USGS DREDGE OPERATIONS LOG

JD LOCAL

CRUISE KODOS 98-3 DATE 239 8/27/98

STATION _____ CHIEF SCIENTIST Lee, KY

DREDGE NO. D9 (Page #1) TECH ON WATCH _____

DEPTH INTERVAL (m): on-off bottom 2676 - 2223 corrected 2650 - 2450

	ON STATION	DREDGE ON BOTTOM	DREDGE OFF BOTTOM	OFF STATION
GMT	20:06:31	20:56:13	00:32.28	01:16:58.08
latitude	08° 5°. 364	08° 50.182 N	08° 48.319	8° 48.210' N
longitude	137° 35.108	137° 35.071 E	137° 35.096	137° 35.470' E
water depth	2582	2,676 m	2,223	2100

Site Description and Target: Yap Arc. ~~Nugut~~

Operation*	GMT	Depth (m)	Wire Out (m)	Tension	HDG/SPD	Comments
wire out	~~21:03:43~~	~~2666~~	3,200	1.4	190.9 / 0.7	
small bite	21:08:43	2620	3188	1.6 ~ 1.8	169.2 / 0.7	
no bite	21:16:13	2636	3171	1.7 ~ 1.8	179.2 / 0.7	8° 47.878 / 137° 35.100
small bite	21:25:43	2640	3167	1.8	195.1 / 0.6	8° 49.725 / ~~137~~ 137° 35.09
bite	21:29:43	2620	3167	2.~~1~~ ~ 1.9	184.9 / 0.7	
bite	21:30:00		3167	2.4 ~ 2.3		
no bite	21:34:58	2626	3166	1.6 ~ 1.9	187.2 / 1.3	08° 49.602 / 137° 35.100
no bite	21:39:28	2588	3166	1.6 ~ 1.5	180.0 / 1.1	49.496 / 35.090
bite	21:40:50	2,588	3165	2.0 ~ 1.7	184.8 / 0.9	
bite	21:43:50	2491	3165	1.9 ~ 1.8	181 / 0.8	
bite	21:53:50	2454	3164	1.8 ~ 1.7	184.1 / 0.9	
bite	22:01:43	2346	3164	1.8 ~ 1.7	181.1 / 0.7	8° 48.923 / 137° 35.045
no bite	22:12:28	2258	3164	1.5	184.9 / 0.7	08° 48.845 / 137° 35.0[illegible]
no bite	22:22:28	2217	3163	1.7 ~ 1.5	168.0 / 0.7	08° 48.723 / 137° 35.003

*on/off bottom, bites, etc.

Other Comments:

D9

USGS DREDGE OPERATIONS LOG

JD LOCAL

CRUISE KODOS 98-3 DATE 239 8/27/98

STATION _____ CHIEF SCIENTIST Lee KY

DREDGE NO. D9 (Page #2) TECH ON WATCH _____

on-off bottom

DEPTH INTERVAL (m) _____

	ON STATION	DREDGE ON BOTTOM	DREDGE OFF BOTTOM	OFF STATION
GMT				
latitude				
longitude				
water depth				

Site Description and Target: _____

Operation*	GMT	Depth (m)	Wire Out (m)	Tension	HDG/SPD	Comments
Big bite	22:24:43	2222	3163	3.2 ~ 3.8	175.4 / 0.3	08°48.686 / 137.°34.9
"	22:26:28	2232	3162	2.9 ~ 3.8	179.9 / 0.1	8°48.663 / 137°34.98
Broken	22:30:28	2220	3157	4.0 ~ 5.0	164.3 / 0.3	
Big bite	22:31:50	2212	3156	3.9 ~ 4.8	170.7 / 0.2	8°48.644 / 137°34.97
"	22:35:43	2215	3146	~ 5.0	167.3 / 0.2	
Broken	22:41:13	2221	3150	1.8	189.5 / 1.2	8°48.644 / 137.34.9
no bite	23:03:43	2156	2945	1.8 ~ 1.9	144.1 / 0.9	8°48.337 / 137°34.94
small bite	23:15:58	2116	2934	1.9	160.7 / 0.9	
no bite	23:25:13	2101	2925	1.7 ~ 1.8	174.2 / 1.0	
small bite	23:31:43	2096	2925	2.1 ~ 1.9	197 / 0.8	08°47.914 / 137° 35.052
"	23:33:58	2096	2926	to ~ 2.2, 2.4	185.1 / 0.6	08°41.893 / 137°35.030
				3.0, 3.2, 3.8		
Broken	23:41:28	2100	2860	0.9	179.2 / 1.2	
Bite	23:52:43	2103	2780	3.6, 3.8	195.3 / 0.2	

*on/off bottom, bites, etc.

Other Comments:

DREDGE LOG

CRUISE KODOS 98-3 DATE JD 239 LOCAL 8-27-98

STATION

DREDGE D9

	GMT	LOCAL
	on-off bottom	on-off bottom
TIME	20:56:13 - 20:32:28	05:56:13 - 09:32:28

DEPTH INTERVAL (m) on-off bottom 2676 - 2223

DEPTH (m) CORRECTED 2650 - 2450

LATITUDE on-off bottom 8° 50.182' N - 8° 48.319' N

LONGITUDE 137° 35.071' E - 137° 35.096' E

TOTAL WEIGHT: DREDGE ~~100 kg~~ 81 actual CRUST 4kg

% OF ROCK COVERED BY CRUST 60%

% BROKEN FROM: OUTCROP 90% TALUS 10%

THICKNESS OF CRUST: MAX 10 MIN 0 AVG 3mm

DOMINANT SURFACE TEXTURE ① Granular

SUBSTRATE LITHOLOGY ① ~~Pebbly~~ Muddy Limestone
② Breccia
③ Basalt
④ ?Unknowns
⑤ Pumice
⑥ Sandstones

NODULES PRESENT

REMARKS: - Tuffaceous Mudstones → unknowns? dominant w/ crust
- Basalts - most have crusts
- ~~Pebbly~~ Muddy limestone - No crust

D9 KODOS 98-3

DREDGE 9

Sample #	CC	PGE	REE	OC	CFA	PTS	Paleo	XRD
D9-3-1A						TS		
D9-3-1A				X				
3-1B				X				
3-2A								X
3-2B								X
3-2C								X
3-2D								X
3-2E								X
D9-4A				X				
D9-4A						TS		
D9-5-1A	X							
D9-6-1A	X							
D9-6-2A						TS		
D9-6-2A	~~X~~			X				
D9-6-2B								X
D9-8A						X		X
D9-8B						TS BASALT		
D9-8C								X
D9-8D								X
D9-8E								X
D9-11-1A	~~X~~			X				X
D9-14A								X

1 coated cobble (95x75x160)

SAMPLE DESCRIPTION

1 coated boulder

Cruise Id: KODOS 98-3 Size (mm): 235x130x335 Location: 8°49.25'N 137° 35.083'E

Sample Id: D9-1 Weight (kg): 6.5+1.5 (8Kg total) Depth (m): 2650 - 2450

Mn Crust Description

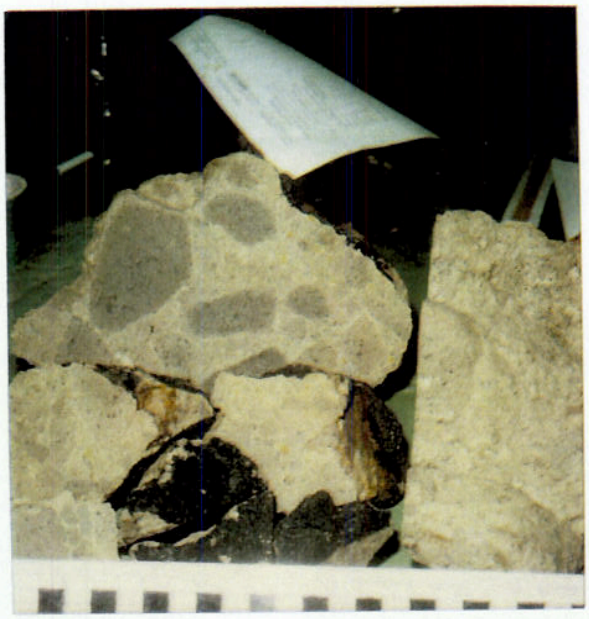
Surface Texture: Granular to microbotryoidal

Mn Crust Thickness (mm):

Min: 0 Max: 3 Ave: <1

Outer to Inner Layers (mm)

	Min	Max	Ave	Texture & Color
1				Black, very porous
2				
3				
4				
5				
6				



D9-1
Kodos 98-3

Comments and XRD Mineralogy:

Subsample No.	Analysis	Layer Thick.	Wt.(g)
	95% HORDI		
	5% USGS		

Substrate Description

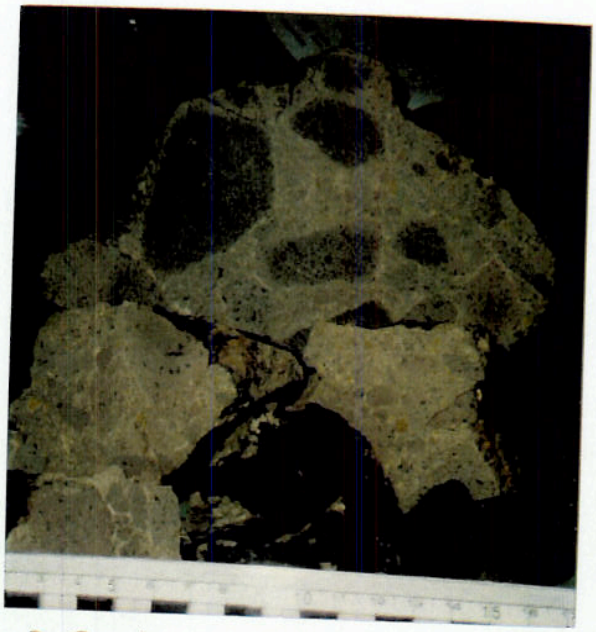
Rock Type: ~~Basalt~~ Breccia; grayish-brown

Description: Gray clasts (4-70mm) Andesite(as in D9-4); yellow-brown altered volcanic clasts, gray, & brown volcanic clasts clasts (2-6mm); clast supported; silt & clay volcaniclastic matrix

Biology (?): Planktonic Foraminifera

Described by: MBurrows

Subsampled by:



D9-1

Kodos 98-3

SAMPLE DESCRIPTION

Cruise Id: KODOS 98-3 Size (mm): 370 X 200 X 175 Location: 8°49.25'N 137°35.083'E

Sample Id: D9-2 Weight (kg): ~~370 X 200~~ 5 Depth (m): 2650 - 2450

Mn Crust Description

Surface Texture: Granular To botryoidal

Mn Crust Thickness (mm):

Min: 8 Max: 15 Ave: 10

Outer to Inner Layers (mm)

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

Comments and XRD Mineralogy:

Subsample No.	Analysis	Layer Thick.	Wt.(g)
	60% TORD		
	40% USGS		

Substrate Description

Rock Type: Tuffaceous bedded Sandstone - siltstone - mudstone

Description: brown, yellow-brown, dark brown layers deformed by soft sediment deformation + burrowing - Peppered w/ Mn oxide grains that also form laminae - graded from sand to mud; non-calcareous; clay veins; mostly

Biology (?): smectite

Described by: Heim

Subsampled by:

SAMPLE DESCRIPTION

1 boulder, 8 cobbles, 5 pebble

Cruise Id: KODOS 98-3 Size (mm): MAX 280 x 170 x 70 Location: 8°49.25'N 137° 35.083'E

Sample Id: D9-3 Weight (kg): 7.3 Depth (m): 2650-2450

Mn Crust Description

Surface Texture: granular to smooth

Mn Crust Thickness (mm):

Min: 2 Max: 9 Ave: 5

Outer to Inner Layers (mm)

	Min	Max	Ave	Texture & Color
1				massive, porous,
2				to dendritic
3				to dense
4				
5				
6				

D9-3 KODOS 98-3

Comments and XRD Mineralogy:

Substrate Description

Rock Type: Tuffaceous, bedded sandstone, siltstone, mudstone

Description: brown, black, yellow-brown, dark brown layers; some layers are graded; some rich in Mn oxide - Mn dendrites in waxy mudstone & Mn veins

Biology (?):

Analyses

Subsample No.	Analysis	Layer Thick.	Wt.(g)
D9-3-1A	XRD OC	Built	Sandy layer + TS 10.4g
1B	XRD C	Built	claystone layer 21.3g
OC = XRF-102, FeO, CO_2, H_2O^+, H_2O^-			
D9-3-2A	XRD		
2B	XRD		
2C	XRD		
2D	XRD		
2E	XRD		

99% HORDI
1% USGS

Described by: Hein

Subsampled by: Hein & Dowling

D9-3-2A

ICODOS 98-3

SAMPLE DESCRIPTION

Cruise Id: KODOS 98-3 Size (mm): 200 x 200 x 150 Location: 8° 49.25' N 137° 35.083' E

Sample Id: D9-4 Weight (kg): 5 Depth (m): 2650 – 2450

Mn Crust Description

Surface Texture: Patchy smooth patina

Mn Crust Thickness (mm):

Min: <1 Max: <1 Ave: <1

Outer to Inner Layers (mm)

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

KODOS 98-3 D9-4

Comments and XRD Mineralogy:

Substrate Description

Rock Type: Andesite

Description: Fresh, gray, massive, highly vesicular, ~~&~~ Feldspar phyric

Biology (?):

Described by: Hein

Analyses

Subsample No.	Analysis	Layer Thick.	Wt.(g)
D9-4A	Bulk OC, TS		~~22.5~~ 22.5

OC = XRF-102, FeO, CO_2, ~~P_2O_5~~, H_2O^-

80 % KORDI

20 % USGS

Subsampled by: Hein

9 Pebbles

SAMPLE DESCRIPTION

3 large Cobbles; 4 small cobbles

Cruise Id: KODOS 98-3 Size (mm): Max: 260x160x120 Location: 8°49.25'N 137°35.083'E

Sample Id: D9-5 Weight (kg): 12 Depth (m): 2650-2450

Mn Crust Description

Surface Texture: smooth, granular, botryoidal

Mn Crust Thickness (mm):

Min: 0 Max: 6 Ave: 4

Outer to Inner Layers (mm)

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

D9-5 KODOS 98-3

Comments and XRD Mineralogy:

Analyses

Subsample No.	Analysis	Layer Thick.	Wt.(g)
D9-5-1A	XRD CC Bulk Crust	0-5mm	5.0g

CC = MER, Te, H_2O^-

100% KORDT

Substrate Description

Rock Type: ~~Basaltic~~ Andesite?

Description: Gray to dark-gray, highly vesicular, feldspar phyric-like D9-4

Biology (?):

Described by: Hein

Subsampled by: Dowling

SAMPLE DESCRIPTION

2 lg. cobbles, 5 small cobbles, 1 pebble

Cruise Id: KODOS 98-3 Size (mm): MAX 210 x 150 x 90 Location: 8°49.25'N 137°35.083'E

Sample Id: D9-6 Weight (kg): 2 Depth (m): 2650-2450

Mn Crust Description

Surface Texture: Granular, modified botryoidal

Mn Crust Thickness (mm):

Min: 2 Max: 10 Ave: 6

Outer to Inner Layers (mm)

	Min	Max	Ave	Texture & Color
1				Massive, black
2				TO porous
3				
4				
5				
6				

D9-6 KODOS 98-3

Comments and XRD Mineralogy:

Substrate Description

Rock Type: ~~Basalt~~ Andesite Glass on Glassy ~~Basalt~~ Andesite

Description: Black glassy, highly vesicular ~~basalt~~ Andesite, surrounded by rim of gray altered ~~basalt~~ andesite - To clay minerals - soft both feldspar Phyric - Some zeolite(?) veins - Some w/ Limestone of outer surface

Biology (?):

Described by: Hein

Analyses

Subsample No.	Analysis	Layer Thick.	Wt.(g)
D9-6-1A	CC, XRD Bulk	0-9mm	5.1g
D9-6-2A	OC, XRD Bulk black glass + TS		37.
-2B	XRD gray rind		

CC = MER-REE, Te, H_2O^-

OC = XRF-102, FeO, CO_2, H_2O^+, H_2O^-

85% TORDI

15% 4S 6S

Subsampled by: Hein + Dowling

SAMPLE DESCRIPTION

4 Cobbles; 7 Pebbles

Cruise Id: KODOS 98-3 Size (mm): Max: 150x100x70 Location: 8049.25'N 137° 35.083'E

Sample Id: D9-7 Weight (kg): 3.9 Depth (m): 2450 - 2450

Mn Crust Description

Surface Texture: Granular, smooth, botryoidal

Mn Crust Thickness (mm):

Min: 1 Max: 8 Ave: 5

Outer to Inner Layers (mm)

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

D9-7 KODOS 98-3

Comments and XRD Mineralogy:

Analyses

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

100% WHOLE

Substrate Description

Rock Type: Breccia

Description: Black, vesicular, feldspar phyric glassy basalt (as in D9-6) & brown altered basalt clasts + other volcanic rock clasts in brown to yellow-green smectite matrix - (altered glass?); some yellow & yellow-green smectite grains;

Biology (?): also clay mineral vein (

Described by: Hein

Subsampled by:

SAMPLE DESCRIPTION

Cruise Id: KODOS 98-3 Size (mm): 150 x 100 x 80 Location: 8°49.25'N 137° 35.083'E

Sample Id: D9 - 8 Weight (kg): 1.1 Depth (m): 2405O - 2450

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 98-3 D9-8

Comments and XRD Mineralogy:

Substrate Description

Rock Type: Basalt(?) Andesite?

Description: Brown, feldspar phyric, granular basalt w/ Thick (To 20 mm) hydrofracture breccia vein w/clasts of same rock in Mn oxide; yellow-green patches of smectite in basalt & vein

Biology (?):

Analyses

Subsample No.	Analysis	Layer Thick.	Wt.(g)
D9-8A	PTS accross vein + XRD		
8B	~~XRD basalt~~ PTS Basalt		
8C	XRD yellow		
	55% HORDI		
	45% USGS		
8D	XRD Basalt		
8E	XRD Vein		

Described by: Hein

Subsampled by: Hein + Dowling

SAMPLE DESCRIPTION

Cruise Id: KODOS 98-3 Size (mm): 155 x 150 x 45 Location: 8° 49.25'N 137. 35.083'E

Sample Id: D9-19 (D9-9) Weight (kg): 0.680 Depth (m): 2650-2450

Mn Crust Description

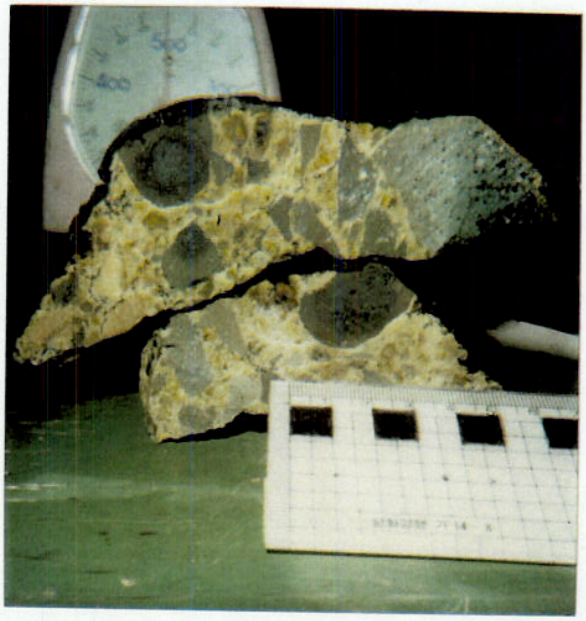
Surface Texture: Granular to Smooth

Mn Crust Thickness (mm):

Min: ~~0~~ Max: 3 Ave: 1

Outer to Inner Layers (mm)

	Min	Max	Ave	Texture & Color
1	~~0~~	3	1	Black, Asicular
2				
3				
4				
5				
6				



Comments and XRD Mineralogy:

Analyses

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

Substrate Description

Rock Type: Breccia (matrix-supported) Fe-Mn dendrites and veinlets

Description: Dark gray to Pale gray, aphyric to feldspar phyric basalt & Andesite clasts in yellow-green matrix of smectite ± zeolites(?) → cement-white veinlets; Mn veinlets & grains - also smectite clasts (altered Volcanic Rock)

Biology (?): Planktonic and Encrusting Foraminifera

Described by: M Burrows Subsampled by:

SAMPLE DESCRIPTION

Cruise Id: KODOS 98-3 Size (mm): 90 x 100 x 50 Location: 8° 49.25'N 137° 35.083'E

Sample Id: D9-10 Weight (kg): 0.320 Depth (m): 2650 - 2450

Mn Crust Description

Surface Texture: Granular to smooth to Microbotryoidal (sparse)

Mn Crust Thickness (mm):

Min: ~~0~~ Max: <1 Ave: Patina

Outer to Inner Layers (mm)

	Min	Max	Ave	Texture & Color
1	~~0~~	<1		Black
2				
3				
4				
5				
6				

D9-10 KODOS 98-3

Comments and XRD Mineralogy:

Substrate Description

Andesite glass?

Rock Type: Hyaloclastite or glassy basaltic sandstone (?)

Description: Black, 1-5mm alteration rim (orange); some vugs in //, linear alignment, clastic texture

Biology (?): Planktonic Foraminifera

Described by: M. Burrows

Analyses

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

Subsampled by:

SAMPLE DESCRIPTION

Cruise Id: KODOS 98-3 | Size (mm): 9 coated Pebbles 28-63 long | Location: 8°49.25'N 137°35.083'E

Sample Id: D9-11 | Weight (kg): 1.08 | Depth (m): 2650-2450

Mn Crust Description

Surface Texture: Smooth to Granular to microbotryoidal

Mn Crust Thickness (mm):

Min: ~~0~~ Max: 12 Ave: 1

Outer to Inner Layers (mm)

	Min	Max	Ave	Texture & Color
1	~~0~~	3	2	Black, Asiwlar
2	~~0~~	8	4	Black, Massive
3				
4				
5				
6				

D9-11
Kodos 98-11

Comments and XRD Mineralogy:

3 pebbles with sparse, incipient Fe-Mn crust have altered rims (green, ≤ 3mm)

Substrate Description

Rock Type: Volcaniclastic Sandstone

Description: Fine-to-Medium grain size, medium-to-dark gray; reddish-brown to black; finer grained = greenish (smectite) massive (no bedding planes); ~~Fe-Mn to~~ Fe-oxide cement + fine-grained volcaniclastic matrix

Biology (?): Planktonic to Encrusting Foraminifera

Described by: M Burrows

Analyses

Subsample No.	Analysis	Layer Thick.	Wt.(g)
D9-11-1A	XRD OC, XRD Bulk	Red-brown SS	5.7g

OC = XRF-102, FeO, CO_2, H_2O^+, H_2O^-

90% KORDI
10% USGS

Subsampled by: Hein

SAMPLE DESCRIPTION

8 coated Pebbles

Cruise Id: KODOS 98-3 Size (mm): 37-65 long Location: 8°49.25'N 137°35.083'E

Sample Id: D9-12 Weight (kg): .710 Depth (m): 2650-2450

Mn Crust Description

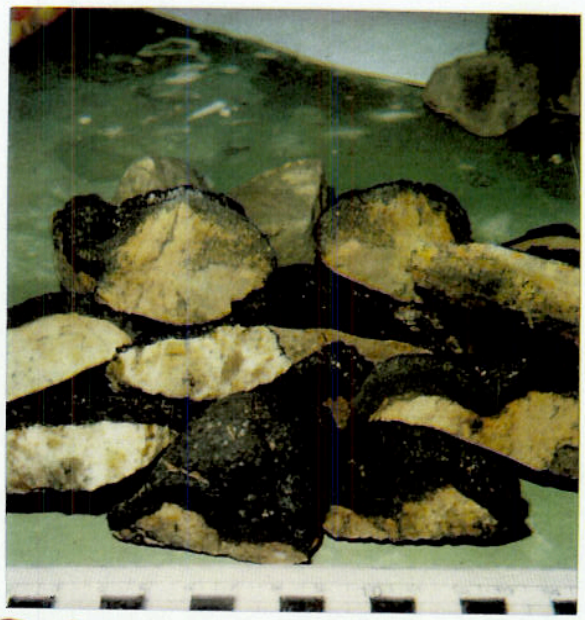
Surface Texture: Granular

Mn Crust Thickness (mm):

Min: 0 Max: 12 Ave: 5

Outer to Inner Layers (mm)

	Min	Max	Ave	Texture & Color
1	0	2	1	Black, Acicular
2	0	4	3	Black, Massive
3				
4				
5				
6				



D9-12
Kodos 98-3

Comments and XRD Mineralogy:

1 piece greenish brown, fine-grained scoria with no Fe-Mn crust

Analyses

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

Substrate Description

Rock Type: Volcaniclastic siltstone and Mudstone

Description: pale brown; vary from yellow-green, greenish, slight to ≈ completely altered (orange); Fe-Mn veinlets, dendrites and blebs; all altered To smectite

Biology (?): Planktonic and Encrusting Foraminifera

Described by: MBurrows

Subsampled by:

SAMPLE DESCRIPTION
7 pebbles, 3 cobbles, 4 boulders

Cruise Id: KODOS 98-3 Size (mm): ~~385×225×135~~ (MAX) Location: 8°49.25'N 137°35.083'E

Sample Id: D9 -13 Weight (kg): 24.25 Depth (m): 2650-2450

Mn Crust Description

Surface Texture: patchy granular to smooth patina

Mn Crust Thickness (mm):

Min: 0 Max: 1mm Ave: <1mm

Outer to Inner Layers (mm)

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

D9-13 Ruler = 200mm

KODOS 98-3

Comments and XRD Mineralogy:

Analyses

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

Substrate Description

Rock Type: Muddy Limestone micritic

Description: Pale brown-clay rich, Mn filled veinlets; foraminiferal sand layer up to 6mm underlain by extensively burrowed micritic limestone; some capped w/ off-white foram Limestone >up to 3mm underlain by sandy breccia, up to 10mm, w/ clay replaced volcanic grains; extensive fractured due to dehydration + maybe also shearing

Biology (?):

Described by: DOWLING

Subsampled by:

D9-13 KODOS 98-3

SAMPLE DESCRIPTION

Cruise Id: KODOS 98-3 Size (mm): 230×150×125 Location: 8°49.25'N 137°35.083'E

Sample Id: D9-14 Weight (kg): 4.6 Depth (m): 2650-2450

Mn Crust Description

Surface Texture: Smooth to Granular, very sparse

Mn Crust Thickness (mm):

Min: 0 Max: Patina Ave:

Outer to Inner Layers (mm)

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

D9-14
Kodos 98-3

Comments and XRD Mineralogy:

On surface: Dendritic Fe-Mn at contacts between two different types of limestone (sandy limestone and micritic limestone

Analyses

Subsample No.	Analysis	Layer Thick.	Wt.(g)
D9-14A	XRD		
	60% HORDI		
	40% USGS		

Substrate Description

Rock Type: limestone

#1) $CaCO_3$-cemented, sand-sized grains of foraminifera and rock fragments - minor layer on top

#2) Description: Micritic limestone

Bedding defined by color change from pale to medium brown & by bioturbation density; Rock is extensively burrowed

Mn veinlets oblique to & Mn dendrites eminating from vein walls & as disseminated grain; Better consolidated than other limestones

Biology (?):

Described by: M Burrows + J. Hein

Subsampled by: Dowling

D9-14

Kodos 98-3

SAMPLE DESCRIPTION

Cruise Id: KODOS 98-3 Size (mm): 63x70x35 Location: 8049.25'N 137°35.083'E

Sample Id: D9-15 Weight (kg): .065 Depth (m): 2650-2450

Mn Crust Description

Surface Texture: None

Mn Crust Thickness (mm):

Min: 0 Max: 0 Ave: 0

Outer to Inner Layers (mm)

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

D9-15
Kodos 98-3

Comments and XRD Mineralogy:

Subsample No.	Analysis	Layer Thick.	Wt.(g)
1009	CORDJ		

Substrate Description

Rock Type: Pumice

Description: gray

Biology (?):

Described by: M Burrows

Subsampled by:

SAMPLE DESCRIPTION

≈ 200 pebbles

Cruise Id: KODOS 98-3 Size (mm): ____ Location: 8° 49.25'N 137° 35.083'E

Sample Id: D9-16 Weight (kg): 5 Depth (m): 2650-2450

Mn Crust Description

Surface Texture: Smooth to Granular to Microbotryoidal

Mn Crust Thickness (mm):

Min: 0 Max: 5 Ave: ____

Outer to Inner Layers (mm)

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

Comments and XRD Mineralogy:

Substrate Description

Rock Type: various lithologies, all described elsewhere in dredge sample descriptions

Description:

Biology (?):

Described by: Malia Burrows

Analyses

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

Subsampled by: