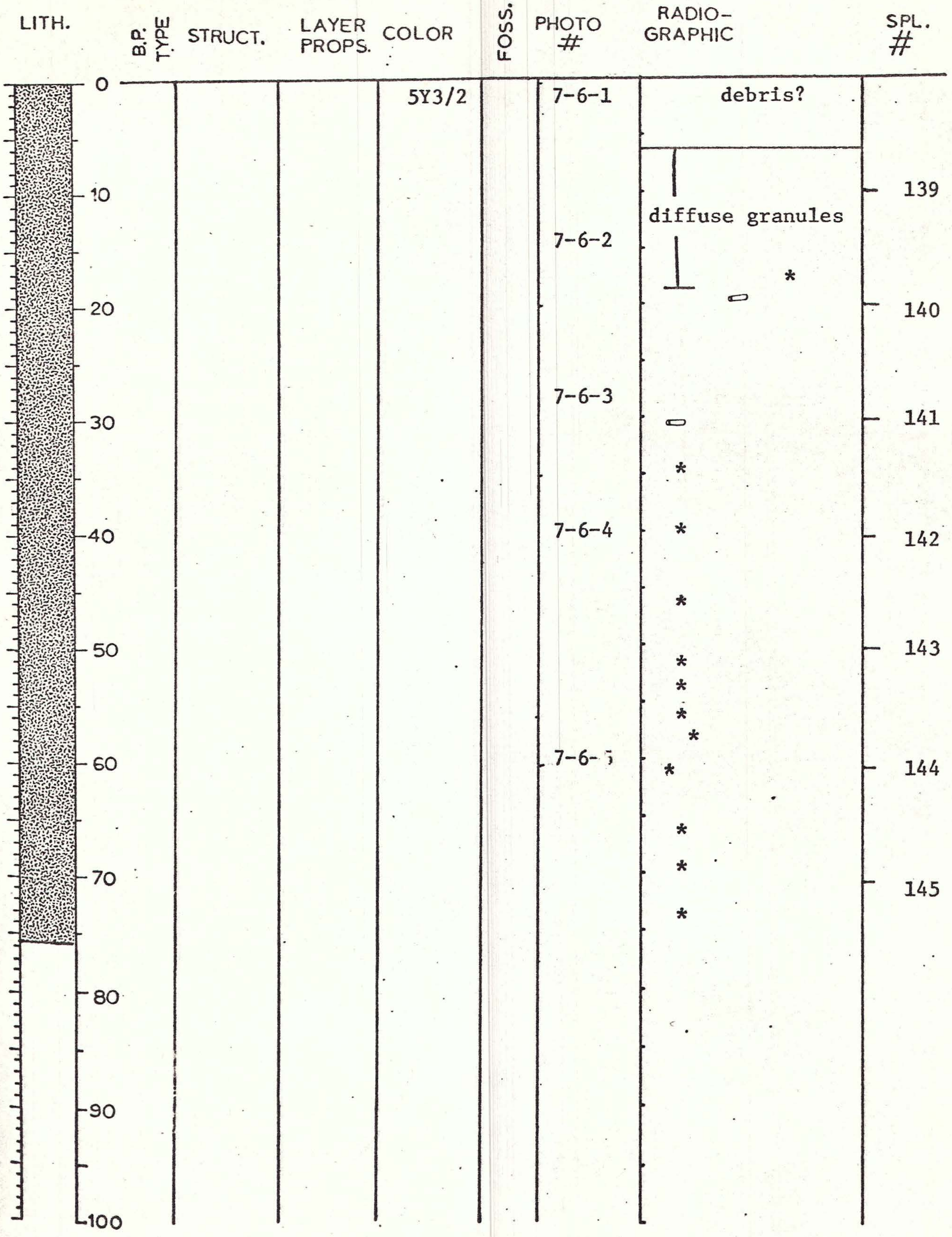
HOLE 7 SLUG 5 DEPTH 305 cm. to 381 cm.



scattered granules, fish bones and scales throughout

bioturbation throughout

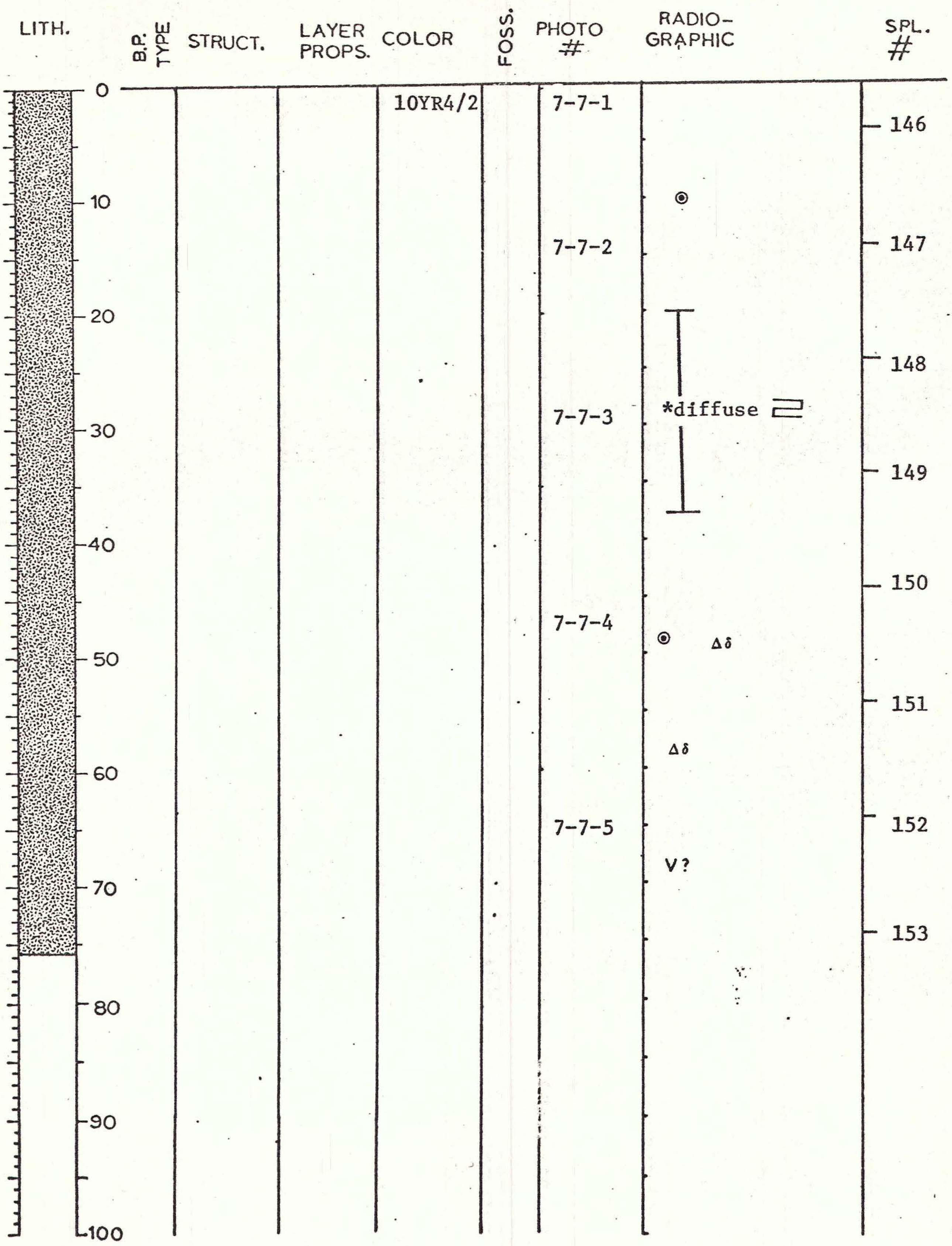
HOLE 7 SLUG 6 DEPTH 381 cm. to 457 cm.



* granule horizons at cms noted under Radiographic

scattered fish bones, scales and bioturbation throughout

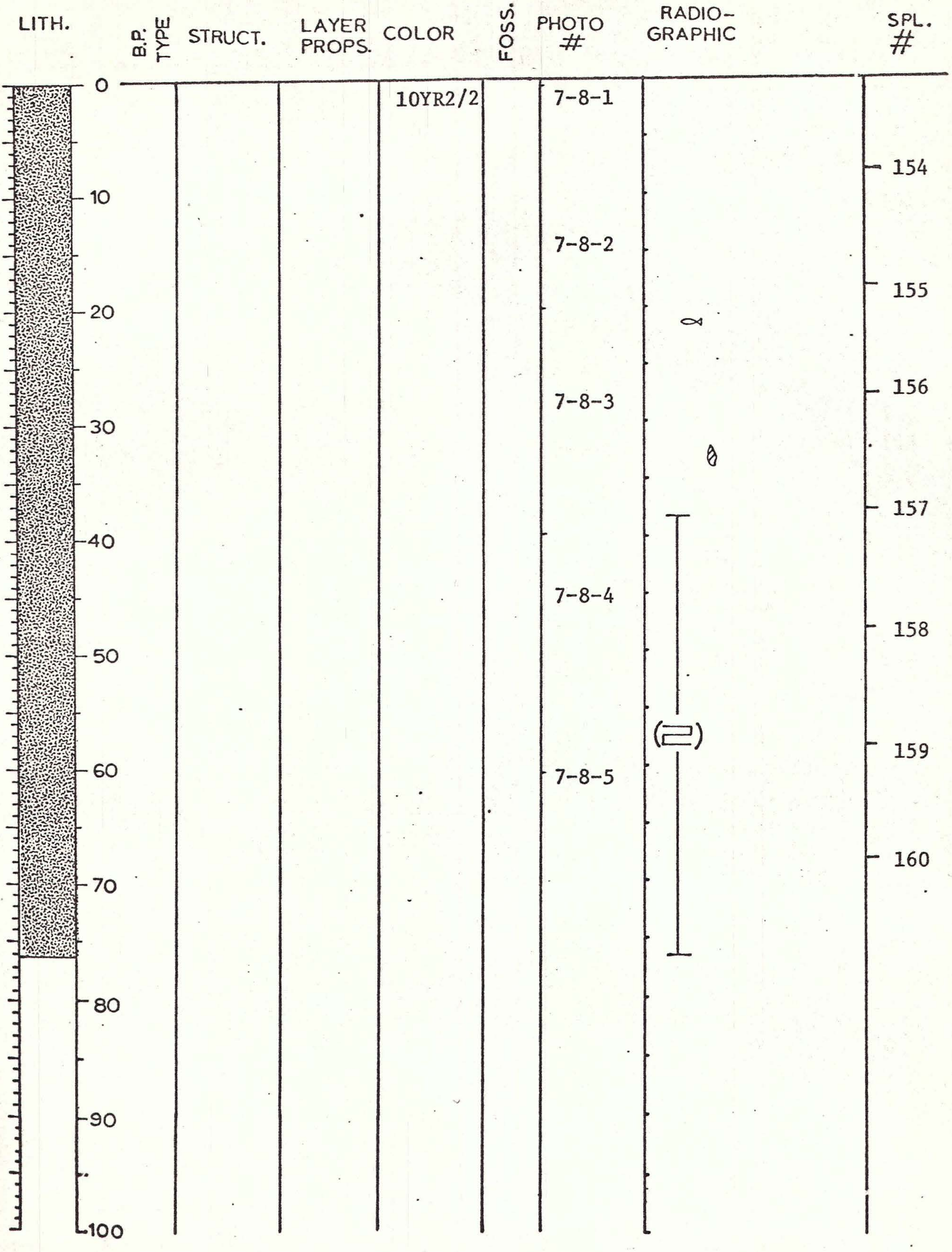
HOLE 7 SLUG 7 DEPTH 457 cm. to 533 cm.



scattered granules, fish bones, scales and bioturbation throughout

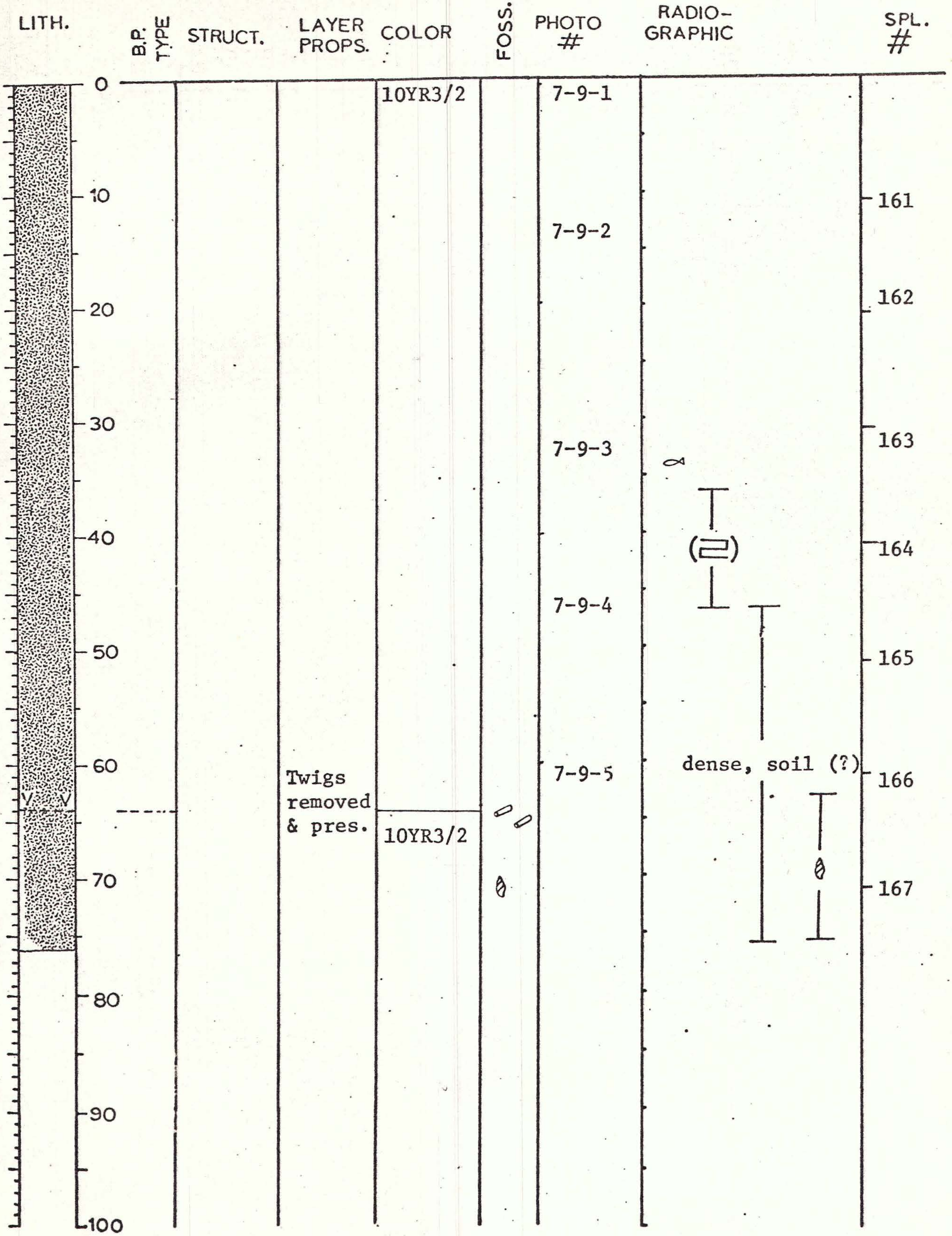
*shown by more x-ray opaque granules

HOLE 7 SLUG 8 DEPTH 533 cm. to 610 cm.



scattered granules, fish bones, scales and bioturbation throughout

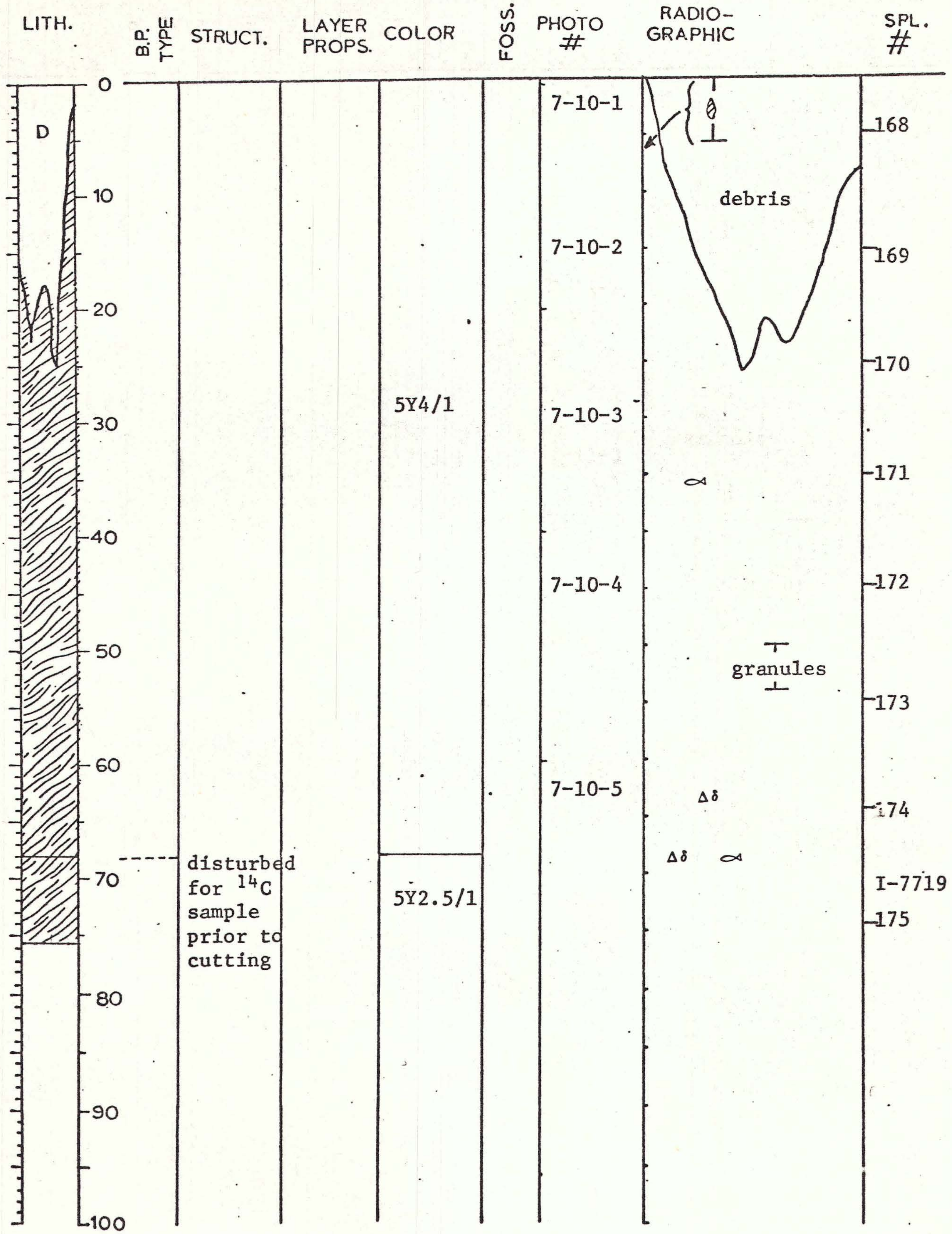
HOLE 7 SLUG 9 DEPTH 610 cm. to 686 cm.



bioturbation throughout

0-40 dissem. granules and fish bones, teeth and scales

HOLE 7 SLUG 10 DEPTH 686 cm. to 762 cm.

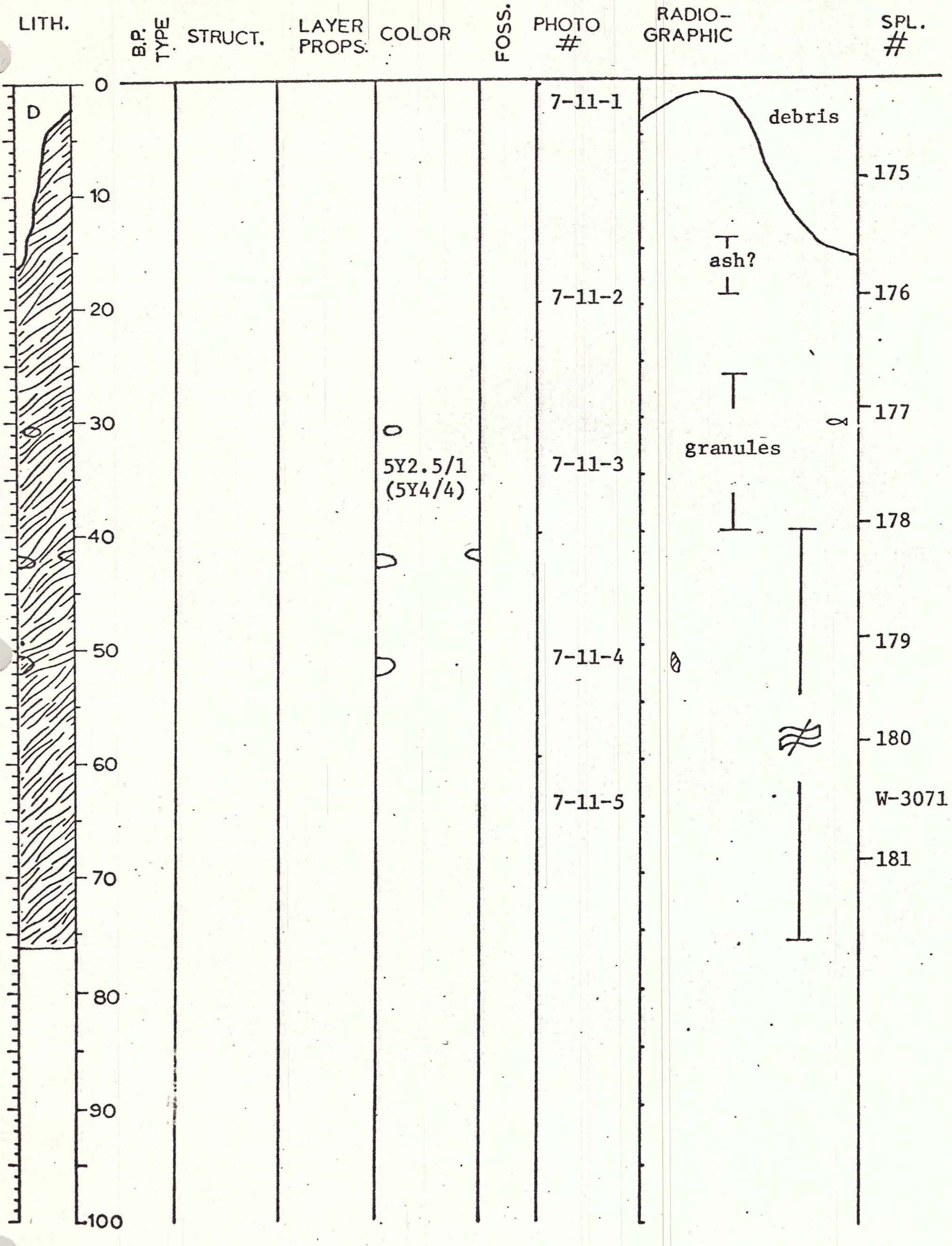


The debris above is in 1/2 of the core only. The 1/2 that D. Adam spld. was not so disturbed.

I-7719: 11,350 ± 350 yr. B.P.

Sedimentation rate for first 750 cm of core is 0.67 mm per year

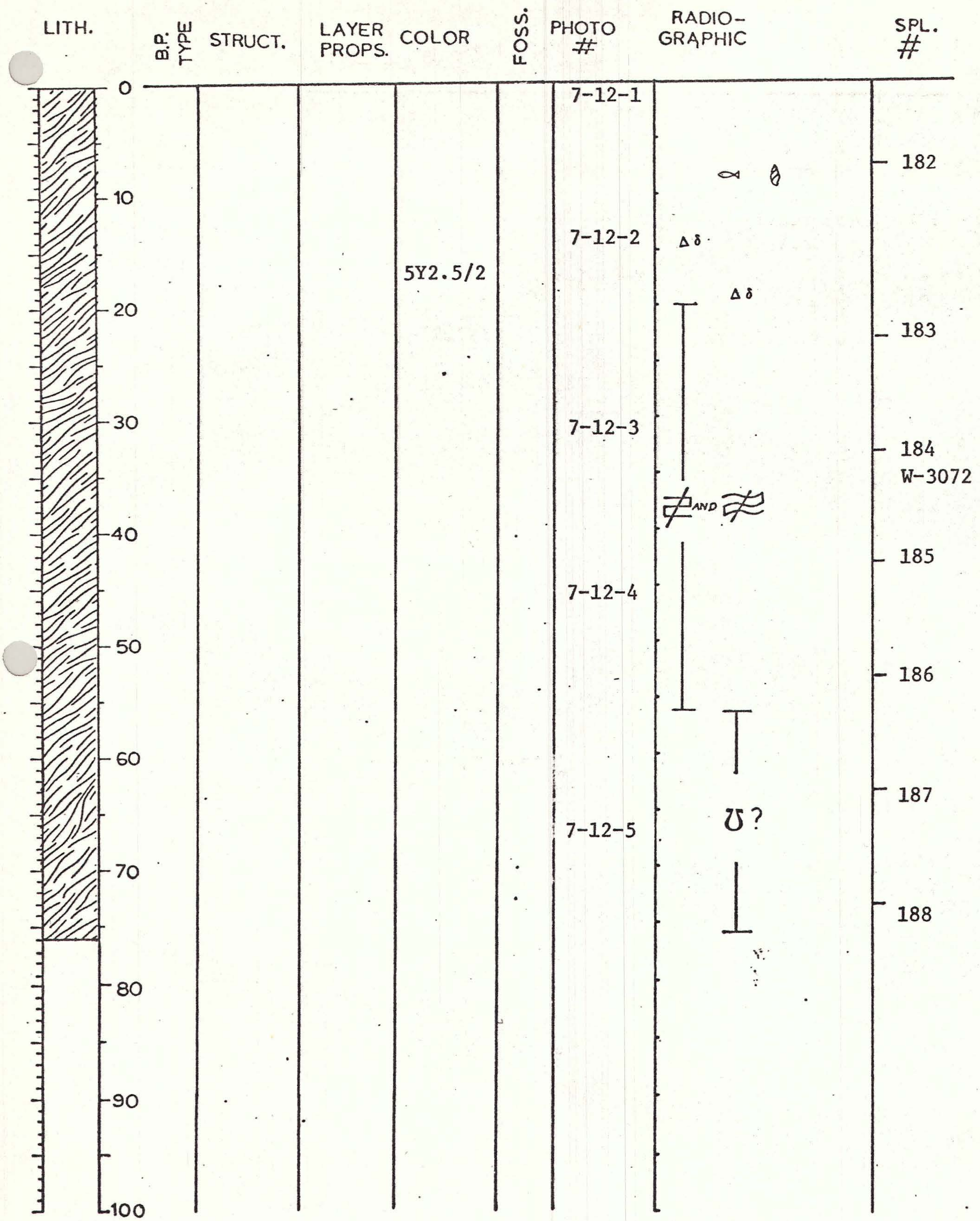
HOLE 7 SLUG 11 DEPTH 762 cm. to 838 cm.



W-3071: 11,780 ± 250

bioturbation throughout

HOLE 7 SLUG 12 DEPTH 838 cm. to 914 cm.

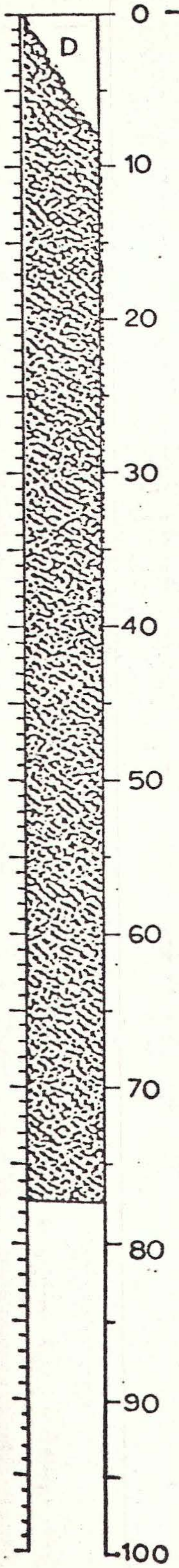


W-3072: 12,820 ± 250

bioturbation through

HOLE 7 SLUG 13 DEPTH 914 cm. to 991 cm.

LITH. | B.P. TYPE | STRUCT. | LAYER PROPS. | COLOR | FOSS. | PHOTO # | RADIOGRAPHIC | SPL. #



COLOR: 5Y2.5/1

PHOTO #:
7-13-1
7-13-2
7-13-3
7-13-4
7-13-5

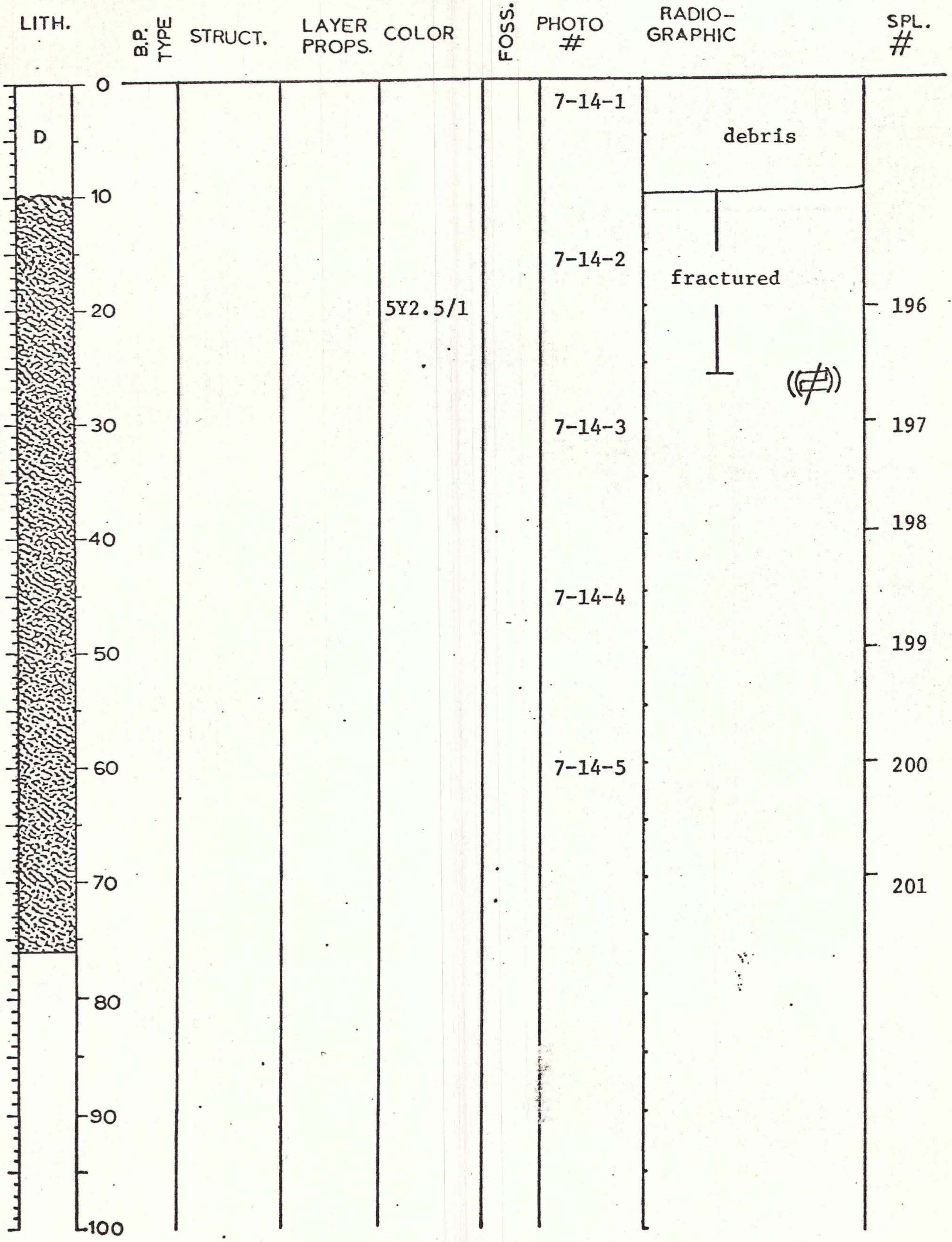
RADIOGRAPHIC:
⊤ x-ray opaque filamentous objects ⊥
Δδ disrupted
Δδ large seed?
Ʊ (≠)

SPL. #:
189
190
191
192
193
194
195
W-3073
196

W-3073: 13,160 ± 300

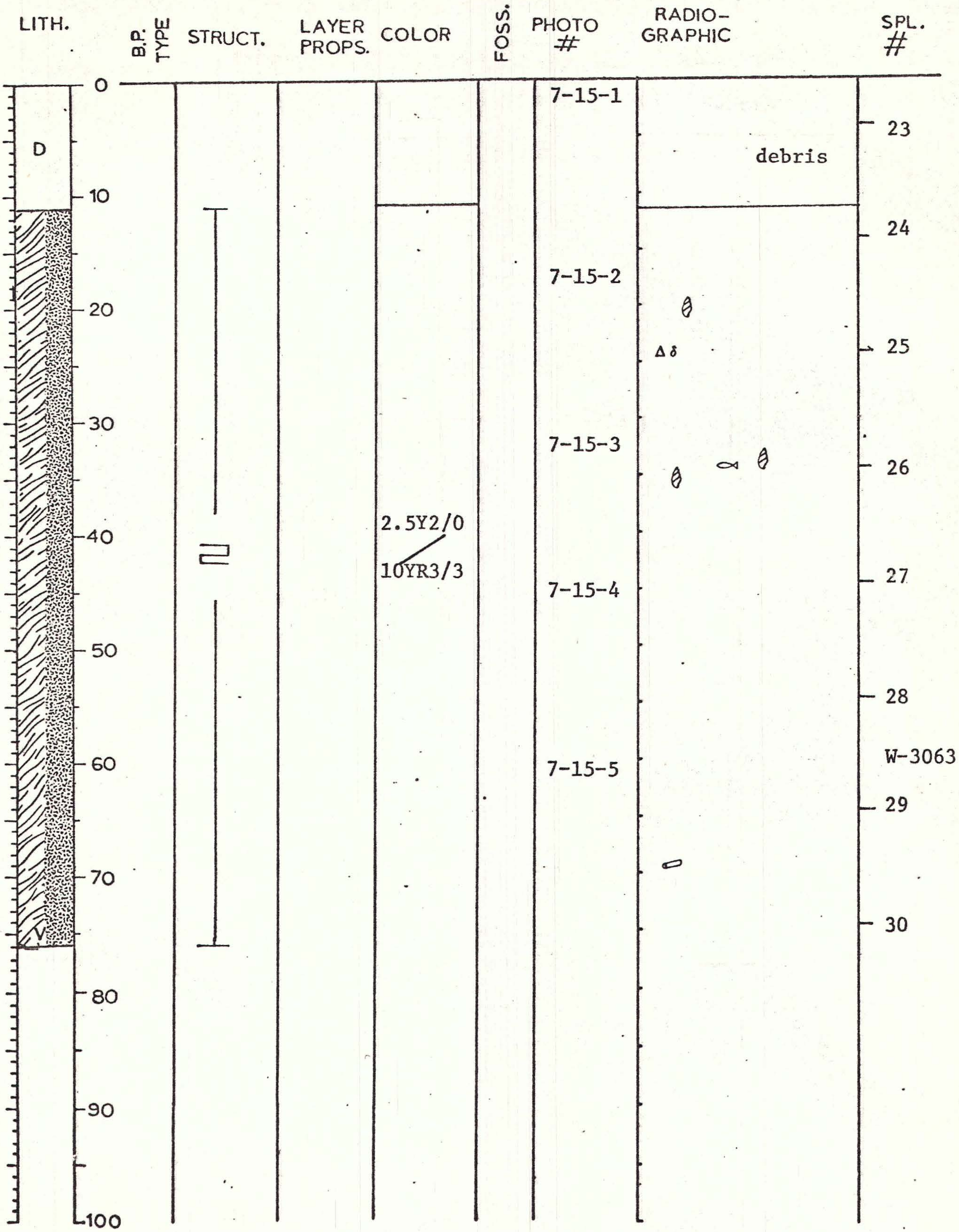
bioturbation throughout

HOLE 7 SLUG 14 DEPTH 991 cm. to 1067 cm.



bioturbation throughout

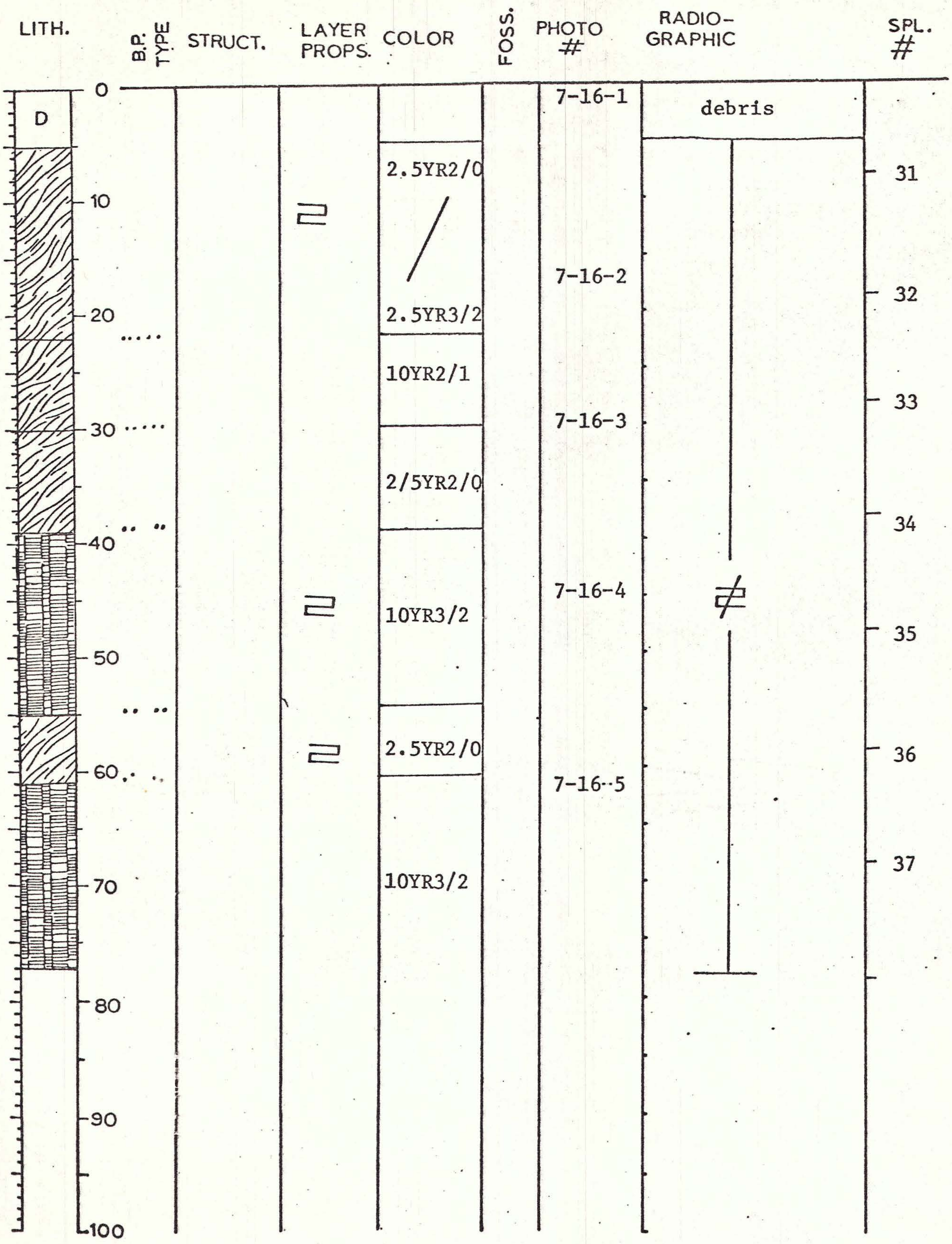
HOLE 7 SLUG 15 DEPTH 1069 cm. to 1143 cm.



W-3063: 14,900 ± 300

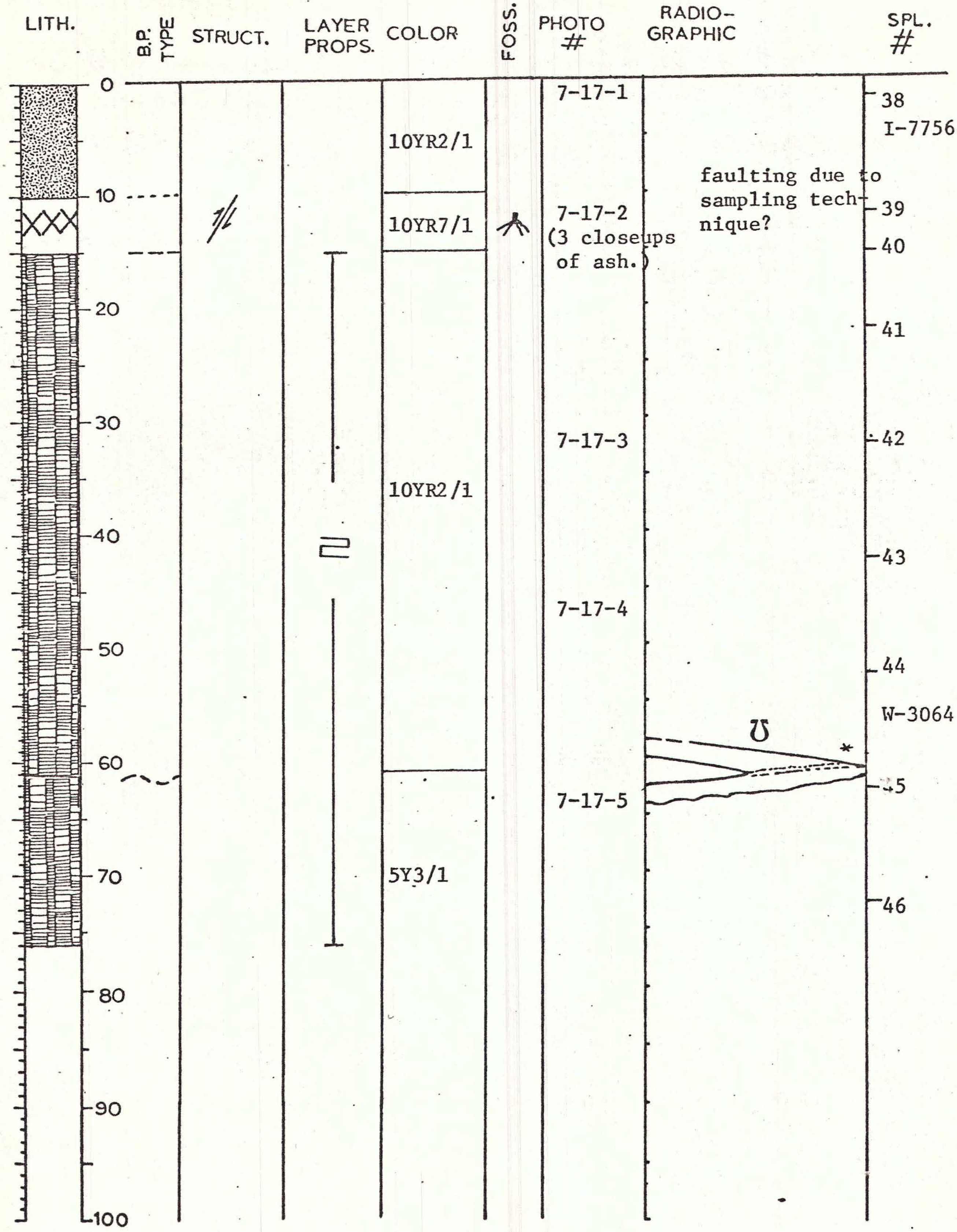
bioturbation throughout

HOLE 7 SLUG 16 DEPTH 1143 cm. to 1219 cm.



bioturbation throughout

HOLE 7 SLUG 17 DEPTH 1219 cm. to 1295 cm.



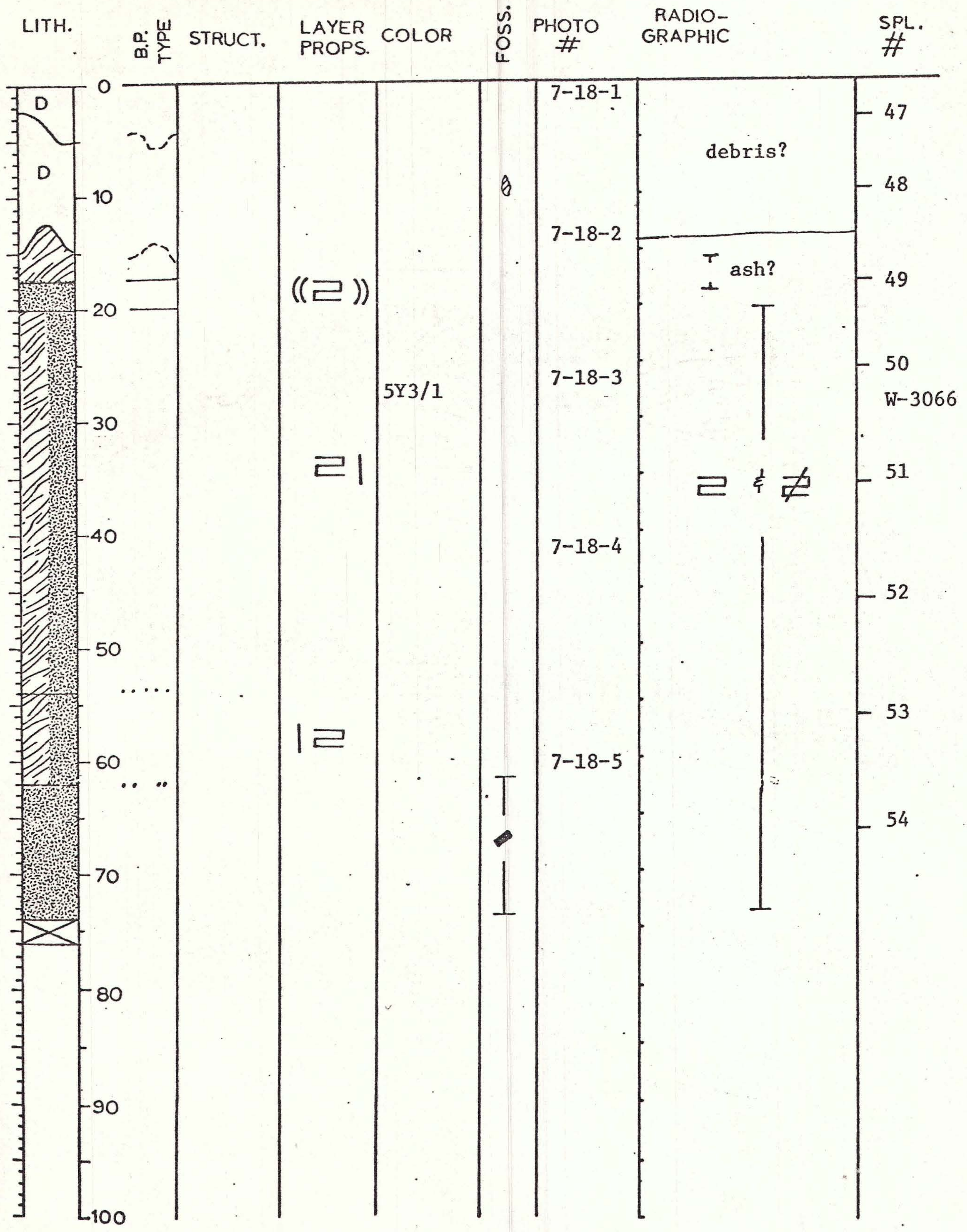
* graphical representation of deformation structure as seen in radiograph

I-7756: 17,660 ± 340

W-3064: 17,470 ± 300

bioturbation throughout

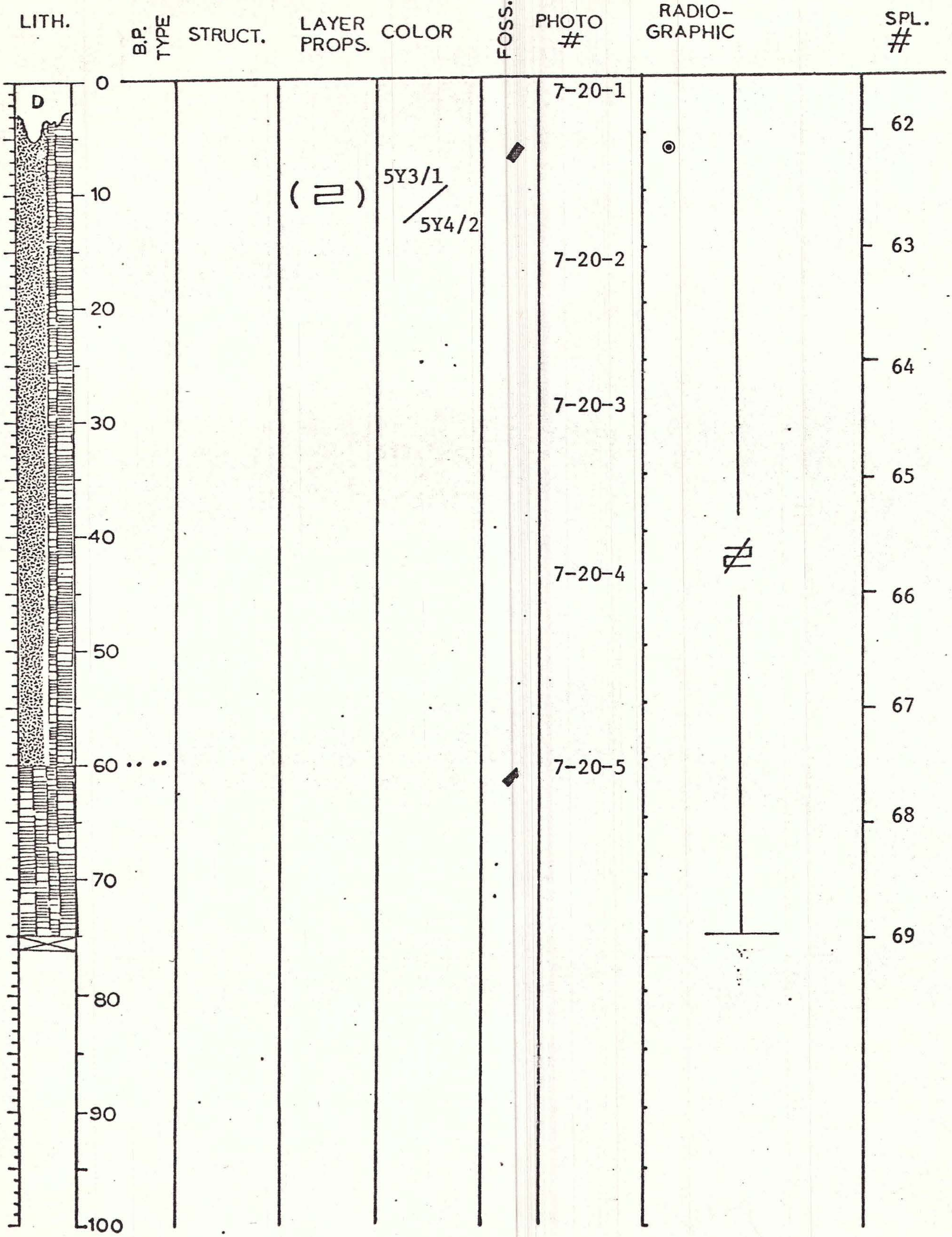
HOLE 7 SLUG 18 DEPTH 1295 cm. to 1369 cm.



W-3066: 18,340 ± 300

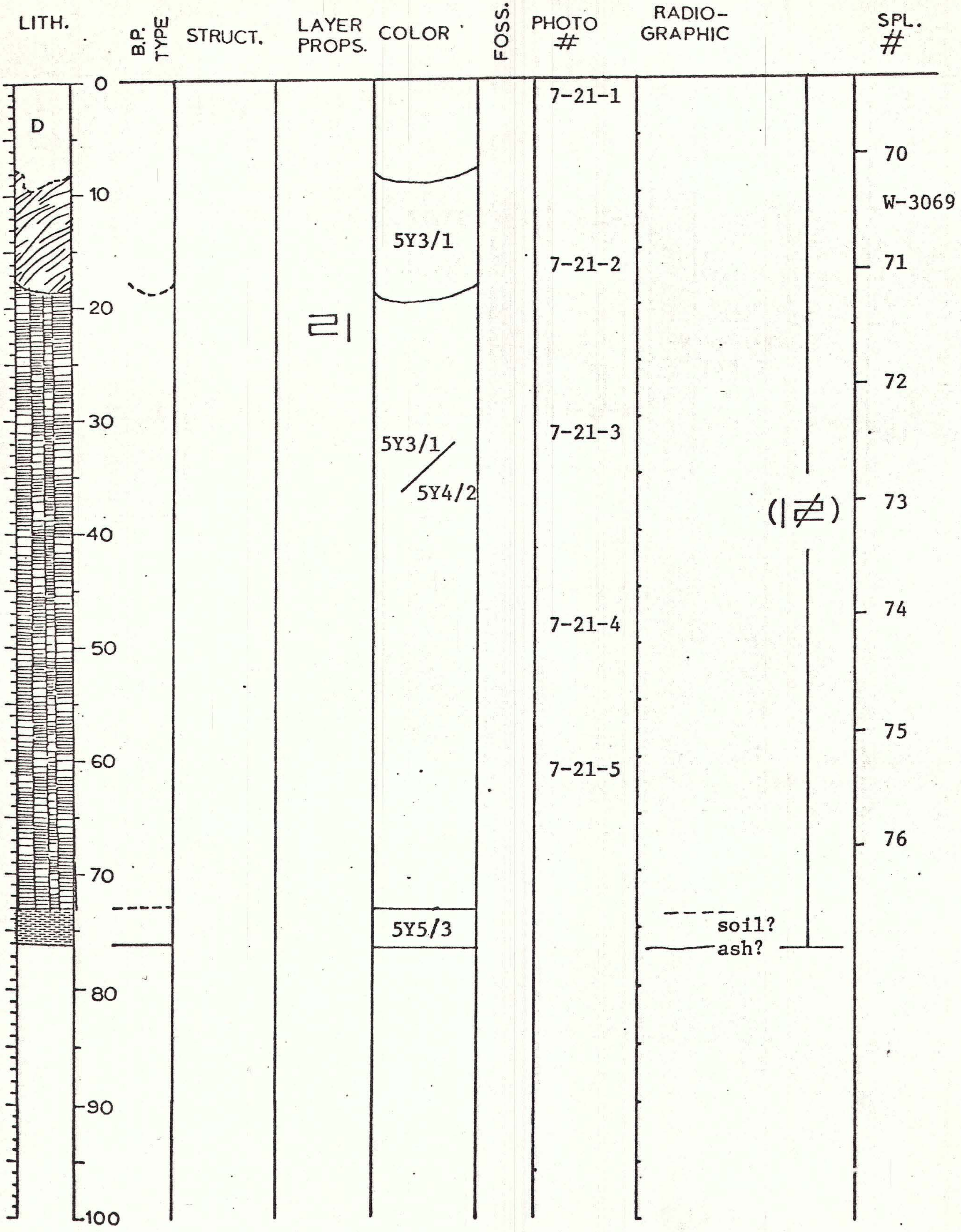
bioturbation throughout

HOLE 7 SLUG 20 DEPTH 1447 cm. to 1524 cm.



bioturbation throughout

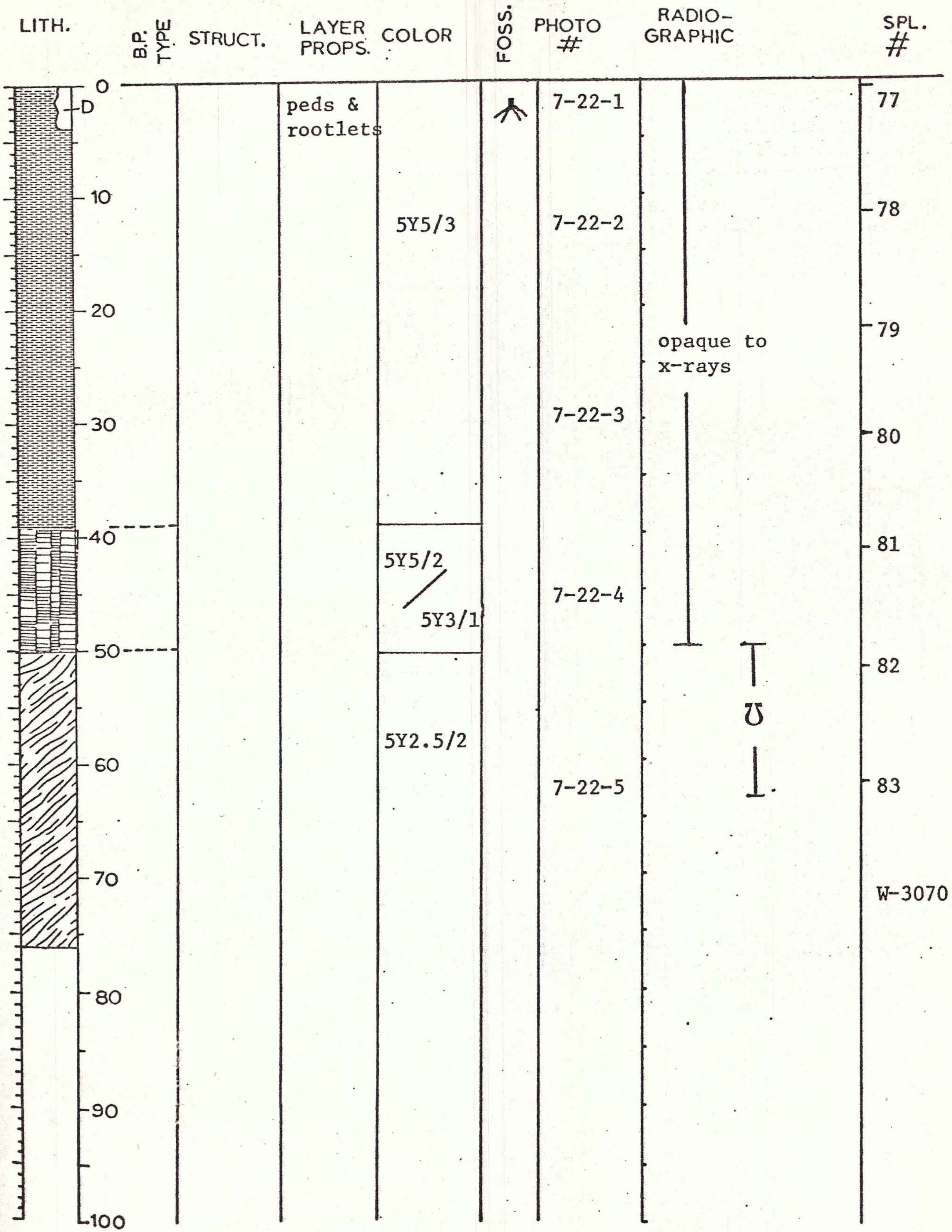
HOLE 7 SLUG 21 DEPTH 1524 cm. to 1600 cm.



W-3069: 21,210 ± 400

bioturbation throughout

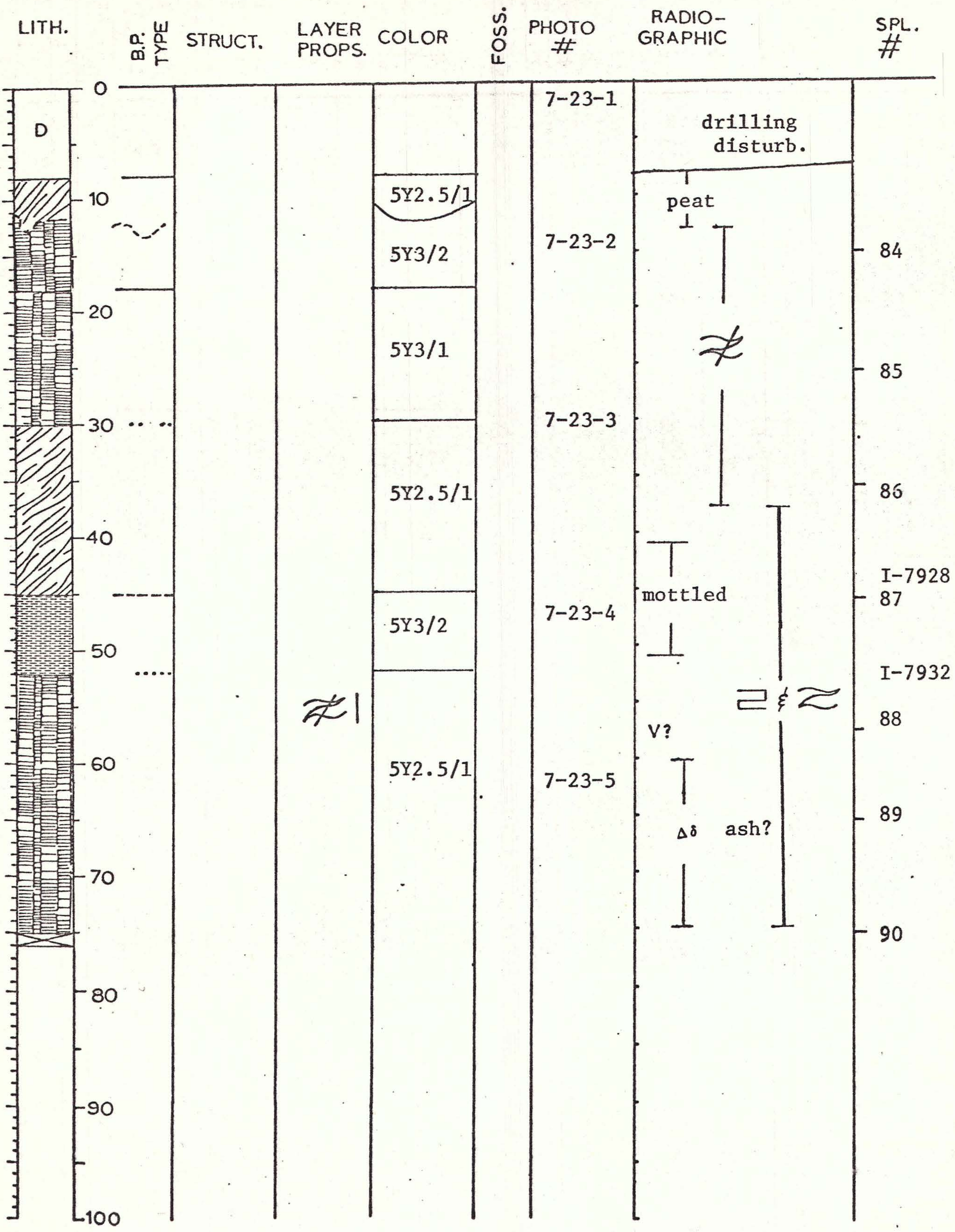
HOLE 7 SLUG 22 DEPTH 1600 cm. to 1676 cm.



W-3070: 26,150 ± 600

bioturbation throughout

HOLE 7 SLUG 23 DEPTH 1676 cm. to 1752 cm.

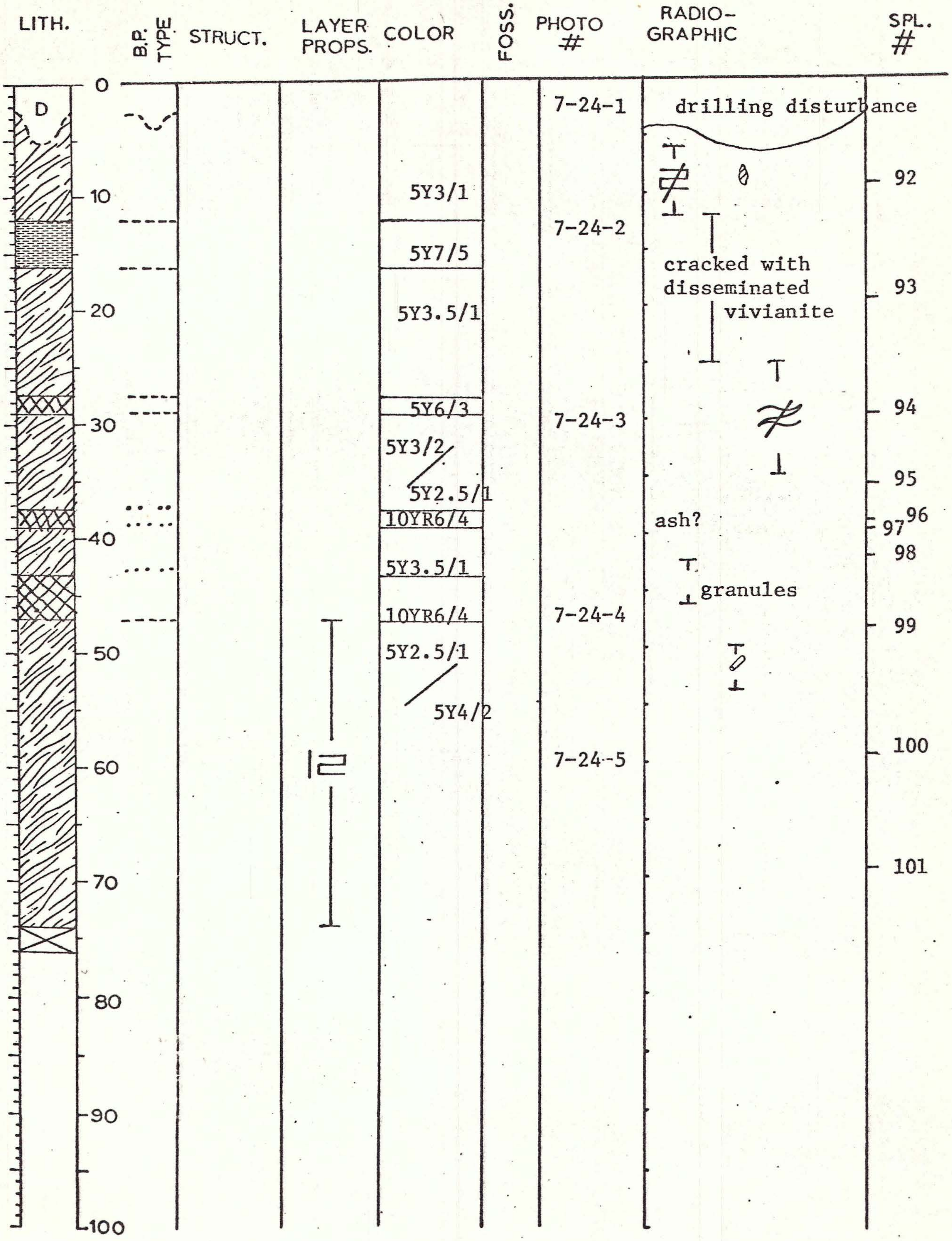


I-7928: 23,900 ± 640

I-7932: 23,300 ± 600

bioturbation throughout

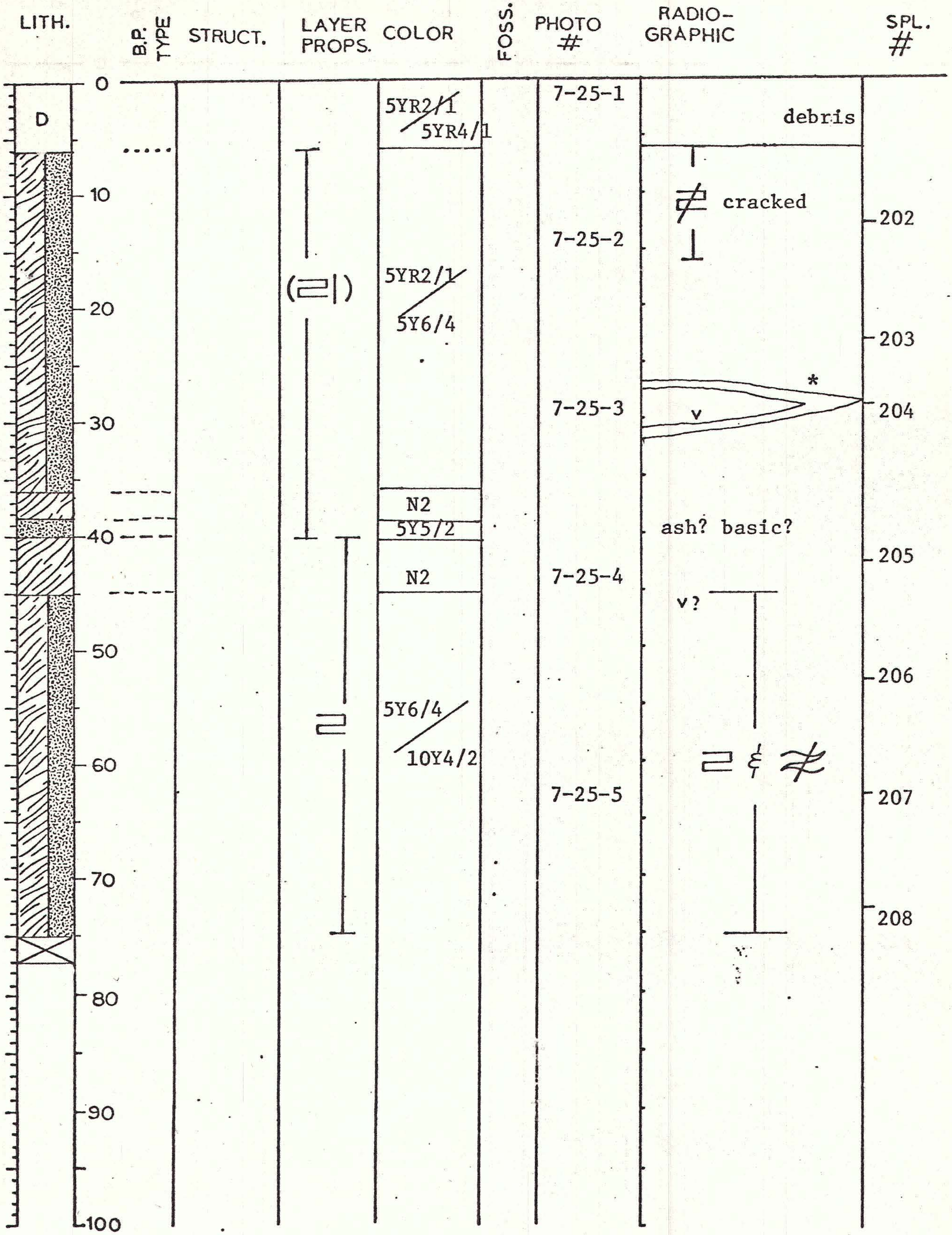
HOLE 7 SLUG 24 DEPTH 1752 cm. to 1828 cm.



slight elongation (~ 2 1/2 cm) due to cracking in sample and displacement of the pieces has been taken into consideration in the information described under RADIOGRAPHIC. Gradual increase in density down the core slug.

bioturbation throughout

HOLE 7 SLUG 25 DEPTH 1828 cm. to 1905 cm.

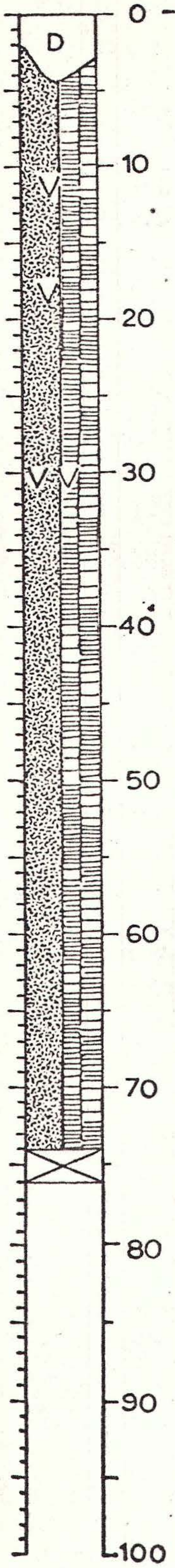


* this structure occurs between 24 and 26.5 cm, and is associated with abundant disseminated vivianite (?).

bioturbation throughout

HOLE 7 SLUG 26 DEPTH 1905 cm. to 1981 cm.

LITH. | B.P. TYPE | STRUCT. | LAYER PROPS. | COLOR | FOSS. | PHOTO # | RADIO-GRAPHIC | SPL. #



drilling disturb.

ash?

(⊏|)

10YR4/2 / 5YR2/1

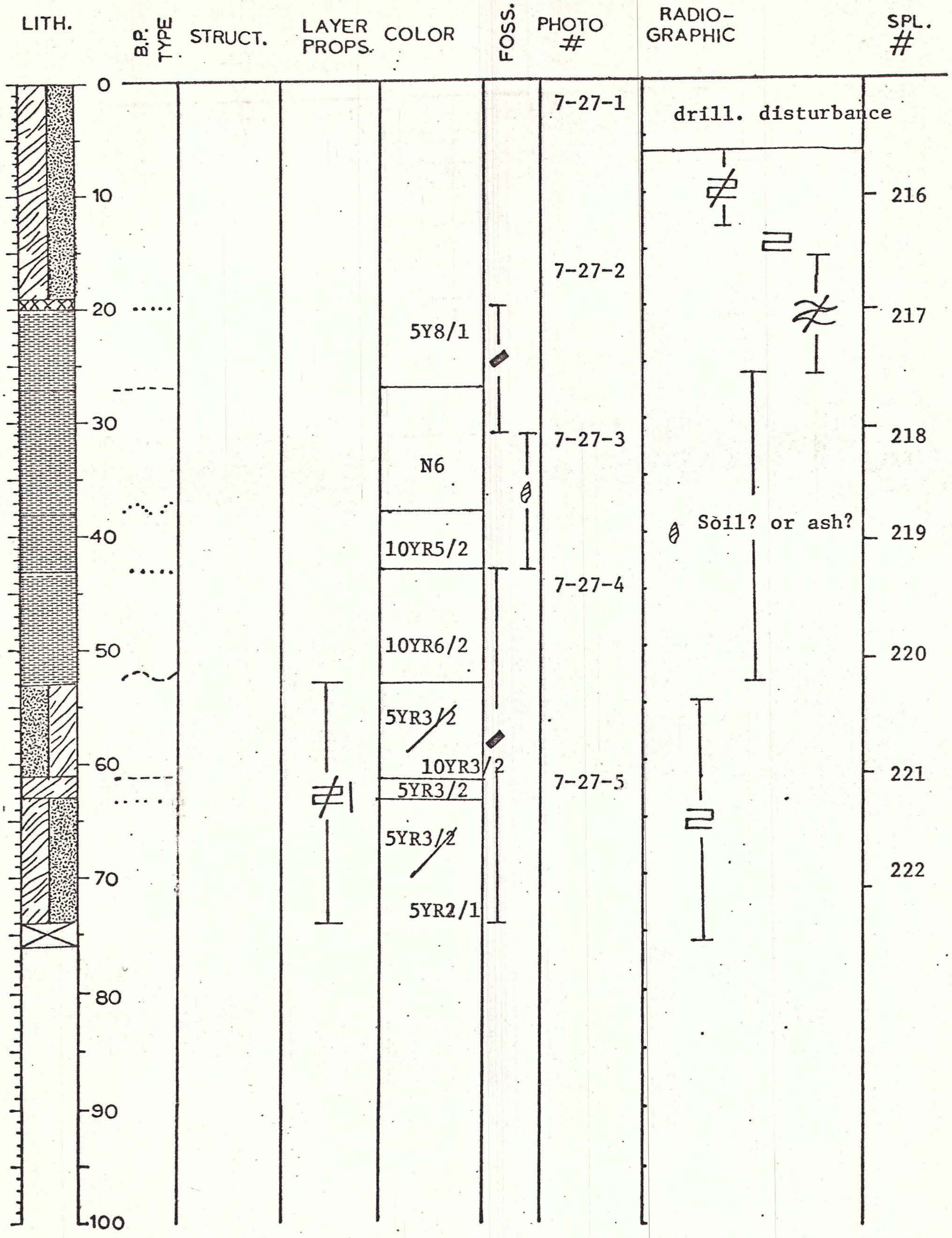
⊢⊙⊣

≠

209
210
211
212
213
214
215

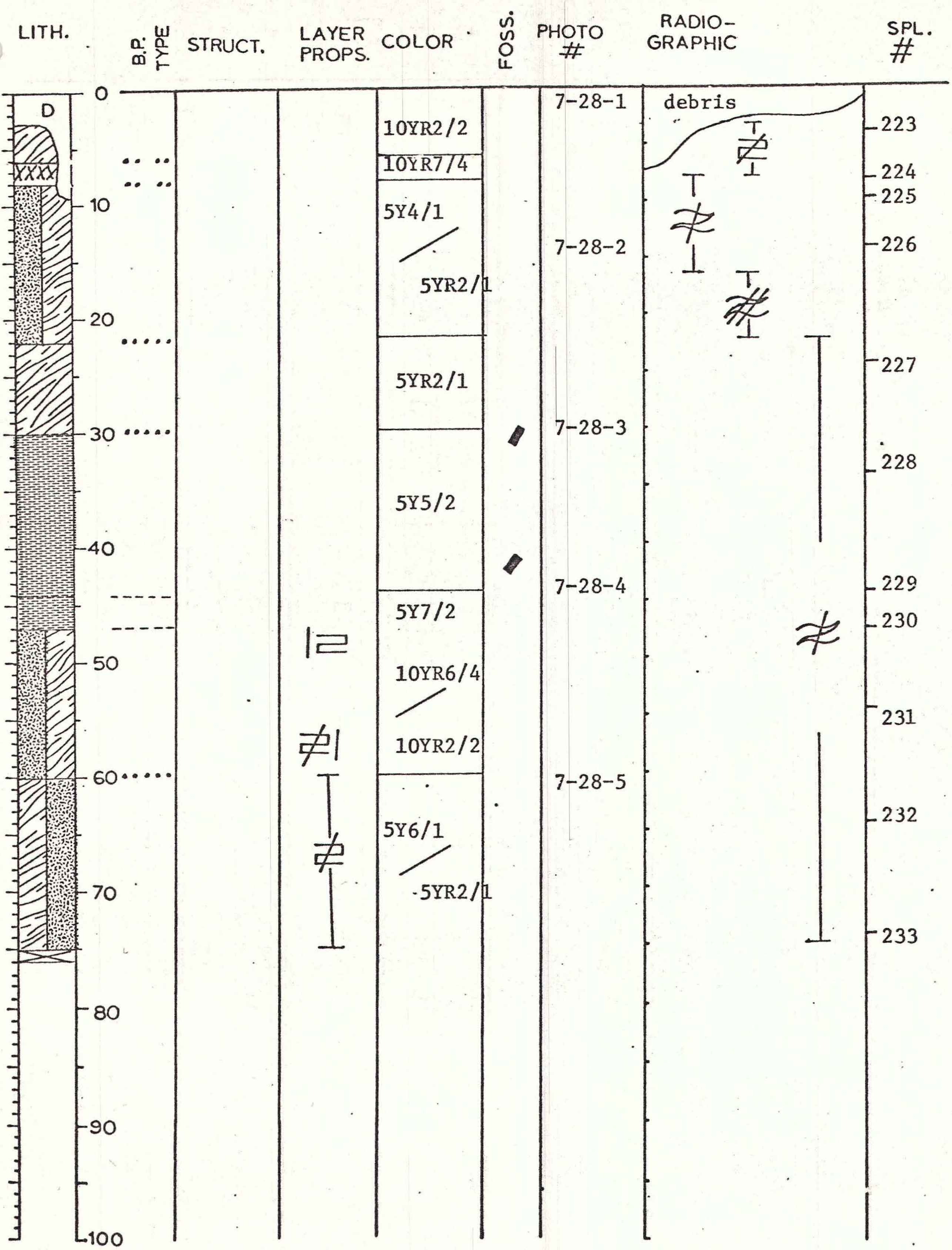
18 cm. white paste (unox. vivienite) altered to blue past in time (1 day)
bioturbation throughout

HOLE 7 SLUG 27 DEPTH 1981 cm. to 2057 cm.



bioturbation throughout

HOLE 7 SLUG 28 DEPTH 2057 cm. to 2133 cm.

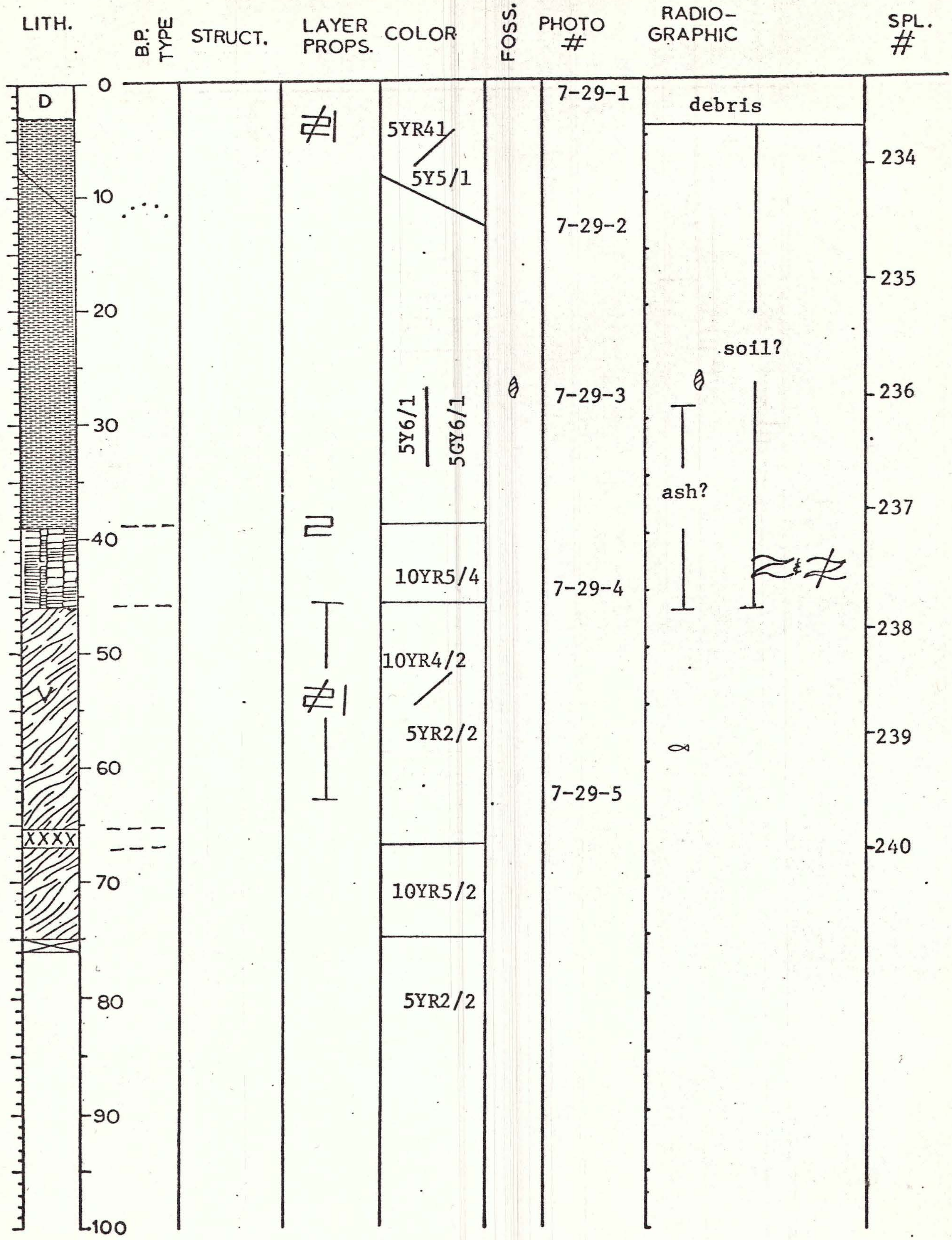


Many Δδ which are probably due to variations in clay content.

bioturbation throughout

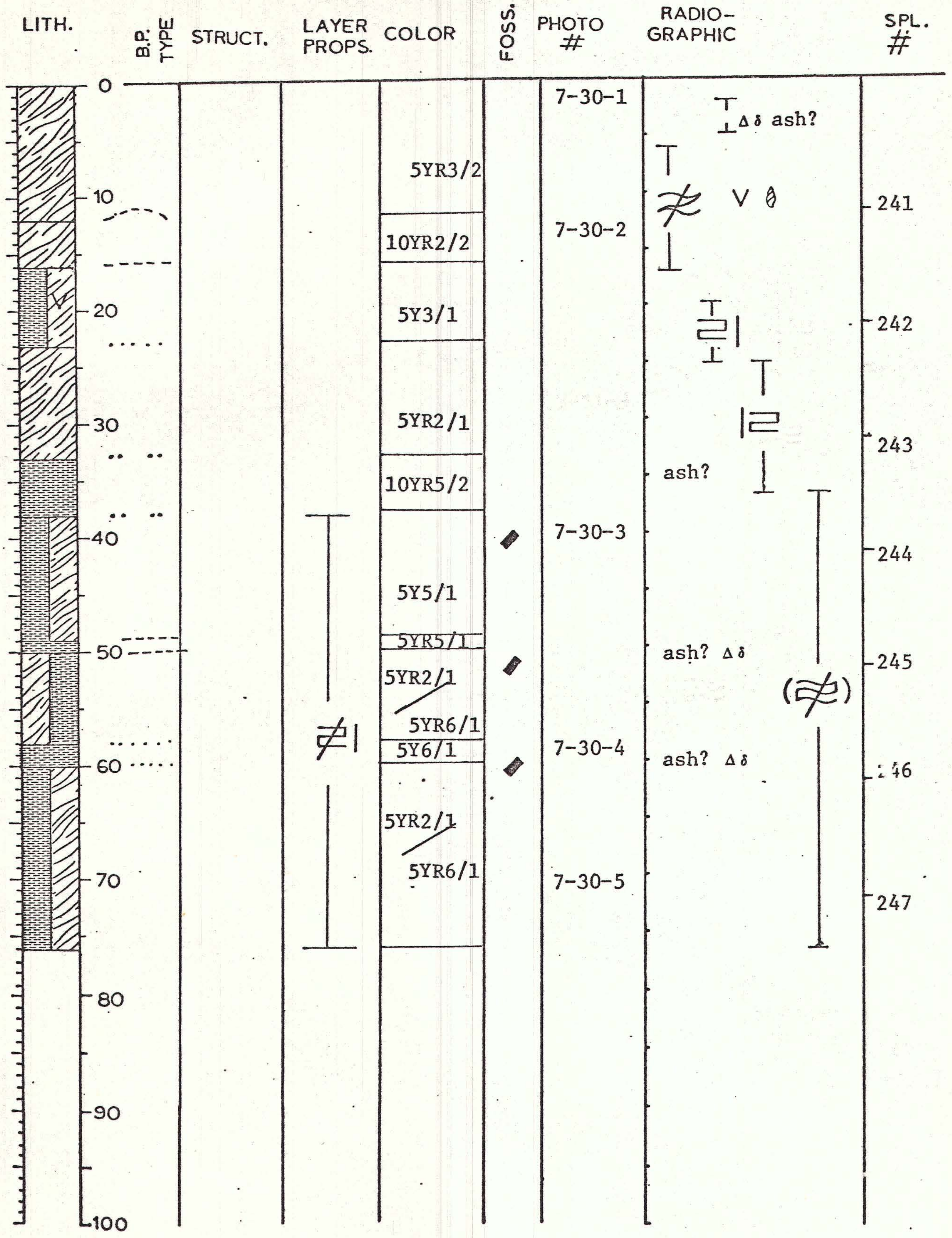
dissem. viv. throughout

HOLE 7 SLUG 29 DEPTH 2133 cm. to 2210 cm.



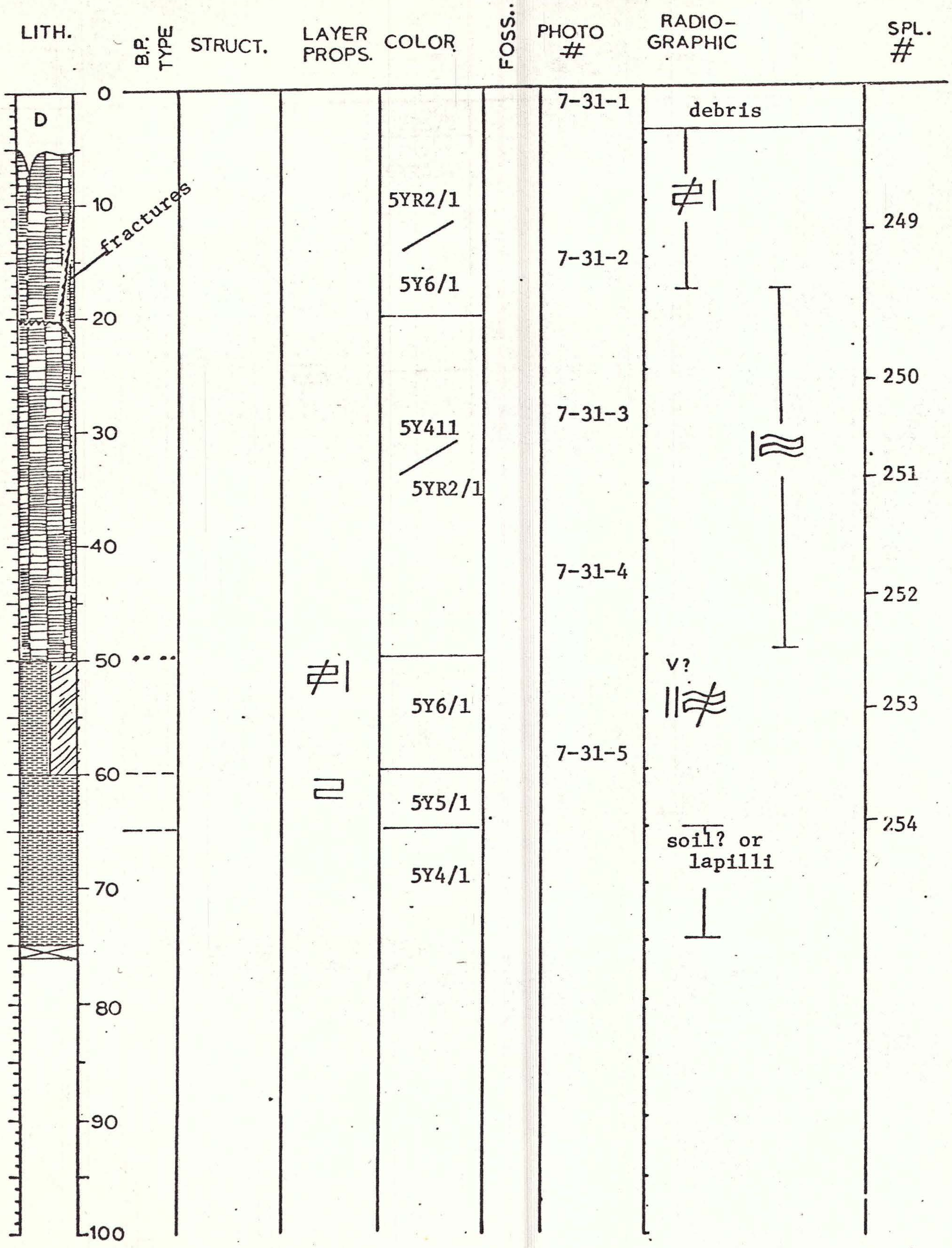
bioturbation throughout

HOLE 7 SLUG 30 DEPTH 2210 cm. to 2286 cm.



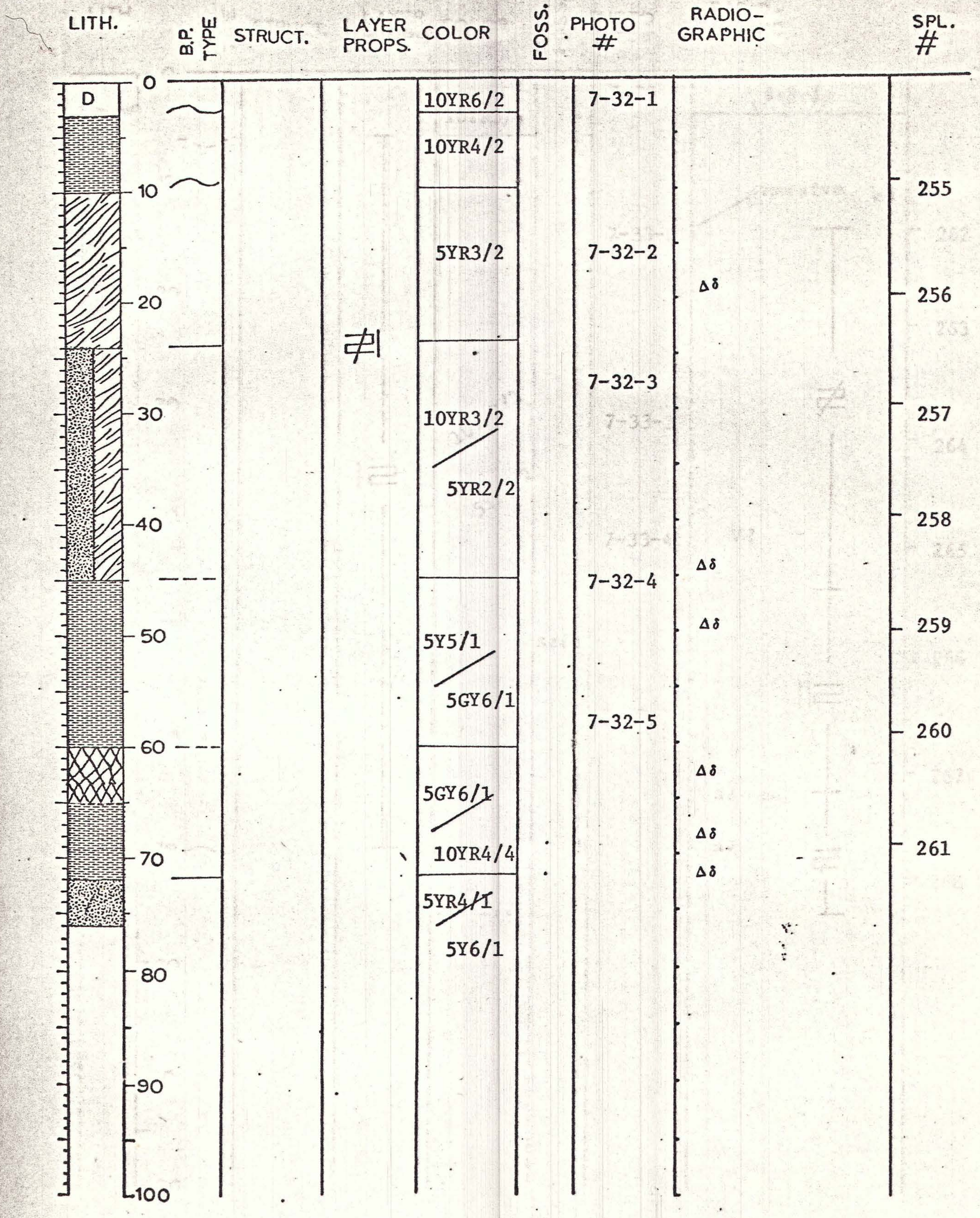
bioturbation throughout

HOLE 7 SLUG 31 DEPTH 2286 cm. to 2362 cm.



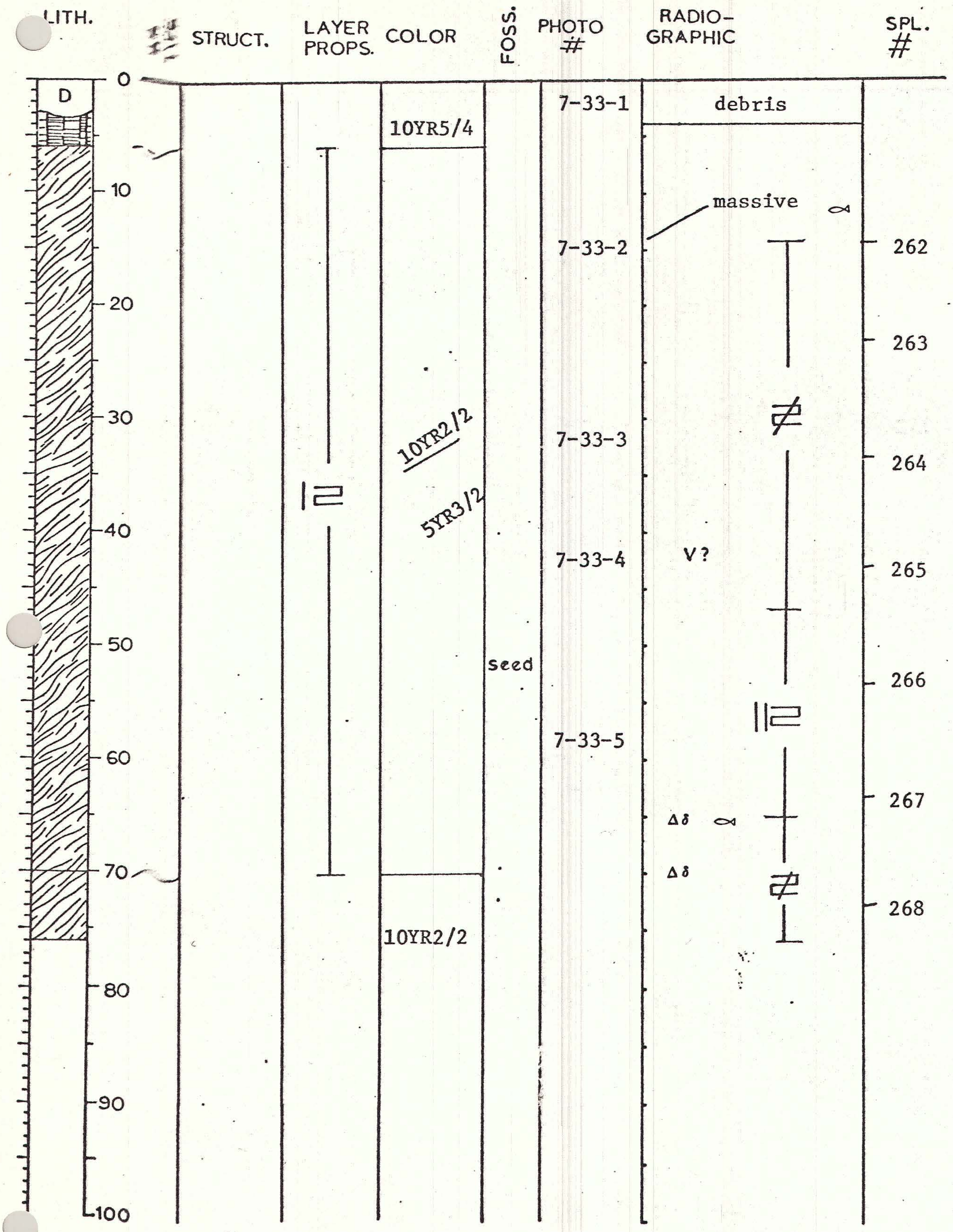
bioturbation throughout

HOLE 7 SLUG 32 DEPTH 2362 cm. to 2438 cm.



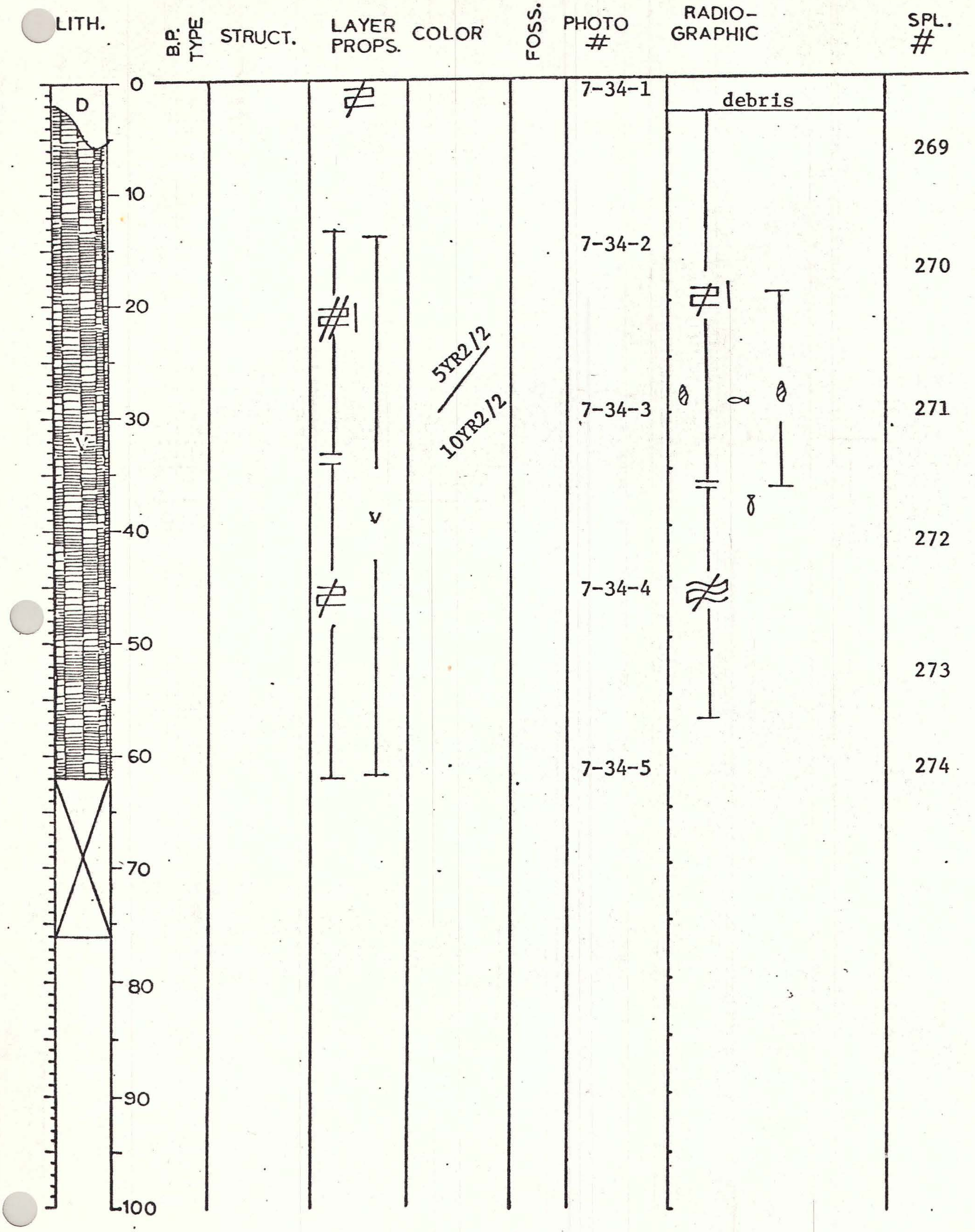
bioturbation throughout

HOLE SLUG 33 DEPTH 2438 cm. to 2515 cm.



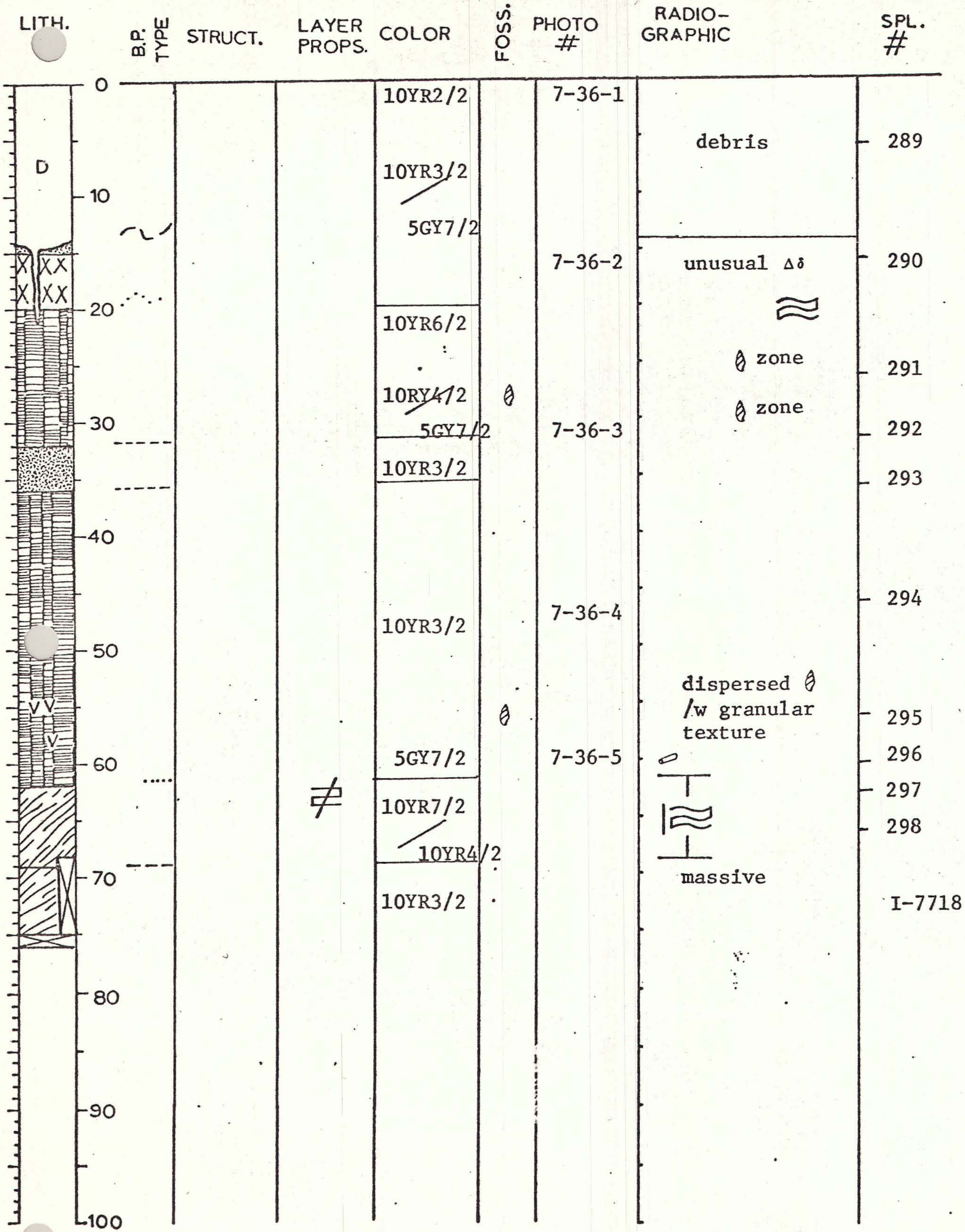
bioturbation throughout

HOLE 7 SLUG 34 DEPTH 2515 cm. to 2591 cm.



bioturbation throughout

HOLE 7 SLUG 36 DEPTH 2667 cm. to 2743 cm.

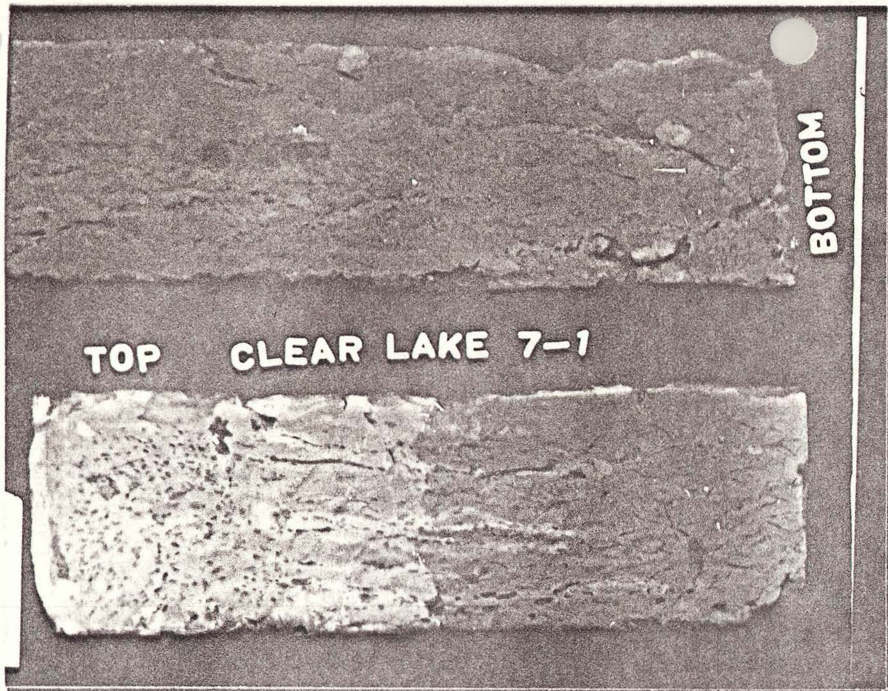


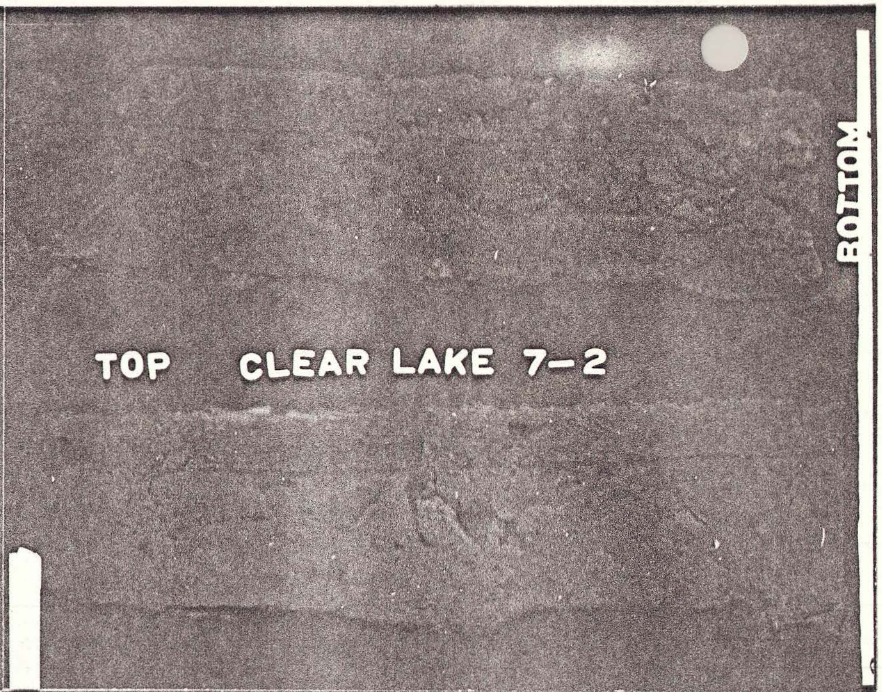
bioturbation throughout

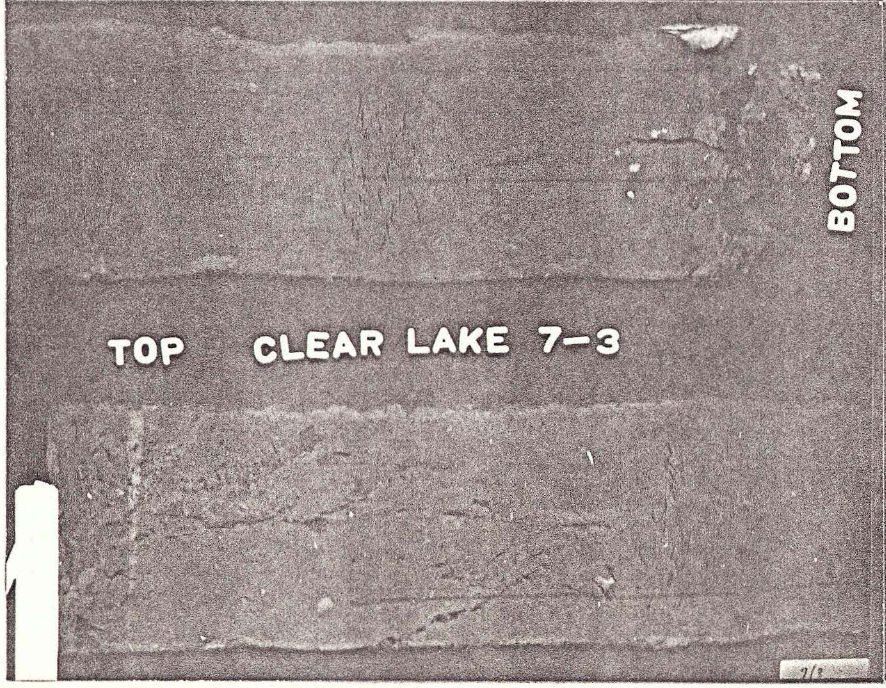
I-7718: >40,000

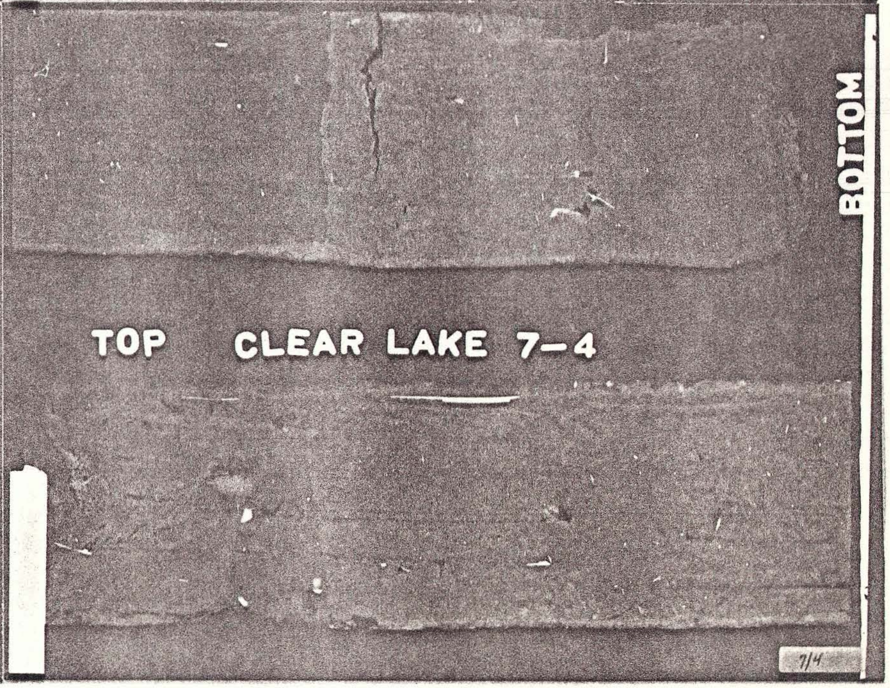
Appendix B

X-ray radiographs

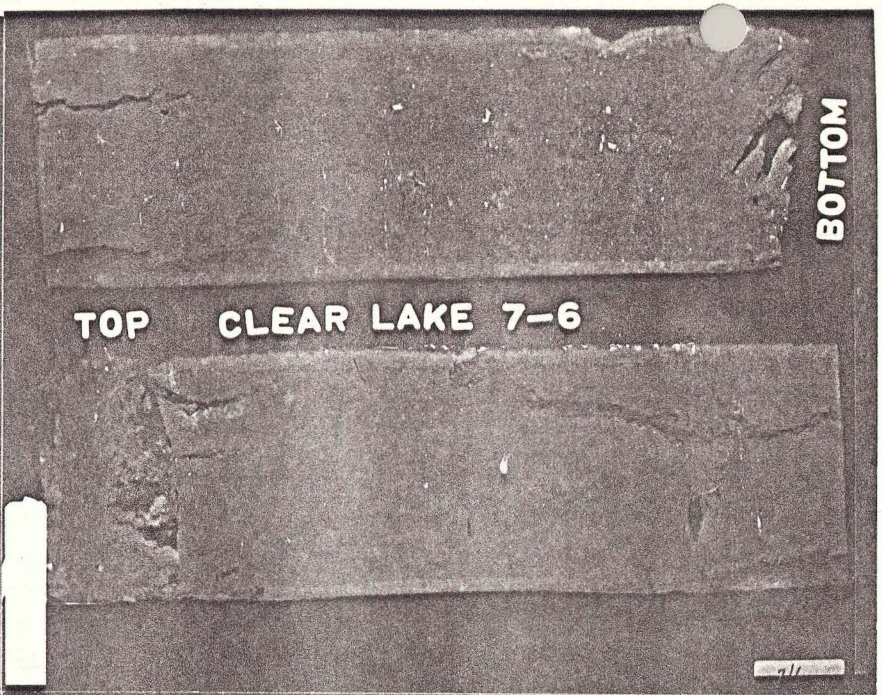

BOTTOM
TOP CLEAR LAKE 7–1

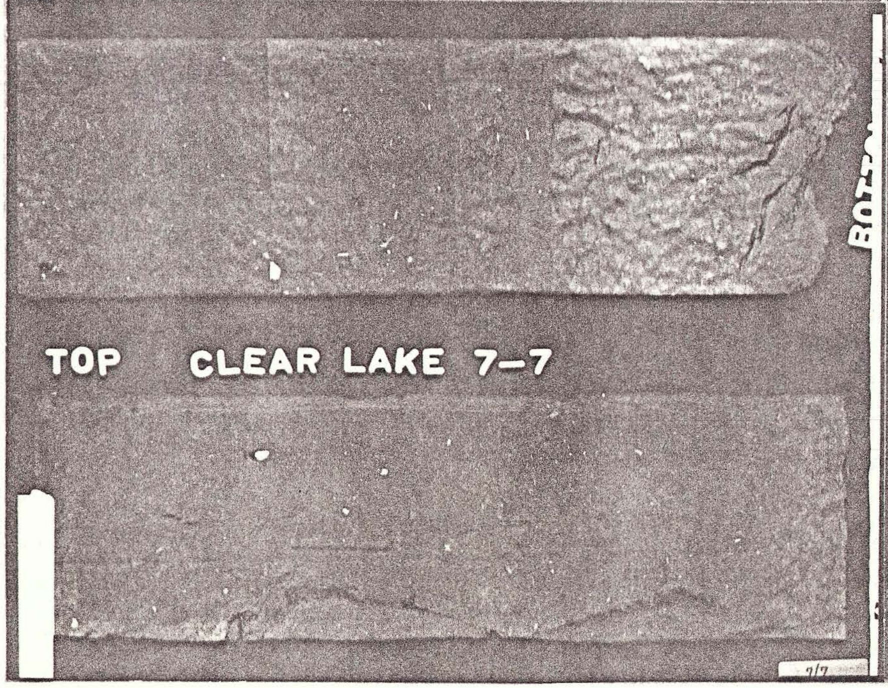

BOTTOM
TOP CLEAR LAKE 7–2

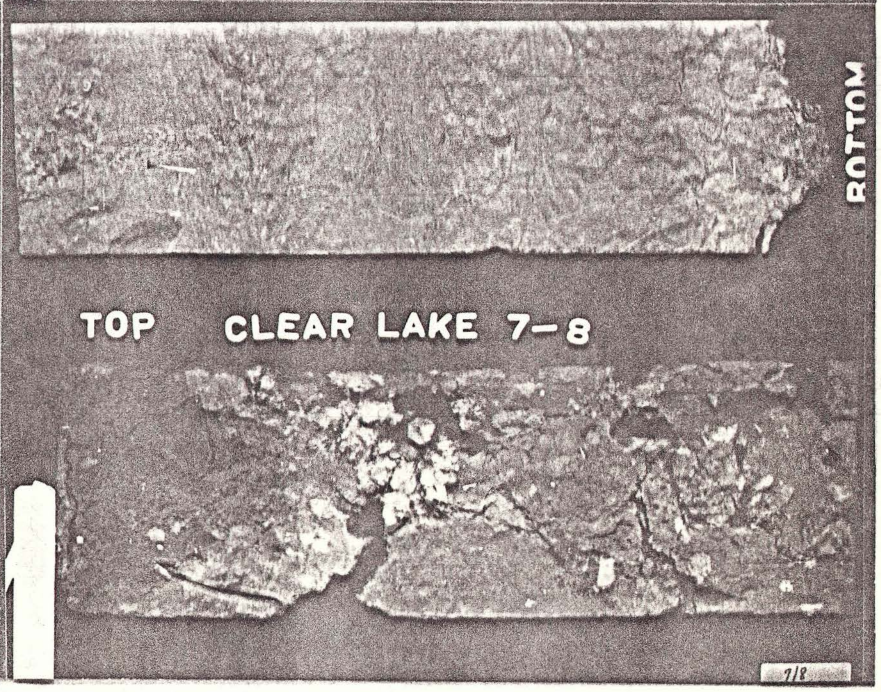

BOTTOM
TOP CLEAR LAKE 7–3
7/3

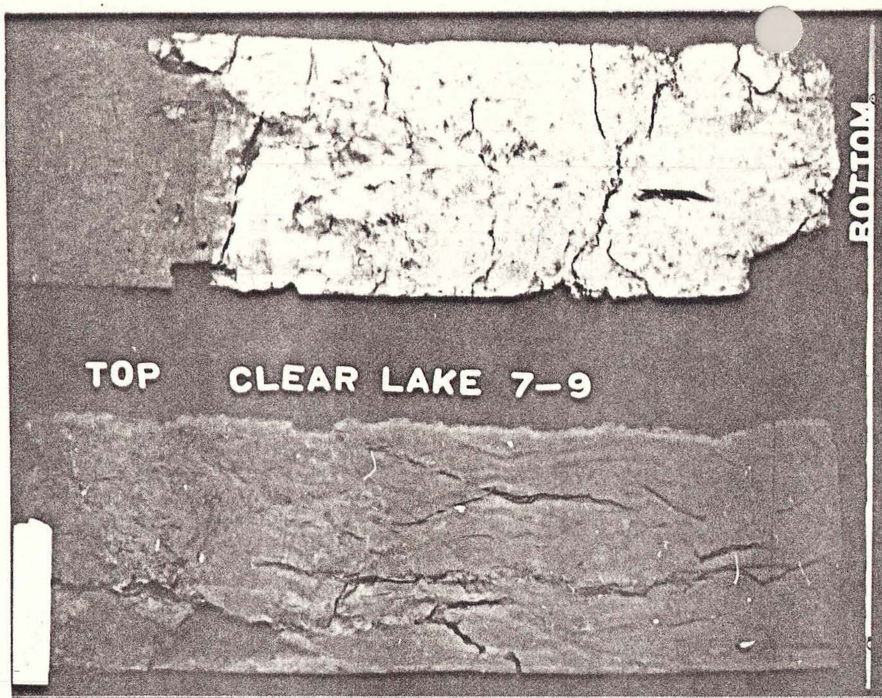

BOTTOM
TOP CLEAR LAKE 7–4
7/4


TOP CLEAR LAKE 7–5

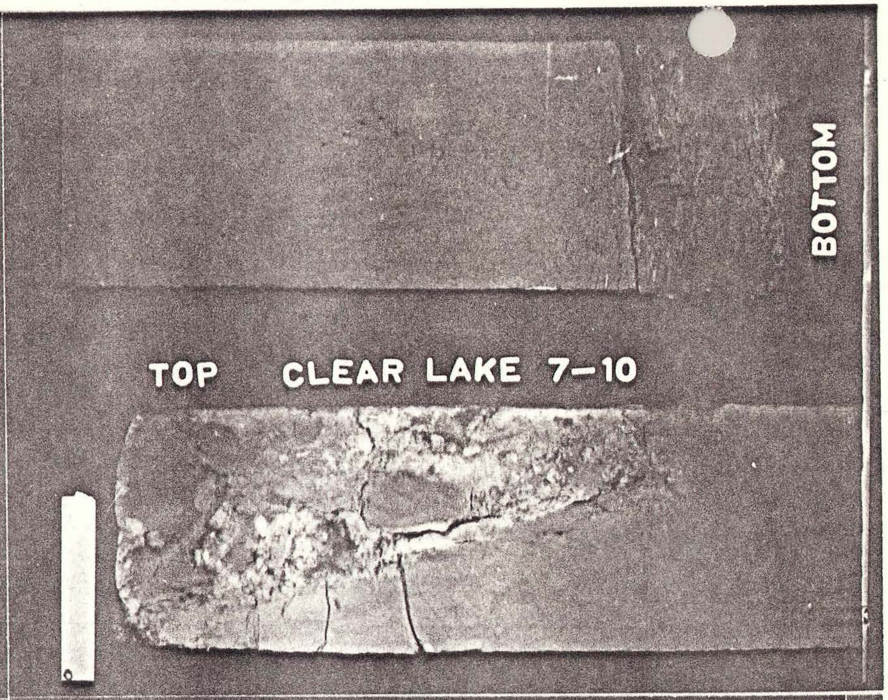

BOTTOM
TOP CLEAR LAKE 7–6


BOTTOM
TOP CLEAR LAKE 7–7
7/7

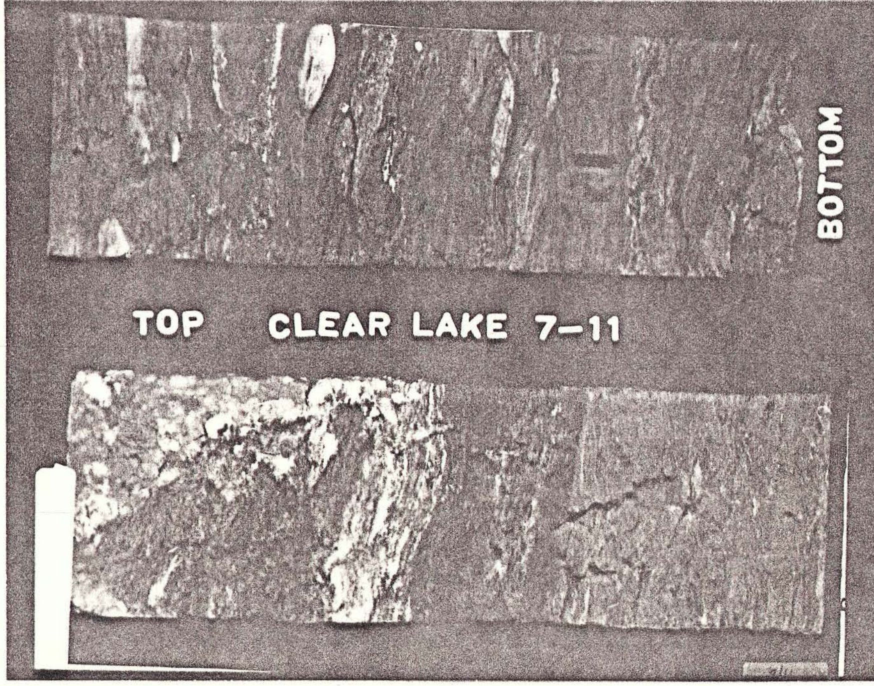

BOTTOM
TOP CLEAR LAKE 7–8
7/8



BOTTOM
TOP CLEAR LAKE 7-9

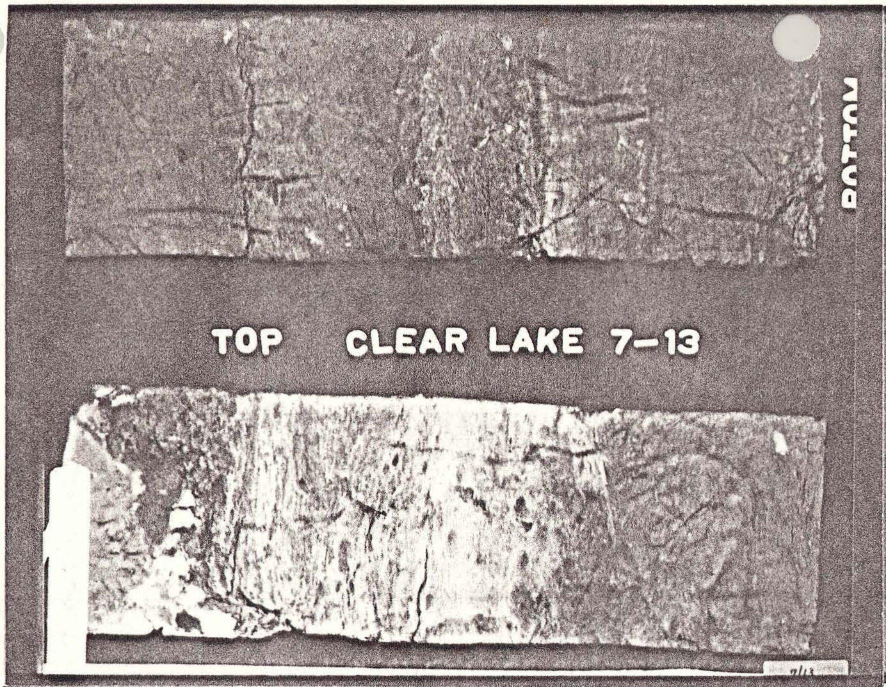


BOTTOM
TOP CLEAR LAKE 7-10

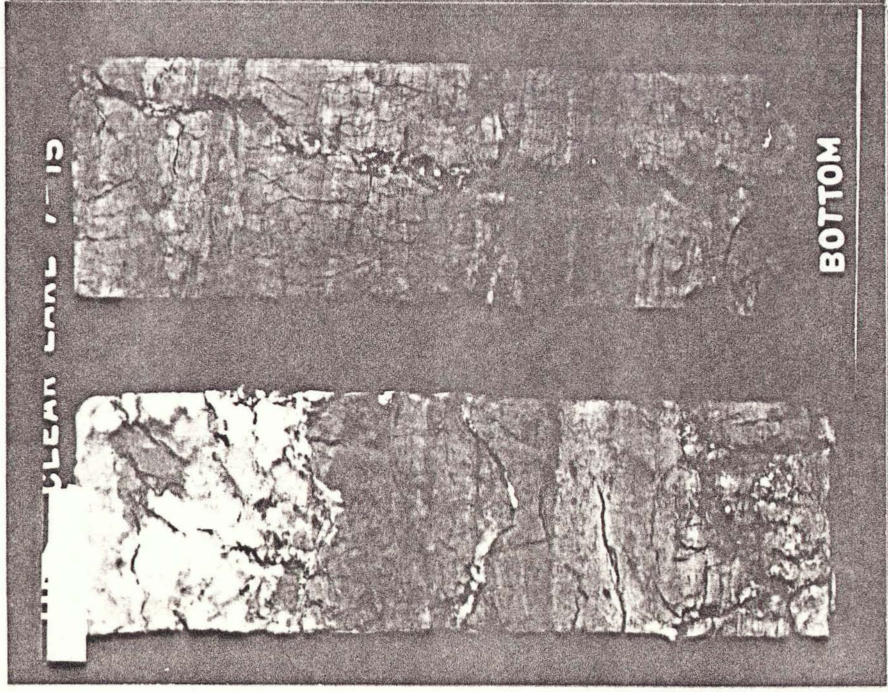


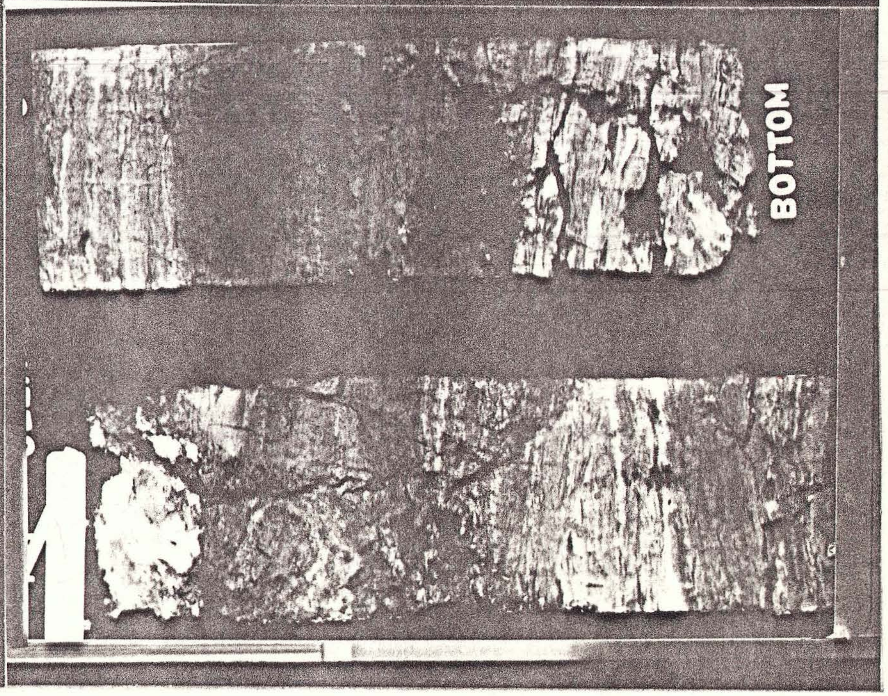
BOTTOM
TOP CLEAR LAKE 7-11

BOTTOM
TOP CLEAR LAKE 7-12

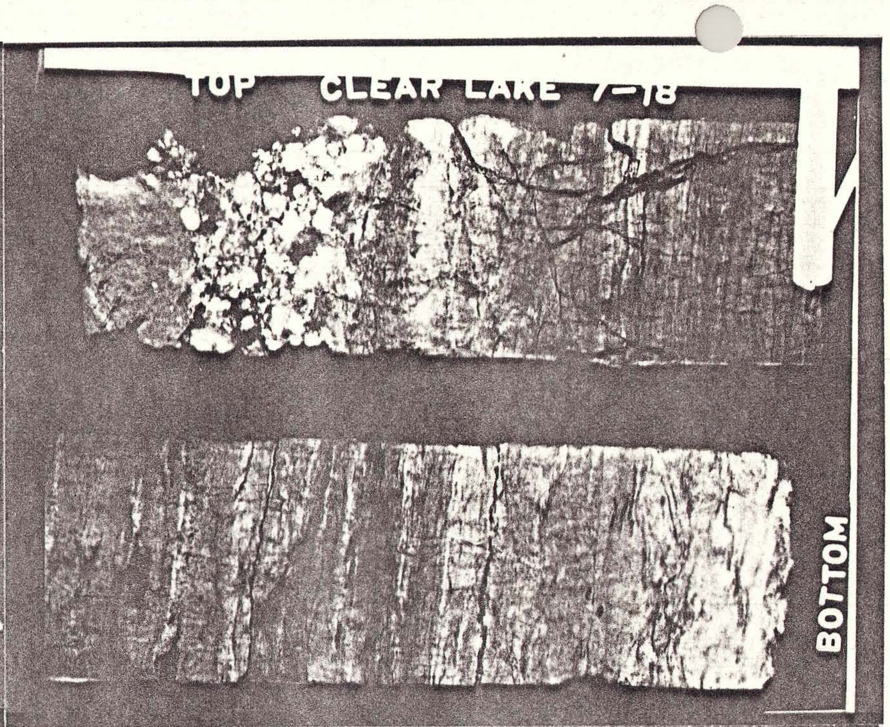

BOTTOM
TOP CLEAR LAKE 7-13
7/13

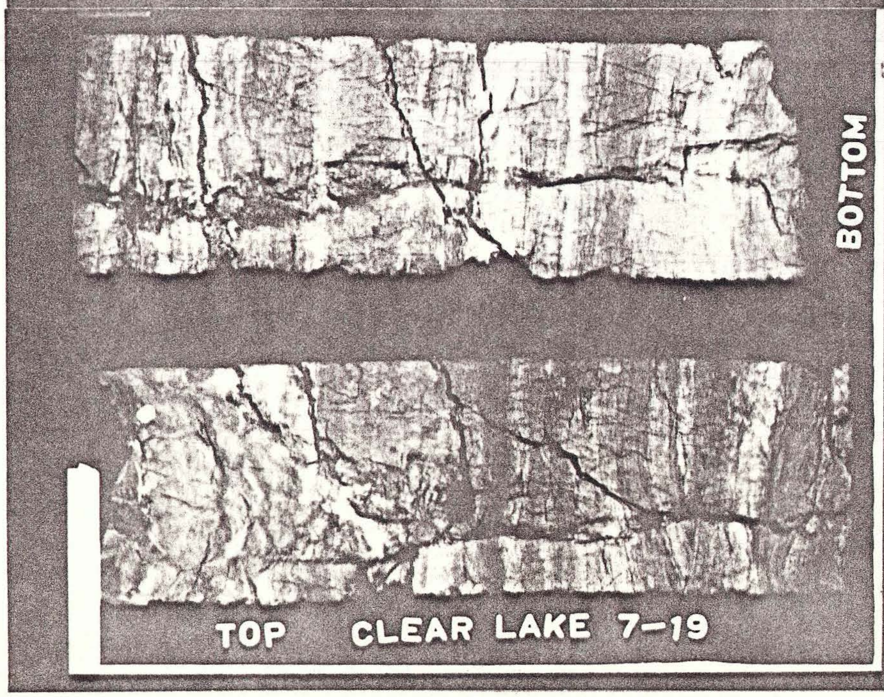

BOTTOM
TOP CLEAR LAKE 7-14
7/14

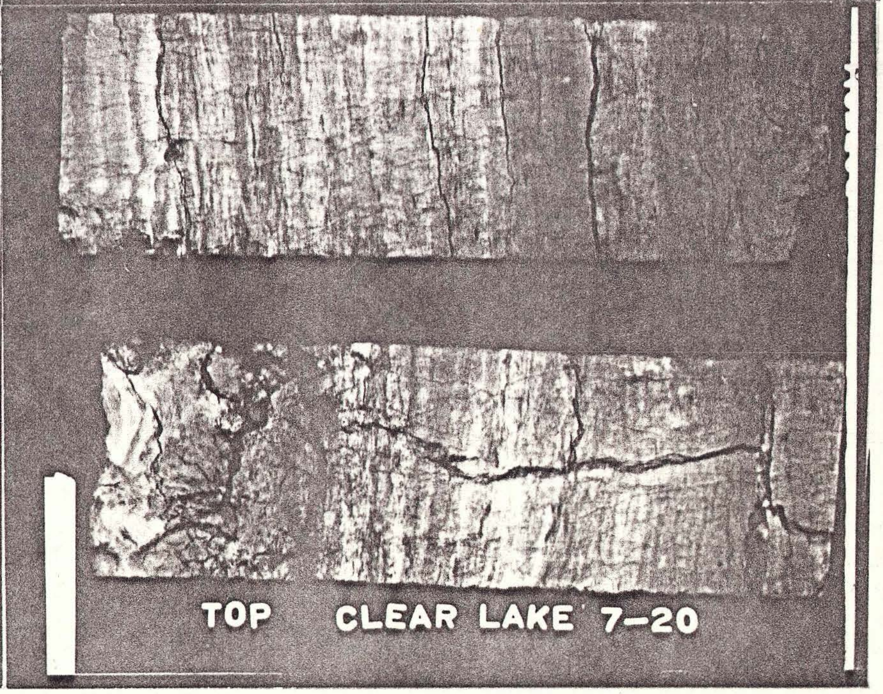

BOTTOM
CLEAR LAKE 7-15

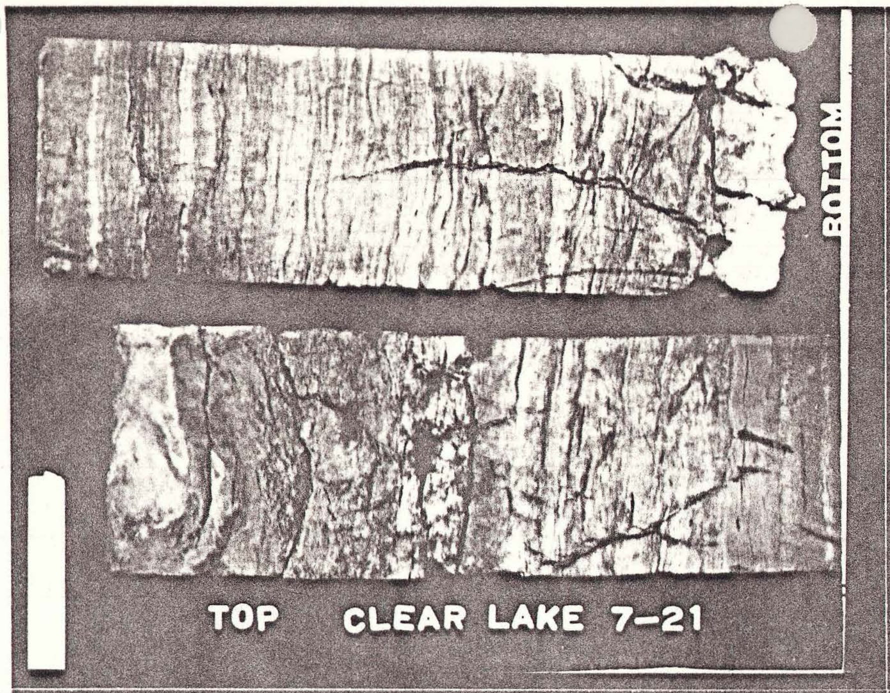

BOTTOM


TOP
CLEAR LAKE 7-17

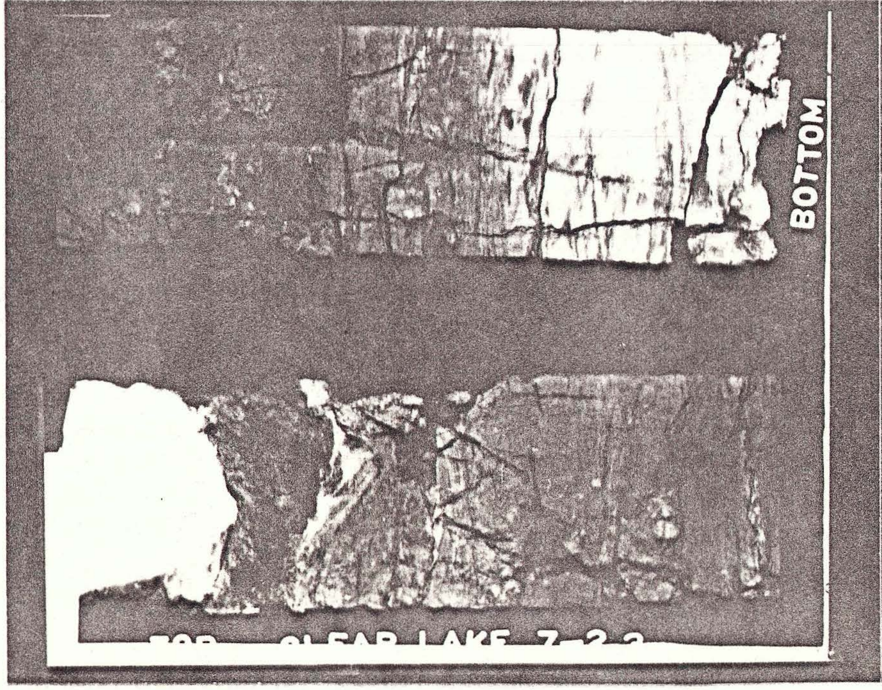

TOP
CLEAR LAKE 7-18
BOTTOM

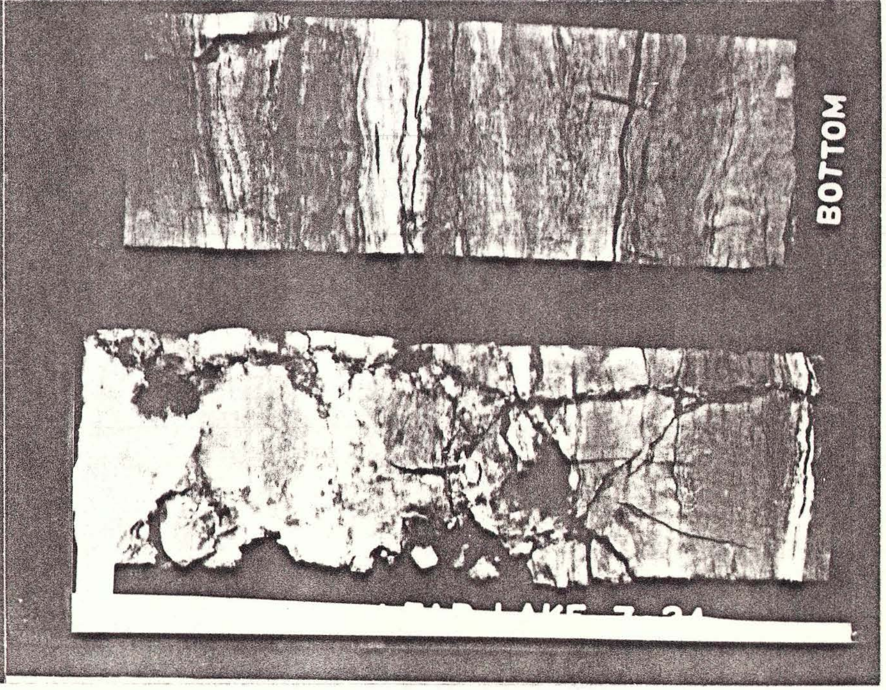

BOTTOM
TOP
CLEAR LAKE 7-19

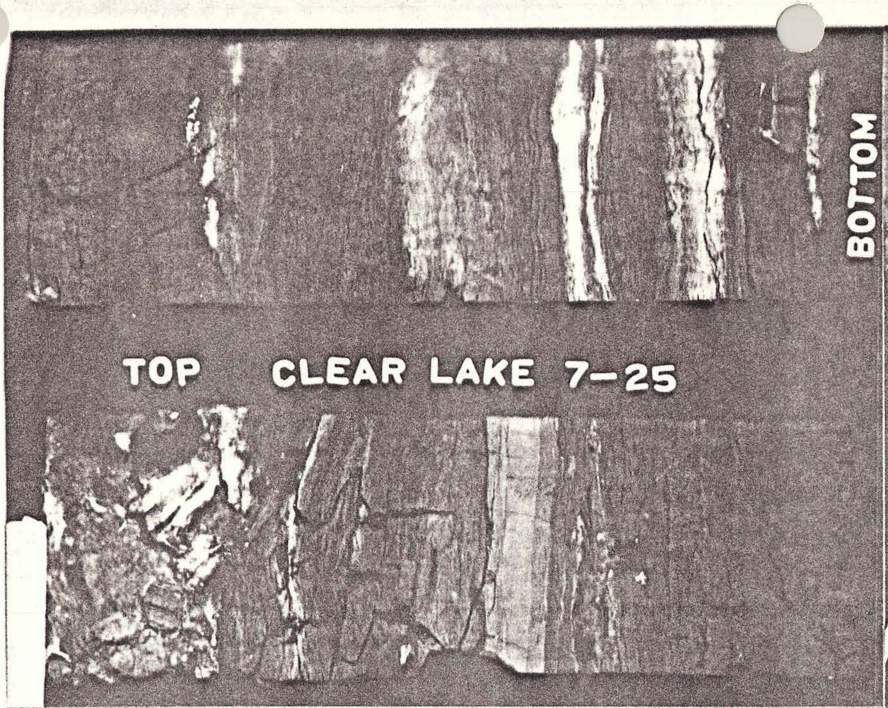

TOP
CLEAR LAKE 7-20

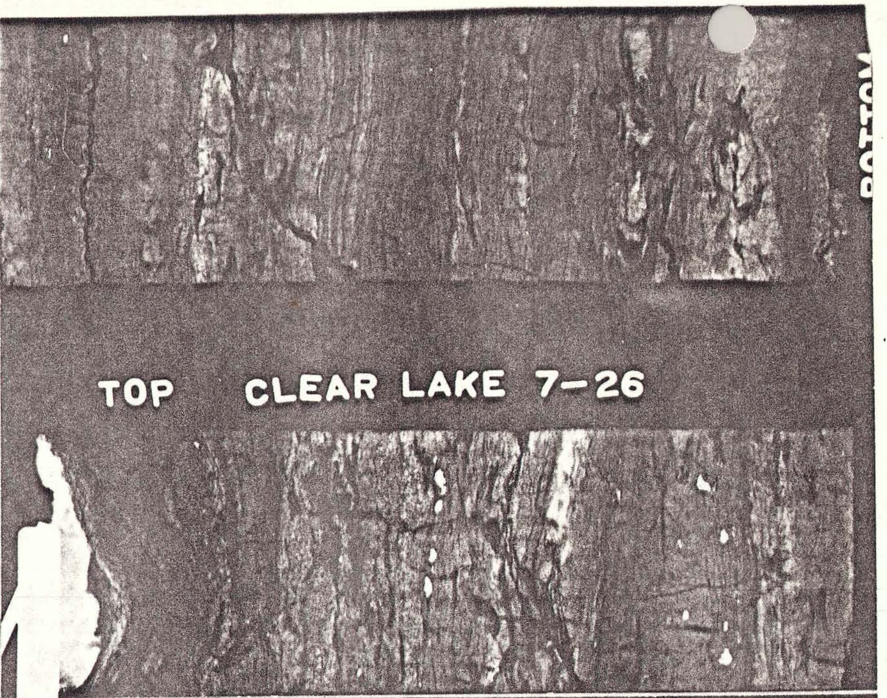

BOTTOM
TOP CLEAR LAKE 7-21

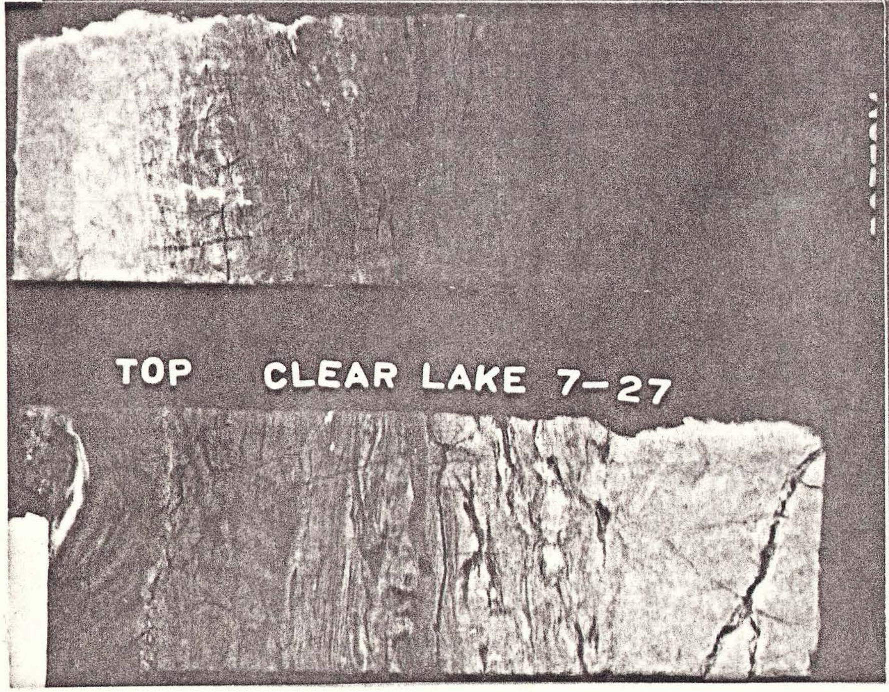

BOTTOM
TOP CLEAR LAKE 7-22

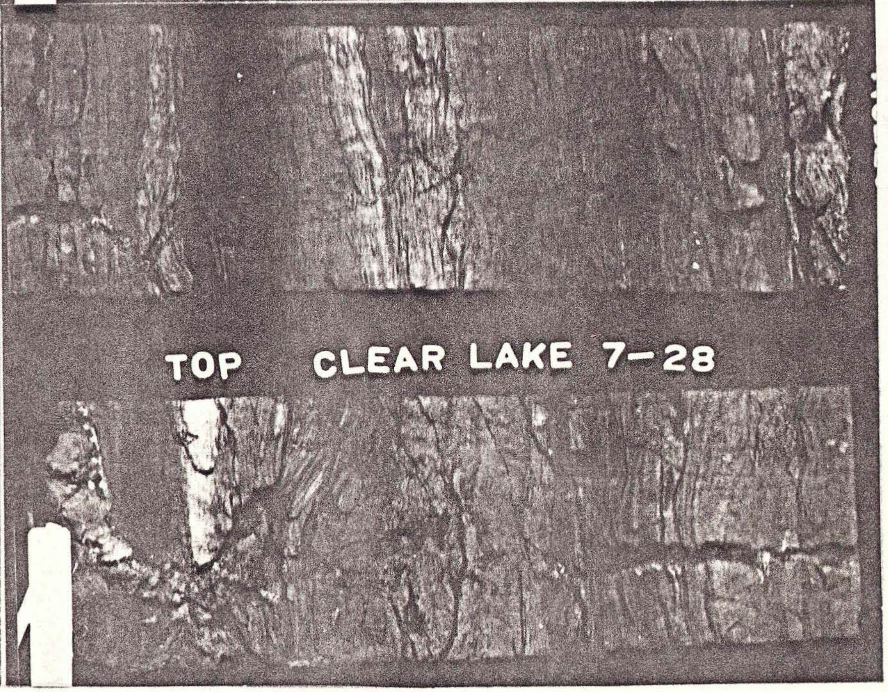

BOTTOM

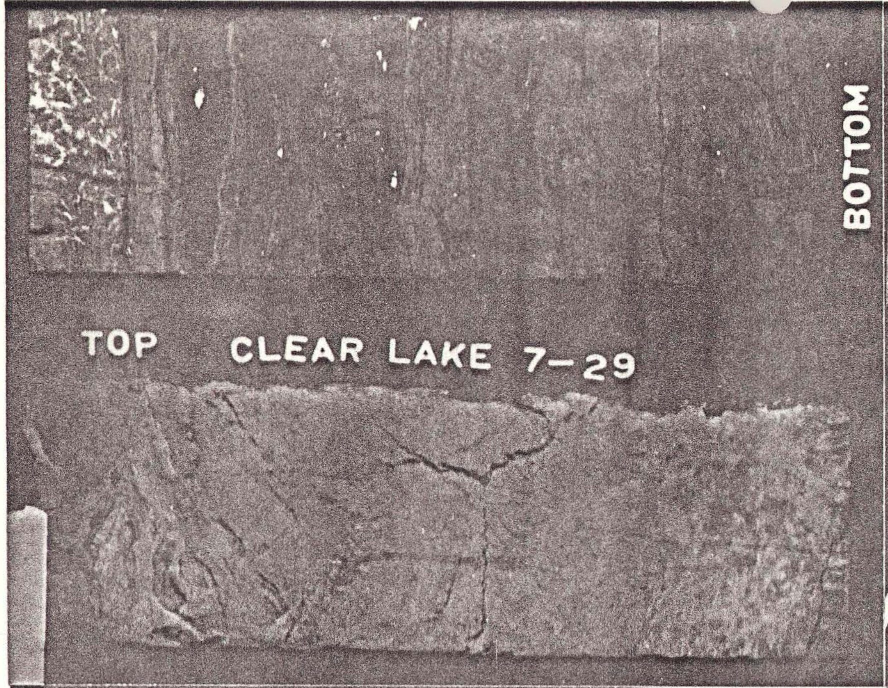

BOTTOM

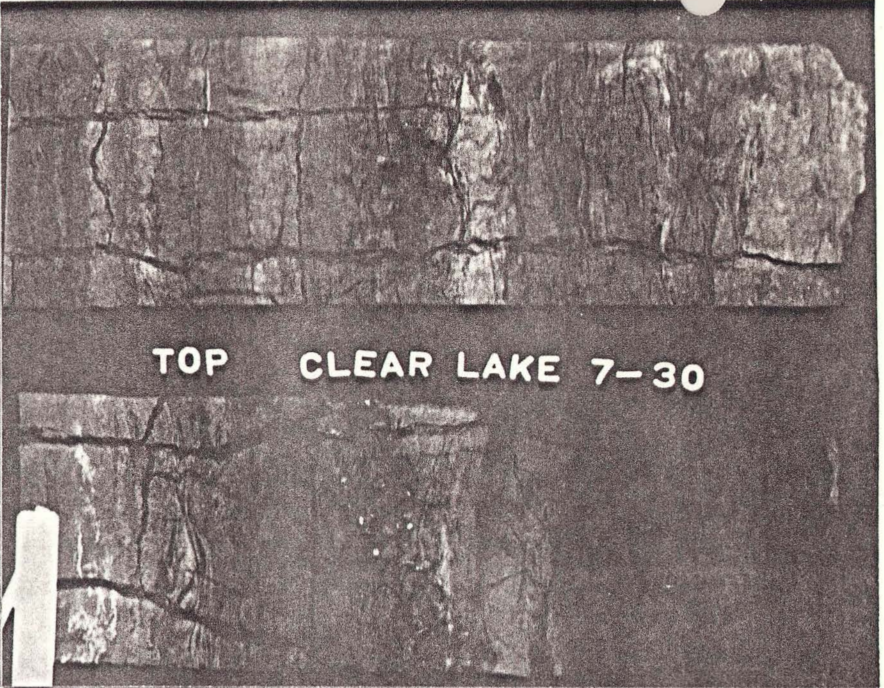

BOTTOM
TOP
CLEAR LAKE 7-25

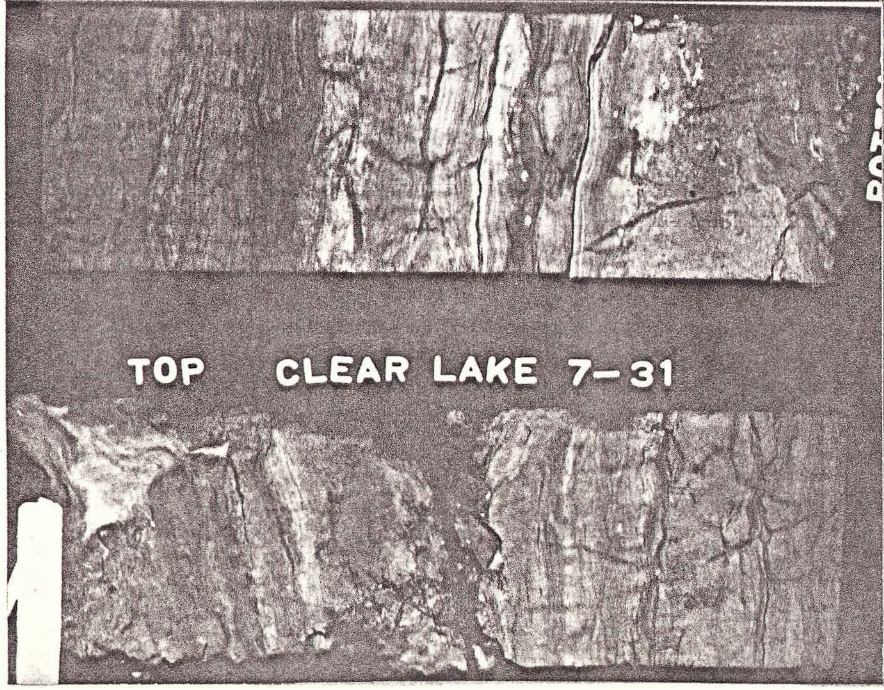

TOP
CLEAR LAKE 7-26

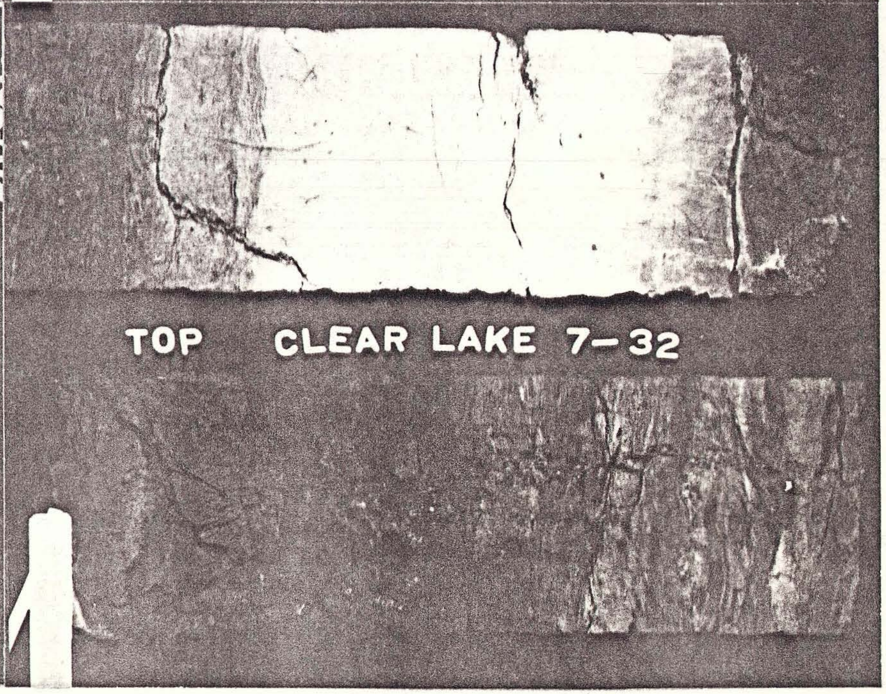

TOP
CLEAR LAKE 7-27

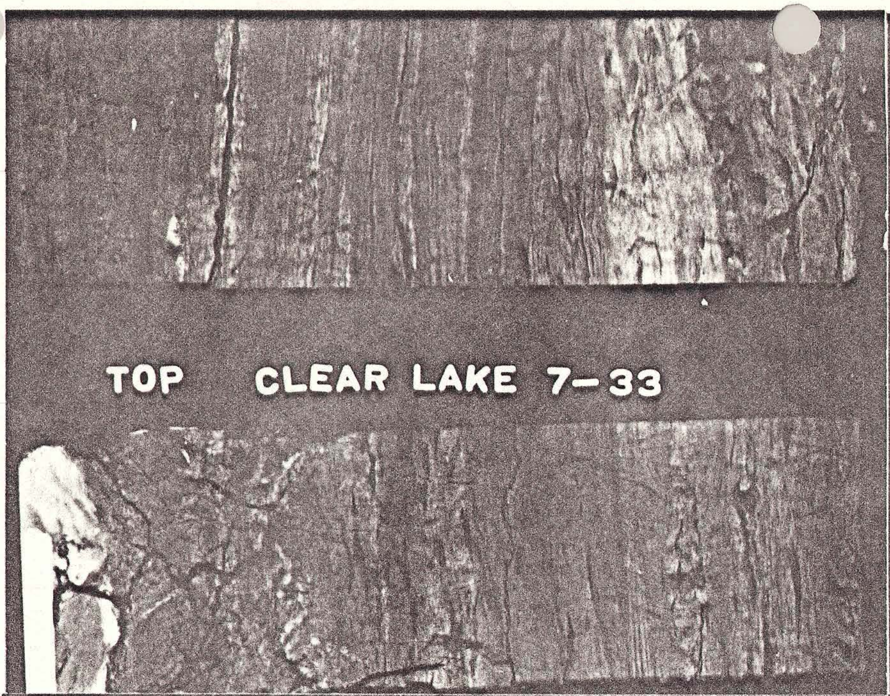

TOP
CLEAR LAKE 7-28

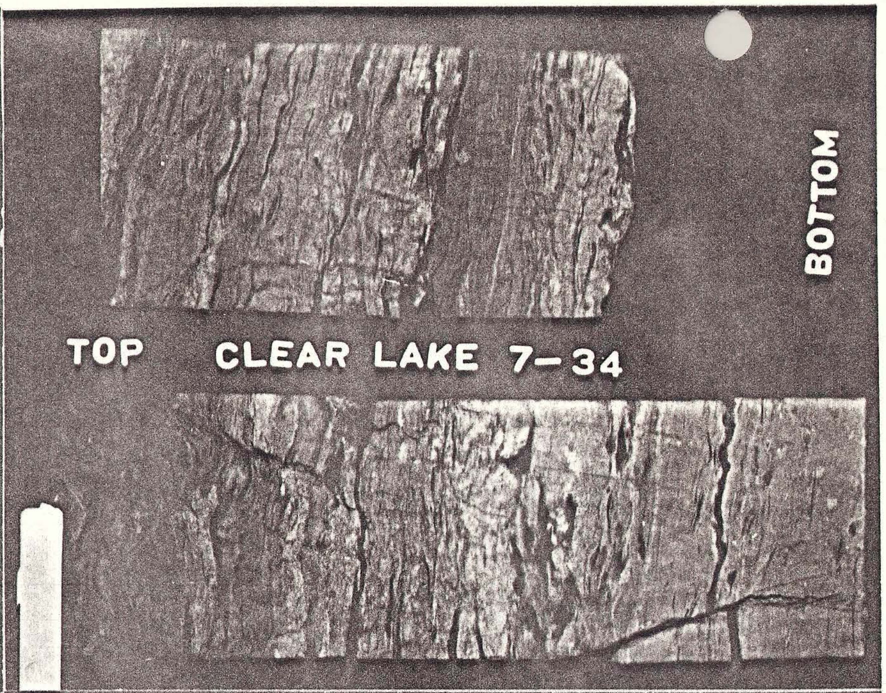

BOTTOM
TOP
CLEAR LAKE 7-29


TOP
CLEAR LAKE 7-30

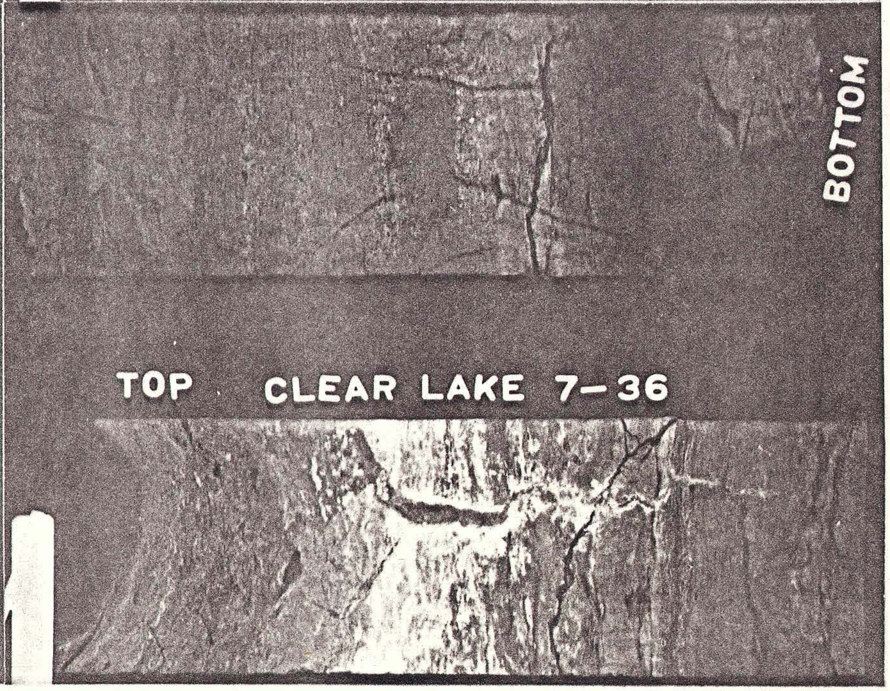

TOP
CLEAR LAKE 7-31


TOP
CLEAR LAKE 7-32


TOP
CLEAR LAKE 7-33


BOTTOM
TOP
CLEAR LAKE 7-34


BOTTOM
TOP
CLEAR LAKE 7-35


BOTTOM
TOP
CLEAR LAKE 7-36