DREDGE SAMPLE LOG

			JD	LOCAL
CRUISE	KODOS97-4	DATE	240	8-31-00
STATION	4		GMT	LOCAL
DREDGE	D4	TIME		
DEPTH INTERVAL(m)	2100 - 1850	LATITUDE (N,S)		
DEPTH(m) CORRECTED	1950	LONGITUDE (E,W)		

TOTAL WEIGHT : ~~80Kg~~ DREDGE 80Kg CRUST 15Kg

%OF ROCK COVERED BY CRUST 90% crust 10% patina

%BROKEN FROM : OUTCROP 40 TALUS 60

THICKNESS OF CRUST : MAX 30mm MIN patina AVG 15mm

DOMINANT SURFACE TEXTURE granular > micro botriodal > botryoidal > smooth

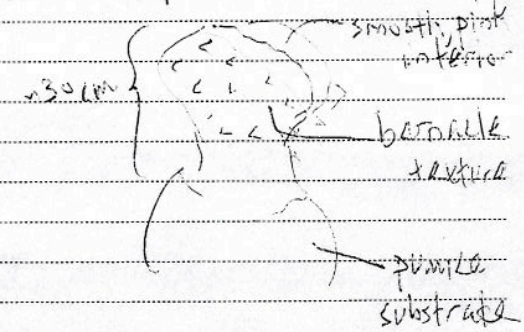
SUBSTRATE LITHOLOGY 90% basalt ; 7% limestone ; 3% pumice

D4

NODULES PRESENT ϕ

REMARKS: limestones have thin Fe-Mn crust, pumice no crust, thickest crust on basalt

one pumice fragment hosts biological specimen.



KODOS 97-4
D4

Dredge Sample Summary Sheet

Sample ID	Bulk CC	Layer CC	Pt & Au	FEE	OC	DPTS/TS	XRD	35mm Photo	Archive	Paleo	powder to ko
DY-1A	X		X				X				10g
DY-1B		X	X				X				
DY-1C		X	X				X				
DY-1D		X	X				X				
DY-2A	X						X				10g
DY-2A							X				
DY-2B	X						X				
DY-2B							X				
DY-2C											
					if interesting XRD						

SAMPLE DESCRIPTION

Cruse Id: KODOS97-4 Size(cm): 27 x 23 x 20 Location: Lomilik

Sample Id: D4-1 Weight(kg): 13.25 kg Depth(m): 2100 - 1950

Mn Crust Description

Surface Texture: [illegible]

Mn Crust Thickness(mm):

Min: 46 Max: 60 Ave: 50

Outer to Inner Layers(mm)

	Min	Max	Ave	Texture & Color
1		18	14	[illegible]
2		15	12	[illegible]
3	19	27	24	[illegible]
4				[illegible]
5				
6				

KODOS 97-4 D4-1

Comments and XRD Mineralogy:

indistinct boundary between crust & substrate

Substrate Description

RockType: Breccia

Description: Vesicular basalt clasts (cobble to small pebble with common Fe-Mn crusts up to 3 mm thick > Mn crust fragments >> CFA clasts. In upper part matrix < CFA + Fe-Mn oxides in lower part matrix is CFA. 2 generations of CFA cement. Also CFA filled fractures

Biology:

Described by: Benninger

Analyses

Subsample No.	Analysis	Layer Thick.	Wt.(g)
D4-1A	bulk CC PGE	0 - 70 mm	55g
D4-1B	CC PGE	0 - 15 mm	60g
D4-1C	CC PGE	16 - 36 mm	105g
D4-1D	CC PGE	37 - 55 mm	100g

→ send for PGE both labs

50% KOCd

50% USGS

D4-1A – 10g powder to HORDI

Subsampled by: Benninger

SAMPLE DESCRIPTION

Cruse Id: KODOS97-4 Size(cm): 12x6.5x15 Location: Lomilik

Sample Id: D4-2 Weight(kg): 1.4 Depth(m): 2100-1950

Mn Crust Description

Surface Texture: subdued botryoidal with granular overgrowth in depressions to smooth

Mn Crust Thickness(mm):

Min: 10.0 Max: 40 Ave: 16

Outer to Inner Layers(mm)

	Min	Max	Ave	Texture & Color
1	1.0	5	2.0	porous black
2	9.0	35	14	Fe-oxide stained porous
3				
4				
5				
6				

KODOS 97-4
D4-2

Comments and XRD Mineralogy:

Analyses

Subsample No.	Analysis	Layer Thick.	Wt.(g)
D4-2A	Bulk CC	0-18	30g

Some thin CFA veins are in the sample (unavoidable)

50% HORDI

60% HORDI

D4-2A - 10g of powder to HORDI

Substrate Description

RockType: vesicular basalt

Description: altered vesicular basalt vesicles 1mm-6mm some filled or rimmed w/ CFA and Calcite(?) a few veins in basalt filled w/ CFA thick fracture (4mm) in layer 2 filled with CFA, inclusion of basalt & CFA veins between layers 1 & 2 on one side

Biology:

Described by: Susie Zielinski

Subsampled by: SZ

SAMPLE DESCRIPTION

Cruise Id: KODOS97-4 Size(cm): 34.5 x 17 x 30 Location: [illegible]

Sample Id: D4-3 Weight(kg): 22.8 Depth(m): 2100-1950

Mn Crust Description

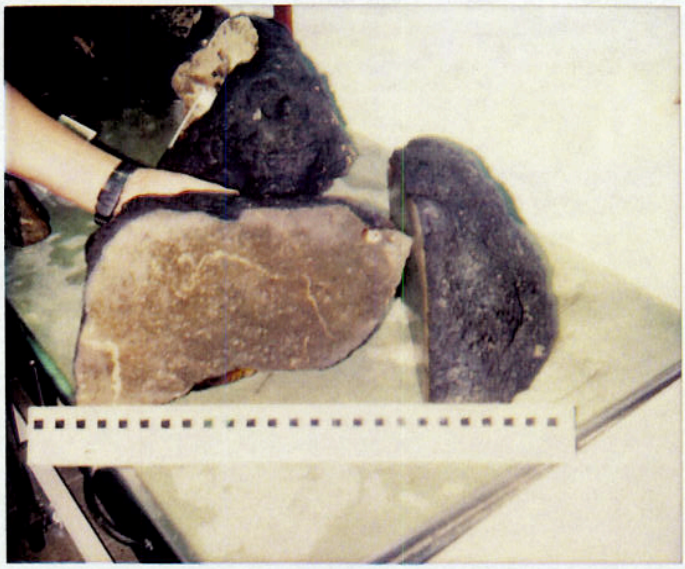
Surface Texture: granular to botryoidal

Mn Crust Thickness(mm):

Min: 0.5 Max: 4 Ave: 2.5

Outer to Inner Layers(mm)

	Min	Max	Ave	Texture & Color
1	0.5	4.0	2.5	massive black
2				
3				
4				
5				
6				



KODOS 97-4
D4-3

Comments and XRD Mineralogy:

Analyses

Subsample No.	Analysis	Layer Thick.	Wt.(g)
	50% [illegible]		
	50% USGS		

Substrate Description

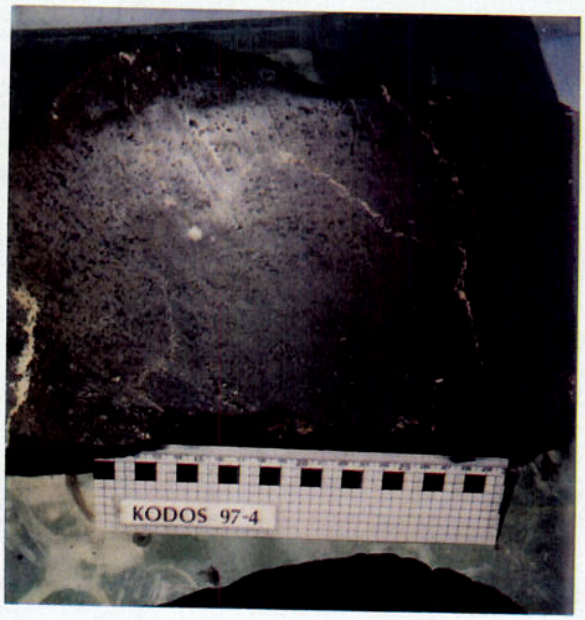
RockType: vesicular basalt (brown)

Description: altered,
vesicles <1 mm – 3 mm
Some vesicles rimmed w/ black, others w/ white minerals
CFA infilling veins – cream colored

Biology:

Described by: Susie Zielinski

Subsampled by:



KODOS 97-4
D4-3

SAMPLE DESCRIPTION

Cruse Id: KODOS97-4 Size(cm): 29 x 27 x 19 Location: Lomilik

Sample Id: D4-4 Weight(kg): 17.25 Depth(m): 2100-1950

KODOS 97-4
D4-4

Mn Crust Description

Surface Texture: smooth botryoidal with [illegible] aggregates in depress

Mn Crust Thickness(mm):

Min: 1 Max: [illegible] Ave: 3

Outer to Inner Layers(mm)

	Min	Max	Ave	Texture & Color
1	1	[illegible]	3	massive black
2				
3				
4				
5				
6				

Comments and XRD Mineralogy:

Analyses

Subsample No.	Analysis	Layer Thick.	Wt.(g)
½ KORDI			
½ USGS			

Substrate Description

RockType: Phosphorite Breccia

Description: Massive and foraminiferal phosphorite breccia (after limestone) with locally abundant dendritic Fe-Mn oxide precipitates. Cobble to pebble sized phosphatic limestone fragments contain common [illegible] indicating more than one phosphatization episode. Carbonate matrix is locally phosphatized. Upper 8cm of sample composed of carbonate mud. Inner 4 cm are massive [illegible] 4 mm of [illegible] & [illegible] abundant gravel to pebble-sized volcaniclastic + volcanics & phosphorite intraclasts — Phosphorite Cobble is bedded —

(phosphatized?)

Biology:

Described by: Benninger

Subsampled by:

SAMPLE DESCRIPTION

Cruse Id: KODOS97-4 Size(cm): 21x9.5x15 Location: Lomilik

Sample Id: D4-5 Weight(kg): 2.75 Depth(m): 2100-1950

Mn Crust Description

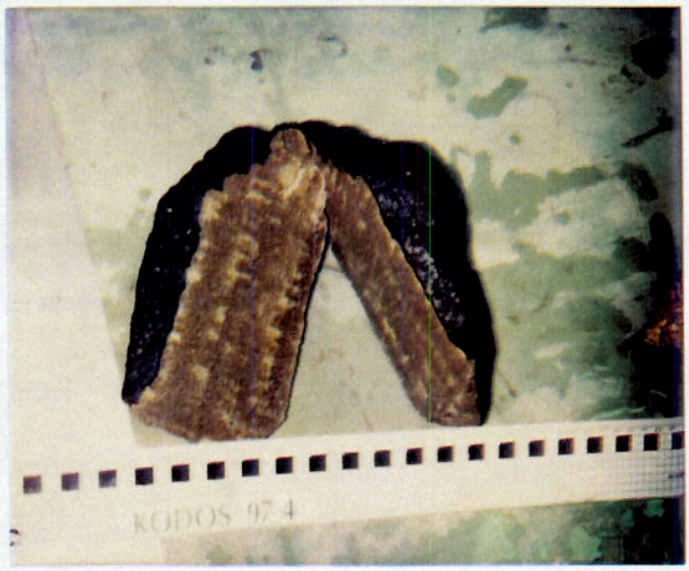
Surface Texture: subdued botryoidal with granular overgrowths in depressions

Mn Crust Thickness(mm):

Min: 1.0 Max: 7.0 Ave: 3.5

Outer to Inner Layers(mm)

	Min	Max	Ave	Texture & Color
1	1.0	7.0	3.5	Massive black
2				
3				
4				
5				
6				



KODOS 97-4 D4-5

Comments and XRD Mineralogy:

Substrate Description

RockType: bedded volcanic lastic sandstone

Description: interbedded fine to very coarse sand beds 1.5 to 2 cm fine sand is yellow, coarse is reddish brown subrounded - some lenses of yellowish-green - same as thin layers

Biology:

Described by: Susie Zielinski

Analyses

Subsample No.	Analysis	Layer Thick.	Wt.(g)
D4-5A	OC	substrate	20g
D4-5B	CC	0-5 mm	10g

50% KORDI
50% USGS

Subsampled by: 5A Suzie / 5BDJ.

SAMPLE DESCRIPTION

Cruse Id: KODOS97-4 Size(cm): 21.5x12.5x11 Location: Com. 1.5

Sample Id: D4-6 Weight(kg): 2.3 Depth(m): 2100-1950

Mn Crust Description

Surface Texture: Subdued botryoidal granular on side

Mn Crust Thickness(mm):

Min: 1.0 Max: 6.0 Ave: 2.5

Outer to Inner Layers(mm)

	Min	Max	Ave	Texture & Color
1	1.0	6.0	2.5	massive Fe-stained
2				
3				
4				
5				
6				

KODOS 97-X
D4-6

Comments and XRD Mineralogy:

Substrate Description

RockType: breccia

Description: volcanic & phosphorite clasts in diagenetically phosphatized cement

Carbonate Cement

Biology:

Described by: Susie Zelinski

Analyses

Subsample No.	Analysis	Layer Thick.	Wt.(g)
	½ USGS		
	½ KORDI		

Subsampled by:

SAMPLE DESCRIPTION

Cruse Id: KODOS97-4 Size(cm): 13x10x8 Location: Lomilik

Sample Id: D4-7 Weight(kg): 1.1 Depth(m): 2100-1950

Mn Crust Description

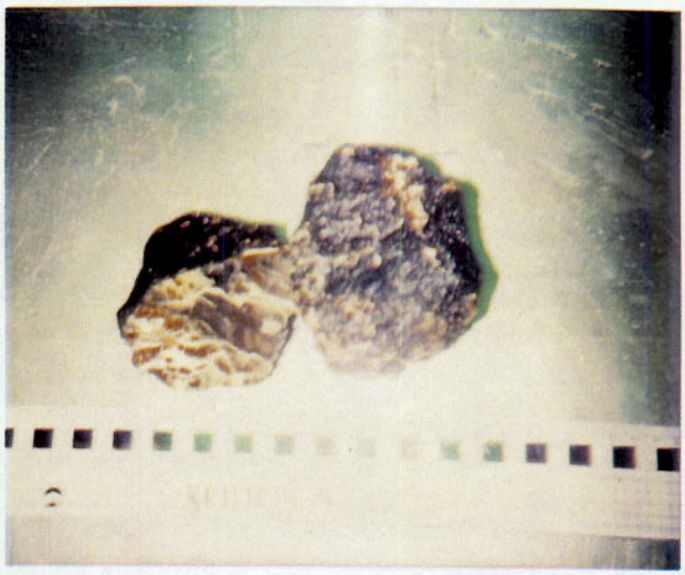
Surface Texture: Subdued botryoidal to smooth w/ granular overgrowths

Mn Crust Thickness(mm):

Min: <1.0 Max: 6.0 Ave: 2.0

Outer to Inner Layers(mm)

	Min	Max	Ave	Texture & Color
1	<1.0	6.0	2.0	massive porous black
2				
3				
4				
5				
6				



KODOS 97-4
D4-7

Comments and XRD Mineralogy:

Analyses

Subsample No.	Analysis	Layer Thick.	Wt.(g)
D4-7A	XRD	Ironstone clast	
D4-7B	XRD	Mn clast	
D4-7C	XRD	CFA Cement	

50% USGS
50% NORDI

DO OC on any ones w/ interesting XRD

Substrate Description

RockType: phosphorite breccia

ironstone clast: acid shows small amount of carbonate
Mn-clast: acid shows carbonate

Description:
Mn & phosphorite cements
CFA veins
phosphorite clasts gravel-sized (4mm to 42mm) (- hydrothermal
Mn oxide clasts(?) Ironstone clasts(?)

Biology:

Described by: Susie Zielinski

Subsampled by: Hein

SAMPLE DESCRIPTION

Cruse Id: KODOS97-4 Size(cm): 17x11x5.5 Location: Comalik

Sample Id: D4-8 Weight(kg): 2.60 Depth(m): 2100-1950

Mn Crust Description

Surface Texture: Subdued botryoidal w/ granular overgrowths in depressions

Mn Crust Thickness(mm):

Min: 0.8 Max: 6.0 Ave: 3.0

Outer to Inner Layers(mm)

	Min	Max	Ave	Texture & Color
1	0.8	6.0	3.0	porous black - iron stain in pores
2				
3				
4				
5				
6				

KODOS 97-4
~~D4-8~~ D4-8

Comments and XRD Mineralogy:

Analyses

Subsample No.	Analysis	Layer Thick.	Wt.(g)

Substrate Description

RockType: Volcaniclastic sandstone (bedded)

50% USGS

50% KORDI

Description: medium to very coarse sand some carbonate cement (or CFA) medium sand is green to tan coarse sand is reddish brown subrounded 5 cobbles

Biology:

Described by: Susie Zielinski

Subsampled by:

SAMPLE DESCRIPTION

Cruse Id: KODOS97-4 Size(cm): 12x8.5x5 Location: Lomilik

Sample Id: D4-9 Weight(kg): 0.6 Depth(m): 2100 - 1950

KODOS 97-4
D4-9

Mn Crust Description

Surface Texture: botryoidal + granular

Mn Crust Thickness(mm):

Min: 1.0 Max: 2.5 Ave: 2.0

Outer to Inner Layers(mm)

	Min	Max	Ave	Texture & Color
1	1.0	2.5	2.0	massive porous black
2				
3				
4				
5				
6				

Comments and XRD Mineralogy:

Analyses

Subsample No.	Analysis	Layer Thick.	Wt.(g)
50%	40AD		
50%	40GS		

Substrate Description

RockType: volcaniclastic sandstone & phosphorite

Description: phosphorite cemented volcaniclastic sandstone & phosphorite

Biology:

Described by: Susie Zielinski

Subsampled by:

SAMPLE DESCRIPTION

Cruse Id: KODOS97-4 Size(cm): 9x5.5x4.5 & 7.5x6.5x2.5 Location: Lomilik

Sample Id: D4-10 Weight(kg): 0.45 Depth(m): 2100-1950

Mn Crust Description

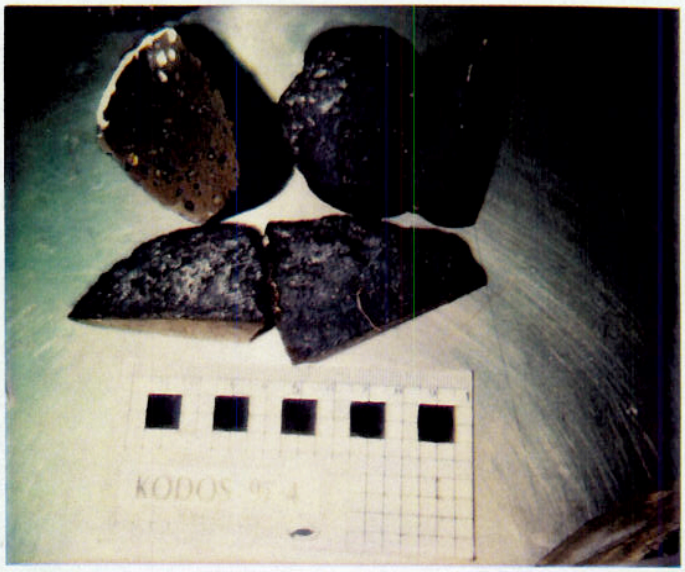
Surface Texture: Subdued botryoidal to smooth

Mn Crust Thickness(mm):

Min: patina Max: 1.5 Ave: <1.0

Outer to Inner Layers(mm)

	Min	Max	Ave	Texture & Color
1	patina	1.5	<1.0	massive black,
2				slightly fe-stained
3				
4				
5				
6				



D4-10 KODOS 97-4

Comments and XRD Mineralogy:

Substrate Description

RockType: vesicular basalt

Description: 2 cobbles of slightly altered brown basalt vesicles 1-6 mm elongated in one. Some pores filled or lined w/ CFA or zeolite. One cobble has a 2.3 mm layer of CFA between basalt & crust

Biology:

Described by:

Susie Zielinski

Analyses

Subsample No.	Analysis	Layer Thick.	Wt.(g)

100% HORDI

Subsampled by:

SAMPLE DESCRIPTION

Cruse Id: KODOS97-4 Size(cm): 8.5x6.5x3 6.5x4x3 Location: Lomilik

Sample Id: D4-11 Weight(kg): 0.5 Depth(m): 2100-1950

Mn Crust Description

Surface Texture: subdued, sinuosal to smooth [illegible] on sides

Mn Crust Thickness(mm):

Min: 1.0 Max: 4.0 Ave: 2.0

Outer to Inner Layers(mm)

	Min	Max	Ave	Texture & Color
1	1.0	4.0	2.0	Massive black
2				
3				
4				
5				
6				

KODOS 97-4 D4-11

Comments and XRD Mineralogy:

Substrate Description

RockType: phosphorite breccia

Description: 9 cobbles
mn dendrites in some phosphorite
CFA replaced limestone
CFA cement

Biology:

Described by:

Susie Zielinski

Analyses

Subsample No.	Analysis	Layer Thick.	Wt.(g)
All KORDI			

Subsampled by:

SAMPLE DESCRIPTION

Cruse Id: KODOS97-4 Size(cm): 5x6x3 to 4x3.5x2 Location: Lomilik

Sample Id: D4-12 Weight(kg): 0.26 Depth(m): 2100-1950

Mn Crust Description

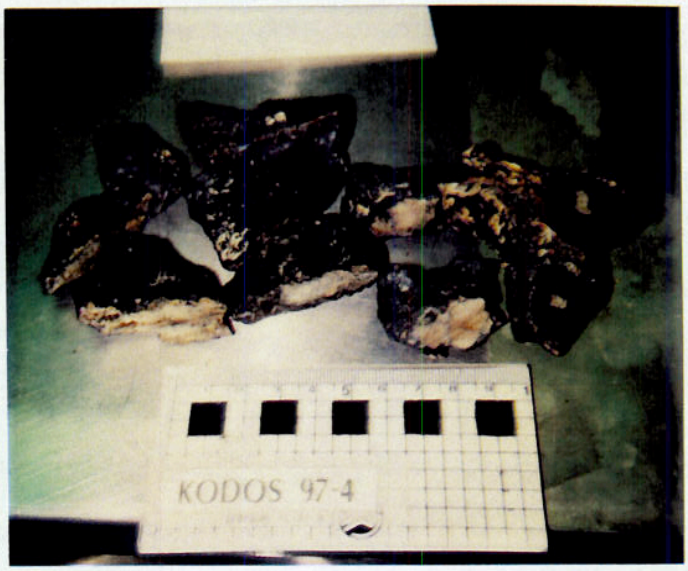
Surface Texture: smooth

Mn Crust Thickness(mm):

Min: 1.0 Max: 11 Ave: 2.0

Outer to Inner Layers(mm)

	Min	Max	Ave	Texture & Color
1	1.0	11	2.0	massive Fe stained
2				& black
3				
4				
5				
6				



KODOS 97-4
D4-12

Comments and XRD Mineralogy:

Analyses

Subsample No.	Analysis	Layer Thick.	Wt.(g)

100% HORDI

Substrate Description

RockType: phosphorite

Description: phosphorite w/ Mn dendrites
one small nodule w/ basalt nucleus
pinkish to gray

Biology:

Described by:

Susie Zielinski

Subsampled by:

SAMPLE DESCRIPTION

Cruse Id: KODOS97-4 Size(cm): 5.5x5x2.5 3x3x2 Location: Lomilik

Sample Id: D4-13 Weight(kg): 0.14 Depth(m): 2100-1950

Mn Crust Description

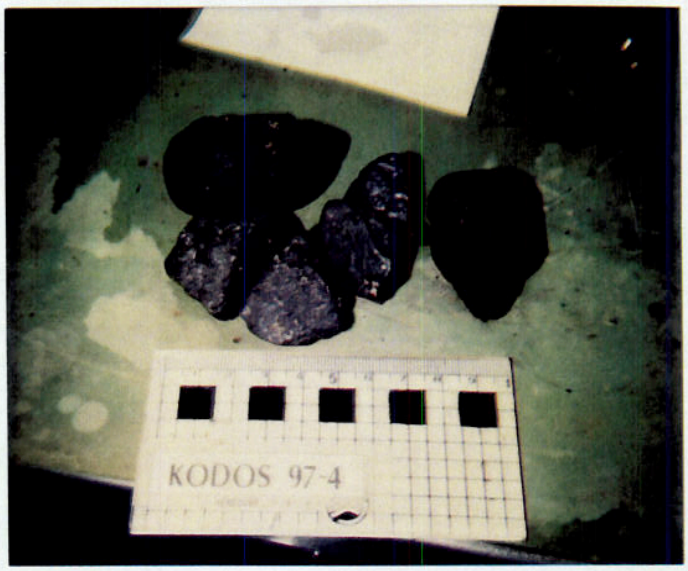
Surface Texture: smooth

Mn Crust Thickness(mm):

Min: 16 Max: 39 Ave: 31

Outer to Inner Layers(mm)

	Min	Max	Ave	Texture & Color
1	12	21	19	massive iron-stained
2	4	18	12	massive black
3				
4				
5				
6				



KODOS 97-4
D4-13

Comments and XRD Mineralogy:

Substrate Description

RockType: all crust

Description: 3 gravels - 1 is a nodule
nodule is 5.5 x 5 x 2.5 cm
center is massive black 2x1 cm
surrounded by massive porous iron-stained crust - some CPA in veins of center - other 2 are crust fragments

Biology:

Described by:

Susie Zielinski

Analyses

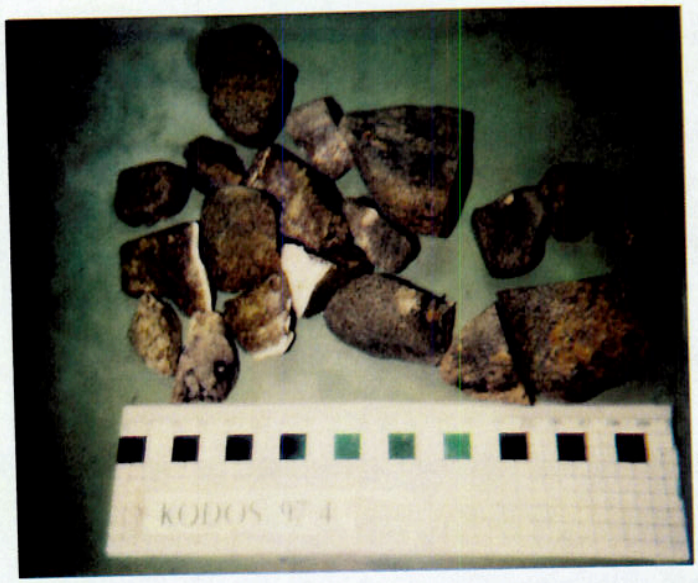
Subsample No.	Analysis	Layer Thick.	Wt.(g)
all HORDI			

Subsampled by:

SAMPLE DESCRIPTION

Cruse Id: KODOS97-4 Size(cm): 12 Pebbles Location: Lomilik

nple Id: D4-14 Weight(kg): 1.5 kg Depth(m): 2100-1950



KODOS 97-6
D4-14

Mn Crust Description

Surface Texture: NONE

Mn Crust Thickness(mm):

Min: _____ Max: _____ Ave: _____

Outer to Inner Layers(mm)

	Min	Max	Ave	Texture & Color
1				
2				
3				
4				
5				
6				

Comments and XRD Mineralogy:

Analyses

Subsample No.	Analysis	Layer Thick.	Wt.(g)

100% HORDJ

Substrate Description

RockType: Volcaniclastic Sandstone

Description: Brown to greenish brown fine to coarse-grained sand - 2 pebbles w/ CFA layer attached (2 mm) - 95 altered to clay minerals

Biology:

Described by: HCM

Subsampled by:

SAMPLE DESCRIPTION

Cruse Id: KODOS97-4 Size(cm): 5 Cobbles Location: [illegible]

Sample Id: D4-15 Weight(kg): 0.8 Depth(m): 2100-1950

Mn Crust Description

Surface Texture: Smooth Coating

Mn Crust Thickness(mm):

Min: _____ Max: _____ Ave: _____

Outer to Inner Layers(mm)

	Min	Max	Ave	Texture & Color
1				
2				
3				
4				
5				
6				

KODOS 97-4
D4-15

Comments and XRD Mineralogy:

Substrate Description

RockType: Brown Vesicular Basalt

Description: Some vesicles filled w/ Calcite also zeolites

Biology:

Described by: [illegible]

Analyses

Subsample No.	Analysis	Layer Thick.	Wt.(g)

100% [illegible]

Subsampled by:

SAMPLE DESCRIPTION

Cruse Id: KODOS97-4 Size(cm): 15 Pebbles & Cobbles Location: Lomilik

Sample Id: D4-16 Weight(kg): 1.7 kg Depth(m): 2100-1950

Mn Crust Description

Surface Texture: granular to smooth patina

Mn Crust Thickness(mm):

Min: _____ Max: _____ Ave: _____

patina

Outer to Inner Layers(mm)

	Min	Max	Ave	Texture & Color
1				
2				
3				
4				
5				
6				

KODOS 97-4
D4-16

Comments and XRD Mineralogy:

Analyses

Subsample No.	Analysis	Layer Thick.	Wt.(g)
70%	HORDI		
30%	USGS		

Substrate Description

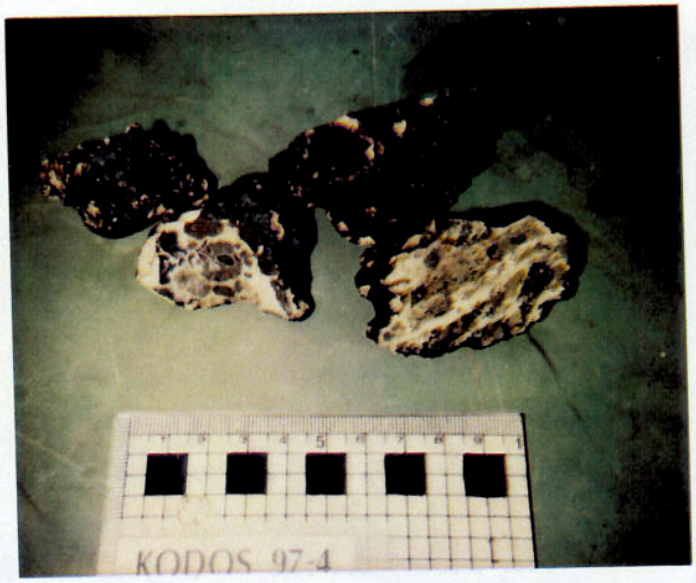
RockType: Phosphorite

Description: Pinkish massive to gray to cream differentially phosphatized Lms w/ Mn dendrites - many w/ 2 layers - cream massive + brown to pinkish w/ Mn dendrites - Rest are CFA-supported breccias w/ few small altered volcanic clasts

Biology:

Described by: Hein

Subsampled by:



KODOS 97-4
D4-II 16

SAMPLE DESCRIPTION

Cruse Id: KODOS97-4 Size(cm): 3x9.5x5.5 Location: Lomilik
Sample Id: D4-17 Weight(kg): 0.7 Depth(m): 2100 - 1950

Mn Crust Description

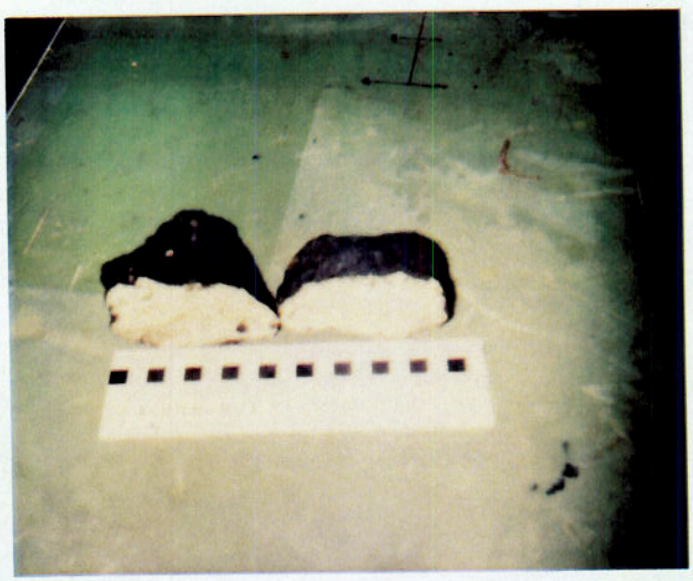
Surface Texture: Smooth & granular

Mn Crust Thickness(mm):

Min: 0.5 Max: 1.0 Ave: 1.0

Outer to Inner Layers(mm)

	Min	Max	Ave	Texture & Color
1	0.5	1.0	1.0	massive black
2				
3				
4				
5				
6				



KODOS 97-4
D4-17

Comments and XRD Mineralogy:

Analyses

Subsample No.	Analysis	Layer Thick.	Wt.(g)
50% USGS			
50% HORDT			

Substrate Description

RockType: phosphorite

Description: differentially phosphatized limestone, massive, few scattered small breccia clasts

Biology:

Described by:

Susie Zielinski

Subsampled by:

SAMPLE DESCRIPTION

Cruse Id: KODOS97-4 Size(cm): 9x4.5x3.5 & 8x4x3 Location: Lowelik

Sample Id: D 4-18 Weight(kg): 0.23 Depth(m): 2900 - 1950

Mn Crust Description

Surface Texture: microbotryoidal & granular patina

Mn Crust Thickness(mm):

Min: <1.0 Max: 1.5 Ave: 1.0

Outer to Inner Layers(mm)

	Min	Max	Ave	Texture & Color
1	<1.0	1.5	1.0	massive black
2				
3				
4				
5				
6				

KODOS 97-4
DK-18

Comments and XRD Mineralogy:

Analyses

Subsample No.	Analysis	Layer Thick.	Wt.(g)
50% UCGS			
50% HORDI			

Substrate Description

RockType: phosphorite & phosphatized limestone

Description: 2 cobbles of phosphorite w/ Mn dendrites & phosphatized limestone → dense massive brown

Biology:

Described by: Susie Zielinski

Subsampled by:

SAMPLE DESCRIPTION

Cruse Id: KODOS97-4 Size(cm): 8 Pumice Pebbles Location: Lomilite

Sample Id: D4-20 Weight(kg): 0.4 kg Depth(m): 2100-1950

Mn Crust Description

Surface Texture: NONE

Mn Crust Thickness(mm):

Min: _____ Max: _____ Ave: _____

Outer to Inner Layers(mm)

	Min	Max	Ave	Texture & Color
1				
2				
3				
4				
5				
6				

KODOS 97-4 D4-20

Comments and XRD Mineralogy:

Substrate Description

RockType: Gray Pumice

Description:

Biology:

Described by: Aoin

Analyses

Subsample No.	Analysis	Layer Thick.	Wt.(g)
100% KODOS			

Subsampled by:

DREDGE OPERATIONS LOG

			JD	LOCAL
CRUISE	KODOS97-4	DATE	241	8-29-97
STATION	4	CHIEF SCIENTIST	Moon/Hair	
DREDGE NO.	D4	TECH ON WATCH	Lee	
DEPTH INTERVAL(m)	2102 ~ 1850			

Corrected 2100 — 1950

	ON STATION	DREDGE ON BOTTOM		DREDGE OFF BOTTOM	OFF STATION
GMT	08:55	09:33	09:37	12:03	12:48
lat	11°44.70	11°43.3	11°44.2	11°42.15	11°41.35
long	161°41.50	161°41.9	161°41.9	161°41.15	161°40.80
#	2155	2102	2076	1850	1790
	150°/0.9		132°/0.9		

Site Description and Target: lomilik 해저산의 2100 ~ 1900 m 부근을 dredge 할 예정

Lomilik Seamount, dredging 2100-1900m

Operation*	GMT	Depth(m)	Wire Out(m)	Tension	HDG/SPD	Comments
on bottom	09:33	2102		~~X~~ 1.2	128°/0.7	
wire out	09:45	2073	2586	0.5, 0.7, 1.0	128°/0.8	11°44.1 161°41.8
Starting dredge	09:45	"	"	약 1.0	"	"
	09:57	2053	2666	1.1, 1.2, 1.3	172°/0.5	
Small bites	10:03	2044	2693	1.5	190/0.3	11°43.4 161°41.6°
"	10:04	2043	2693	1.7	191/0.3	11°43.8 / 161°41.6°
"	10:05	2040	2693	1.6, 1.7	188/0.3	11°43.7 / 161°41.6°
"	10:05	2038	2704	1.8	188/0.3	11°43.7 / 161°41.5°
"	10:06	2037		1.8	192°/0.3	11°43.7 / 161°41.5°
"	10:07	2034	2710	1.7, 2.0	195°/0.5	"
Good Bites	10:08	2032	2716	2.1, 2.2	200°/0.6	~~11°43.7~~ / 161°41.5°
Small Bites	"	2030	2720	1.7, 2.2	200/0.5	2.2 Brake "
"	10:11	2020		1.8, 1.6	165/0.2	~~11°43.6~~ / 161°41.4°
"	"	"	2722	2.2	"	"

*on/off bottom, bites, etc.

Other Comments: 원래 수심 2000m 까지 dredge 할 예정이었으나 wire가 끝나가 있으므로 1900m까지 dredge

KODOS 97-4

D4

DREDGE OPERATIONS LOG

			JD	LOCAL
CRUISE	KODOS97-4	DATE	241	8-29-97
STATION	4	CHIEF SCIENTIST	Moon / Hein	
DREDGE NO.	D4	TECH ON WATCH	lee	
DEPTH INTERVAL(m)	2102-1850			

	ON STATION	DREDGE ON BOTTOM	DREDGE OFF BOTTOM	OFF STATION
GMT				
lat		See page 1		
long				
z				

Site Description and Target:

See page 1

Operation*	GMT	Depth(m)	Wire Out(m)	Tension	HDG/SPD	Comments
Bites	10:12	2012	2222	1.8, 1.7	125 / 1.6	11°43.57 / 161°41.45
Good Bites	10:14	2010		2.2, 2.4, 2.5	148 / 1.5	11°43.54 / 161.41.44
Good Bites	"	"		2.7, 2.8 3.0, 3.1	"	
3 Broken	10:14	2006	2412	3.2, 3.4, 3.6	168 / 1.6	11°43.51 / 161.41.44
Small bite	10:17	1883	2408	1.8	135 / 1.3	
"	10:25	1887	2408	1.7	105 / 1.8	11°43.21 / 161.41.45
"	10:28	1980	2400	1.7	201 / 2.0	
"	10:30	"	2487	1.8	"	
"	10:31	1876	2483	1.8, 1.8	150 / 1.8	11°43.11 / 161.41.56
"	10:35	1861	2412	1.7		
"	10:36	1858		1.8	162° / 1.7	
"	10:37	1851	2412	1.7	184° 1.8	11°42.82 / 171°41.47
"	10:38	1846		1.7		
"	10:47	1930	2408	1.7, 1.7	200 / 2.1	11°42.43 / 161°41.19

*on/off bottom, bites, etc.

Other Comments:

DREDGE OPERATIONS LOG

			JD	LOCAL
CRUISE	KODOS97-4	DATE	241	8-29-97
STATION	4	CHIEF SCIENTIST	Moon / Hein	
DREDGE NO.	D4	TECH ON WATCH	Lee	
DEPTH INTERVAL(m)	2102-1850			

	ON STATION	DREDGE ON BOTTOM	DREDGE OFF BOTTOM	OFF STATION
GMT				
lat		See page 1		
long				
z				

Site Description and Target:

Operation*	GMT	Depth(m)	Wire Out(m)	Tension	HDG/SPD	Comments
Bites	10:48	1905	2704	1.8	205° / 1.9	
	10:50	1900	2703	1.6, 1.5		11° 42.76 / 161.41.1[illegible]
Small Bite	11:01	1889	2634	1.7	259° / 1.6	11° 42.33 / 161.41.0
				1.2, 1.3 표준		
position.	11:10	1900	2580	1.3		11° 42.67 / 161.41.18
Small Bites	11:12	"	2566	1.7		
"	11:16	1900	2544	1.7 1.8, 2.0		
"	11:17	"	2529	1.9		
"	11:18	1898	2525	1.8, 1.9	200° / 2.8	11° 42.21 / 161.41.19
"	11:20	1898		1.9, 1.7, 2.0		
"	11:21		2511	1.8, 1.9		
"	11:22		2503	1.9		
"	11:23	1896	2490	1.8(2) 1.7		
"	11:25		2469	1.9		

*on/off bottom, bites, etc.

Other Comments:

1900m에서 배가 멈춰 섰으며 wire가 1900m 정도 돼 때까지 ~~dredge 하고 있음.~~ 강아올리면서 dredging.

DREDGE OPERATIONS LOG

			JD	LOCAL
CRUISE	KODOS97-4	DATE	240 24	8/29/97
STATION	4	CHIEF SCIENTIST	Moon / Hein	
DREDGE NO.	D4	TECH ON WATCH	Lee	
DEPTH INTERVAL(m)	2102-1850			

	ON STATION	DREDGE ON BOTTOM	DREDGE OFF BOTTOM	OFF STATION
GMT				
Lat		See page 1		
Long				
z				

Site Description and Target:

See page 1.

Operation*	GMT	Depth(m)	Wire Out(m)	Tension	HDG/SPD	Comments
small Bite	11:27	1896	2450	2.1	252/1.0	11°42.21 / 161°41.20
"	11:28		2443	2.0, 1.9		
"			2432	1.8		
"	11:29		2428	1.9, 1.8		
"	11:30		2420	1.8, 1.9		
"	11:31	1892	2403	1.8, 1.9		
"	11:35		2353	1.7		
"	11:38	1888		1.7, 1.8		11°42.15 / 161°41.15
"	11:57	1875	2073	1.7		
off bottom	12:03	1850			246°/1.3	11°42. / 161°41
off station	12:44	1790	0			11°41.35 / 161°40.80

*on/off bottom, bites, etc.

Other Comments: