DREDGE SAMPLE LOG

			JD	LOCAL
CRUISE	KODOS97-4	DATE	244	9-2-97
STATION	18		GMT	LOCAL
DREDGE	D11	TIME	17:39 - 19:50	5:39 - 7:58
DEPTH INTERVAL(m)	2166 - 1860	LATITUDE (N,S)	11°36.74'	11°37.72'
DEPTH(m) CORRECTED	2160 - 1850	LONGITUDE (E,W)	161°37.47'	161°37.20'

TOTAL WEIGHT : DREDGE 160 Kg CRUST 6 Kg

%OF ROCK COVEREDBY CRUST 0% <1% patina <1% Mn crust w/out substrate

%BROKEN FROM : OUTCROP 99% TALUS 1%

THICKNESS OF CRUST : MAX 30 MIN patina AVG 15 (of crust frags)
<1 mm (entire dredge)

DOMINANT SURFACE TEXTURE ① botryoidal (on broken crust fragments); patina (on limestone) ② smooth ③ granular

SUBSTRATE LITHOLOGY 1) limestone, foraminiferal >>>
2) limestone, reef ?
3) greenish brown coarse sandstone to breccia ?
4) mudstone

2 subgroups A) tan coarse-grained foram ls
B) white fine-grained foram limestone

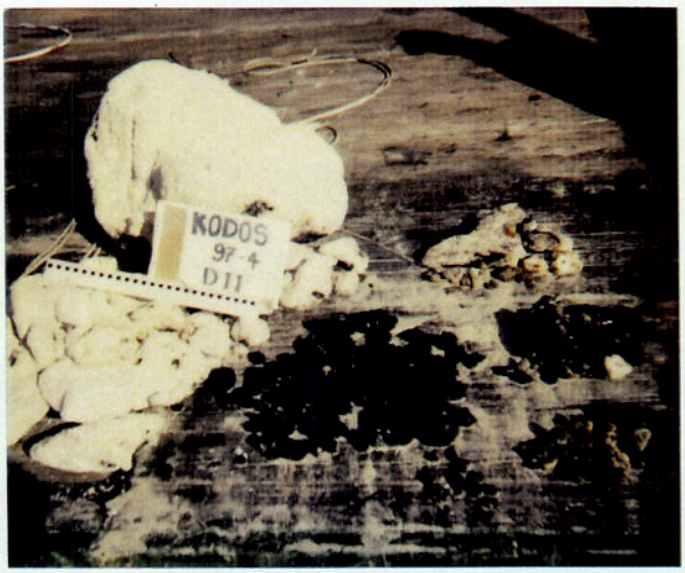
D11

NODULES PRESENT 2

REMARKS:

One big manganese limestone with minor patches (≤10 cm²) of Fe-Mn oxyhydroxide patina.

crust fragments probably detached from limestone



KODOS 97-4
D11

Dredge Sample Summary Sheet

Sample ID	Bulk CC	Layer CC	Pt & Au	~~[illegible]~~ CFA Chem	CC	DPTS/TS	XRD	35mm Photo	Archive	Paleo
D11-1A	X				~~[illegible]~~		✓			
D11-2A	X				~~[illegible]~~		✓			
D11-8A				X	X		X			
D11-10-1A							X			
D11-11A							X			
D11-14A							X			
D11-16-1A							X			
D11-16-2A							X			
D11-16-3A							X			
D11-16-4A							X			
D11-17-1A							X			
D11-17-1B							X			
D11-19-A							X			X
D11-20A							X			X

SAMPLE DESCRIPTION

Cruse Id: KODOS97-4 Size(cm): 29 × 20 × 3 Location: Lomilik

mple Id: D11-1 Weight(kg): 1.79 Depth(m): 2160-1850

Mn Crust Description

Surface Texture: Botryoidal
— granular on botryoid edges; smooth on tops of botryoids

30??

Mn Crust Thickness(mm):

30??

Min: 12.1 Max: 13.4 Ave: 13.0

Outer to Inner Layers(mm)

	Min	Max	Ave	Texture & Color
1	12.1	13.4	13.0	Columnar, black w/
2				Fe-oxide stain
3				
4				
5				
6				

D11-1

Comments and XRD Mineralogy:

Dense columnar Fe-Mn crust with Fe-oxide staining on margins of columns. Elongate vugs at base of columns filled w/pelagic ooze. (Vugs ave 2×8 mm)

Substrate Description

RockType: ϕ

Description:

Biology: ϕ

Analyses

Subsample No.	Analysis	Layer Thick.	Wt.(g)
D11-1 A	CC bulk	0-13	25g

50% USGS
50% KORDI

0-30?
pel size

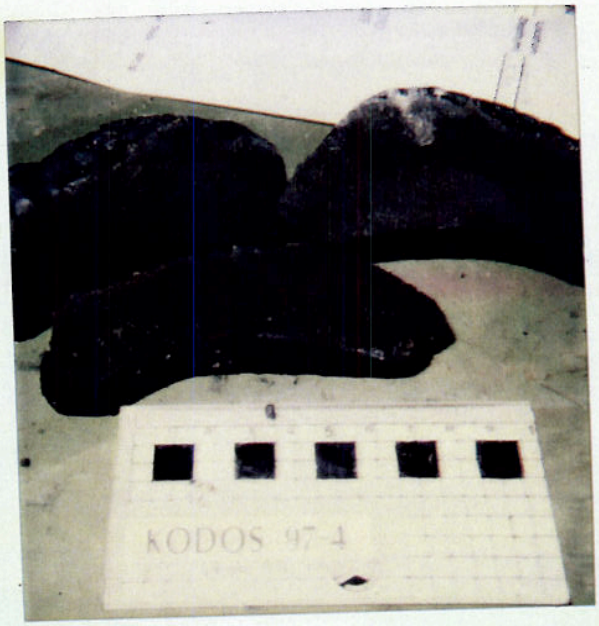
Described by: Laura B.

Subsampled by: S. Zielinski

SAMPLE DESCRIPTION

Cruse Id: KODOS97-4 Size(cm): 8.5x10x3.0 Location: Lomilik

ample Id: D11-2 Weight(kg): 0.35 Depth(m): 2160 - 1850



D11-2

Mn Crust Description

Surface Texture: subdued botryoidal & smooth

Mn Crust Thickness(mm):

Min: 27 Max: 34 Ave: 30

Outer to Inner Layers(mm)

	Min	Max	Ave	Texture & Color
1	27	34	30	dense Fe-stained
2				Columnar
3				
4				
5				
6				

Comments and XRD Mineralogy:

it appears as if this crust has started eroding (tops of botryoids are flaking off)

Substrate Description

RockType: no substrate

Description:

Biology:

Described by:

S Zielinski

Analyses

Subsample No.	Analysis	Layer Thick.	Wt.(g)
D11-2A	CC	0-30mm	60g

50% KORDI

50% USGS

Subsampled by:

Hein

SAMPLE DESCRIPTION

Cruse Id: KODOS97-4 Size(cm): 6.5×4.5×4.5 Location: Lomilik

Sample Id: D11-3 Weight(kg): 0.13 Depth(m): 2160-1850

D11-3

Mn Crust Description

Surface Texture: smooth & modified botryoidal

Mn Crust Thickness(mm):

Min: 50+ Max: 55+ Ave: 52

Outer to Inner Layers(mm)

	Min	Max	Ave	Texture & Color
1	4	10	9	massive Fe-stained
2			3	Black Asicular
3			30	Porous, Fe-stained
4			10	Dense, massive, Black
5				
6				

Comments and XRD Mineralogy:

Analyses

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

Substrate Description

RockType: no Substrate

Description:

Biology:

Described by: S. Zielinski

Subsampled by:

SAMPLE DESCRIPTION

Cruse Id: KODOS97-4 Size(cm): 11 x 6 5 x 3 ~5 x 4 x 2 Location: Louisville

Sample Id: D11-4 Weight(kg): 0.72 Depth(m): 2160 - 1950

6 Pebbles + Cobbles

Mn Crust Description

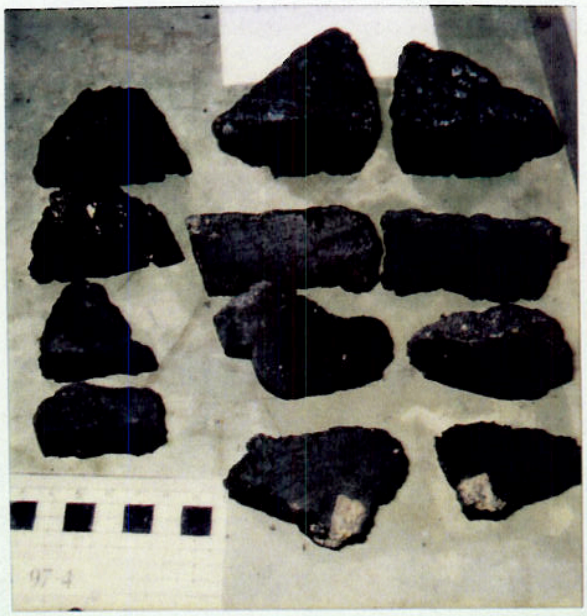
Surface Texture: modified botryoidal, granular, smooth

Mn Crust Thickness(mm):

Min: 7 Max: 22 Ave: 12

Outer to Inner Layers(mm)

	Min	Max	Ave	Texture & Color
1	5	20	15	massive, black
2	2	12	7	Porous, Fe-Stained
3				
4				
5				
6				



D11-4

Comments and XRD Mineralogy:

6 cobbles

one has current modified botryoidal or granular over growths

one has radial growths

Substrate Description

RockType: Substrate in only one - breccia?

Description:

Biology:

Described by: J. Hein

Analyses

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

½ FORDJ

½ USGS

Subsampled by:

SAMPLE DESCRIPTION

Range 2.5x2.3x1.5 → 11x7.5x2

Cruse Id: KODOS97-4 **Size(cm):** mode 5x5x2 **Location:** Lomilik

mple Id: D11-5 **Weight(kg):** 0.85 **Depth(m):** 2160-1850

12 Uncut
1 Cut

D11-5

Mn Crust Description

Surface Texture: Modified Botryoidal
lg vugs w/ granular Texture

Mn Crust Thickness(mm):

Min: 21 Max: 28 Ave: 24

Outer to Inner Layers(mm)

	Min	Max	Ave	Texture & Color
1	21	28	24	dense Columnar, black
2				w/ local Fe stain
3				
4				
5				
6				

Comments and XRD Mineralogy:

Fe stain between columns; Fenestrate
voids between columns contain local
granular Texture

Substrate Description

RockType: NONE

Description:

ology: Encrusting [illegible]

Described by: Laura B

Analyses

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

Subsampled by:

SAMPLE DESCRIPTION

~40 pebbles (one cut)

Cruse Id: KODOS97-4 Size(cm): range = 6.5×4×2 → 1cm³ mode: 2.5×2.5×1.5 Location: Lomilik

Sample Id: D11-6 Weight(kg): 1.6 Depth(m): 2160-1850

Mn Crust Description

Surface Texture: granular >>> microbotryoidal >> smooth

Mostly side pieces -

Mn Crust Thickness(mm):

Min: 13 Max: 23 Ave: 18

from one cut rock

Outer to Inner Layers(mm)

	Min	Max	Ave	Texture & Color
1	13	23	18	massive; black w/local Fe stain
2				
3				
4				
5				
6				

Comments and XRD Mineralogy:

massive black crust w/minor Fe-oxide in local vertical voids w/in crust; side + Layer 3 & layers 1+2 - all fragments

Substrate Description

RockType: ϕ (minor substrate in some samples - not described because rx not cut).

Description: ϕ

Biology: ϕ

Described by: Laura B.

Analyses

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

Subsampled by:

SAMPLE DESCRIPTION

Cruse Id: KODOS97-4 Size(cm): 7.5x6.5x5 6x4.5x3 Location: Lomilik

mple Id: D11-7 Weight(kg): 0.60 Depth(m): 2160 - 1850

3 Nodule

D11-7

Mn Crust Description

Surface Texture: very subdued botryoidal & smooth, some granular

Mn Crust Thickness(mm):

Min: 2 Max: 35 Ave: 20

Outer to Inner Layers(mm)

	Min	Max	Ave	Texture & Color
1	2	13	10	radial Fe-stained
2	2	22	15	radial Fe-stained
3				
4				
5				
6				

Comments and XRD Mineralogy:

5 nodules

Substrate Description

RockType: sandstone
phosphatized mudstone

Description:
coarse sandstone, subangular, iron-stained
grey to tan phosphatized mudstone

Biology:

Described by:
S. Zielinski

Analyses

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

Subsampled by:

SAMPLE DESCRIPTION

Cruse Id: KODOS97-4 Size(cm): 12x6x4 Location: Lomilik

Sample Id: D11-8 Weight(kg): 0.34 Depth(m): 260-165?

Mn Crust Description

Surface Texture: 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				

D11-8

Comments and XRD Mineralogy:

Dendrites

Analyses

Subsample No.	Analysis	Layer Thick.	Wt.(g)
D11-8A	OC, XRD		
	USGS	60%	
	FODIT	40%	

Substrate Description

RockType: Phosphatized (?) Mudstone

Description: very fine-grained to
Small iron dendrites

Lenses of softer carbonate (?) that gives
Rx bedding

Biology:

Described by: S. Fielinski

Subsampled by: Heir

SAMPLE DESCRIPTION

Cruse Id: KODOS97-4 Size(cm): 5x3x2.5 3x2.5x1.5 Location: Comilik

ımple Id: D11-9 Weight(kg): 0.18 Depth(m): 2160 - 1850

D11-9

Mn Crust Description

Surface Texture: botryoidal, granular

Mn Crust Thickness(mm):

Min: 4 Max: 25 Ave: 20

Outer to Inner Layers(mm)

	Min	Max	Ave	Texture & Color
1	4	25	20	massive, black
2				
3				
4				
5				
6				

Comments and XRD Mineralogy:

Substrate Description

RockType: breccia / Sandstone Volcaniclastic

Description: green & tan breccia clasts 1-3mm, some rimmed w/ Mn cement; smectite matrix

ology:

Described by: S. Zielinski

Analyses

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

100% MORDI

Subsampled by:

SAMPLE DESCRIPTION

Cruse Id: KODOS97-4 Size(cm): 13x9x7 5x5x3 Location: Lomilik

ımple Id: D11-10 Weight(kg): 2.47 Depth(m): 2160-1850

7 cobbles

Mn Crust Description

Surface Texture: current polished, smooth, botryoidal, granular

Mn Crust Thickness(mm):

Min: pat. Max: 2 Ave: 1

Outer to Inner Layers(mm)

	Min	Max	Ave	Texture & Color
1	pat	2	1	massive, black
2				
3				
4				
5				
6				

D11-10

Comments and XRD Mineralogy:

Analyses

Subsample No.	Analysis	Layer Thick.	Wt.(g)
D11-10-1A	XRD		

50% USGS
50% HORDI

Substrate Description

RockType: breccia, pebbly sandstone, Sandstone

Volcaniclastic

Greenish-gray

Description: Interbedded SS-breccia-pebbly SS

7 pebbles & cobbles

greenish breccia

clasts 1mm to 14 mm

highly altered vesicular basalt, mudstone,

clasts altered to clays

Unknown cement + mineral Mn cement

~~alogy~~ ↳ likely smectite matrix

Peppered w/ Mn oxides

Matrix supported

Described by:

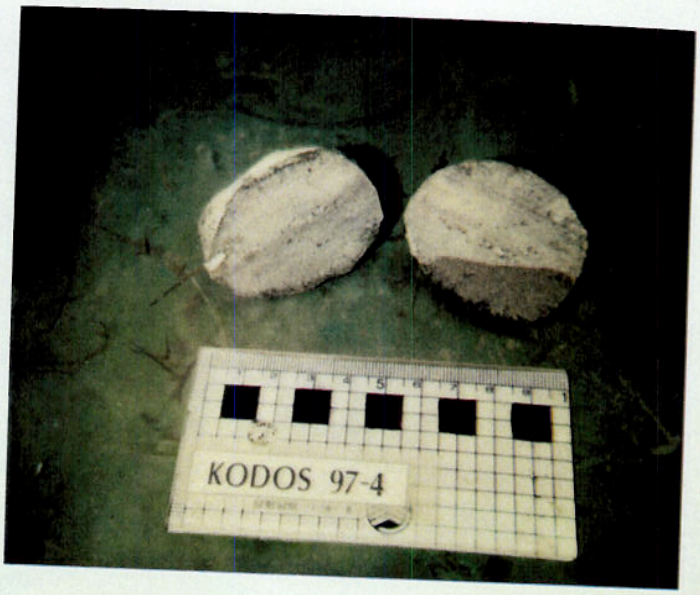
S. Zielinski

Subsampled by:

SAMPLE DESCRIPTION

Cruse Id: KODOS97-4 Size(cm): 5.5 x 5 x 4 Location: Lomilik

Sample Id: D11-11 Weight(kg): 0.14 Depth(m): 2160 - 1850



D11-11

Mn Crust Description

Surface Texture: very patchy
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				

Comments and XRD Mineralogy:

Analyses

Subsample No.	Analysis	Layer Thick.	Wt.(g)
D11-11A	XRD		
50%	HORDI		
50%	USGS		

Substrate Description

RockType: phosphatized sandstone?

Description: green sandstone, minor Mn content
pink / beige foraminiferal sand on outside (lithified) of part

ology:

Described by: S. Zielinski

Subsampled by: B. Zielinski

SAMPLE DESCRIPTION

Cruse Id: KODOS97-4 Size(cm): 6x4x2.5 2x2x1.5 Location: Lomilik

ample Id: D11-12 Weight(kg): 0.35 Depth(m): 2160-1850

Mn Crust Description

Surface Texture: patina, current polished.

Mn Crust Thickness(mm):

Min: patina Max: 2 mm Ave: 1

Outer to Inner Layers(mm)

	Min	Max	Ave	Texture & Color
1	pat	2	1	massive, black
2				
3				
4				
5				
6				

D11-12

Comments and XRD Mineralogy:

Analyses

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

Substrate Description

RockType: breccia & sandstone
pebbly Sandstone
Volcaniclastic

Description: 17 pebbles
clasts 1 - 14mm
mudstone

Cement Unknown minor Mn cement

ology:

Described by: S. Zielinski

Subsampled by:

SAMPLE DESCRIPTION

Cruse Id: KODOS97-4 Size(cm): 7x5x4 4.5x4x2 Location: Lomilik

mple Id: D11-13 Weight(kg): 0.52 Depth(m): 2160 - 1850

Mn Crust Description

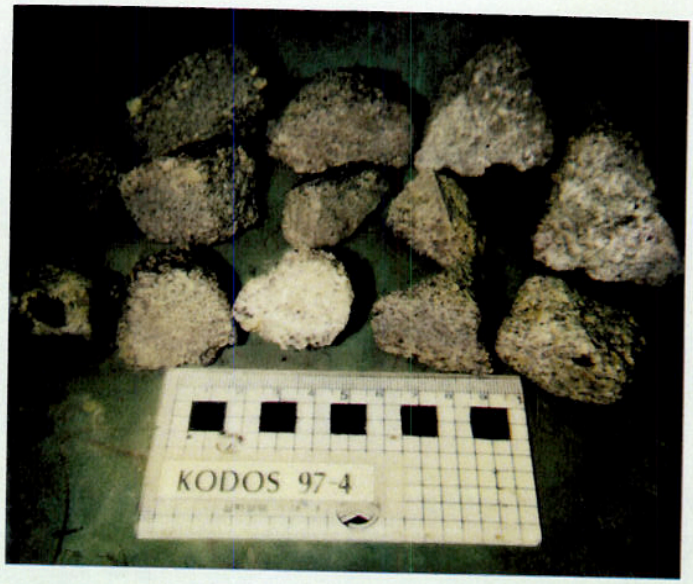
Surface Texture: granular, current polished, patina

Mn Crust Thickness(mm):

Min: patina Max: 2 Ave: patina

Outer to Inner Layers(mm)

	Min	Max	Ave	Texture & Color
1	pat.	2	pat	black massive
2				
3				
4				
5				
6				



D11-13

Comments and XRD Mineralogy:

Analyses

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

100% HORDI

Substrate Description

RockType: breccia IBW Sandstone
7 pebbles
Volcaniclastic

Description: greenish gray breccia
clasts 1 - 4 mm
Smectite mudstone matrix

Smectite matrix, some grains coated w/ Mn cement

ology:

Described by:

J. Zielinski

Subsampled by:

SAMPLE DESCRIPTION

Cruse Id: KODOS97-4 Size(cm): 7.5x6x4 4.5x3x1 Location: Low Pik

Sample Id: D11-14 Weight(kg): 0.38 Depth(m): 2160 - 1850

Mn Crust Description

Surface Texture: patina

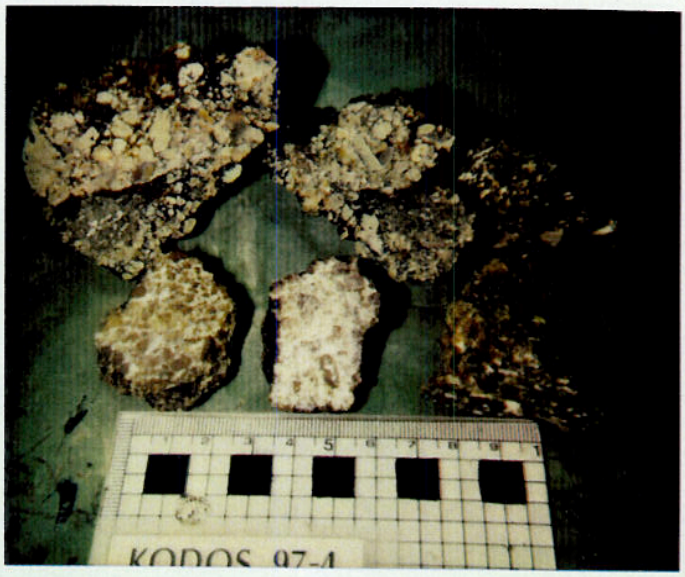
Mn Crust Thickness(mm):

Min: _____ Max: _____ Ave: _____

patina

Outer to Inner Layers(mm)

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



D11-14

Comments and XRD Mineralogy:

Analyses

Subsample No.	Analysis	Layer Thick.	Wt.(g)
D11-14A	XRD		

Substrate Description

RockType: breccia, red & green
3 pebbles

50% NORDI
50% USGS

Description: clasts 1mm to 24 mm of phosphorite, mudstone, highly altered vesicular basalt, reddish sandstone
buff cement (CFA)
grains rimmed w/ Manganese cement

ology:

Described by: S Zielinski

Subsampled by: Hein

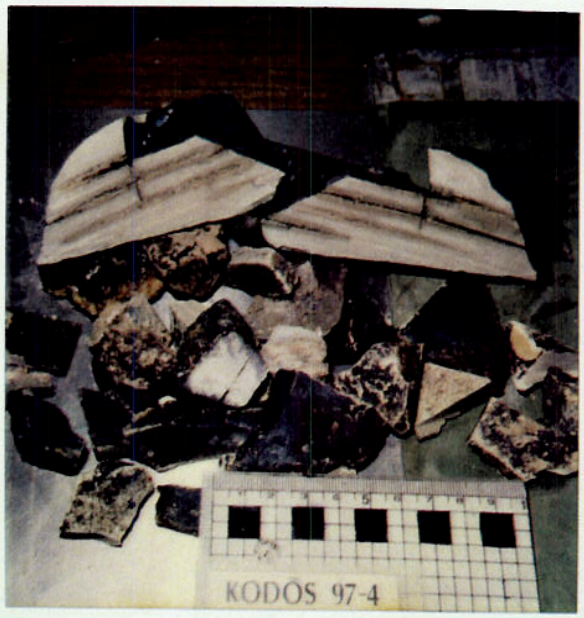
24 pebbles (uncut)

SAMPLE DESCRIPTION

cobble: 23×23×4.2

Cruse Id: KODOS97-4 **Size(cm):** mean pebble: 2.8×2.3×2.0 **Location:** Lomilik

ımple Id: D11-15 **Weight(kg):** 0.9 **Depth(m):** 2160-1850



D11-15

Mn Crust Description

Surface Texture: patina

Mn Crust Thickness(mm):

Min: ϕ Max: patina Ave: patina

Outer to Inner Layers(mm)

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

Comments and XRD Mineralogy:

no crust

Analyses

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

100% HORDP

Substrate Description

RockType: Laminated carbonate?mudstone

Description: Aphanitic carbonate?mudstone with regularly spaced, parrallel lamina (2mm thick) of foraminiferal sandstone. Sandstone laminae are locally bounded by minor disseminated to dendritic Fe-Mn oxyhydroxides. Rock is beige in color. Mudstone layers typically 5 mm thick.

Hand - Maybe CFA Cement

ology: possible minor encrusting forams

Described by:

Laura B.

Subsampled by:

SAMPLE DESCRIPTION

Cruse Id: KODOS97-4 Size(cm): range: 4×2×1 → 9×6×3 mode: 5×5×0.8 Location: Lombok

Sample Id: D11-16 Weight(kg): 0.85 Depth(m): 2160-1850

Mn Crust Description

Surface Texture: patina to unknown (upper crust surface broken from crust)

Mn Crust Thickness(mm):

Min: _____ Max: _____ Ave: patina

Outer to Inner Layers(mm)

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

Comments and XRD Mineralogy:

patina, granular in local large voids.

Substrate Description

RockType: Phosphorite

Description: Various Phosphorites (foraminiferal sandstone & mudstone protolith)

ology:

Described by: Laura B

Analyses

Subsample No.	Analysis	Layer Thick.	Wt.(g)
D11-16-1A	XRD	yellow phosphatic cement	
D11-16-2A	XRD	brown CFA?	
D11-16-3A	XRD	light CFA	
D11-16-3B	XRD	dark CFA	

50% HORD7

50% USGS

Subsampled by: Laura B.

SAMPLE DESCRIPTION

range: 8×6×5 → 3.5×3.5×3.0

Cruse Id: KODOS97-4 Size(cm): mean: 5×4×1.5 Location: Lomilik

Sample Id: D11-17 Weight(kg): 0.35 Depth(m): 2160-1850

Mn Crust Description

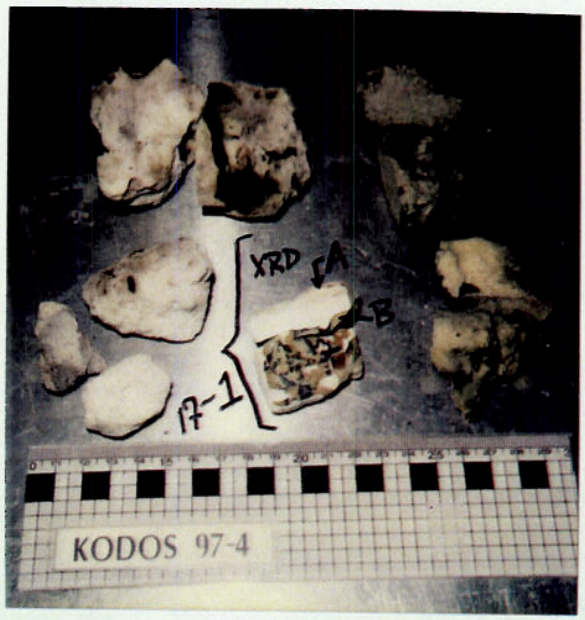
Surface Texture: Local patina w/minor granular Fe-Mn

Mn Crust Thickness(mm):

Min: _____ Max: _____ Ave: patina

Outer to Inner Layers(mm)

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



D11-17

Comments and XRD Mineralogy:

One cobble has minor granular Fe-Mn oxide in burrows on sample surface

Substrate Description

RockType: Foraminiferal limestone

Description: White to green moderately consolidated foraminiferal sandstone with abundant disseminated Fe-Mn oxide in darker samples. One sample (chosen for XRD) is fine grained white carbonate mudstone with underlying, burrowed green-Fe oxide stained mudstone w/common Fe-Mn oxide along fractures.

ology:

Common burrows, traces

Described by: Laura B.

Analyses

Subsample No.	Analysis	Layer Thick.	Wt.(g)
D11-17-1A	XRD	of white very fine grained carbonate substrate	
D11-17-1B	XRD	fine grained green mudstone w/in the same rock	

50% USGS
50% TOEDT

Subsampled by:

D11-17

SAMPLE DESCRIPTION

pebbles ave: 6 x 4 x 2 range 7 x 6 x 3 → 2^3 also 1) 15 x 11 x 5 2) 20 x 16 x 8

5 species

Cruse Id: KODOS97-4 Size(cm): Location: Lamilik

Sample Id: D11-18 Weight(kg): 4.3 Depth(m): 2100-1850

Mn Crust Description

Surface Texture: granular, patina

Mn Crust Thickness(mm):

Min: patina Max: 8 Ave: 5

Outer to Inner Layers(mm)

	Min	Max	Ave	Texture & Color
~~1~~	8	8	8	massive, black
~~2~~	2	2	2	massive, black
~~3~~			patina	massive, black
4				
5				
6				

rock 1
rock 2
rock 3

KODOS 97-4
D11-18

Comments and XRD Mineralogy:

three samples have "crusts"
1) moderately thin (8mm) crust is missing surface layer
2) granular over modified (abraded) botryoidal
3) patina

Analyses

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

70% HORD I
30% USGS

Substrate Description

RockType: Well lithified foraminiferal/hash limestone

Description: Well lithified bioclastic grainstone with common green peloids, microcrystalline white carbonate? and minor angular volcanic clasts.
Common Fe-oxide surface stain
Mn oxide stain in much of Rx -
minor Red volcanic Rock fragments

ology:

Described by: Laura B

Subsampled by:

SAMPLE DESCRIPTION

Cruse Id: KODOS97-4 Size(cm): >1m x 1m x 1m Location: Lomilik

Sample Id: D11-19 Weight(kg): > 125 kg Depth(m): 2160-1850

most Thrown overboard ~ 20 kg kept

Mn Crust Description

Surface Texture: Smooth Patina In Vugs

Mn Crust Thickness(mm):

Min: _____ Max: _____ Ave: _____

PHOTO PASTE

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)
D11-19A	XRD		

80% KORDI

20% USGS

Substrate Description

RockType: Foraminiferal Limestone — Carbonate Sandstone

Description: Pale Brown, V. Poorly Consolidated, Coarse-grained Foraminiferal Sandstone
Lightly peppered w/ Mn oxides
Mostly white pelagic forams, but Color comes from scattered brown forams

sample for paleo

Biology: NONE

Described by:

Subsampled by:

SAMPLE DESCRIPTION

Cruse Id: KODOS97-4 **Size(cm):** Part of D11-19 **Location:** Lomilik
Sample Id: D11-20 **Weight(kg):** >125 kg w/ D11-19 **Depth(m):** 2160-1850
about 15 kg kept

Mn Crust Description

Surface Texture: Smooth patina in Vugs

Mn Crust Thickness(mm):

Min: _____ Max: _____ Ave: _____

PHOTO PASTE

Outer to Inner Layers(mm)

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

Comments and XRD Mineralogy:

Substrate Description

RockType: Foramiferal Limestone - Carbonate Sandstone

Description: Off white, Poorly consolidated fine-grained, lightly peppered w/ Mn oxides. Mostly small white forams

Mineralogy:

Described by:

Analyses

Subsample No.	Analysis	Layer Thick.	Wt.(g)
D11-20A	XRD		

75% HORDI
25% USGS

Sample for polish

Subsampled by:

DREDGE OPERATIONS LOG

			JD	LOCAL
CRUISE	KODOS97-4	DATE	244	9-2-97
STATION	St. 18	CHIEF SCIENTIST	HEIN/MOON	
DREDGE NO.	D11	TECH ON WATCH	Bok - Mun Kim	
DEPTH INTERVAL(m)	2166 – 1860 2160 – 1850			

ON STATION	DREDGE ON BOTTOM	DREDGE OFF BOTTOM	OFF STATION
17:17	17:59		
11° 36. 217	11° 36. 741		
161° 37. 279	161° 37. 468		
2295	2166		

Site Description and Target:

dredging from 2100 to 1500

2141

Operation*	GMT	Depth(m)	Wire Out(m)	Tension	HDG/SPD	Comments
on bottom	17:59	2166	2315	1.0	58.2/0.8	11° 36. 441, 161° 37. 468
wire out	18:04	[redacted]	2600	1.1	61.6/1.0	11° 36. 843, 161° 37. 502
starting to dredge at	"	"	"	"	"	"
dredging	18:10	2125	2622	1.1	39.3/0.2	11° 36 908, 161° 37. 493
"	18:20	2088	2670	1.2	69.8/0.4	11° 37. 050, 161° 37. 499
small bite	18:28	2071	2664	1.8, 1.9	82.2/0.9	11° 37. 266, 161° 37. 516
"	18:30	2064	2656	2.0, 2.1, 2.2	18.8/0.5	11° 37. 156, 161° 37. 544
good bite	18:33	2059	2647	2.4, 2.6	83.6/0.8	11° 37. 202, 161° 37. 324
good bite	18:36	2048	2631	2.7, 2.8, 3.2, 3.3	68.7/0.5	11° 37. 224, 161° 37. 366
"	"	"	"	"	"	"
small bite	18:43	2024	2608	2.0	76.8/0.6	11° 37. 287, 161° 37. 582
"	18:49	2003	2592	2.0	65.0/1.0	11° 37. 370, 161° 37. 624
good bite	18:50	2002	2589	2.3, 2.7	61.8/0.8	11° 37. 387, 161° 37. 619
big bite	18:51	2000	2586	3.1, 3.4, 3.5	"	11° 37. 397, 161° 37. 610

*on/off bottom, bites, etc.

3.9

Other Comments:

2/3

DREDGE OPERATIONS LOG

			JD	LOCAL
CRUISE	KODOS97-4	DATE	244	9-2-97
STATION	St. 18	CHIEF SCIENTIST	Moon/Nein	
DREDGE NO.	D11	TECH ON WATCH	Bok-Ham Kim	
DEPTH INTERVAL(m)				

ON STATION	DREDGE ON BOTTOM	DREDGE OFF BOTTOM	OFF STATION

Site Description and Target:

Operation*	GMT	Depth(m)	Wire Out(m)	Tension	HDG/SPD	Comments
good bite	18:52	1987	2579	3.2	62.5/0.4	11° 37.404, 161° 37.622
small bite	19:00	1941	2555	1.9	62.5/1.0	11° 37.520, 161° 37.685
"	19:04	1916	2532	1.8	1.8/0.6	11. 37.563, 161° 37.653
good bite	19:05	"	2534	2.8 2.7	1.6/0.6	11° 37.579 161 37 639
small bite	19:08	1904	2524	1.8	6.0/0.6	11° 37.640, 161.37.559
"	19:11	1894	2516	1.9	29.7/0.7	11° 37.751 161° 37.511
big bit	19:15	1868	2508	2.7 2.8	36.3/0.8	11° 37.797, 161° 37.507
				3.0, 3.4		
big bite	19:17	1858	2500	3.4 ~ 4.7	12.6/0.6	11° 37.833, 161° 37.479
	19:24	1767		2.6		11° 38.019 / 161° 37.42[illegible]
Big bite 시간	19:25	"		3.4 3.6	3.9, 4.0 13.6/0.7	"
Big bite	"	1775	2393	~~4.7~~ 4.5 4.9		"
	19:33		2393	4.0, 4.1	349.8/0.9	11° 37.911 / 161 37.346
	19:48	1902	2252	3.5, 3.6	303.4/1.2	11° 37.732 / 161° 37.4[illegible]

*on/off bottom, bites, etc.

Other Comments: not broken

DREDGE OPERATIONS LOG

			JD	LOCAL
CRUISE	KODOS97-4	DATE	244	9-2-97
STATION	St. 18	CHIEF SCIENTIST	Moon / Hein	
DREDGE NO.	D11	TECH ON WATCH		
DEPTH INTERVAL(m)				

ON STATION	DREDGE ON BOTTOM	DREDGE OFF BOTTOM	OFF STATION
		19:58	20:42
		11°37.72'	11°37.86
		161° 37.20	161° 36.77
		1888	1871

Site Description and Target:

Operation*	GMT	Depth(m)	Wire Out(m)	Tension	HDG/SPD	Comments
	19:53	1906	2095	1.5, 1.2	229.1 / 1.5	11°37.69 / 161.37.3[illegible]
off Bottom	19:58	1888	1860	1.7	315.7 / 0.9	11°37.72 / 161.37.2[illegible]
off Station	20:42	1871		0.4, 0.6	294 / 0.7	11°37.86 / 161°36.77

*on/off bottom, bites, etc.

Other Comments: