N. Mariana Islands

IT-192-D1- Ruby Volcano -
(Begonia peak) ~ 15°36'N
145°33'E', Z = 1176-750 m
No Manganese - Minor alteration on some RXS, but mostly Fresh plag. phyric Volcanics -

Organisms: Mostly attached organisms, feather corals?; < 1-cm sized sponges, small red crabs, encrusting forams, At least 3 Types of branching encrusting organisms.

IT-192-D2- Ruby Volcano -
(Hoeler Peak) ~ 15°39'N;
145°35'E', Z = 1000-900 m
only recovered Organisms:
2 branching Black Coral
1 Stock of golden Coral.
1 worm wrapped around coral

IT-192-D3- ~~Daon Seamount (West~~
Name?- SW Guguan Ridge ~~East~~ -Z=2975 m
~17°08.8' 145°39.46'E
About 2½ to ~~3~~ 3 kg of ferromanganese coated bone fragments - rare small piece w/ possible red hydrothermal mud

nucleus. Textures are mostly microgranular porous. Some are polished probably due to current activity; several pieces have orange-brown (hydrothermal?) mud on one side = may be the dominant Type of bottom sediment - XRD on mud. Thickness is petina to up to 2 mm. Some parts where current polishing could not have taken place are also polished or very glassy - Cause unknown - Best guess is that these are hydrothermal Crusts - Encrusting Forams.

6 bags for Textural Studies
1 bag full of pieces
2 pieces To Sherm & Bob
2 pieces To Nakamura Sam
1 piece To Robyn.

D4 - Empty

TT-192-D6 - Daon Seamount Summit; 1940 m to 1650 m - Adjacent To Pagan Volcano - 17°56.2'/145°30.1'// 17°56.1'/145°29.6'

3/4 bag full ≈ 800 kg ≈ 10-15% had petina or thin < 2mm Crust of Mn which is granular + porous - Large Variety of rock Types from pumice to coarse-grained (plutonic?). Most Mn or sorphyritic, vesicular Andesite (?) - Maximum Thickness in crevices is probably 2 to 3 mm - Encrusting Forams and some encrused worm (?) tubes - Mn is probably hydrogenous.

16-cm Thick piece of stratified mud, probably altered volcanic ash - w/ one, one-cm Thick layer of coarse-grained, Mn-rich altered lapilli Tuff (?) - In plastic w/ some water -

D5 - Lots of Rks - No Mn - Lower Daon Seamount -

192-D8 - Poyo Seamount; 2225-2185 m
19°10.6'/145°31.1'// 19°10.6'/145°30.56'
D.T. Dredge

≤ 1/2 Bag of mostly ash, volcaniclastic Sandstone and breccia - Minor volcanic pebbles and one cobble - ≤ Half of the dredge is Mn-cemented volcaniclastic Sandstone + ashy debris - Total dredge 300 kg - Mn coated breccia + ash w/ polished surfaces but < 1 mm Thick. Cemented 55 TO 4 cm Thick. Three rocks (volcanic) have Mn Crusts To 4-cm Thick - One piece of apatite, (phosphonite) has a crust

To 4 cm Thick – crusts have botryoidal surface whereas SS cemented have granular porous or microbotryoidal (hydrothermal) Textures – some pure layers of hydrothermal? Mn in the cemented SS – also pods of Mn in Mudst. like in Lau Basin

Measurements of Individual Large Samples Cemented Sandstones and Breccia's

D8-1; 4 kg; 38 cm x 26 cm (average) x 3 cm Thick; At least 2 major layers – Nice Surface Texture –

D8-2; 33 cm x 15 cm x 4½ cm Thick, 5 kg – porous – 2 layers

D8-3 26 cm x 12 cm x 3½ cm Thick = beautiful granular-botryoidal Texture 2½ kg

D8-4 17 cm x 24 cm x 3 cm granular, abraisal Texture 2½ kg

D8-5 17 (average) x 24 cm x 4 cm 2½ kg – hydrothermal Bottom & mid layer

D8-6 24 x 15 average x 3 part granular part botryoidal – 2 kg

D8-7 26 x 12 x 3 cm – granular, encrusting Forams 2 kg

1 bag of small pieces = 6 kg – all went overboard = ~~7 kg~~

1 bag of large pieces = 6 kg D8-19

1 bag of medium pieces = 6 kg D8-21

1 bag of small pieces = 3 kg = over side

1 small bag of V. Thick pieces = 2 kg – D8-9

D8-8 – hydrothermal botryoidal Mn w/ phosphorite – bag of 12 pieces 1 kg.

D8-10 – 15½ x 13 x 4 cm; 1 kg granular – glassy hydrothermal layer

D8-11 triangular 16 x 12 x 12 x 2 (thick) cm 1 kg. granular & botryoidal

D8-12 semi-rectangular 14 x 10 x 1.5 cm 0.75 kg. part granular w/ smooth patches glassy = hydrothermal

D8-13 14 x 8 x 3.5 cm .9 kg granular & botryoidal trace hydro-glassy patches

D8-14 triangular 18 x 12 x 15 x 4 (thick) cm 1 kg granular

D8-15 16 x 10 x 4 cm 1.2 kg Granular w/ some bot. trace smooth

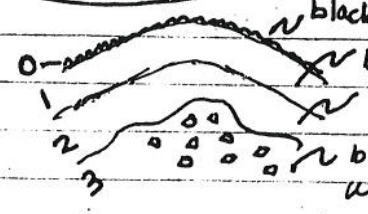
D8-16 12×10×2.5 .5kg
1 side abraded granular
other side hydrothermal bot & gran

D8-17 14×16×[2-4] cm (ranges) 1.25kg
1 side granular w/ some brown stain
other side granular
sandwiched inside is hydrothermal botryoidal (layer)

D8-18 - 1 Bag of 7 pieces w/ good + variable Textures, wrapped in paper Towels -

D8-19 One bag of Large Pieces

D8-20



3 - Vesicular andesitic basalt
(uneven) Sharp, angular boundary w/ tanphos. mud ass. w/ some vesicules
approx 9×5×20 cm

0 - black granular crust (hydrogenous?) somewhat abraded over most of the rock 0-2mm

1 - dk brown - massive Mn (host interior?) ranging in thickness from .5cm to 2.75cm with majority at 2 cm.

2 tan - phosphorite or phos. ash? mostly smooth even contact w/ Mn - covers uneven basalt surface - some basalt seems to be worked into the phos. range: 0-3.5 cm

some phos. absent Mn bas

≈ 2 kg of small Mn-ss not collected + thrown overboard.

Total ~ 60 kg flat ss Crusts and associated rocks.

D9 - ½ bag w/ much Coral, Rx, & Pumice - NO Mn

D10 - 1/5 bag - rocks + pumice - NO Mn to speak of - rare stains - DJ dredge

D9, 10, 11, all on Cheref Seamount -

D11 - ½ bag - NE part of Cheref Seamount, a parasitic knob, 1530 - 840 m; 19°27.0' N; 145°29.4' E.; dominantly vesicular Volcanic Rock, about 1/3 looks like Mn stain or crust & rounded gravel; Dense black glassy volcanic Rx w/ Mn stains - All Mn < 1 mm except in SS. Organisms: Silicosponges, Starfish, horn Coral, other coral, + unknowns - Dr Alch -

D11-1 - 2.0 kg of Mn-cemented Sandstone, similar to D8, medium-sized pieces in ~~5~~ 4 bags, moist - more coarse-grained (granule to pebble) and

more Tightly cemented Than D8 samples - Thickness to 2 cm.

D11-2, More dense variety of D11-1 w/ some massive Mn & hydrothermal botryoidal Mn - ≈ 0.75 kg, Thickness to 2.5 cm.

D12 - Dredge from inside Caldera of Mavg Volcano - ≈ 400 kg of Volcanic Talus - One moderate-sized D12-1 and one small Mn-nodule - pure Manganese - A void as a nucleus may mean it was mud or ash to washed out when Cut - several coral fragments have petina of Mn -

D12-2 - <2 mm of Mn scraped from a volcanic rock & put in a vial

D13 - ≈ 100 kg of Volcanic rocks - + 3.25 kg of small, Thin <5 mm Mn-cemented SS - + .75 kg Tossed - Total 4 kg -
Biology - 3 silicosponges, 2 Crinoids,

D14 ≈ 50 kg - Vole. Rx. mostly, few small pieces Mn-cemented SS - Not collected

D15 ≈ 200 kg volcanic Rxs, few kg of breccias with Mn stains, one partly impregnated w/ Mn - = Mn cemented breccia - 2 collected 3/4 of it - Another Breccia has a Mn Crust on Top 0.8 cm Thick and an abraided massive hydrothermal Mn layer on bottom <1 to ≈4 mm Thick; breccia between Mn layers is 2-5 cm Thick = D15-1

D16 - Turned inner bag out - recovered only 3 basalt Cobbles -

D17 - Lost bag -

D18 - Few Cobbles of volcanic Rock

D19 - mostly Basalt, pumice, and highly (hydrothermally?) altered Vole. Rx. - hydrothermal Fe? - Organisms - Large Soft Coral(?), large Tree of Branching golden Coral, 1 silico Sponge -
Few breccias that may contain some manganese ? D19 or highly altered Vole. Rx.?

D-20 - Bite at 1650m; 1735-1510m; 20° 36.4' / 144° 38.3'; NW Uracus Ridge - Plat or gentle Ridge, maybe Mn Coated

About 75 kg of altered volcanic rocks, Pumice (some w/ hydrothermal(?) Fe-veins), Couple of pumice-volcaniclastic rocks, and a Thin, small To medium sized Mn Crusts -

4/ bags crusts dry, 1 small bag of crusts in water + 0.5 kg discarded

1.75 Kg
1.75 kg
1.75 kg
1.75 kg
0.50 kg in water
7.50
.5 discarded
8-0 kg Total

Max Thickness about 0.8 cm. Crusts mostly more Mn-rich than last ones - less SS, some pieces Though one Mn-cemented pebble breccias - w/ pumice fragments & rock fragments - some pumice is Coated w/ Mn - Sampled pumice w/ Fe veins for Kostif -

D21 - about 60 kg of mostly volcanic rocks, much with flow layering, some volcanic spatter, and 7 pieces of pumice coated with brownish-black ferromanganese Crusts - Pumice preferentially supports crusts - Volc. Rxs - have < 2mm stringers of granular black Mn - much different Than the brown crusts - but no time to scrape rocks - Brown-black crusts are subtley botryoidal, porous

1.5 kg for 6 small pieces + pumice host Crusts To 1.5 cm Thick in water
2.75 kg for 1 Large piece - 23 X 23 X 7 cm w/ crust To 1.5 + Cm Thick - These are real crusts Not cemented Sandstones or breccias -

One piece given To S & B for archives -

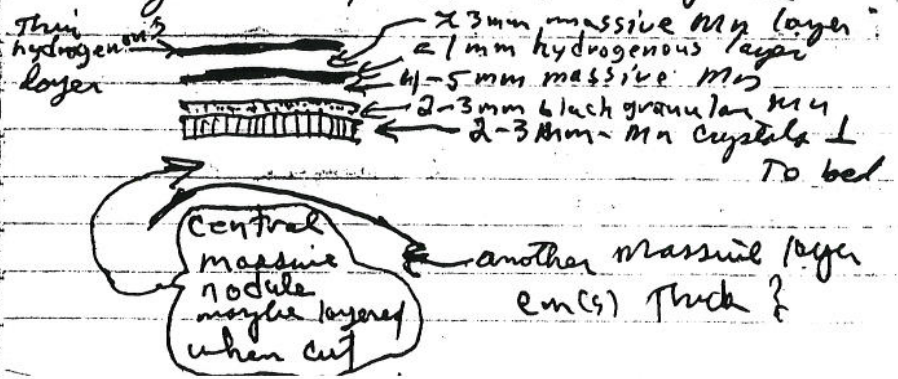
many encrusting Forams -

D22 - Pumice 5 buckets, 2 pieces Basalt, Some Mn stains, mostly on pumice Total ≈ 50 kg

D23 - 3 buckets - 2 pumice + 1 rhyolite - Total 40 kg, 1 pebble w/ Mn stain

D24 - No Recovery
D25 - Volcanic Rxs & Pumice
D26 - " " " "
D27 - 1 piece of breccia w/ Mn crust - Task part ; crust is 1-cm thick & is real - not cement - botryoidal subtlety, w/ much reddish iron in microcracks + between grains ≈ 22 x 25 cm x 4 cm - 1/2 archives.

Cross-chain Seamount off Daikoku - 1650 m
D28 - about 100 kg of basalt, volcanic breccia & volcaniclastic Rock - A little pumice - All stained w/ Mn To coated w < 2 mm Mn - Several pieces of breccia + SS have Thicker crusts and are bagged - 21°08.2' / 143°54.08''
One large Conglomerate pavement (photo) is ~~coated~~ coated by ≈ 1 mm of Mn - not sampled.
D28-1 - hydrothermal nodular massive manganese w/ at least 6 layers



Nov 17, 1985 1710 local

on Maug Island, I slot climb ~10 m above sea level
- encounter 1 ash layer ~5 cm thick
- immediately above is another ash layer, ~ 3-4 m thick
take Sample M-A-1
(Maug Ash
ash w/ black w/ reddish brown tinge
[illegible] up to ~ 3 cm, but generally well sorted
some banding at top of layer
at uppermost boundary 3-5 cm ash layers [illegible]
Rocks

M-A-1

Charlaine - Slab down Center - subsample each layer for Majors & minors -
+ polished sections through over whole Thing

M-A-2

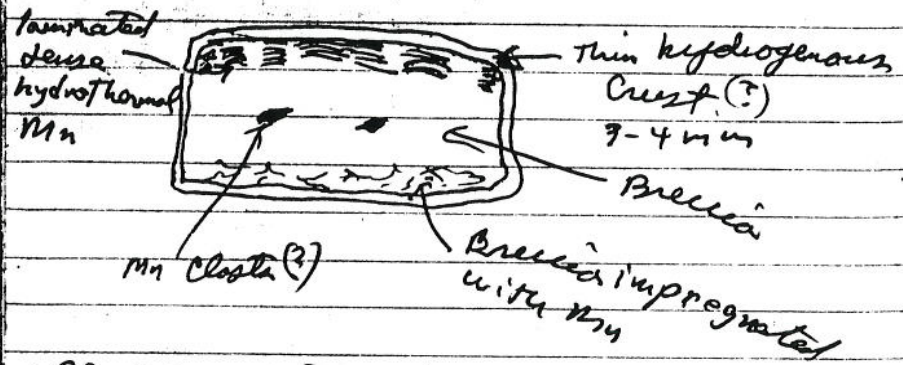
ash 4 1/2 cm

amal 8

ash 3 cm

3 ash layers within 15 cm
central layer well
amalgamated with clasts
up to 4 cm
layers are [illegible]
brown, clayey in texture

D28-2 - Rock Cut =



Phorlaine majors and minors on crust & dense Mn; polished section through top part

D28-3: Rock Cut - Bob + Sherm have other half = A volcanic breccia w/ crust 4 to 15 mm thick, breccia is also cemented w/ Mn or contains Mn clasts.

D28-4: pure, dense, laminated hydrothermal manganese w/ thin hydrogenous coat - 4.8 cm thick of Mn; 8.8 cm long -

D28-5: pure nodule of Mn, hydrogenous (?) - porous, void in center, one layer of dense hydrothermal Mn near bottom. 4.5 x 7.5 x 9.5 cm

D28-6: hydrogenous nodule w/ claystone (altered breccia) clast irregularly distributed in rock w/ pumice fragments - 5.5 x 9.5 x 10.5 cm

D28-7: Large piece of Mn mixed w/ claystone + altered pumice fragments - I have 2/3 + Hoiche 1/3 - my piece is 10 x 13 x 4.5 cm

D28-8: Mn clast Breccia w/ 4 mm-thick hydrogenous crust - Volc. Breccia replaced by Mn - A thin iron-rich layer between crust + breccia; 3.5 x 10.2 x 12.5 cm

D28-9 - Small pieces of crust + substrate ss & breccia -

D28-10 - V. highly hydrothermally altered volcanic Rx. - may have contained sulfides ? for Hoski -

D29 - Basalt Fresh - No Mn

D30 - " " " "

D31 ≈ 200 kg of mostly vesicular Basalt but 29/30

D31-1 - ≈ 0.5 kg of Thin Mn Crusts

D31-2 - Vesicular Basalt w/ Sulfide "Mud" covering one surface - ½ w/ Stern + Bloomer

D31-3 - Breccia w/ disseminated pyrite + native Copper (?) + in veins

D31-4 - Disseminated sulfides in vesicular Basalt

D31-5 - Disseminated Sulfides in feldsic volcanic R

D31-6 - Misc. - P possible Sulfide

Where are D31-2 through D31-6? I have never seen them. Tovie

D32 - Nada

D33 - ≈ 100kg; Type I - Tan Andesite - Type 2 - Mn + Fe-rich breccia Type 3 - grey andesite Type 4 red weathered Andesite - Many rocks have a patina of Mn atleast on one side - Subsampled Type 2; Numbers are those of Stern + Bob

D33-2-1 - An intimate mixture of iron oxide and Mn oxide w/ and outer rim on at least 2 sides of massive hydrothermal Mn - Mn oxide also in veins; Fe-oxides = completely hydrothermally(?) altered volcanic debris - Has a crude boxwork structure like the one sample from Tonga - B-S have ≈ ½ of this sample

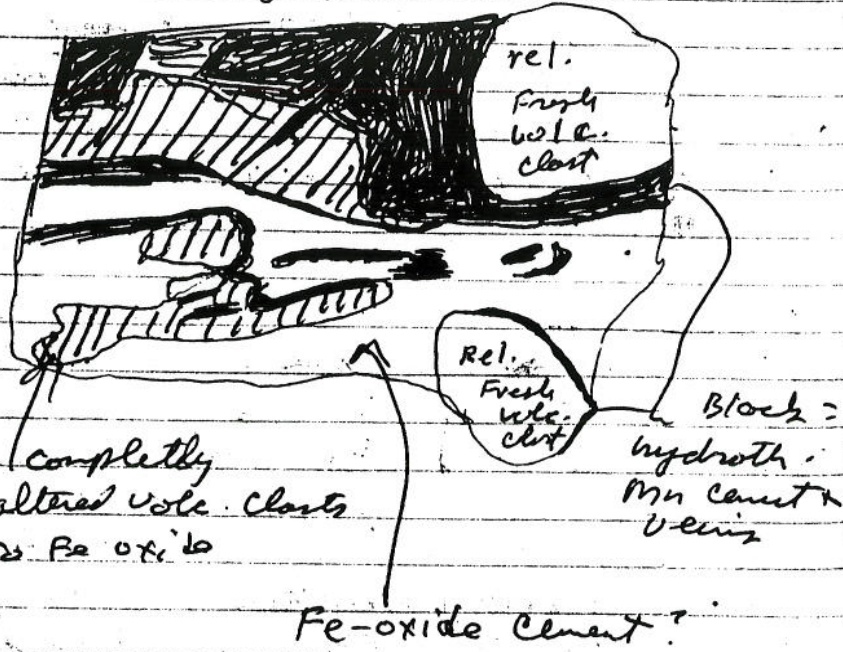
Hoski

D33-2-2 - Similar to 2-1 except outlines of original volcanic clasts more distinct in one part of Rock - Mn is partly a cement + partly veins - B+S have over ½ of this Rock

over

Fukujin (deep dredge) Seamount

D33-2-3 : Large breccia w/ hydrothermal Mn + Fe oxide cements : Photo (3) B+S have ½ of This Rock -



D33-2-4 - Small pieces of same stuff as 1, 2, + 3.

D33 Organisms = x 1 kg of white branching coral - deep water coral -

D34 - ¾ bag of fresh basalts w/ no Mn, 1 v small piece of volcanic Rx w/ sulfides (pyrite?) disseminated throughout -
Organisms: Coral + a Tiny Echinoderm

D35 - ⅓ bag altered Basalt + Andesite + Coralline Limestone - Fukujin shallow dredge
D35-1 ~~Took~~ Took several slabs of The Lmst - Also one rock That is a altered Red Volc. Rx. w/ stringers of Mn - Took ⅓ The rest is B+S - D35-M-8

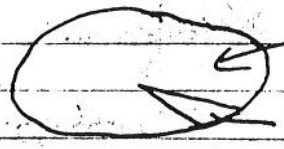
D36 ≥ ⅓ bag of mostly altered andesite and basalt, but also 10-20 kg of Volc. Breccia in clay matrix w/ Mn crusts - Rare Volc. Rxs w/ Mn Crusts To 3 cm.

D36-1 - large piece of breccia (2 Rock ⅓ of it with 3 Volc. Rx. clasts floating in clay + surrounded by Mn which is partly replacing the clay; + the whole Rock is coated w/ Mn, 1 To 30 mm. Clay maybe mixed w/ The crust.

D36-2 - altered andesite completely surrounded w/ crust which much Thicker on The upper surface -

D36: SE Corner Syo Syo Ridge – 1950 – 1291 m – 22°07' ; 143°23' E

D36-3 – small piece w/ :



D36-4 – 12 small pieces of mostly crust w/ a small piece of volc Rx in one –

D36-5 :

S7040
1752 – 1417m ; 22017.57' ; 143013.47'E

D-37 – Bag 1/8 full ; 2 Mn encrusted boulders (47 x 23 x 19 ; 77 x 32 x 24 cm) – A blocky breccia ; mostly Mn-coated altered andesite ; one large chert or phosphorite block ; little pumice – Crusts to 3 cm Old structural Ridge with thick hydrogenous crusts – The Thickest Two for recovered – S7040, 22°17.57'N 143°13.47'E 1878 m TO 1470 m

D37-1 – 2 plastic bags full (large) + 1 slab

Largest block = cobble breccia (3 photos) ; Crust is 2 cm to 3 cm Thick – overall form follow that of rock, surface texture is medium botryoidal, encrusting forams are common, and one side w/ deep voids between botryoids contain granular manganese – removed 75% of crust from Rx – Part to Hoichi + B+S

D37-2
Second largest block – (2 photos) – Crust is 2 1/2 to 3 cm Thick and has a distinct inner massive layer and outer porous botryoidal layer inner layer is 2 cm Thick – outer layer 1 cm – surface is same as large block but badly abraded in places – Took whole rock –

D37-3 – misc. pieces of crust –

D37-4 – 3-cm Thick Crust on Breccia note the Coarsely crystalline manganese on one side – must be hydrothermal –

D37-5 – 23 mm Thick crust on Andesite and phosphorite – Hoichi has a piece + so do B+S

D37 1 & 2 are each in a separate gunny

D39 – ~~Shyoyo Smt 1635–1390~~ Sakuyama Smt.
~~Smt~~ 1955 – 1740 ; 22° 21.62' ;
143° 04.73'

Smt. W/of Syoyo Ridge –

D38 – 2 pieces of porphyretic basalt w/ Thin <2mm Mn-Crust
No Samples

D39 – 3 or 4 pieces of pumice, 1 rock w/ Thin Crust, 1 rock w/ Thicker Crust (Taken) and Three silicosponges Coated w/ Mn (also Taken) but don't know why?

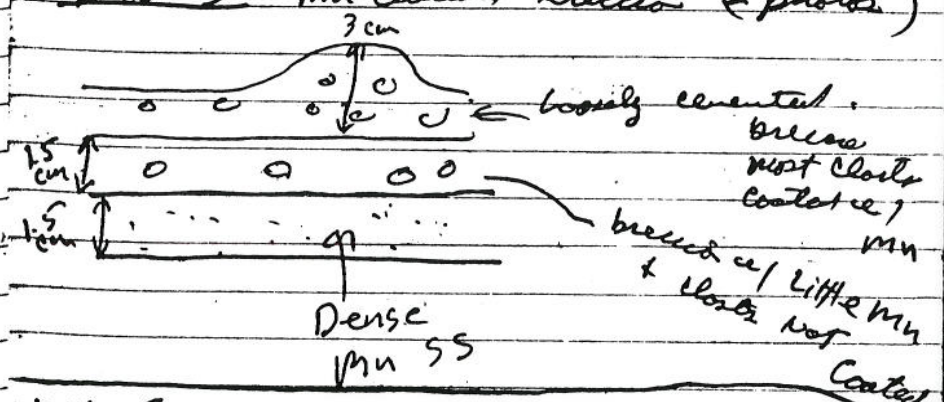
D40 – Shyoyo Smt. – 1635–1390m ; 22° 25.20' ; 142° 54.47'

D40 – ≈ 1/3 To 1/2 bag of mostly pumice, some w/ Mn stains, and lesser amounts of volcanic Rock and Volcanic breccia all with Mn-stains or crusts <2mm – NONE Sampled = granular Black Mn –
One piece of pumice breccia cemented by Mn = D40-1

D40-2 – misc. small pieces of Mn-cemented breccia – Same as 40-1 – NONE Taken

D40-1 ≈ 33 × 24 × 7 cm – dominantly pumice clasts w/ rare volcanic Rx Fragments An upper 2 cm of cement (Mn) supported breccia and a lower 5 cm of Clast Supported breccia w/ Mn cement, although Those relations are variable from place to place. 1/2 Taken – rest To B+S –
Mn coated planktonic forams in voids → To Date for Paula

D40-3 – Mn cemented breccia (2 photos)



D41 – Soyoyo Smt ; 1371m – ~~[illegible]~~ 600m
22° 27.64' ; 143° 00.38'

D41 ≈ 1/2 To 3/4 bag of mostly volcaniclastic rocks ; Some volcanic RXS, 1 pumice ; 10-20 pebbles to cobbles of hydrothermal Mn – dense, laminated, – + pebble conglomerate w/ Mn cement – Thin staining on volcaniclastic + Volc. Rxs – 4 bags of biology – coral, enchinoderms, crabs ?,

D41-1 – pebble Congl. Mn cemented – 1/2 of one piece + 1/3 of another cobble – Well sorted clasts, clasts are coated w/ Mn as well as cemented by Mn –

D41-2 – Pure hydrothermal Manganese – dense + laminated : 2A, 2B, 2C + 2D,

D41-3 – Dominantly hydrothermal Mn, but w/ some % of volcanic clasts – 3a, 3b + 3c.

D42 shgo go (Syoyo) Ridge; 2450–1500 m
22°49.80' / 22°52.94' // 142°35.2' / 142°35.98'

D42 ≈ 50 kg of altered volcanic rock and sheared + highly altered greenstone w/ a preferred fabric. Couple pieces of pumice – Most Rocks have Mn stain and some have Crusts up to 1.5 – 2 cm Thick some mudstones show alternating laminations of mudstone + Manganese may not be sedimentary layering.

D42-1 – A large boulder had about 2 mm of crust on it which I scraped off – The outer mm was granular black Mn + The inner mm was more massive – The inner layer did not occur in all places + The removed material is more representative of the granular material – This Type of Mn Typically coats the rocks recovered but is usually not so Thick – About 1/3 To 1/2 of the rock was scraped –
Mn for Majors + Minors + PT – group + RRE. In a freezer Box – ≈ 30–40 gm.

D42-2 – basalt w/ 1 cm – Thick granular crust – 1/2 taken – one side of rock crust is more massive –

D42-3 – Took about 1/3 of a large rock That is mudstone w/ a large clast of sheared + altered greenstone – Mudstone has laminations or streaks of Mn alternating w/ mudstone – Two pieces Taken w/ The Thickest crusts To 1.6 cm –

D43 – about 4–5 kg of scoria + pumice – + whole bone fragments – kept 2 bone fragments, one is the large spine? w/ offset vertebrae that we have photographed in the Central Pacific –

D44 – Ichiyo Smt. 2250–1630.
22° 55.43' / 142° 31.06'; 1/2 full – 125 kg – few pumice + Mn pieces; Type I, basalt; Type II, Volcaniclastic – 12 slabs; Type III, Mn-cemented breccia – Type IV – Sandy reddish orange volcaniclastics.
Manganese pebbles and cobbles consist of:

D44-1: Massive dense hydrothermal manganese, laminations not visible,

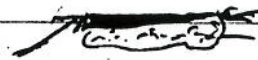
and some pieces V. Coarse grained Mn - looks like pyrolusite - 5 pebbles & 3 cobbles.

D44-2 - Mn-cemented pumice SS; 1 pebble; 3 cobbles; Coarse-grained to granule stone -

D44-3 - Mn cemented, cement supported granule to pebble breccia - V. Mn-rich - 1 pebble, 2 cobbles -

D44-4 - Mn impregnated pumice, one piece small cobble

D44-5 - same as # 3 w/ a layer of #1 at the Top To 0.6 cm

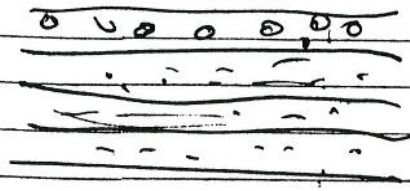


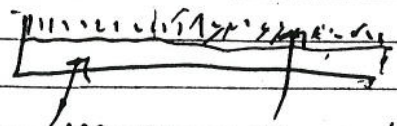
D44-6 - vesicular porphyritic volcanic rock w/ 2.4 cm layer of Mn-cemented breccia above -
good contact relations for T.S. Study.

D45 98% Basalt, NO Mn; 1/2 Bag of pebbles + cobbles - 2% vesicular glass; rare pumice Nitto Smt.; 1930 - 1315 m; 23°06' / 142°15.6'

D46 scoriaceous basalt. massive basalt NO Mn - 1/4 - 1/2 bag = 100 kg - 1 large boulder, Rare Mn stains - 3. Nitto Smt. 1440m - 1430m; 23°07.90N / 142° 21.33'E.

D47 - Ho-Hi yoshi - 2070 - 1725 m - 23° 23.97' to 142° 00.08'
about 1/3 bag To 1/4 - ~ 75 - 100 kg - Dominantly stratified volcaniclastic basalt debris flows; all coated w/ Mn; small amount of brown mudstone and volcanic rock; rare pumice and ash - everything coated with manganese
Took 1 piece of volcaniclastic & cut along stratification.





pebbly SS Mn w/ clasts oriented out in only one direction - outcrops are thin vertical slices -

D47-1 - 3 - small pieces of Mn-rich breccia & SS w/ some hydrothermal Mn-

D48 – Mostly basalt & Andesite – some volcaniclastics & pumice – S. Hiyoshi Smt. 1268–740 m; 23° 26.84 – 141° 54.36 – 225 kg – 3/4 basalt –
2 samples w/ sulfides for Koski
D48-4-1 S&B's #; NO Mn –

D49 3/4 bag – 98% basalt – fresh – NO Mn – 1 bag of biology collected NW Flank of peak, S. Hiyoshi Smt. 740–430 m,
23° 30.2'/23° 30.2' // 141° 56.7'/141° 57.0'

D50 – Lost dredge bag –

D51 Basalt mostly, & a Tuff breccia layer w/ Mn that I have 1/2 of, upper disturbed laminated layer and a low planar bed w/ Mn? = Total 1.5 kg. whole dredge about 10 kg. SE Flank of central Hiyoshi Knoll; 1400 – 975 m – 23° 34.13'/23° 34.2'// 141° 49.83'/141° 49.2; 100 bites – altered Basalt & Andesite; ≃ 2 kg of scoriaceous – glassy material

Central Hiyoshi – 1105 – 647 m; 23° 37.06'N 141° 49.13'E – 1/4 full – 250 kg – 1/2 basalt, volcaniclastic Rxs & hydrothermal Mn = 1/3 haul; rare breccia, siltstone – The largest Rx of pure Mn – cut in 3 pieces

D52 D52-1 28×27×12 cm – layers of dense grey Mn alternating w/ layers of porous granular Mn – some zones are deformed & jumbled – some beds bifurcate

D52-2 20×14×7 cm – 2nd Largest Pure Mn same as #1 except dense Mn more concentrated on one side & porous on the other – rare glassy areas – Mostly contorted texture.

D52-3 17×8×7 cm – mostly // layered porous Mn w/ 1 grey massive layer & 1 brown-grey massive layer

D52-4 13×11×6 cm – central double layer of massive dense Mn w/ alternating above & below w/ porous & massive layers – Central layers = brown-grey & polished on bedding planes –

D52-5 12×8×6 cm (cut surface)

tabular; laminated hydrogenous/hydrothermal with small layers of hydrogenous & hydrothermal – topped w/ hydrogenous & some hydrogenous layers stained color of red mud

D52-6 10×10×7 cm // bedded massive dense alter. w/ porous layers – 1 red layer & vein – massive grey polished & highly reflective mass of Mn

D52-7 12×7×7 cm – contorted bedding of dense & porous layers – some patches of red mud – a polished – brown – black layer –

D52-8 17×14×9 cm – 3rd Largest Rx – contorted dense & porous layers – some red & green mud on the outside of the Rx. – The massive layers are always more grey or grey – brown & porous layers black – brick – red mud –

D52-9 - bag of misc. pieces of Mn w/ at least one Thick dense layer of Mn

D52-10 - Bag of Misc. pieces w/ at least one layer of glassy Mn -

D52-11 - Bag of Misc. pieces w/ massive, but not dense Mn

D52-12 - Bag of Misc. pieces That are laminated

D52-13 - A piece w/ a red clay layer next To The massive-dense Mn-layer

D52-3, 5, 6, 7, and 13 are in Cardboard boxes - airmail - The rest are in a gunny sack for surface mail -

Total ≈ 60+kg of pure Mn oxides

D53 - North Hiyoshi Smt - 1725 m - 1160 m; 23° 50' N 141° 49' E. 1/8 full, 75 kg - basalt, scoria, Light brown Clays, volcaniclastics - NO Mn -

D54 - N end Hiyoshi Smt - 1690 - 1300 m; 23° 48.08'/23° 45.00' // 141° 43.80'/141° 43.02' - ≈ 100 kg - 2 large blocks, 98% vesicular to massive plag. Basalt rose pumice - ≈ 2/3 kg. Mn-crust

D54-1: Mn-SS w/ at least one layer of coarser-grained material of Unknown origin. porous or vesicular some coarser-grained Mn scattered in SS of the massive SS.

D54-2 Mn-rich SS w/ at least one layer of dense-massive gray-brown Mn oxide - This layer may occur in The middle or at either edge of The sample - Some resinous brown Mn oxide occurs on The surface of one sample = should be analyzed separately -

D54-3 Laminated Mn-rich SS.

D54-4 - Mn Nodules w/ volc. Rx nucleus - Mn = Mn-rich SS - 7 Sample only

D54-5 - Massive Mn-rich SS - one sample has gray-brown resinous Mn on The surface -

biology - a large siliceosponge 23cm x 10cm x 7cm - kept - one small siliceosponge - discarded -

D55 SW Fututoku Smt - 1800 - 1055m 24°01.48'N ; 141°35.05'E ± 25 kg Total ; Type 1 : Vesicular basalt . Type 2 - Basaltic Tuffs (Mn cemented) type 3 - Pumice ; Mn-cemented volaniclastics + Mn-hydrothermal - Mn-95 + hydrothermal Mn = 8-10 kg , I took 3/4 of it . - 1 small bag of biology

D55-1 - largest Piece : 19 x 14 x 3 cm - massive - dense hydroth. Mn on surface w/ pebbles of volc. Rx. - ⊥ oriented Mn crystals becoming more porous toward the upper(?) surface -

D55-2 - 6 cobbles that have at least 1 layer of dense-grey manganese - usually on the outer surface - insides, pure porous Mn to Layered Mn to Sandy Mn -

D55-3 - layered or laminated porous Mn

D55-4 - Pure Mn-oxide - 10 cobbles - mostly grey Mn - some black and some brown-grey but no glossy or resinous Mn -

D55-5 - 1 piece of Mn-cemented breccia

D55-6 - bag of Misc. pebbles that need to be cut + categorized.

D56 NW Fututoku Smt. ; 1500 - 1462 m - 24°04.46' / 141° 33.18' / 1/6 bag ; mostly sedimentary - Tuffaceous Rxs - and manganese ; rare volcanic Rocks + breccias - Layered, burrowed + Mn - mixed Sed. Rxs - 3%

D56-1 - burrowed mudstone w/ 2-3-cm Thick crust of hydrogenous (?) Mn - 1/3 of Sample + small crust Sample only from other 1/3 - Smooth - dense - surface -

D56-2 - Porous Mn surrounding a 1 1/2 cm thick layer(s) of dense - massive brown-grey Mn. in the dense layer is a fossil shell (?) infilled w/ anything - brachiopod ?(?) Could date episode of hydrothermal activity

D56-3 - Volc. Rx. Breccia, ~~con~~ ~~Fe~~ clasts floating in Mn-oxide + Capped by Mn-oxide Crust , some V. Coarse-grained manganese on Top of the crust - now crumbled off .

D56-4 - Same as # 3 but dense manganese on top is shiny-grey, mammulary instead of blocky brown-grey

D56-5 - porous but massive cobble of ~~grey~~ m. dark grey Mn

D56-6 - highly bioturbated mudstone w/ mixed Mn due to Mn bioturbation -

D56-7 Porous, massive, dark grey Mn, with floating clasts of pumice and a thick layer of blocky brown-grey Dense Mn -

D56-8 - Volc. Rx breccia cemented w/ Mn + coated by Mn crust

D56-9 - Misc. pieces of Mn - all types -

D57 - SE Futatoku Smt.; 1800 - 1200 m; 24°02.35' / 141°40.26'; 1/3 bag - 300 kg - Type I - Mn coated green-black volcaniclastic ≈ 1/3; Type II - Mn stained + coated pillow fragments; rare basalt

D57-1 - Mn-S.S w/ veins of dense-grey Mn + patches of Fe-oxides - largest sample - NO real Mn-rich except in veins - 16 x 17 x 7 cm -

D57-2 - Clasts of sedimentary rock that is laminated + stained by iron oxides - cemented by veins of dense Mn gray + clays -

D57-3 - yellow clay + volcanic glass mixed w/ dense-grey - Mn

D57-4 - Dual mn - misc. pieces - porous + dense

D57-5 - Misc pieces of Mn mixed w/ red clayey material

D58 Komachi Smt; ~~1210~~ - 740 m - 23° 11.42' - 141° 23.42'
1/8 full - 100 kg - Type I Mn crusts - on orange siltst. or w/ oat substr. - some to me, Koichi, + overboard - Type II - Lots - 1 bucket over, several pieces saved - one w/ a crust - 1/2 To me 1/2 To Robyn - Type III - Mn-encrusted cobbles of Volc. Rx -

D58-1 - largest piece - ~~[illegible]~~ amend corner to Koichi - 38 x 29 x 22 cm - botryoidal surface Typical of hydrogenous crusts - Reddish-yellow altered volcaniclastic substrate - Crust is 2 1/2 To 4 cm Thick but Boulder needs To be cut on a large saw for detailed study - A more black-granular Mn on the underside should be analyzed separately - Typically has higher Trace metal contents Nice surface textures remain

D58-2 - Yellow-red volcanic breccia w/ few grey volc. Rx clasts coated by - 3 To 30 mm of Mn crust - The upper surface is subtly botryoidal and maybe abraided - some encrusting foraminifera - yellow mud on bottom surface - 1/3 To Koichi

D58-3 - reddish volcaniclastic rock coated w/ 13 To 40 mm of Mn - Botryoidal surface w/ many forams & abraided in spots - Large cavity on underside lined w/ granular-black Mn - host Rx laced w/ Mn - 20 x 15 x 10 cm

D58-4 - Lms w/ Thin crust - 2-9 mm w/ granular-black Mn on sides of Lms. surface is botryoidal w/ forams - Compare chemistry of Crusts on Lms vs volcaniclastic Rxs -

D58-5 - Volcaniclastic breccia w/ Thin crust all around - 3 mm to 10 mm - Nice botryoidal surface Top & bottom but more black-granular Mn on bottom; 2/3 To Koichi - 1/3 To ~~[illegible]~~ - my 1/3 = 10 x 17 x 5 cm.

D58-6 - red-yellow volcaniclastic mudst. w/ botryoidal crust 3 To 10 mm, some Mn mixed in matrix - granular-black in cavities - many encrusting organisms - worm Tubes, forams etc - 1/2 To Koichi

D58-7 - barrel shaped cobble of porous volcaniclastics & Lms?, botryoidal crust on all sides ~~[illegible]~~ 4-20 mm Thick - Thicker Mn on ends (broke-off) - Black-granular on sides & encrusting worms in gunny sack for surface mail

D58-8 - small ~~nodule~~ substrate of volcanic breccia supporting a Thick Crust 20-30 mm - 4 layers defined by porosity & Fe-content - 12 x 11 x 5 1/2 cm

D58-9 - Same as #8 - Crust 12-35 mm botryoidal surface

D58-10 - Same as #8 + #9 - Crust 35-50 mm - Thickest yet but may have some hydrothermal layers - laminations are visible -
#8, 9, & 10 are the 3 Thickest Crusts -

D58-11 - Flat slab of Mn w/ some volcaniclastic debris near the bottom - upper surface is botryoidal & abraded - bottom surface is botryoidal and coated w/ granular - black Mn - Crust Thickness varies between 12 & 40 mm ; 23 x 19 x 4 cm.

D58-12 - Volcaniclastic breccia w/ smooth crust 6-13 mm Thick ; granular-black Mn on underside -, botryoidal on one edge - ½ To Height -

D58-13 - Volcaniclastic - yellow-red w/ botryoidal Crust 10-15 mm Thick - granular black on the bottom - V. heavily encrusted w/ Forams & worms - ½ To Height

D58-14 - Same as #13 - Crust 12-23 mm 24 x 14 x 5.5 cm -

[redacted]

D59 South Rolan Smt ; 1565 - 1100 m 23°05.50-N / 23°06.25E ; ½ bag - 50-75 kg - Type 1 - Scoriaceous andesite Lapilla ; Type 2 - Vesicular buff volcaniclastic ; Type 3, Pumice ; Type 4 - Abundant Mn on volcaniclastic Siltst -

D59-1 - Tuffaceous Volcanic breccia Coated on one side w/ finely botryoidal crust 6-8 mm Thick - Many forams - 38 x 29 x 7.5 cm ; little more than ½ ~~goes to Height~~ doesn't want Thrown out

D59-2 : Largest Rock - Excellent for paleoceanography Program - 31 x 29 x 18 cm - Crust is 3-8 To 4-8 cm Thick + botryoidal Surface - good surface Texture left ; granular-black Mn on sides ; Reddish-brown, Tuffaceous breccia host Rx -

D59-3 - Same as 59-1 - Crust 6-10 mm Thick ; 41 x 13 x 8 cm Thick ; a little less than ⅔ kept -

D59-4 – Volcaniclastic SS coated w/ botryoidal crust that has black granular Mn between botryoids on Two Side – Crust = 35–45 mm Thick; maybe layered; 20 x 10 x 9.5 cm –

D59-5 – 4 misc. pieces of Thick crusts w/ botryoidal surfaces –
(a) To 4-cm Thick
(b) To 4-cm Thick
(c+d) small

Biology: bag of silicosponge fibers – mermaids hair

D60 – Empty

D61 – Lost bag + 3000m wire

D62 – 6 pebbles of pumice

D63 Empty

D64 South Seamount Backarc
Empty – Kinked wire

D65 – 2820 m – 2560m; 21° 54.97', 143° 05.00'; 1/3 bag – 200 kg – PL microphyric Basalt; one large pillow Tube – All fresh – NO Mn –

D66 3415 m To 3482 m – 9 kg – six pieces of dense basalt w/ glass rind + moderate Mn-coating – Talus – 21° 46.29' / 143° 07.90' –

D67 Backarc – 3430 – 2970 m – 21° 49.68'; 143° 03.75'; 2 buckets of basalt blocks, 30 kg – small pieces of mudst. w/ Thin Mn crust – several pieces sampled – granular Mn – Crust < 2mm & encrusted w/ forams –

D68 – backarc – 3385 – 3100 m – 21° 42.5' / 21° 43.03' // 143° 10.2' / 143° 08.07' – 80 kg fresh basalts – NO Mn

OVER

Pt-group, major, minors, REE

D69 - E. Facing Scarp, base of W. Mariana Ridge (Northern Segment) -
Empty -

D70 - W. Mariana Ridge; 1870 - 1770 m
21°48.1' / 21° 48.0' // 142°08.0' / 142°06.9'

Empty

West Mariana Ridge; 1660 m; 22° 26.85'
D71 141° 56.72'; 1 large dacite boulder

Dacite ignimbrite?

One Large boulder of basalt w/ crust to 4 cm Thick - Scrapped crust from 1/2 of boulder = D71-1 - has an inner black resinous layer next to the basalt & iron oxides laced throughout the crust
Total wt of crusts collected ≈ 3-4 kg.
25 cm radius on boulder

D71-2 - volcanic breccia w/ crust 2.8 to 4.5 cm Thick - One end to B&S and one thin slab to Koichi -
24 x 20 x 9.5 cm - innermost layer more massive + less iron stained - Crust on edges more porous, black + granular - chemistry on outer mm, iron stained part, & inner massive part

both on Top & sides = 6 splits for analysis - botryoidal surface -

D71-3 - end piece of an ignimbrite w a crust 6-20 mm Thick - granular & black = outer 1/2 + massive inner half - 2 analyses

D71-4 Thick crust 2.8 to 4 cm & w/ thin mudstone substrate - Substrate has fossils & should be dated! -
19 x 12 x 5 1/2 cm

D71-5 - misc - pieces of crust fragment w/ little if any substrate - Thickest crust is 3-8 cm.

D72 Creamed onion shoals - 1590 m -
23° 03.3' / 23° 02.82' // 141° 44.4' / 141° 42.3'

Lost Bag! #4

Kita Io
D73 - 1700 m - 1260 m - -
25°05.80' N / 141° 15.30' E; 1/3 full
Type 1 - volcaniclastic sandstone w/ hydrothermal layers of mn - 1 bag - only some saved; II basalt III; breccia - 40 pieces IV - massive basalt; 20 pieces

D73-1 9 pieces of Volcaniclastic Sandstone, Coarse grained w/ DBL of coarse-grained hydrothermal Mn - plus one surface is coated w/ Mn - Mn is concoidally fractured; ~~and~~ and fragmented into equant blocks - or it is microbotryoidal and metallic, or smooth, massive, and metallic; some microbotryoidal layers are glassy - looks very fresh -

a) b) c) d) e) f) g) h) ~~i)~~

(a) largest 9 x 10 x 14 cm, Mn layers to 5 mm.

(b) second largest 8 x 14 x 5 cm - Mn layers to 5 mm -

D73-2 porphyritic and vesicular andesite w/ 5 mm Thick hydrogenous crust, botryoidal surface -

D74 SE Flank of SW Kaitoku Smt - 1855 -

Lost Dredge

D75 Torpedo Dredge #1 - SE Flank Kaitoku Smt. 1500 m - 1090 m - black basaltic sand w/ pebbles, sand was slightly cemented (by what?). 26° 03.50' / 141° 80.55' E

Torpedo Dredge #2

D76 upper Flanks of Kaitoku Smt - 1190 - 1133 m; 26° 04.8 / 141° 07.1; Never went down #3

D77 Same as 76; 950 - 850 m; 26° 04.83' / 141° 07.27' basaltic sand & pebbles -

D78 Empty

D79 off Nishino-Shima - 1990 - 1766 m; 27° 09.10' / 140° 57.34' / 2 buckets of volcanic blocks & pebbles -

D80 off Nishino-Shima - 1600 m - 1450 m; 27° 09' / 140° 56' / ⅓ full - 3 Large volcanic, Fragments - Andesite; basalt cobbles & pebbles + pumice

D80-1 - ~~Bas~~ pyroxene Andesite w/ rind of hydrothermal Goethite?

D80-2 - " " " " & mud! -

D81 Secondary Cone, W. Nishino-Jima 1090 - 950 m; 27° 13.5' / 27° 13.8' // 140° 43.5' / 140° 43.4 - mostly burrowed & bored bedded Sedimentary (volcaniclastic) sandstones - w/ red upper surface - some volcanic clasts & Many Many benthic biology 4 bags, 1 sed. RX collected