Northwest Hawaiian Islands Collection: Multibeam Bathymetry & Backscatter and Optical Validation Maps v. 1

2007

Northwest Hawaiian Collection:
Multibeam Bathymetry, Backscatter and Optical Validation Maps

Acknowledgements:

All multibeam bathymetry, backscatter imagery and optical validation data are from the National Oceanic and Atmospheric Administration (NOAA) Pacific Island Fisheries Science Center (PIFSC) Coral Reef Ecosystem Division (CRED), the Pacific Islands Benthic Habitat Mapping Center (PIBHMC), the Joint Institute for Marine and Atmospheric Research (JIMAR), and the Hawaii Mapping Research Group (HMRG) with funding from NOAA's Coral Reef Conservation Program. All terrestrial Ikonos satellite imagery is from Space Imaging.

The Collection:

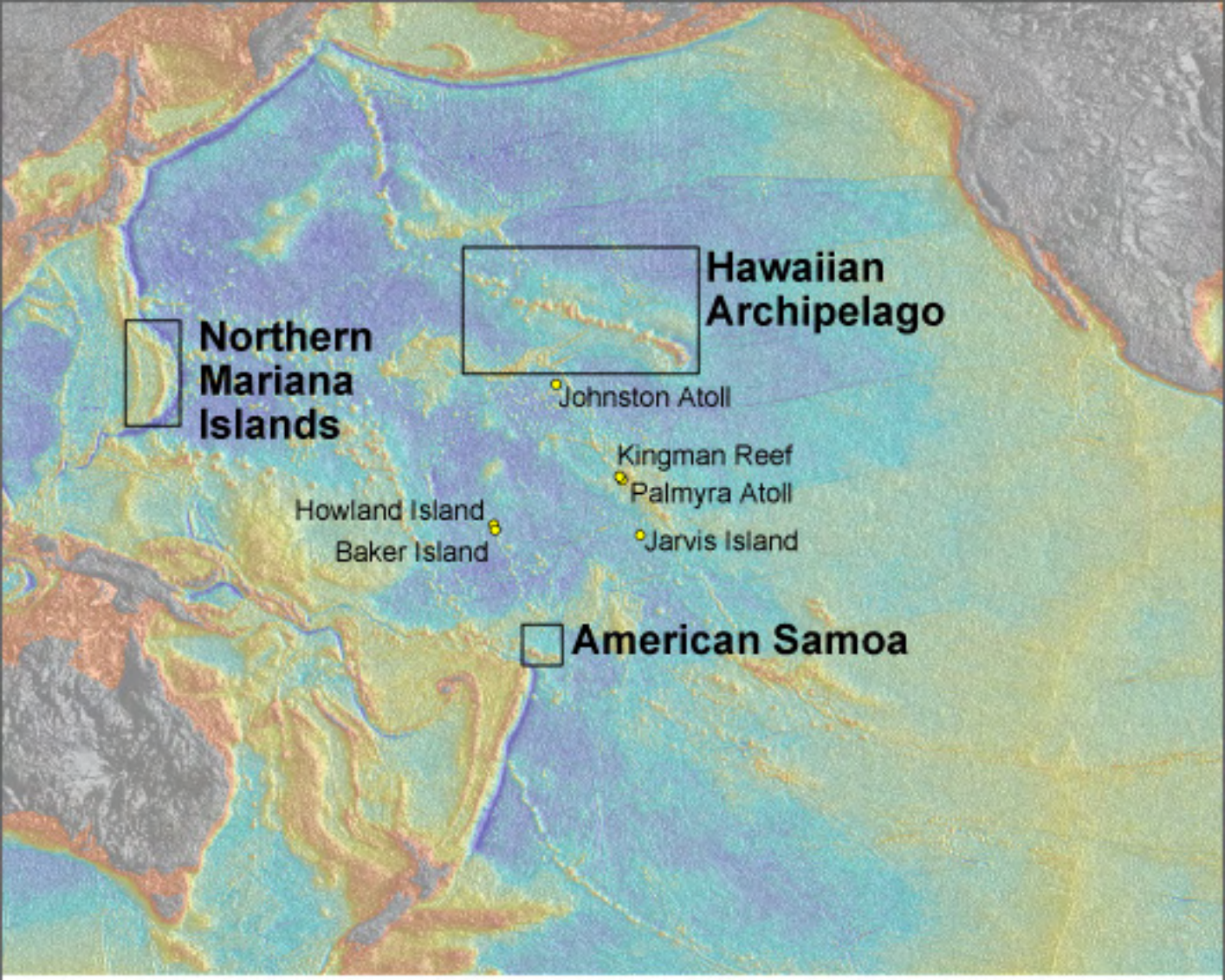
This collection of maps was made in 2007 by PIBHMC. It includes multibeam bathymetry, backscatter, and optical validation collected between 2001 and 2006 from the NOAA survey launch R/V Acoustic Habitat Investigator (AHI), NOAA Ship Oscar Elton Sette, NOAA Ship Townsend Cromwell, NOAA Ship Hi'ialakai, and University of Hawaii R/V Kilo Moana. Details on the surveys, platforms and processing may be found in the metadata appendix. Some of the maps also include Ikonos satellite imagery for reference to land features. Many of the bathymetry maps also include Ikonos derived depths between depths of 0 and 16 meters.

These data are not for navigation. The data were collected in support of Coral Reef Conservation Program goals to map all shallow (0-30 m) coral reefs and priority moderate (> 30 m) depth areas in US Pacific waters by 2009. The data are being used to provide bathymetric, backscatter and optical validation products for previously unmapped areas and to study the area geology in support of ecosystem management (e.g. benthic habitat mapping for Essential Fish Habitat determination). Georeferenced optical validation enhances benthic habitat mapping efforts as ground truth information.

The bathymetry (depth) data are represented with a red to blue color ramp where red is the most shallow and blues are deep. The backscatter (acoustic intensity) data are represented with a white to black color ramp where black is a high return and white is a low return. Generally, the dark backscatter indicates hard bottom (e.g. coral, rock), the light backscatter indicates soft bottom (e.g. sand, mud), and grays are mixed (e.g. rubble, sand/pavement). See individual maps for depth and intensity values. The optical validation data were classified for multiple bottom types and bottom cover; the maps in this collection present the data as classified for scleractinian coral cover where white is 0% and the darkest red is 100% cover.

The Metadata Appendix:

The metadata appendix includes a file for each bathymetry and backscatter imagery product that is served on the PIBHMC website (http://www.soest.hawaii.edu/pibhmc/pibhmc_nwhi.htm). The metadata that are included are for the ASCII products. Background information and instrument/platform details are the same for the netCDF data type; processing steps differ. Metadata for both data types will be available with the data downloads on the PIBHMC website. Additionally, cruise metadata, outlining the details of the acquisition system for each cruise that data were collected on are included in the appendix.
Contact pibhmc@soest.hawaii.edu for more information.


Hawaiian Archipelago
Northern Mariana Islands
Johnston Atoll
Kingman Reef
Palmyra Atoll
Howland Island
Baker Island
Jarvis Island
American Samoa
Pacific Islands
N
W
E
S
0
1000
2000
Nautical miles
0
1000
2000
Kilometers

Northwest Hawaiian Islands

(Papahanaumokuakea Marine National Monument)

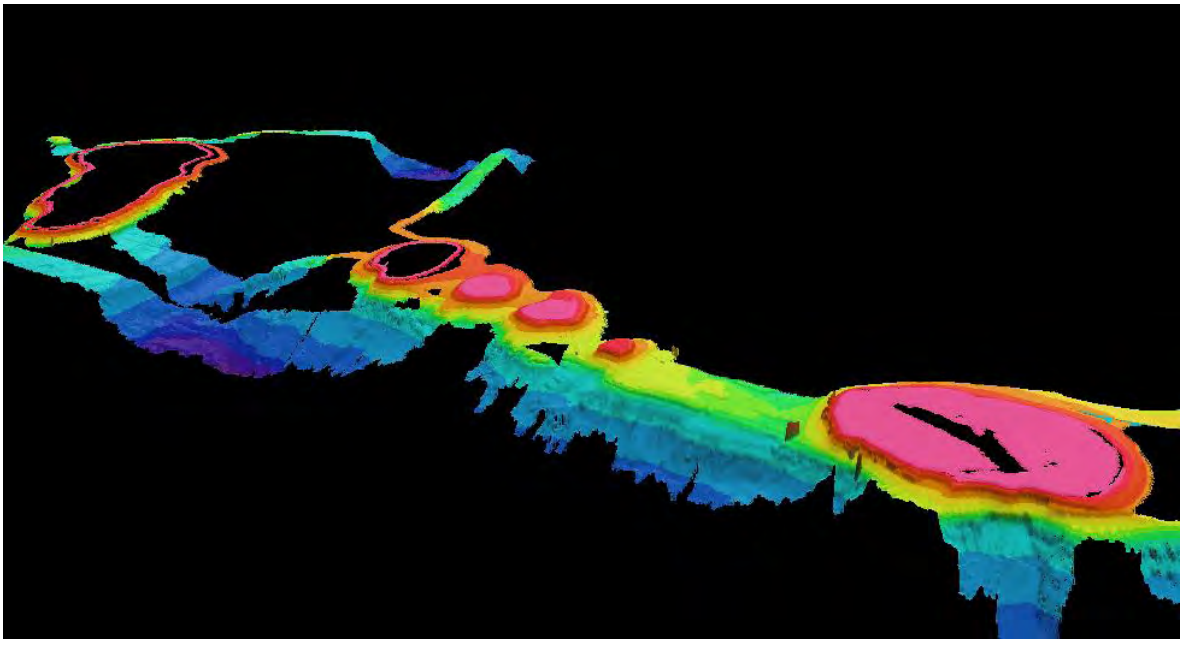
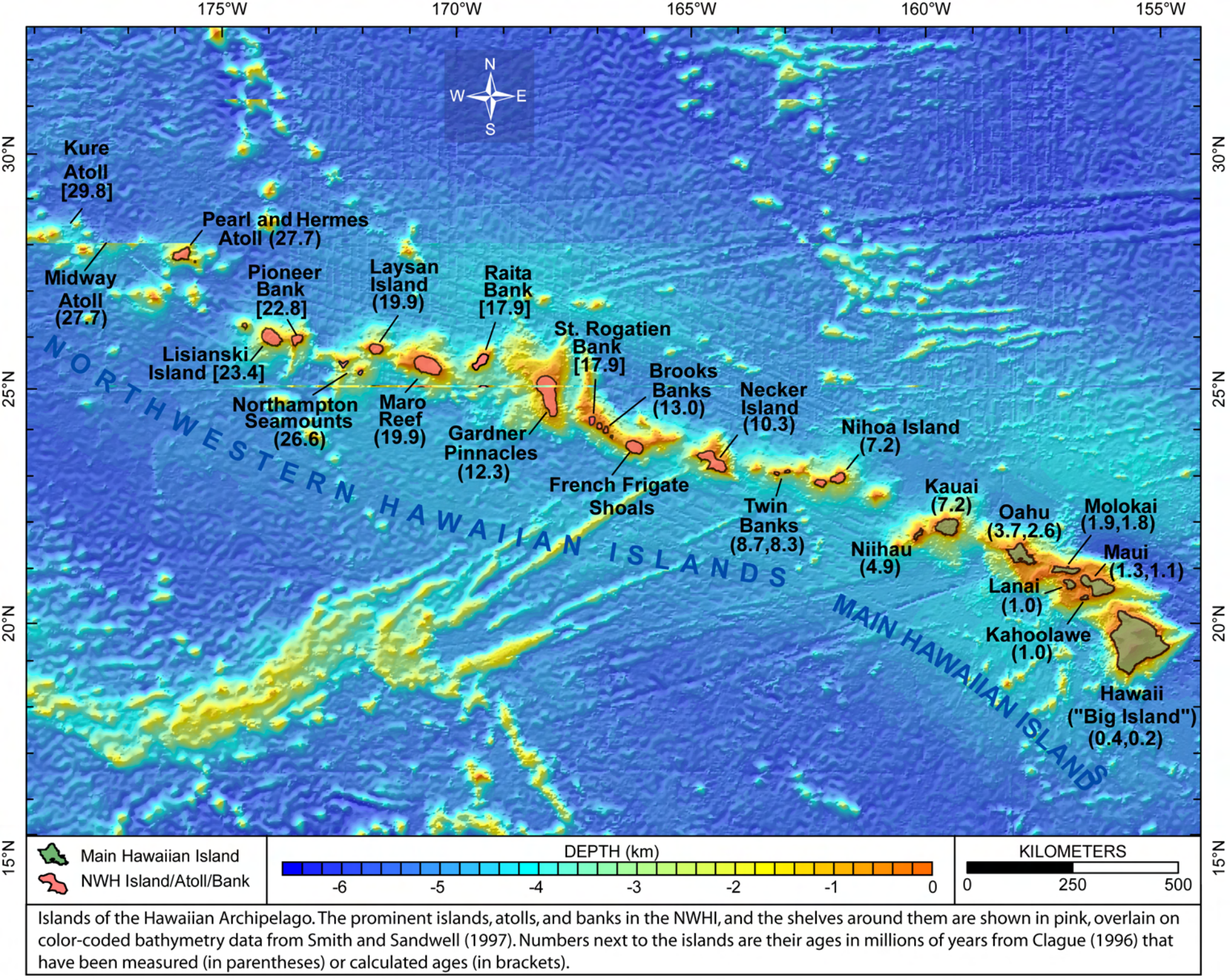
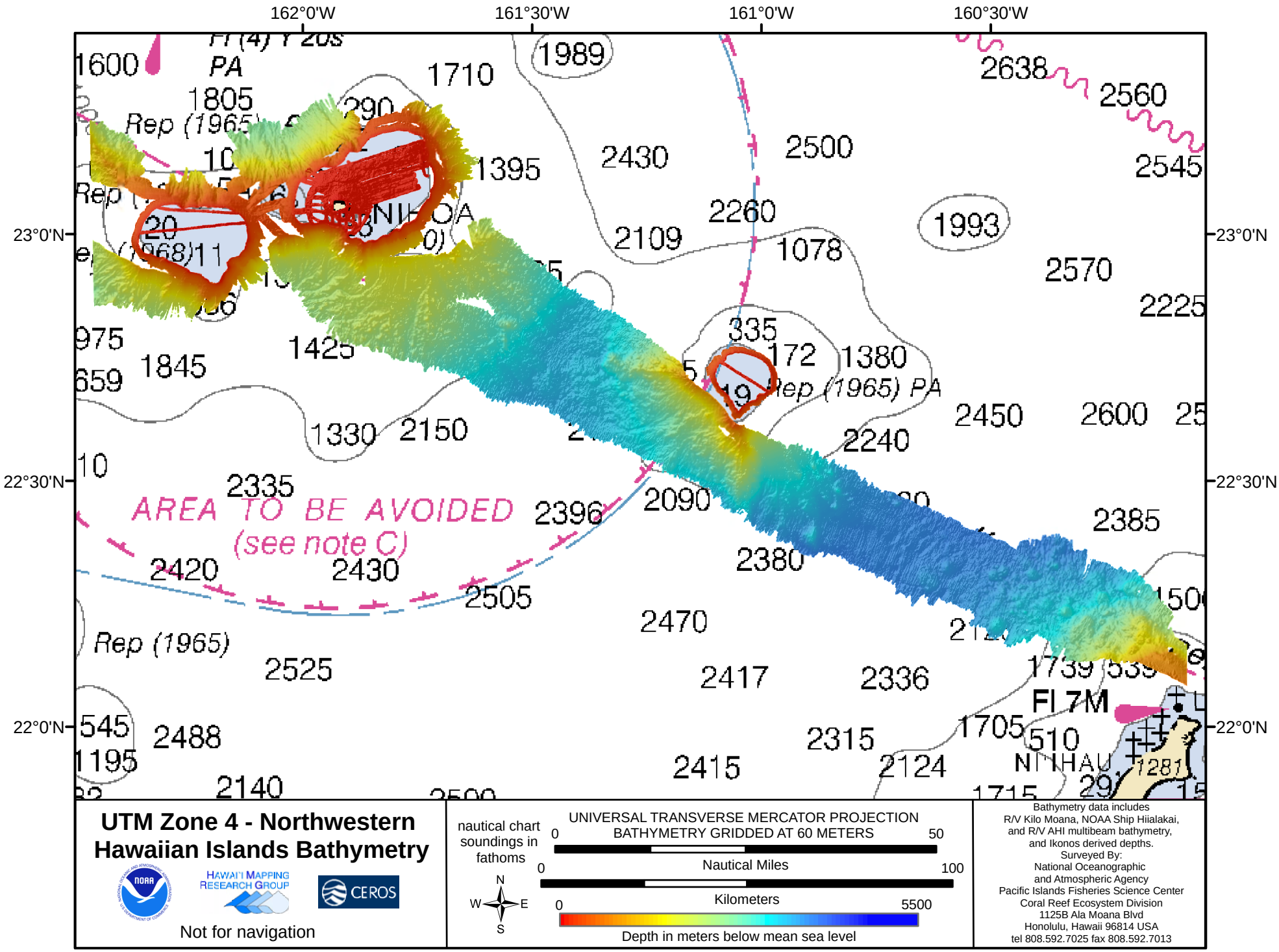


Figure by Pacific Islands Benthic Habitat Mapping Center



Islands of the Hawaiian Archipelago. The prominent islands, atolls, and banks in the NWHI, and the shelves around them are shown in pink, overlain on color-coded bathymetry data from Smith and Sandwell (1997). Numbers next to the islands are their ages in millions of years from Clague (1996) that have been measured (in parentheses) or calculated ages (in brackets).



UTM Zone 4 - Northwestern Hawaiian Islands Bathymetry

Not for navigation

nautical chart soundings in fathoms

UNIVERSAL TRANSVERSE MERCATOR PROJECTION
BATHYMETRY GRIDDED AT 60 METERS

0 — 50 Nautical Miles

0 — 100 Kilometers

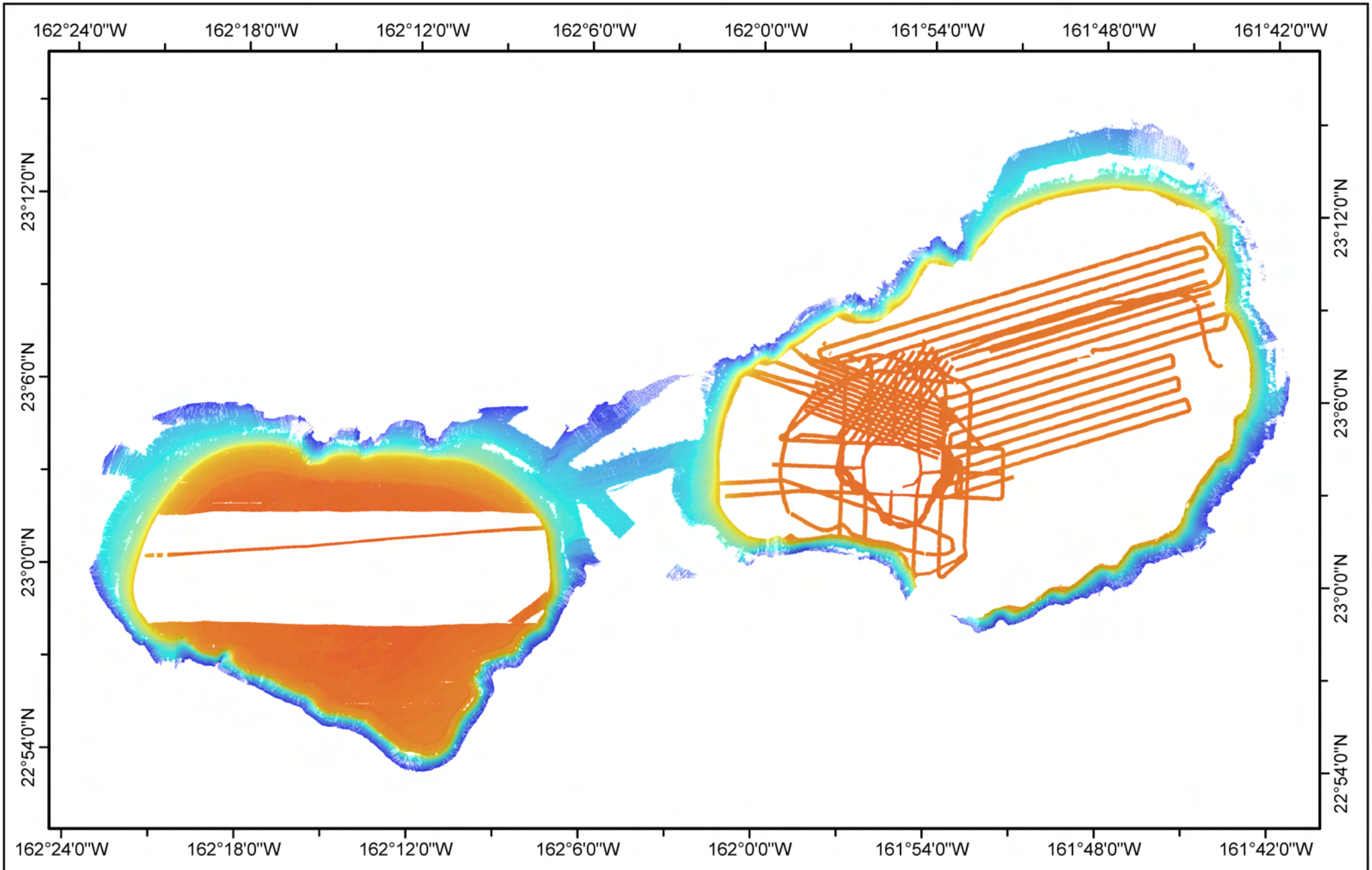
0 — 5500 Depth in meters below mean sea level

Bathymetry data includes R/V Kilo Moana, NOAA Ship Hiialakai, and R/V AHI multibeam bathymetry, and Ikonos derived depths.

Surveyed By:
National Oceanographic and Atmospheric Agency
Pacific Islands Fisheries Science Center
Coral Reef Ecosystem Division
1125B Ala Moana Blvd
Honolulu, Hawaii 96814 USA
tel 808.592.7025 fax 808.592.7013

Nihoa Island & Twin Banks

Photo By Emily Lundblad



Nihoa Island Multibeam Bathymetry
20 m Grid Cell Size
NOAA Coral Reef Ecosystem Division

Data include R/V Kilo Moana and NOAA Ship Hiialakai multibeam bathymetry.

NOT FOR NAVIGATION

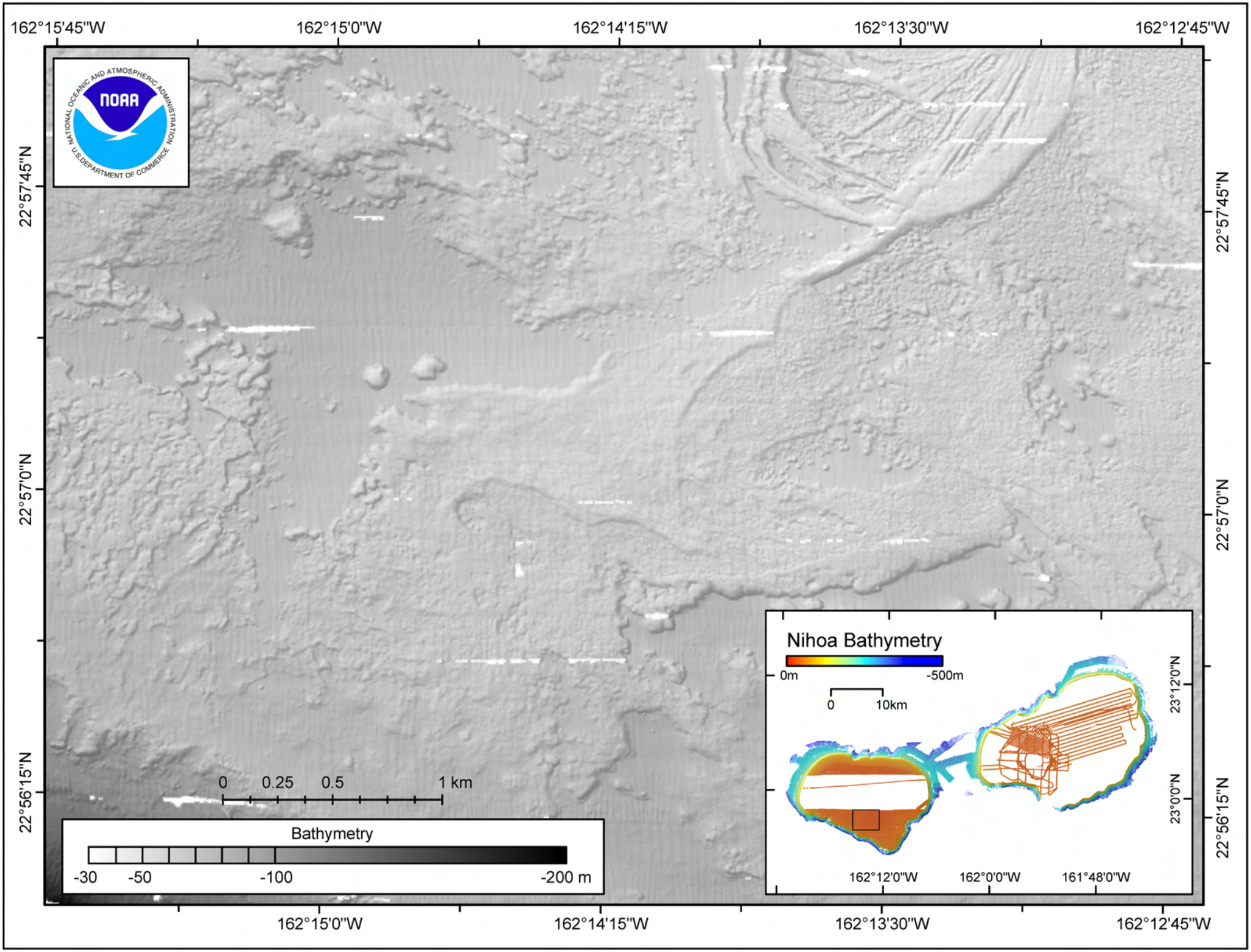
Universal Transverse Mercator Projection,Zone 4N, Ellipsoid: WGS84

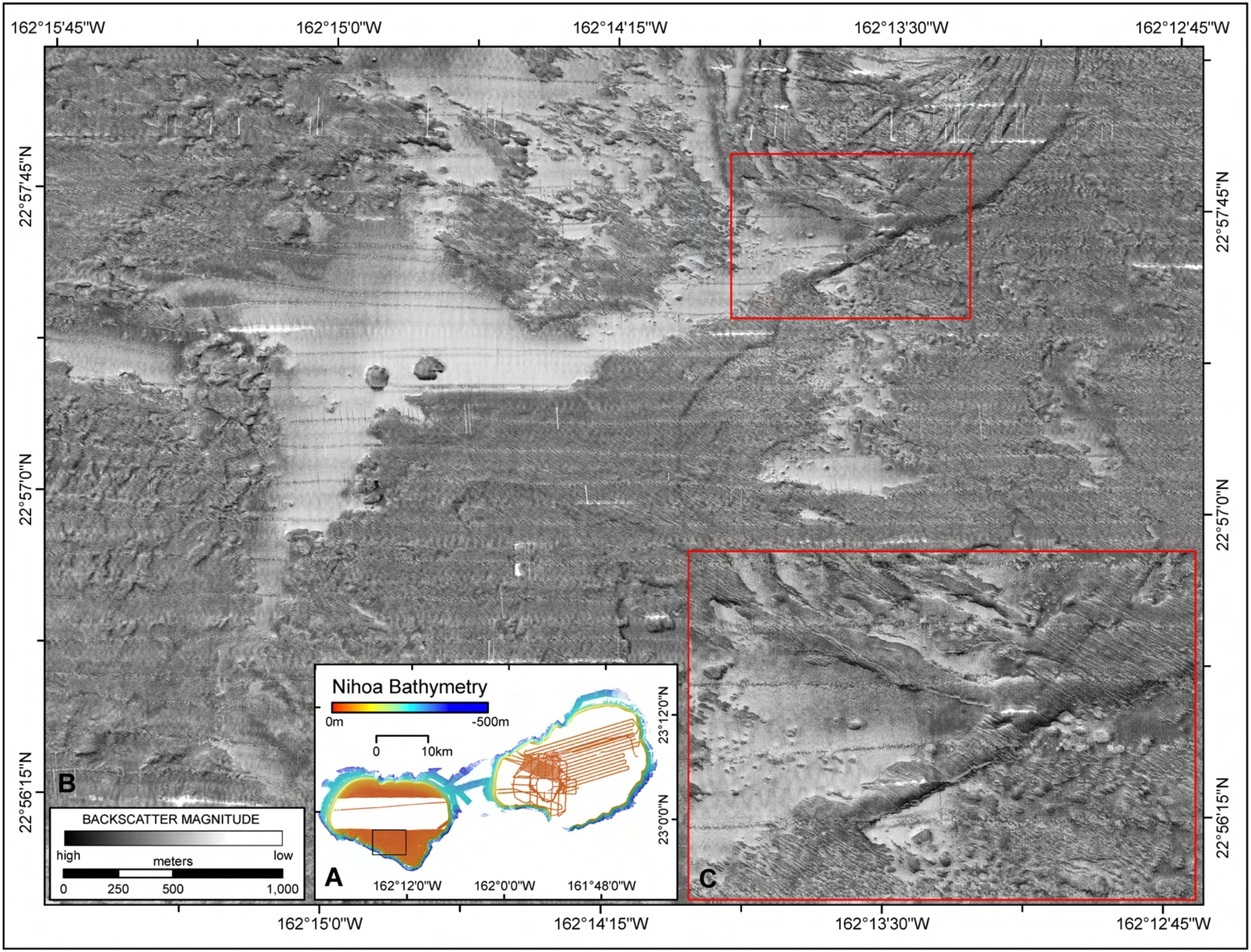
km
0 5 10 20 30

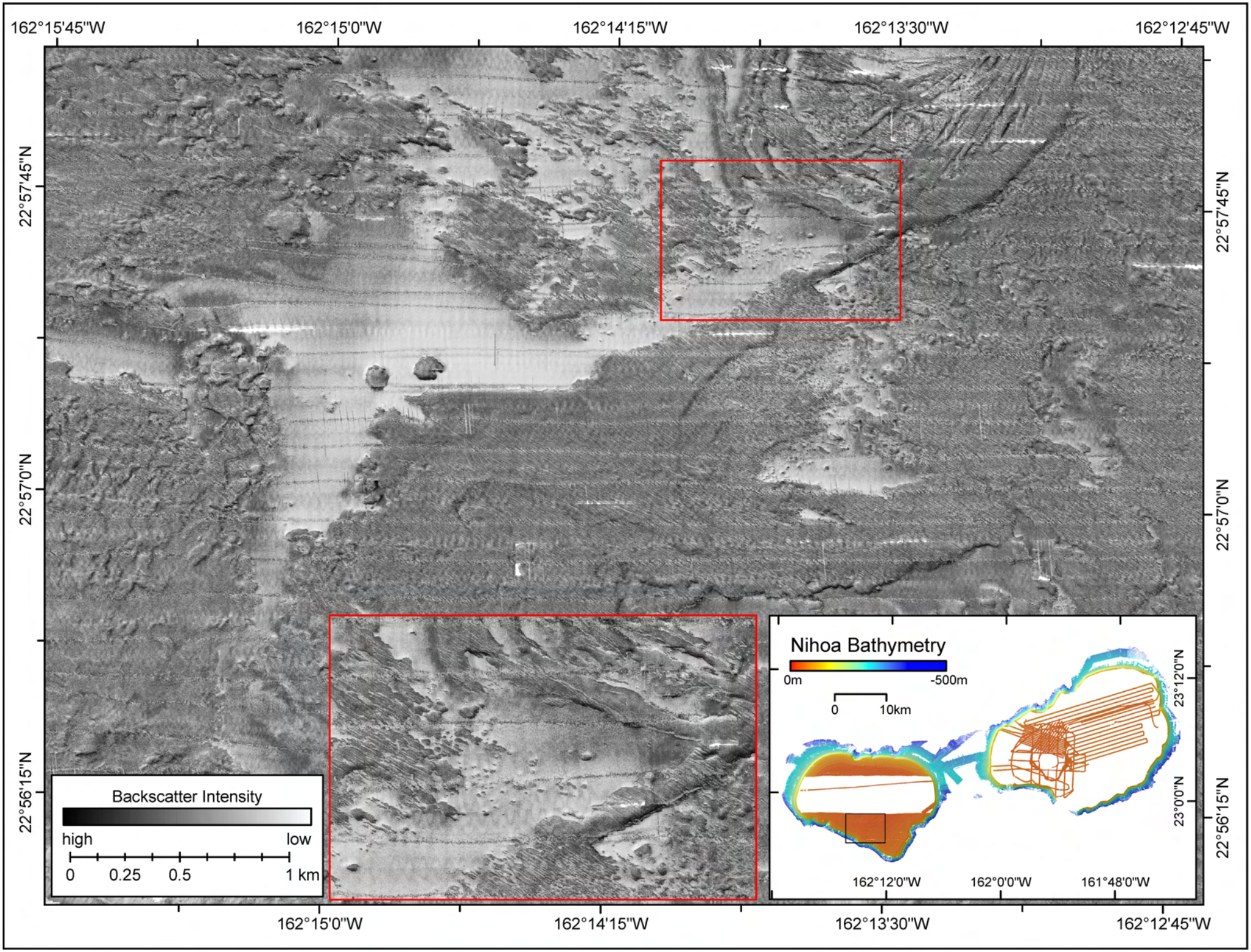
BATHYMETRY

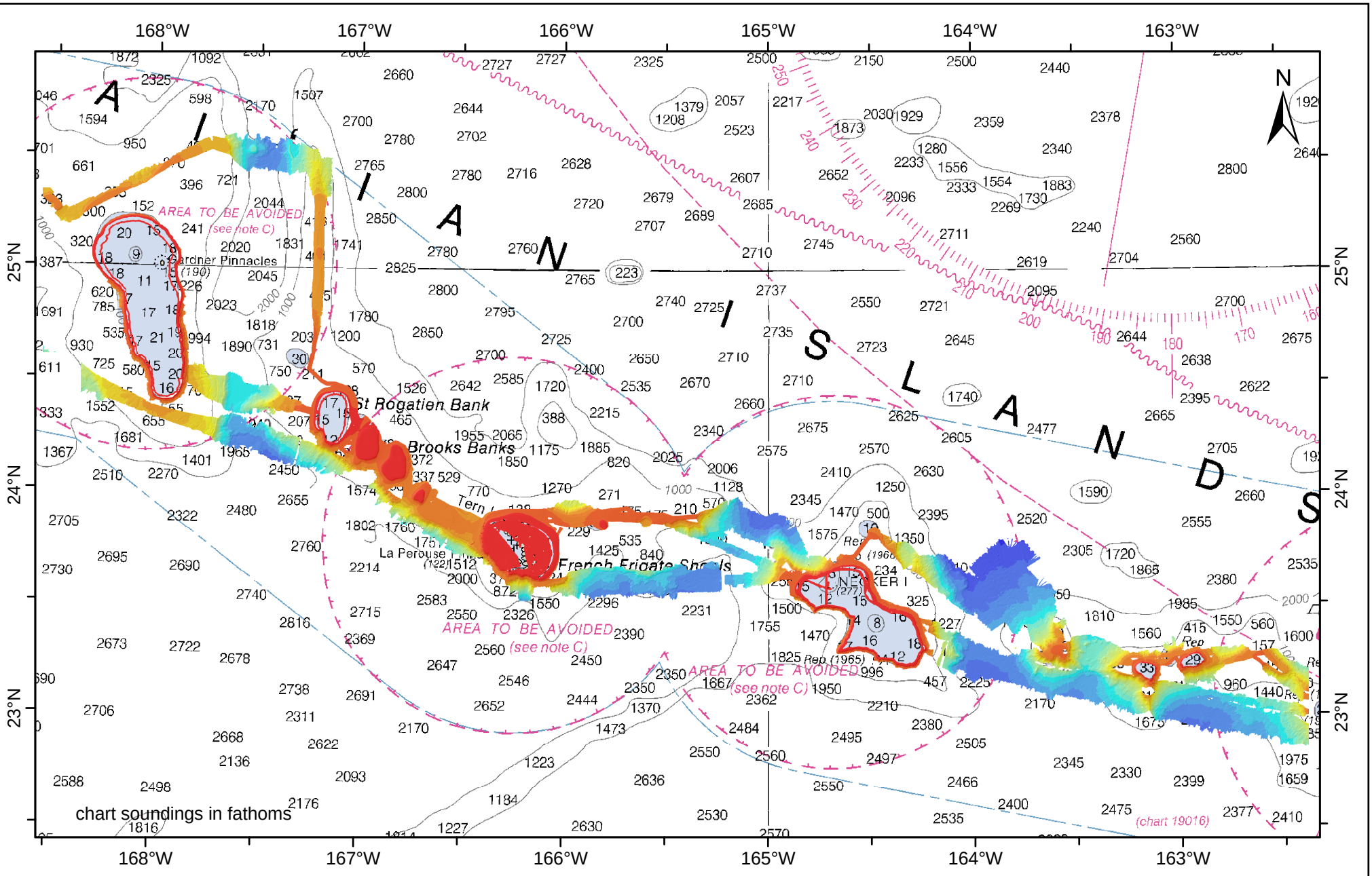
m
0 -100 -200 -300 -400 -500

NOAA
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
U.S. DEPARTMENT OF COMMERCE


162°15'45"W
162°15'0"W
162°14'15"W
162°13'30"W
162°12'45"W
22°57'45"N
22°57'0"N
22°56'15"N
NOAA
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
U.S. DEPARTMENT OF COMMERCE
0 0.25 0.5 1 km
Bathymetry
-30 -50 -100 -200 m
Nihoa Bathymetry
0m -500m
0 10km
23°12'0"N
23°0'0"N
162°12'0"W
162°0'0"W
161°48'0"W


162°15'45"W
162°15'0"W
162°14'15"W
162°13'30"W
162°12'45"W
22°57'45"N
22°57'0"N
22°56'15"N
Nihoa Bathymetry
0m
-500m
0
10km
23°12'0"N
23°0'0"N
162°12'0"W
162°0'0"W
161°48'0"W
A
B
C
BACKSCATTER MAGNITUDE
high
low
meters
0
250
500
1,000


162°15'45"W
162°15'0"W
162°14'15"W
162°13'30"W
162°12'45"W
22°57'45"N
22°57'0"N
22°56'15"N
Backscatter Intensity
high
low
0
0.25
0.5
1 km
Nihoa Bathymetry
0m
-500m
0
10km
23°12'0"N
23°0'0"N
162°12'0"W
162°0'0"W
161°48'0"W



Northwestern Hawaiian Islands Bathymetry

UTM Zone 3N - 60 m Grid Cell Size

NOAA Coral Reef Ecosystem Division

Data include R/V Kilo Moana, NOAA Ship Hiialakai, and R/V AHI multibeam bathymetry and Ikonos derived depths

NOT FOR NAVIGATION

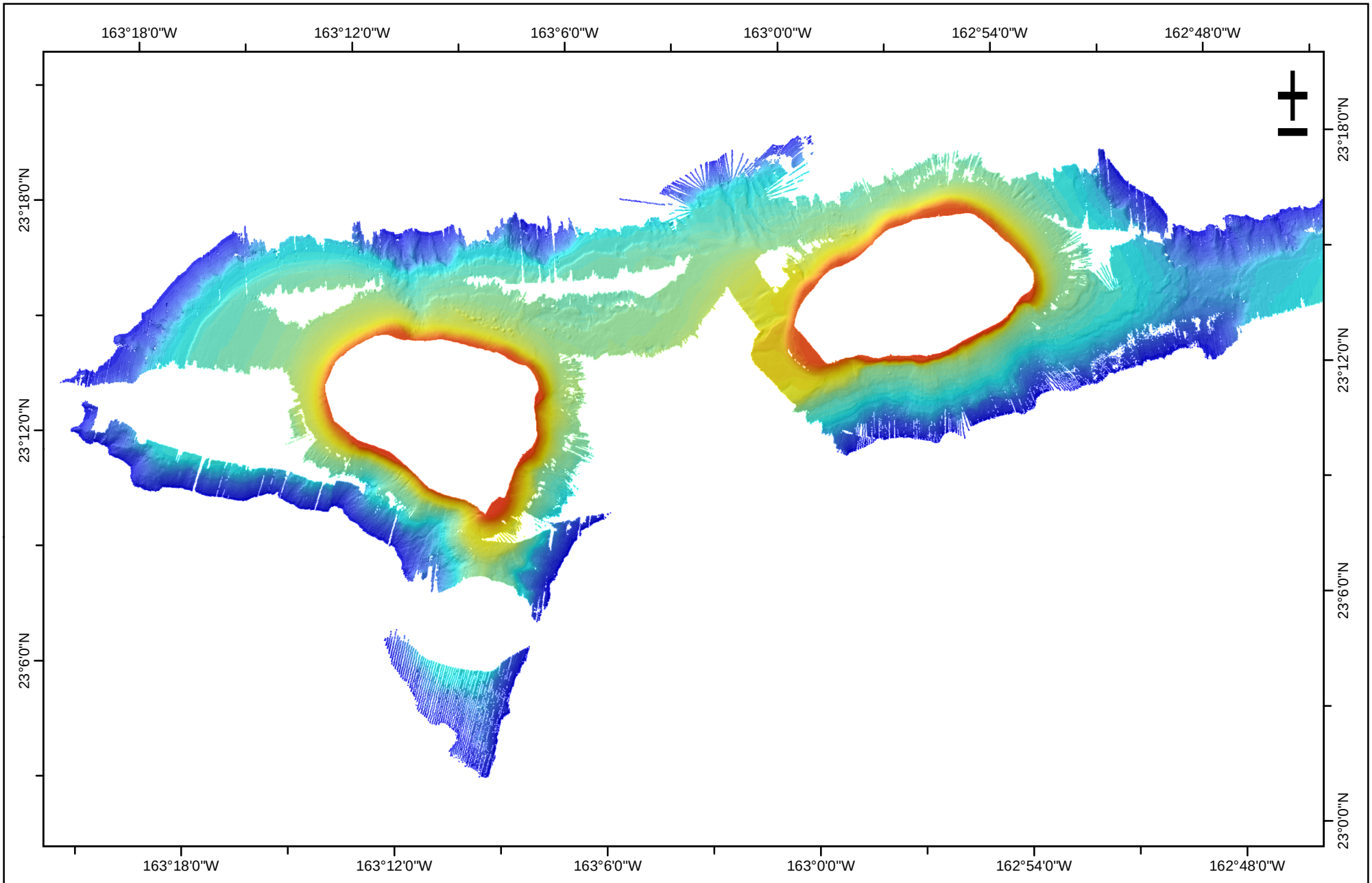
Universal Transverse Mercator Projection, Zone 3N, Ellipsoid: WGS84

km: 0 25 50 100 150 200

BATHYMETRY

m: 0 -1000 -2000 -3000 -4000

NOAA — National Oceanic and Atmospheric Administration — U.S. Department of Commerce



Twin Banks Bathymetry

20 m grid cell size

NOAA Coral Reef Ecosystem Division

Data include R/V Kilo Moana multibeam bathymetry

NOT FOR NAVIGATION

Universal Transverse Mercator Projection,Zone 3N, Ellipsoid: WGS84

0 15 30 km

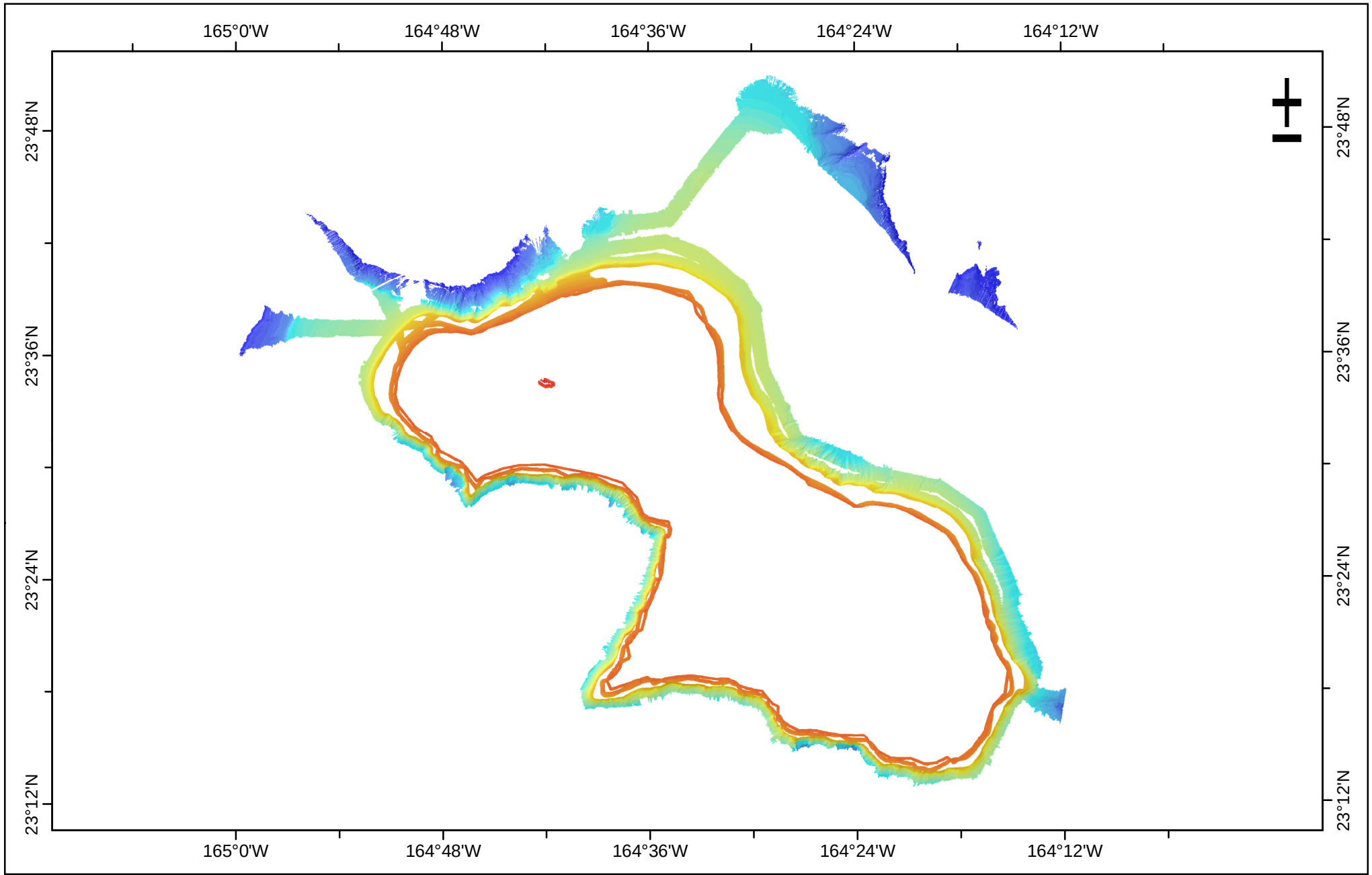
BATHYMETRY

-60 -200 -300 -400 -500 -1000 -1500m

NOAA
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
U.S. DEPARTMENT OF COMMERCE

Necker Island

Photo By Jean Kenyon



Necker Island Bathymetry

20 m grid cell size

NOAA Coral Reef Ecosystem Division

Data include R/V Kilo Moana Multibeam Bathymetry and Ikonos derived depths

NOT FOR NAVIGATION

Universal Transverse Mercator Projection,Zone 3N, Ellipsoid: WGS84

km

0 5 10 20 30 40 50

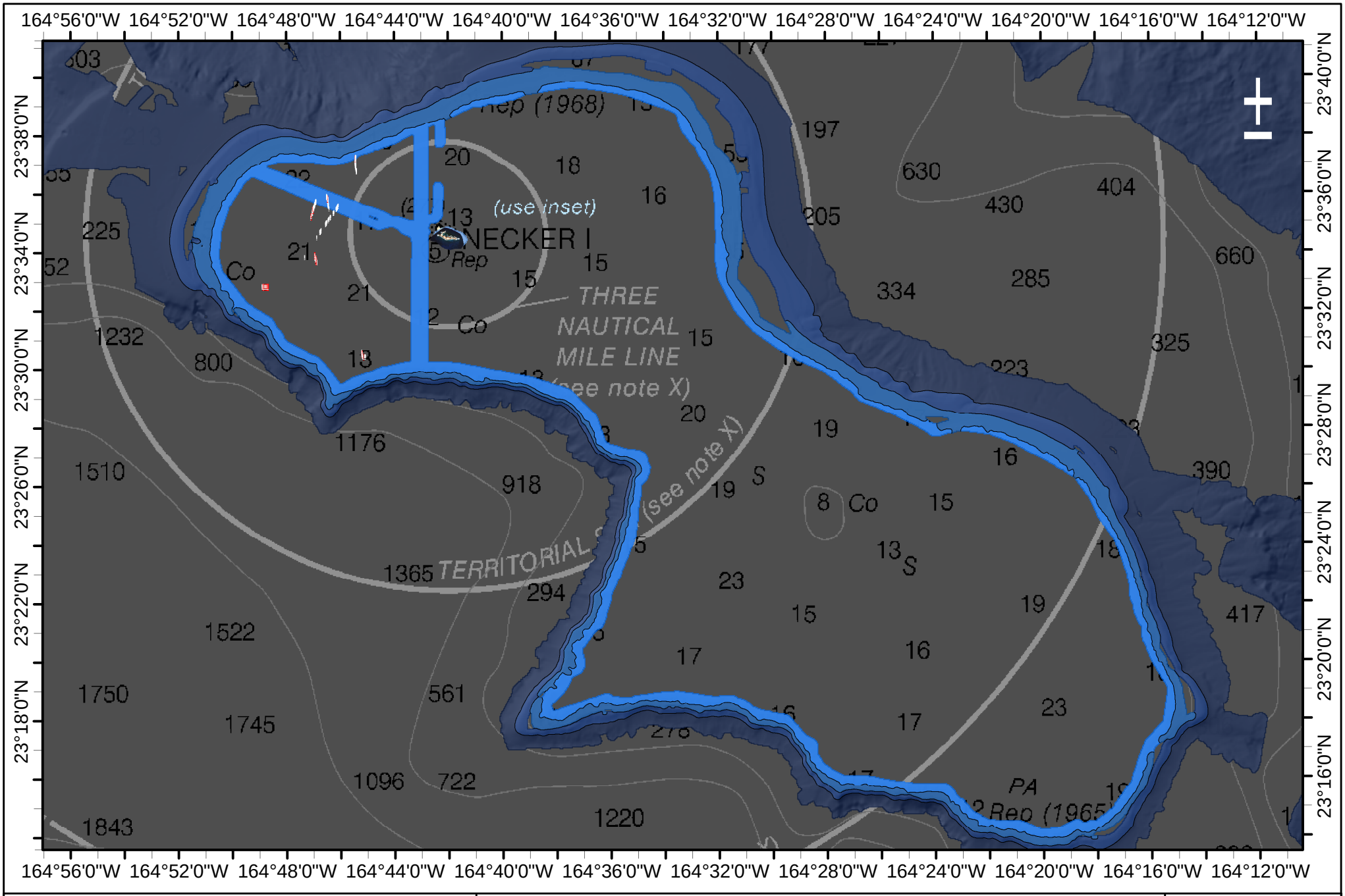
BATHYMETRY

0 -50 -100 -200 -500 -1500m

NOAA

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

U.S. DEPARTMENT OF COMMERCE



Necker Island Optical Validation

Photo and video classification results plotted on multibeam bathymetry, IKONOS, and NOAA chart 19016 derived depths.

NOT FOR NAVIGATION

BATHYMETRY

- 5 m
- 10 m
- 25 m
- 50 m
- 100 m
- 250 m

Universal Transverse Mercator Projection, Zone 3N, Ellipsoid: WGS84

0 6 12 18 24 30 Km

PERCENT COVER OF SCLERACTINIAN CORAL

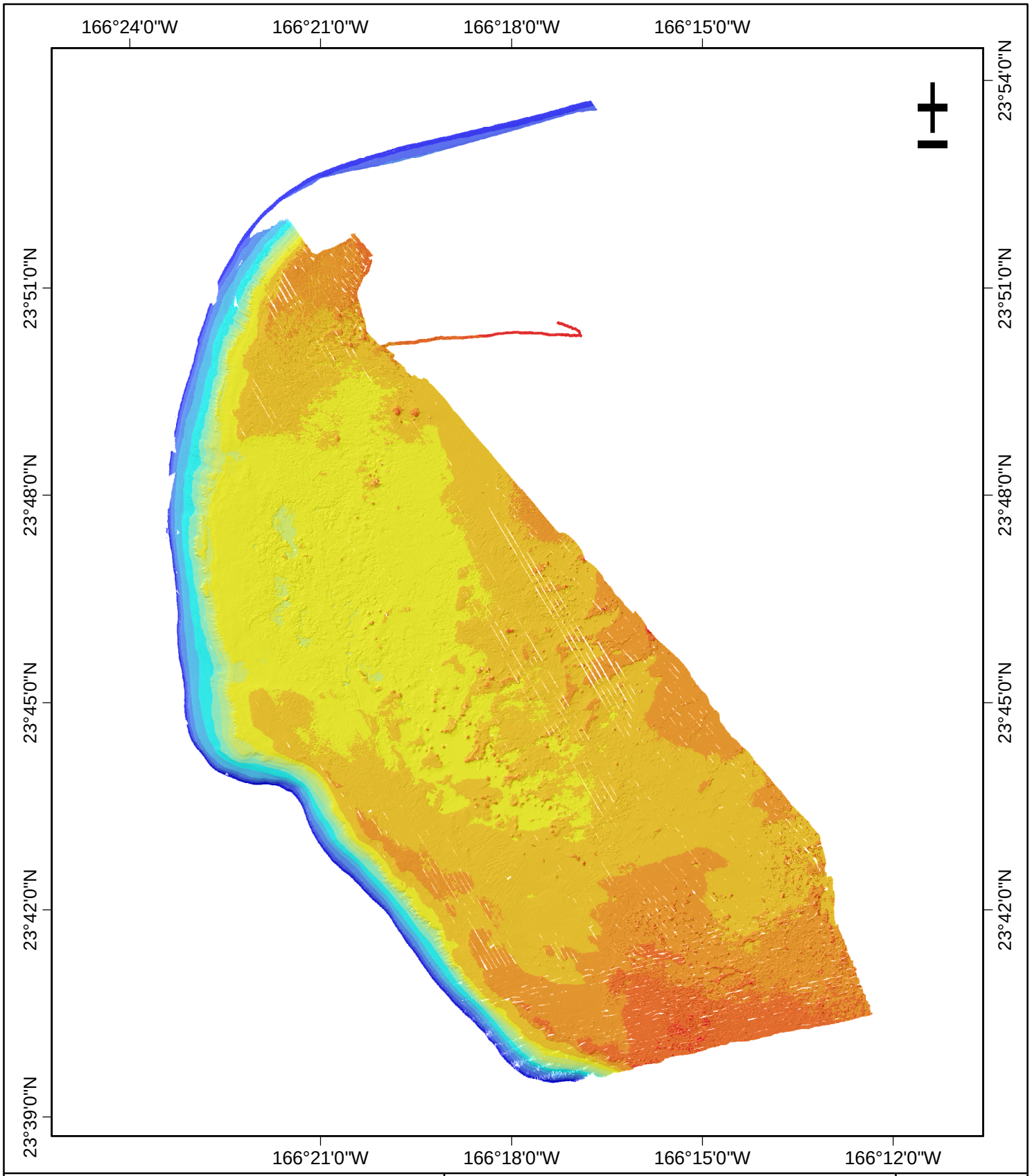
0 | 1-10 | 11-20 | 21-50 | 51-100

NOAA

Coral Reef Ecosystem Division

French Frigate Shoals

Figure by Rob O'Conner



French Frigate Shoals Bathymetry

5 m grid cell size

NOAA Coral Reef Ecosystem Division

Data include NOAA Ship Hiialakai and R/V AHI multibeam bathymetry

NOT FOR NAVIGATION

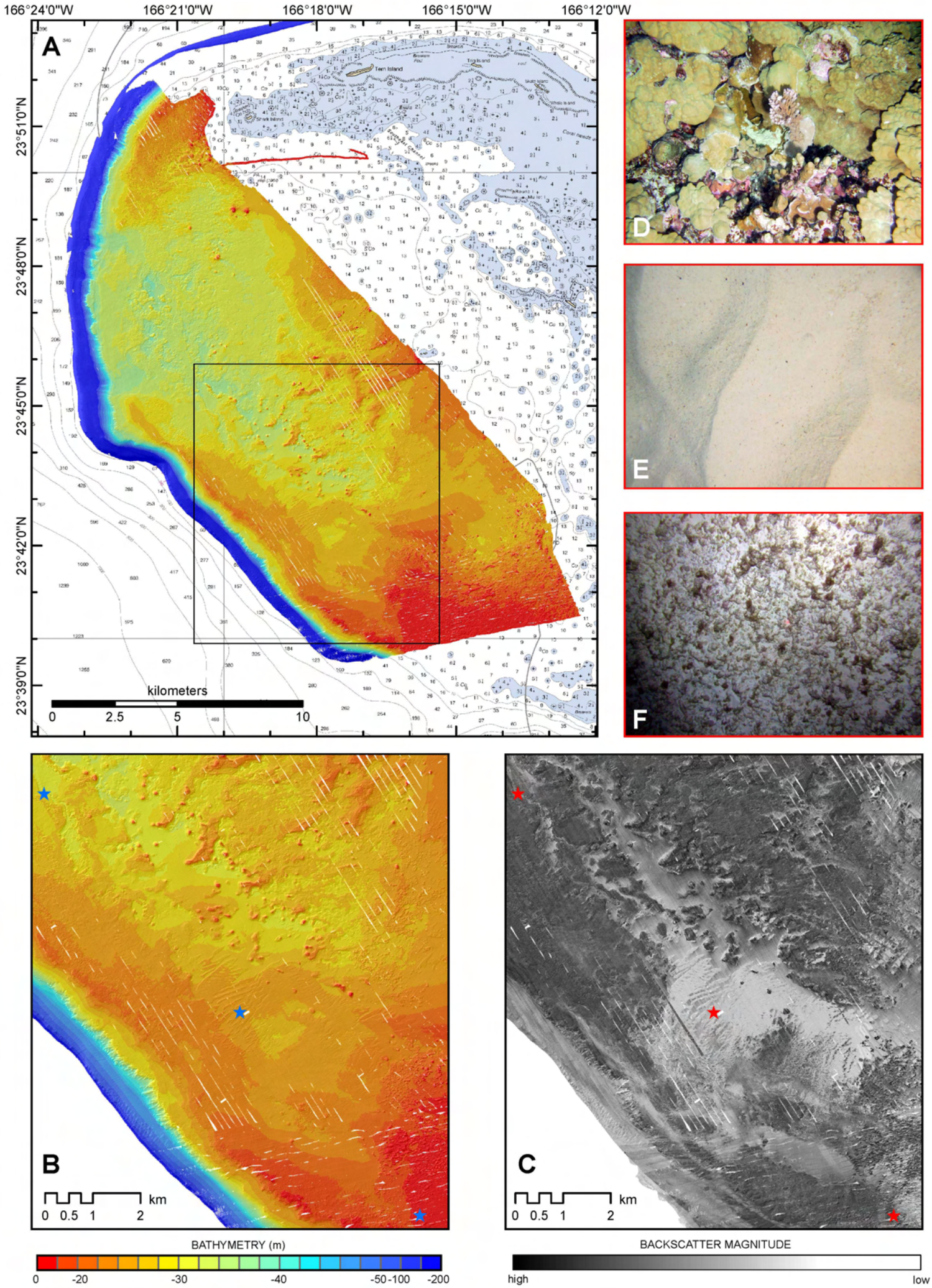
Universal Transverse Mercator Projection,
Zone 3N, Ellipsoid: WGS84

km
0 5 10

BATHYMETRY

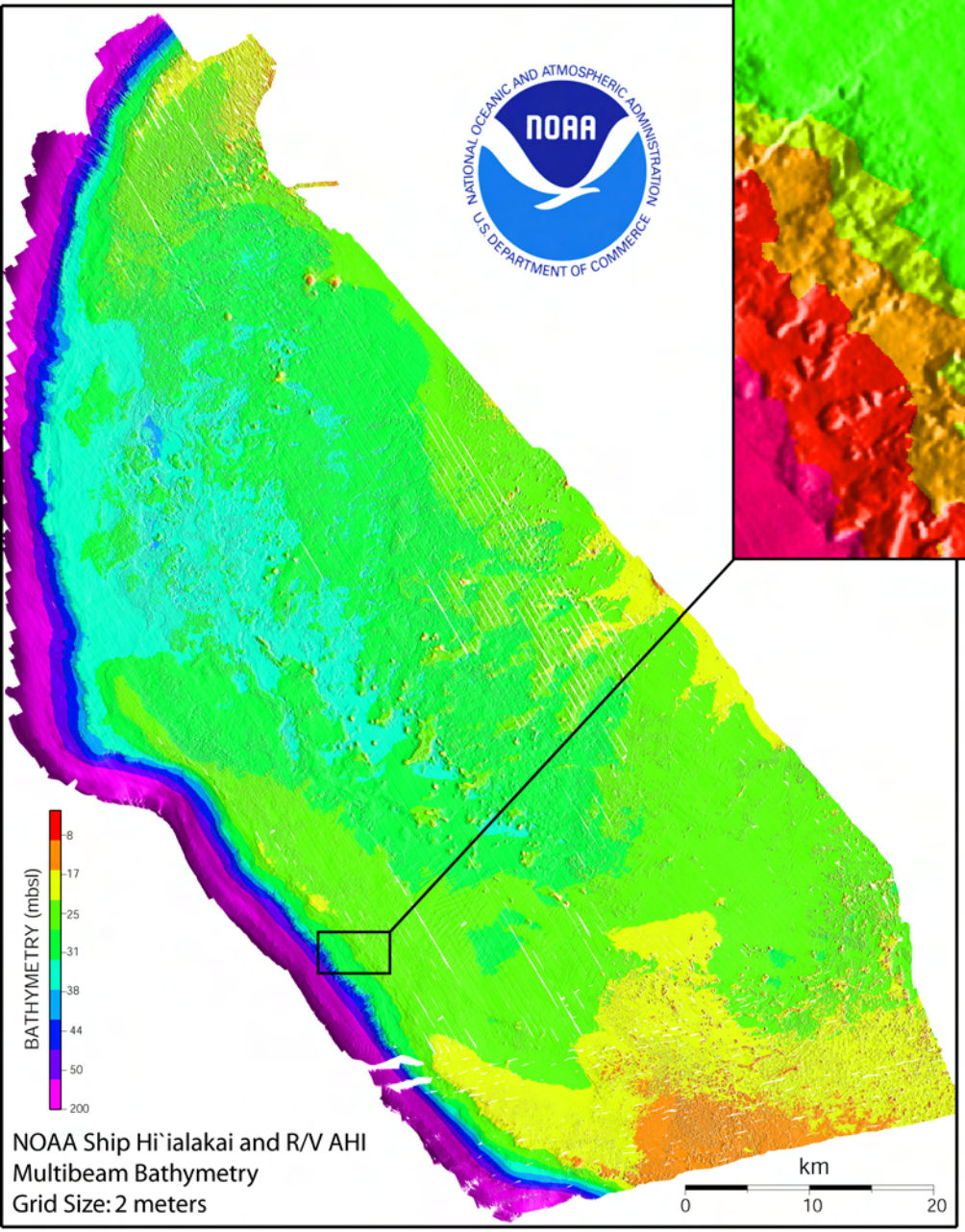
-10 -20 -30 -40 -50 -100 m

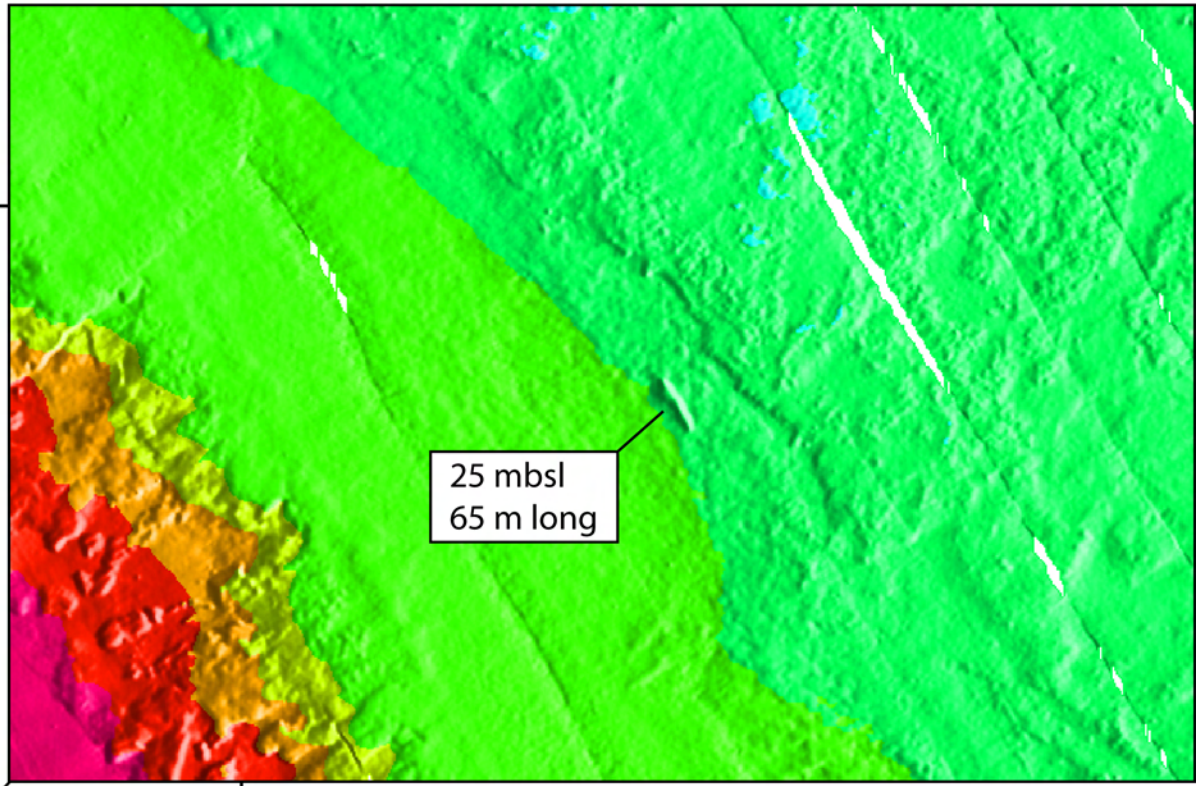
NOAA
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
U.S. DEPARTMENT OF COMMERCE

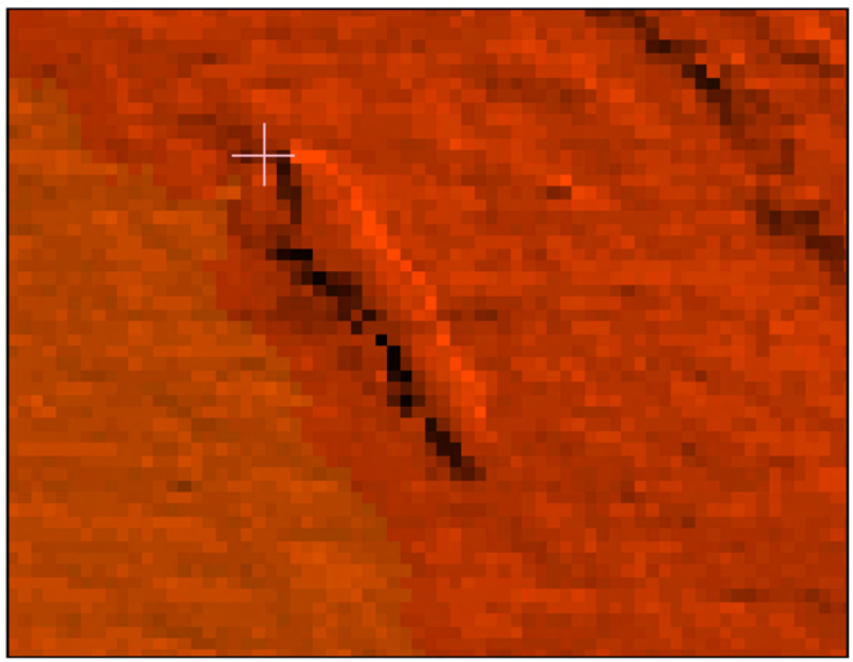

166°24'0"W
166°21'0"W
166°18'0"W
166°15'0"W
166°12'0"W
23°51'0"N
23°48'0"N
23°45'0"N
23°42'0"N
23°39'0"N
A
kilometers
0
2.5
5
10
D
E
F
B
km
0 0.5 1 2
C
km
0 0.5 1 2
BATHYMETRY (m)
0 -20 -30 -40 -50 -100 -200
BACKSCATTER MAGNITUDE
high
low

Northwestern Hawaiian Islands
French Frigate Shoals
Curious Seafloor Feature/Possible Shipwreck

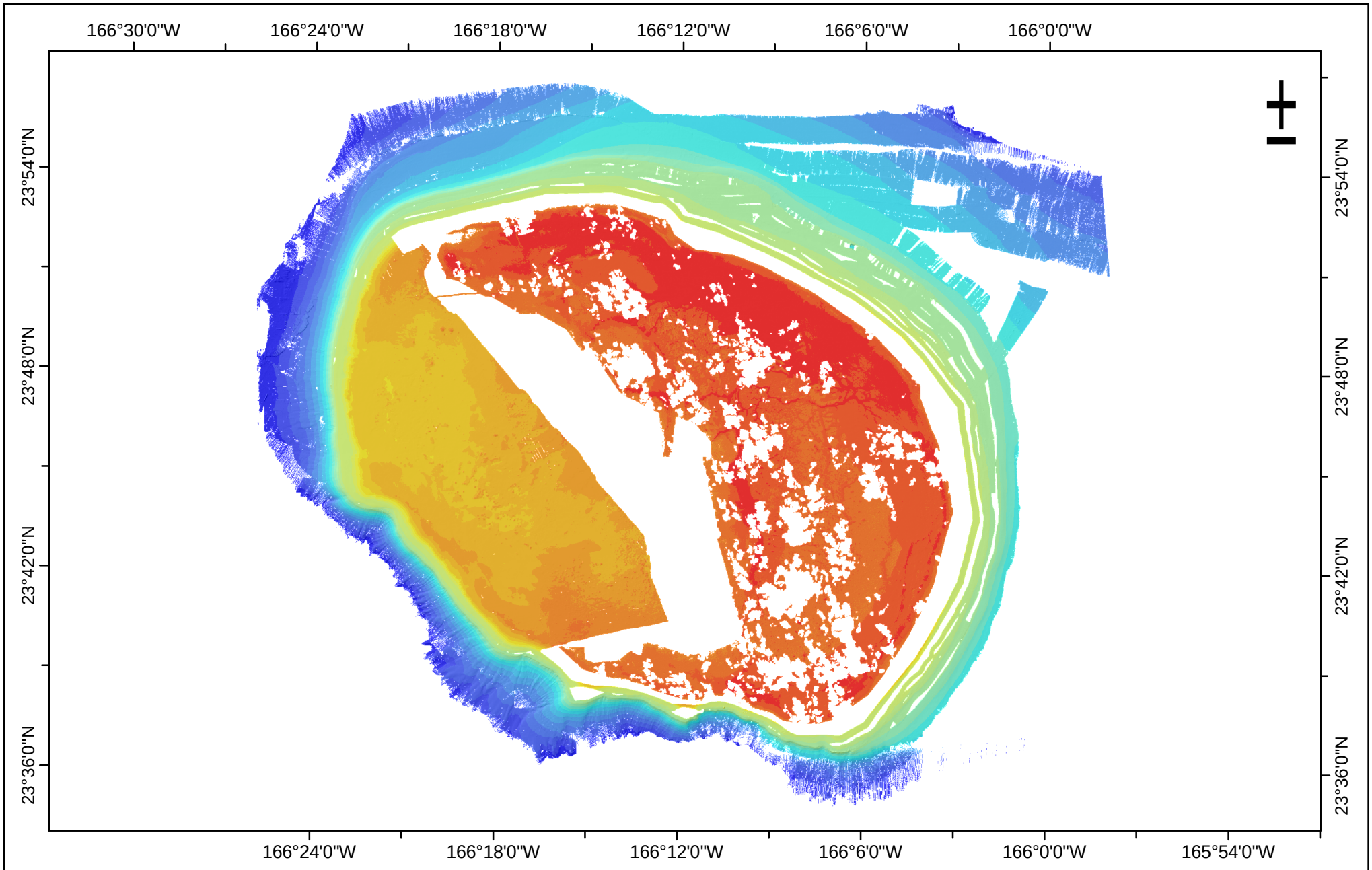
identified on May 21st 2005







Pacific Islands Benthic Habitat Mapping Center



French Frigate Shoals Bathymetry

20 m grid cell size

NOAA Coral Reef Ecosystem Division

Data include R/V Kilo Moana, NOAA Ship Hiialakai, and R/V AHI multibeam bathymetry and Ikonos derived depths

NOT FOR NAVIGATION

Universal Transverse Mercator Projection,Zone 3N, Ellipsoid: WGS84

0 5 10 20 30 km

BATHYMETRY

0 -50 -100 -300 -500 -700 m

NOAA

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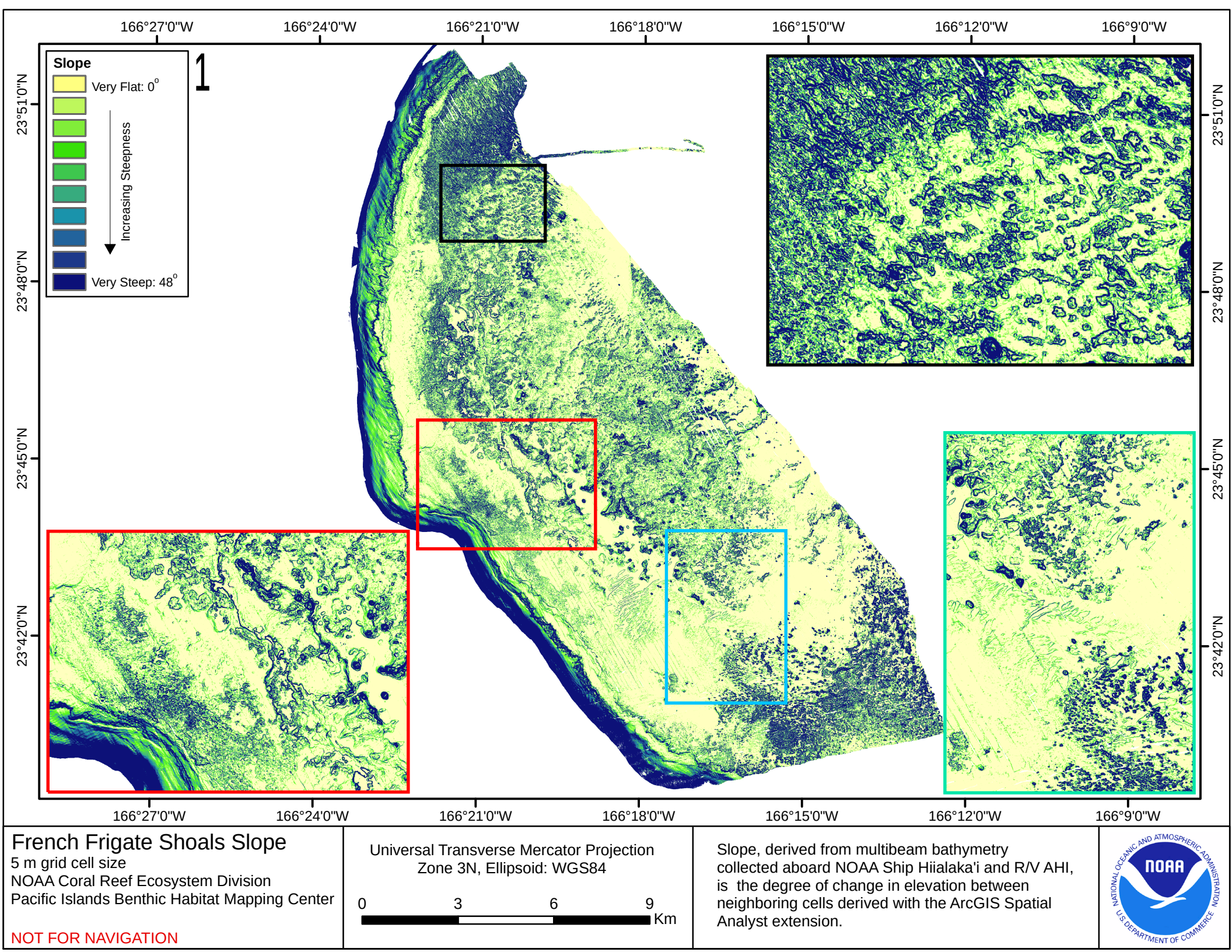
U.S. DEPARTMENT OF COMMERCE



French Frigate Shoals Slope

5 m grid cell size
NOAA Coral Reef Ecosystem Division
Pacific Islands Benthic Habitat Mapping Center

NOT FOR NAVIGATION

Universal Transverse Mercator Projection
Zone 3N, Ellipsoid: WGS84

0 3 6 9 Km

Slope, derived from multibeam bathymetry collected aboard NOAA Ship Hiialaka'i and R/V AHI, is the degree of change in elevation between neighboring cells derived with the ArcGIS Spatial Analyst extension.

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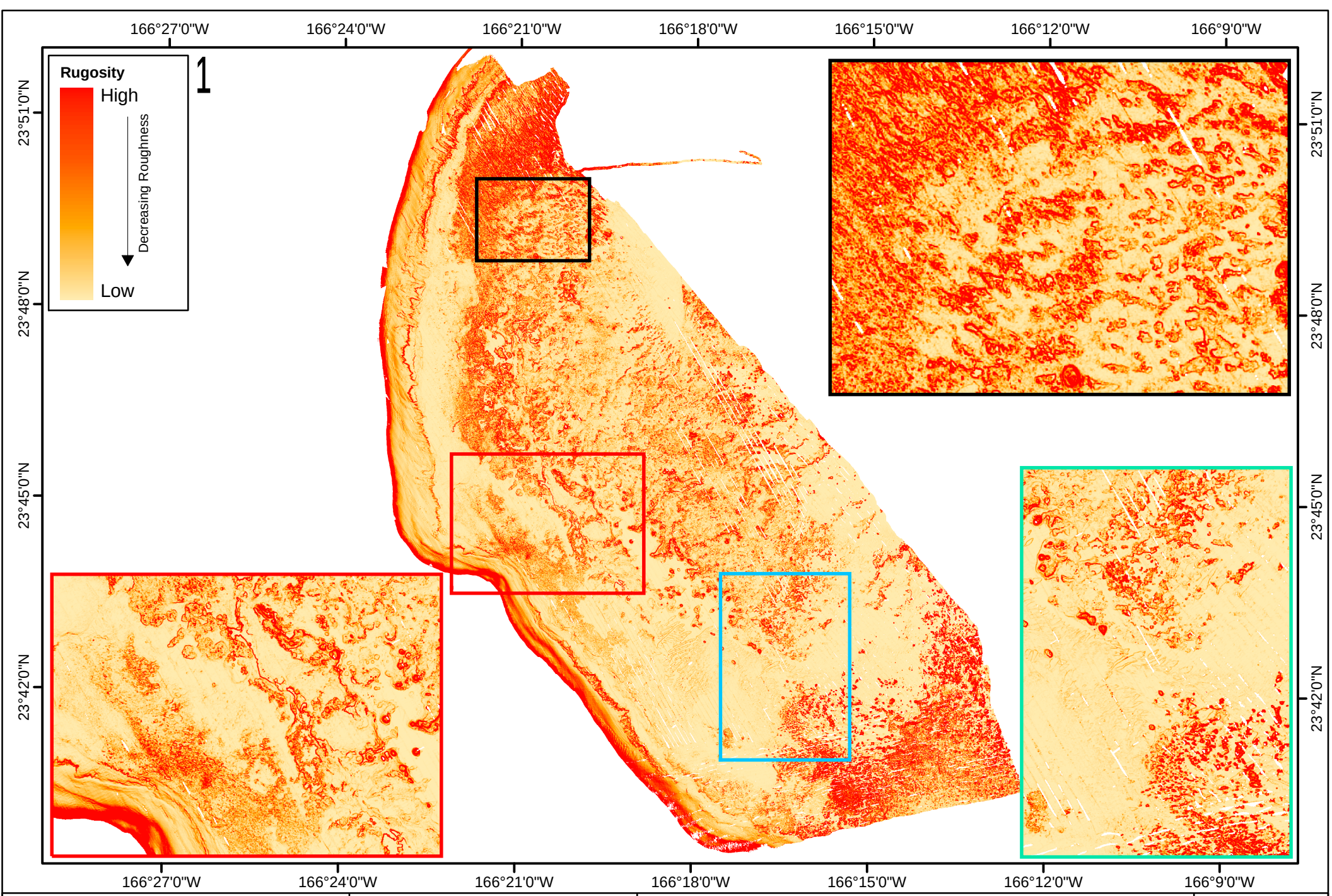
U.S. DEPARTMENT OF COMMERCE



French Frigate Shoals Rugosity

5 m grid cell size

NOAA Coral Reef Ecosystem Division

Pacific Islands Benthic Habitat Mapping Center

NOT FOR NAVIGATION

Universal Transverse Mercator Projection

Zone 3N, Ellipsoid: WGS84

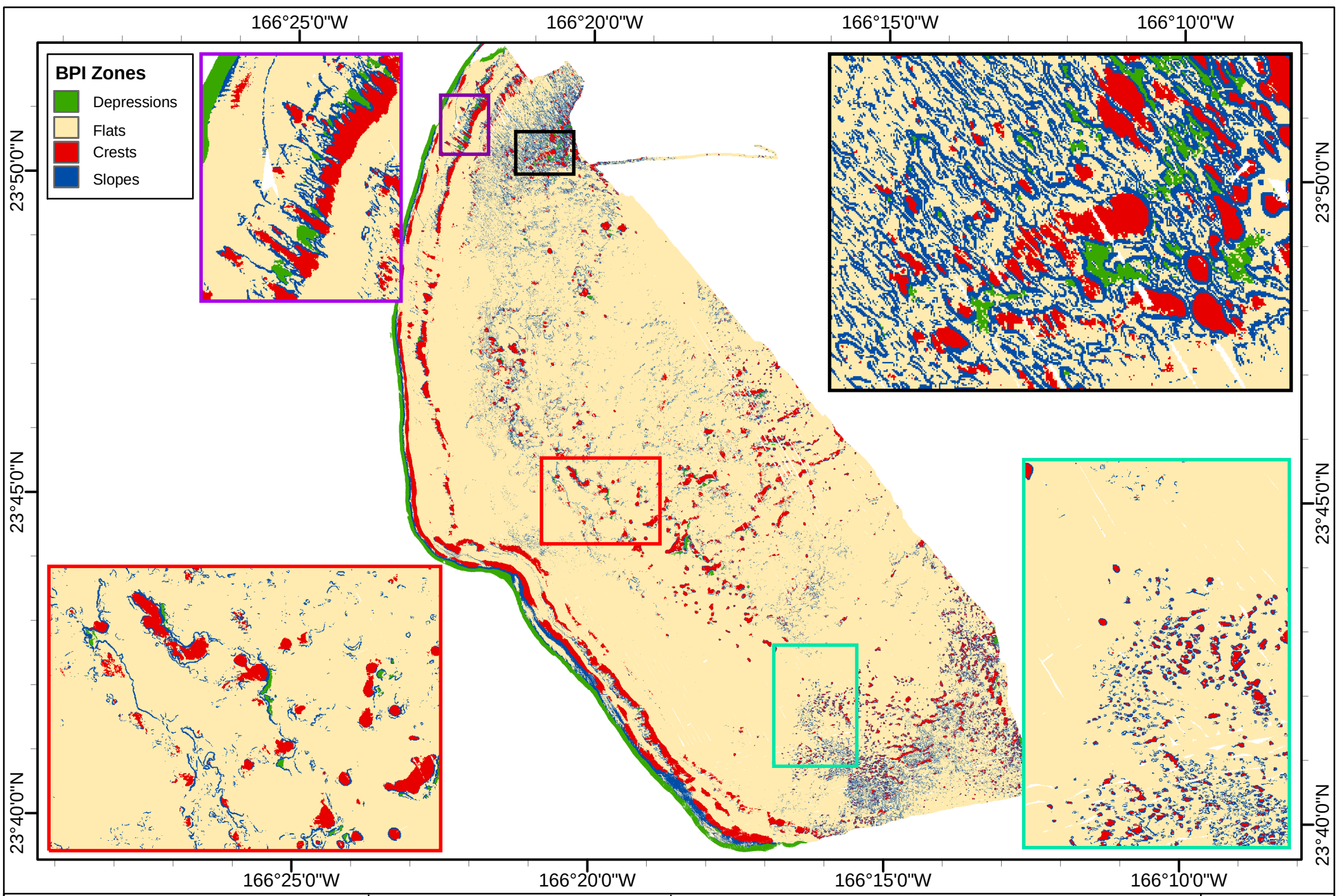
0 2 4 6 Km

Rugosity is derived from multibeam bathymetry, collected aboard NOAA Ship Hiialaka'i and R/V AHI, using the Benthic Terrain Modeler with rugosity methods by Jeff Jenness (2003). Cell values for rugosity reflect the surface area and (surface area) / (planimetric area) ratio for the area contained within that cell's boundaries. They provide indices of topographic roughness & convolutedness.

NOAA

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

U.S. DEPARTMENT OF COMMERCE



French Frigate Shoals BPI Zones

5 m grid cell size
NOAA Coral Reef Ecosystem Division
Pacific Islands Benthic Habitat Mapping Center

NOT FOR NAVIGATION

Universal Transverse Mercator
Projection Zone 3N,
Ellipsoid: WGS84

0 2 4 6 Km

Bathymetric Position Index (BPI) Zones are derived from a focal mean analysis on bathymetry and slope. After testing 5 experimental scales, the BPI with scalefactor 250 was chosen based on distance across predicted reef structures as seen in the bathymetry (also after Lundblad et al. 2006). Two ranges of slope defined flats and slopes: x < 5 and 5 < x < 70.

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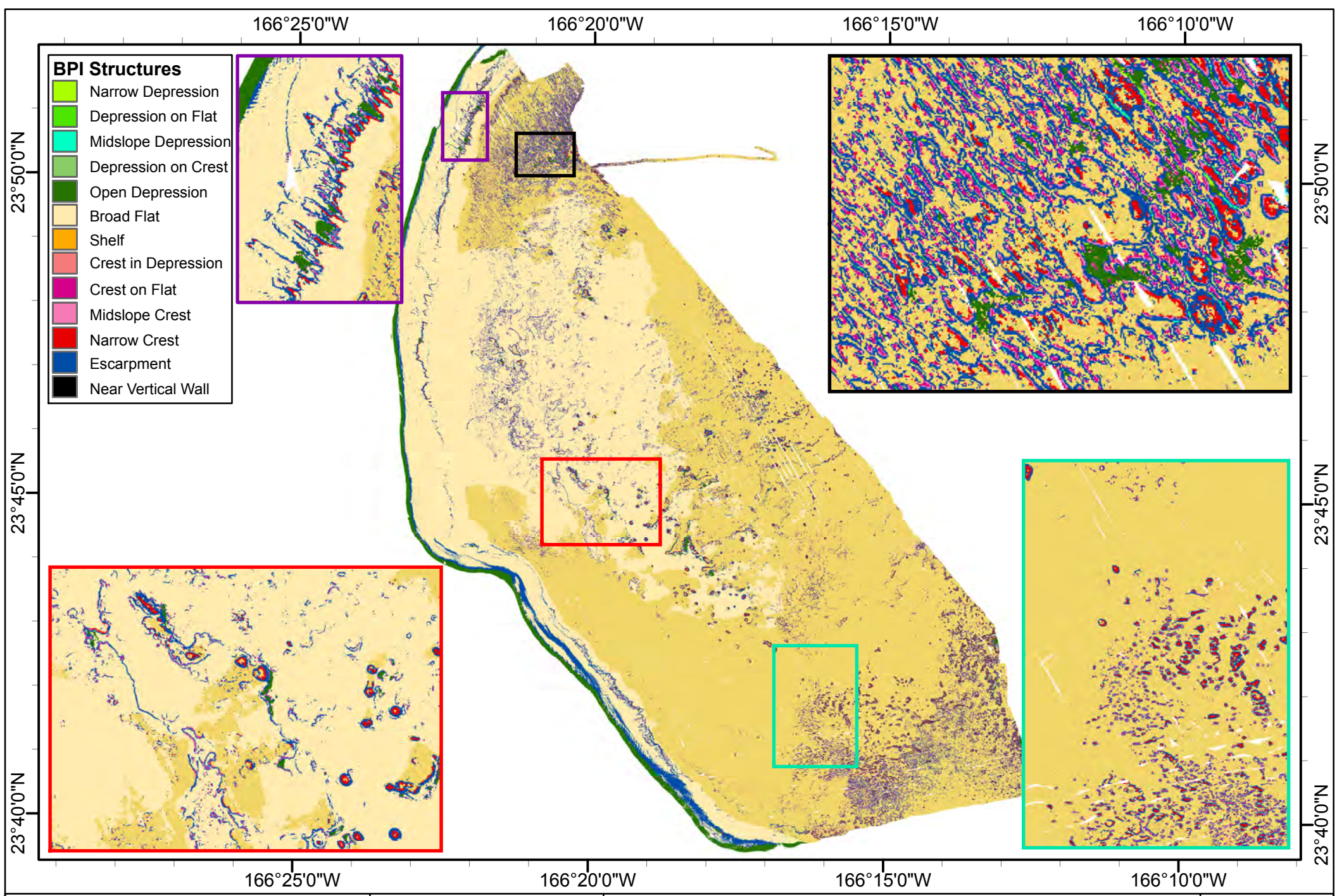
U.S. DEPARTMENT OF COMMERCE



French Frigate Shoals BPI Structures

5 m grid cell size

NOAA Coral Reef Ecosystem Division

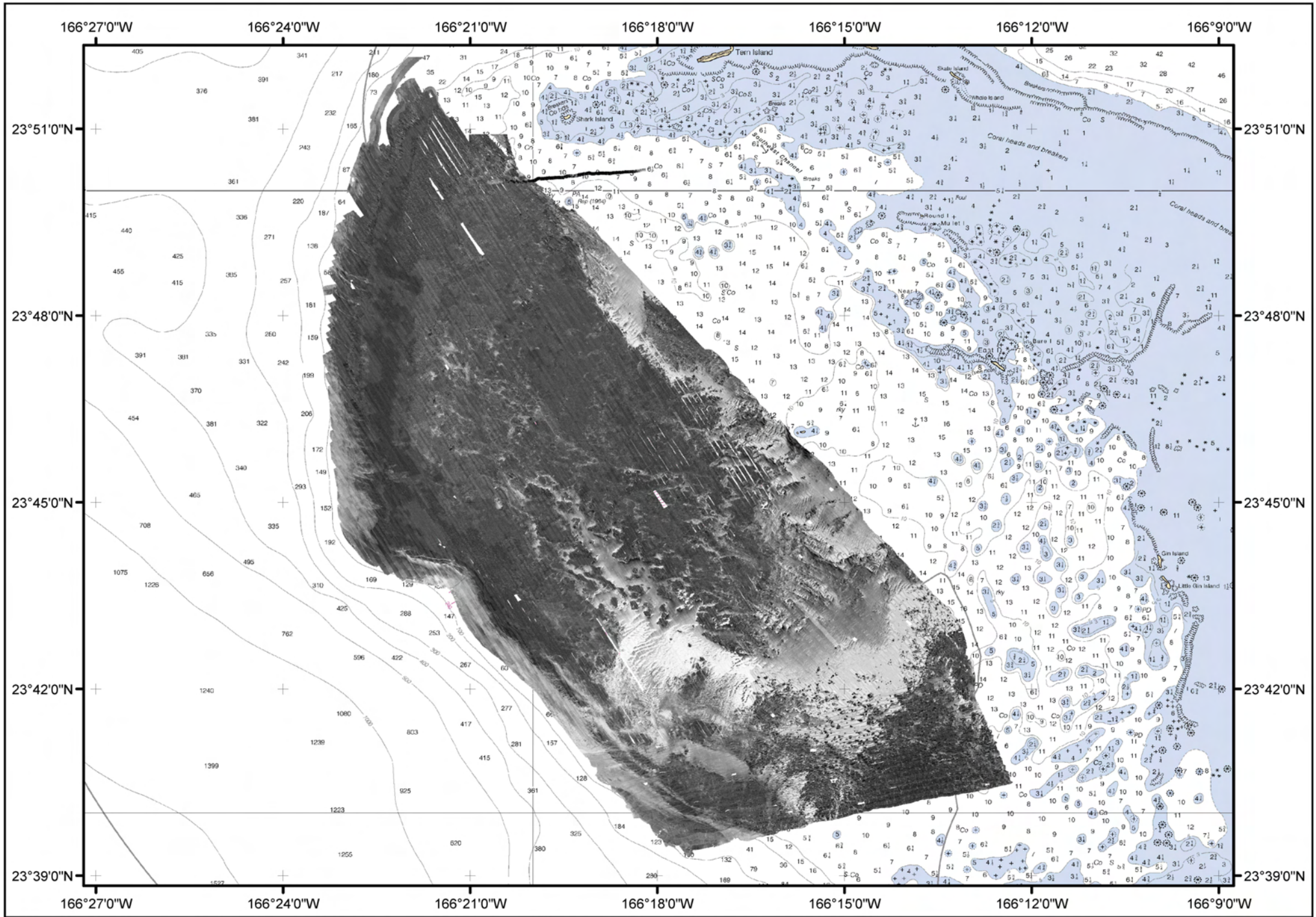
Pacific Islands Benthic Habitat Mapping Center

NOT FOR NAVIGATION

Universal Transverse Mercator Projection Zone 3N, Ellipsoid: WGS84

0 2.5 5 Km

Bathymetric Position Index (BPI) Structures are derived from two scales of a focal mean analysis on bathymetry; slope; and depth. After testing 10 experimental combinations, the two scales of BPI (20 & 250) were chosen based on distance across predicted reef structures as seen in the bathymetry (also after Lundblad et al. 2006). Three ranges of slope defined flats, slopes, and near vertical: x < 5; 5 < x < 70; x > 70. Depth alone, in this case, is added only to separate flat structures into shelf (<30 m) and broad flat (>30 m) environments (depths based on SCUBA limits).



French Frigate Shoals, Northwestern Hawaiian Islands Backscatter Imagery

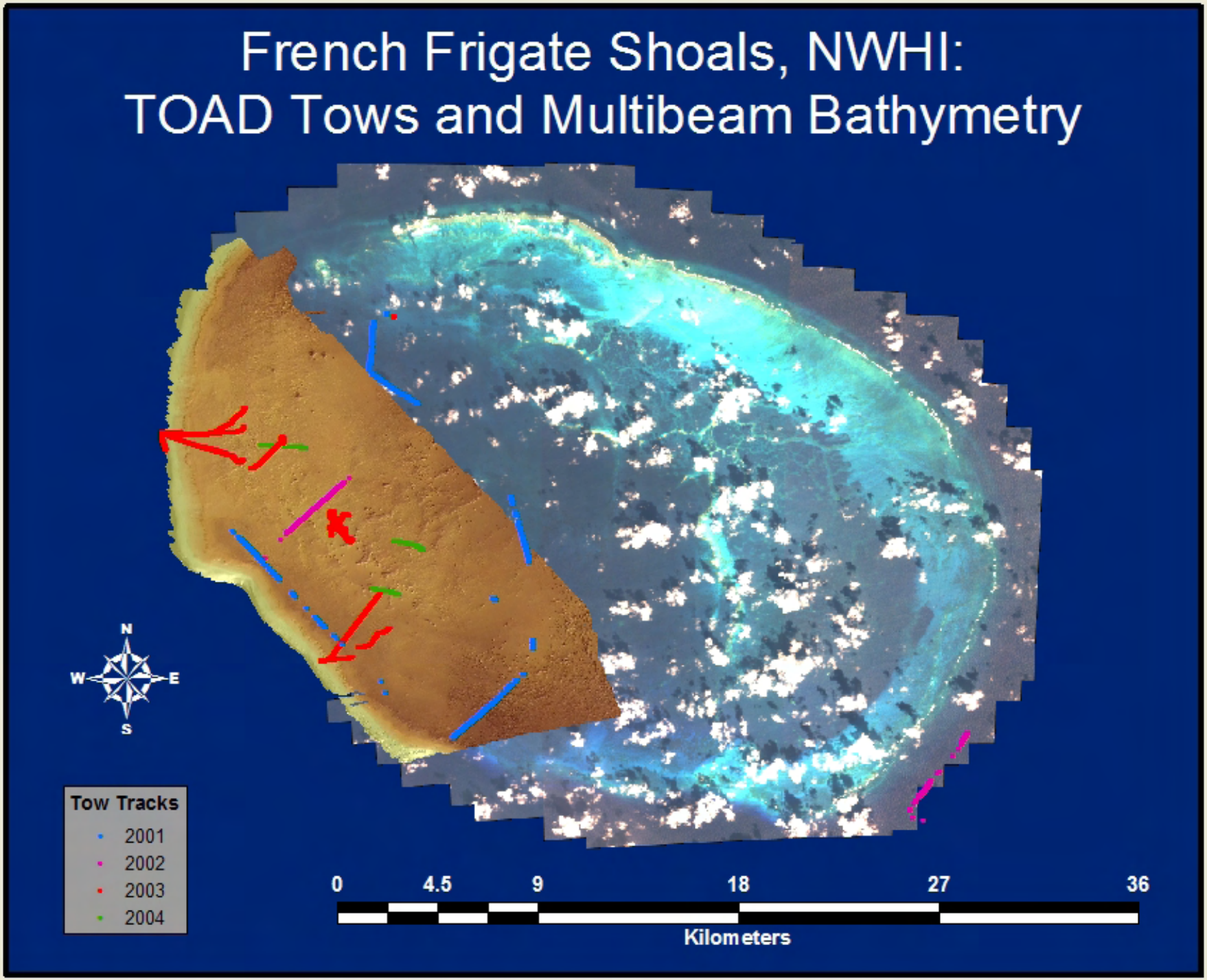
NOAA Coral Reef Ecosystem Division

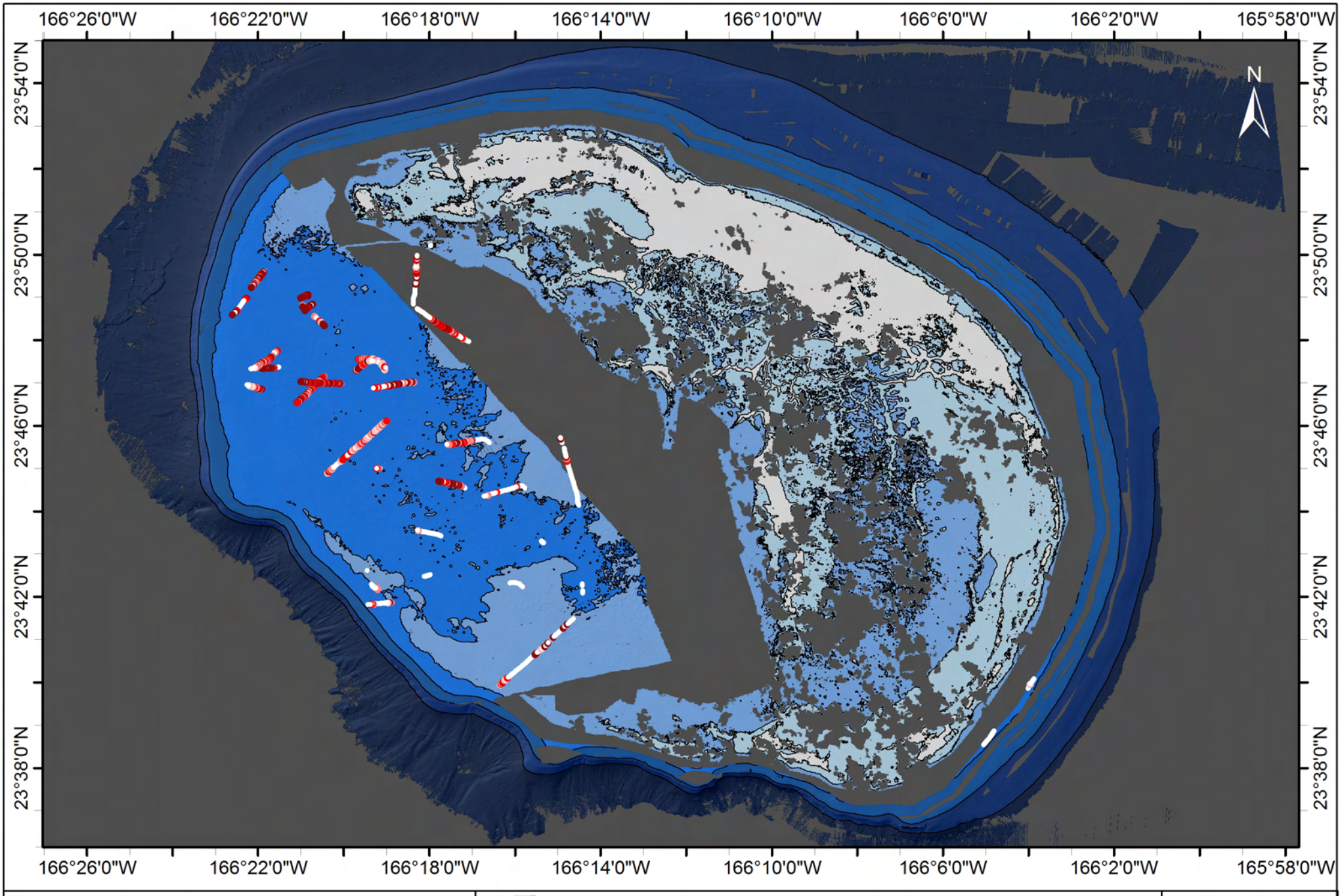
Not For Navigation

Universal Transverse Mercator Projection
UTM Zone 03 N
Nautical Miles
0 5
kilometers
0 5

low — high
Backscatter Magnitude

Grid Size: 1 m Chart: NOAA-NOS Chart 19401_1
Ellipsoid: WGS-84 Equipment: POS-MV CA-GPS


French Frigate Shoals, NWHI:
TOAD Tows and Multibeam Bathymetry
N
W
E
S
Tow Tracks
2001
2002
2003
2004
0
4.5
9
18
27
36
Kilometers



French Frigate Shoals Optical Validation

Photo and video classification results plotted on multibeam bathymetry and IKONOS© derived depths.

NOT FOR NAVIGATION

BATHYMETRY
- 5 m
- 10 m
- 25 m
- 50 m
- 100 m
- 250 m

Universal Transverse Mercator Projection, Zone 3N, Ellipsoid: WGS84

0 4 8 12 16 20 Km

PERCENT COVER OF SCLERACTINIAN CORAL

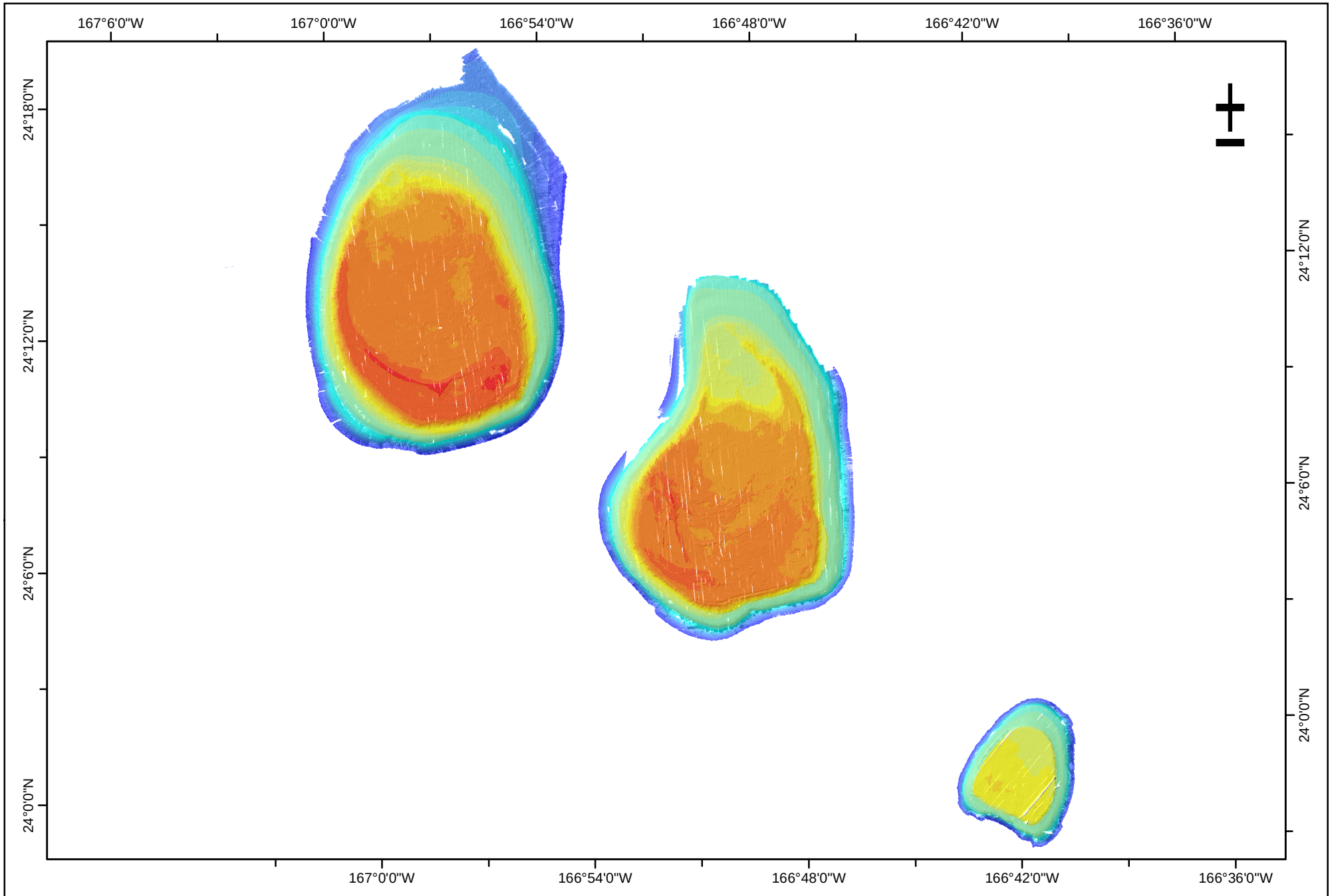
○ 0 ● 1-10 ● 11-20 ● 21-50 ● 51-100

NOAA

Coral Reef Ecosystem Division

St. Rogatien & Brooks Banks

Photo By Akel Sterling



Brooks Bank Bathymetry

5 m grid cell size

NOAA Coral Reef Ecosystem Division

Data include NOAA Ship Hiialakai and R/V AHI multibeam bathymetry

NOT FOR NAVIGATION

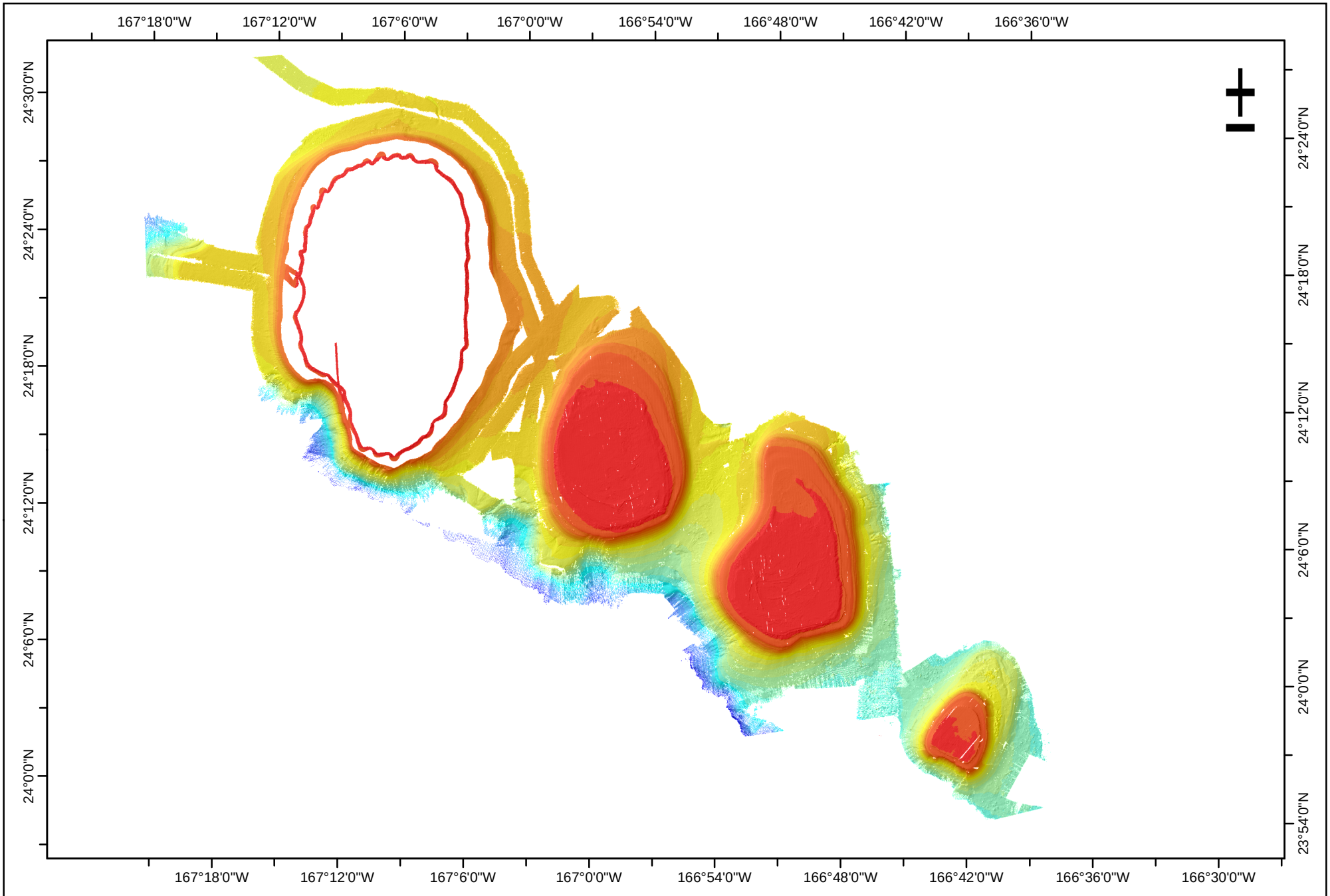
Universal Transverse Mercator Projection,Zone 3N, Ellipsoid: WGS84

0 5 10 20 30 km

BATHYMETRY

-25 -50 -75 -100 -200 -300m

NOAA NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION U.S. DEPARTMENT OF COMMERCE



Brooks Bank Bathymetry

20 m grid cell size

NOAA Coral Reef Ecosystem Division

Data include R/V Kilo Moana, NOAA Ship Hiialakai and R/V AHI multibeam bathymetry

NOT FOR NAVIGATION

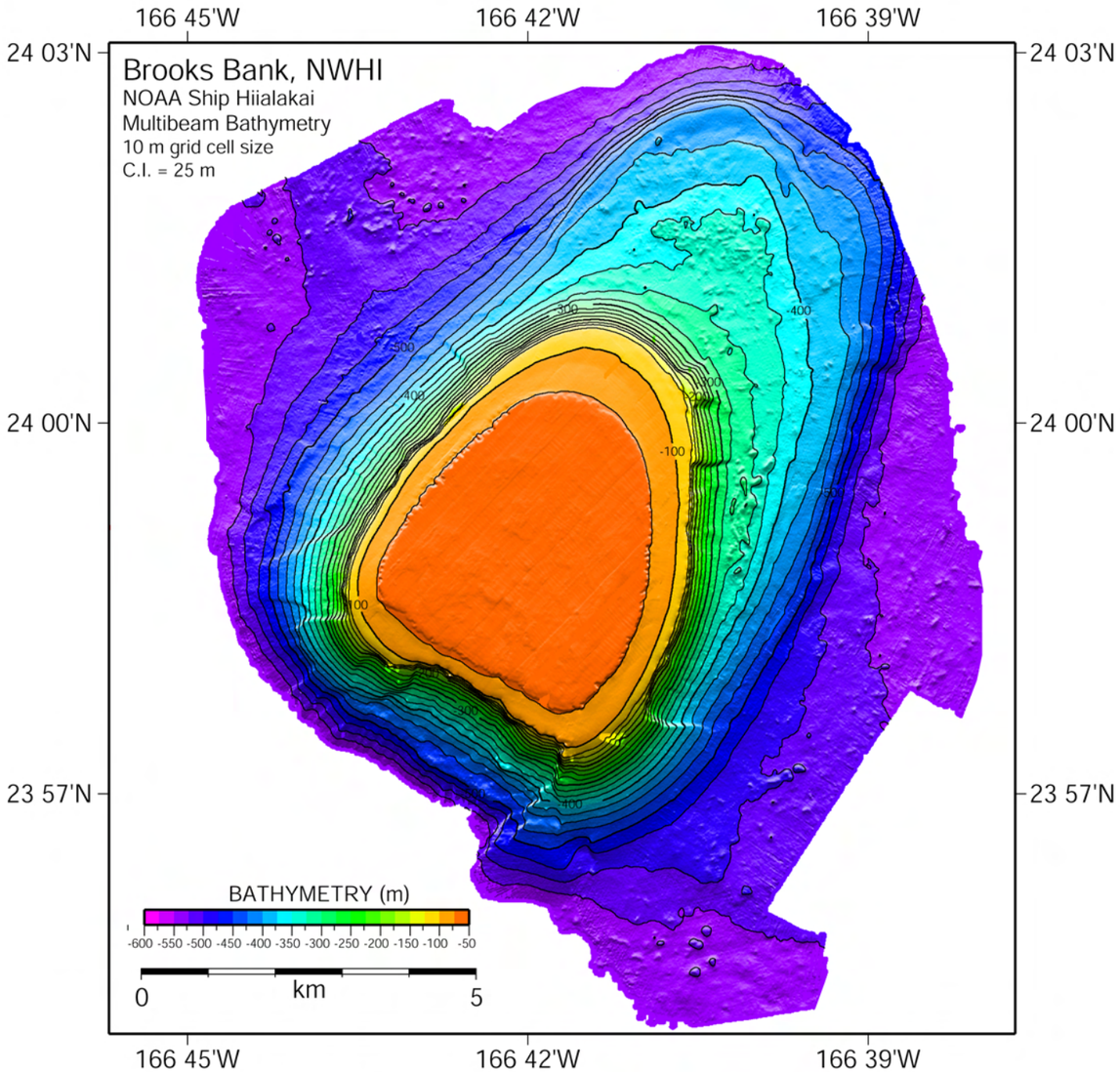
Universal Transverse Mercator Projection,Zone 3N, Ellipsoid: WGS84

0 5 10 20 30 40 km

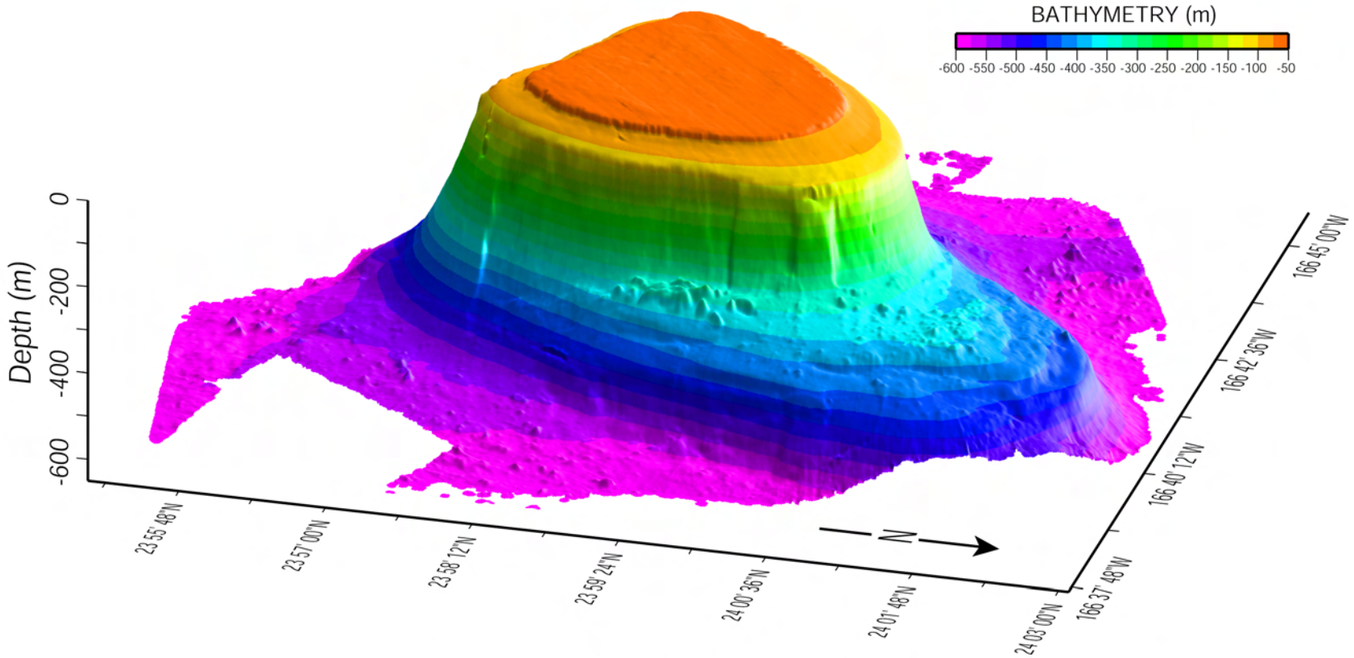
BATHYMETRY

0 -100 -200 -300 -400 -500 -1000 m

NOAA NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION U.S. DEPARTMENT OF COMMERCE

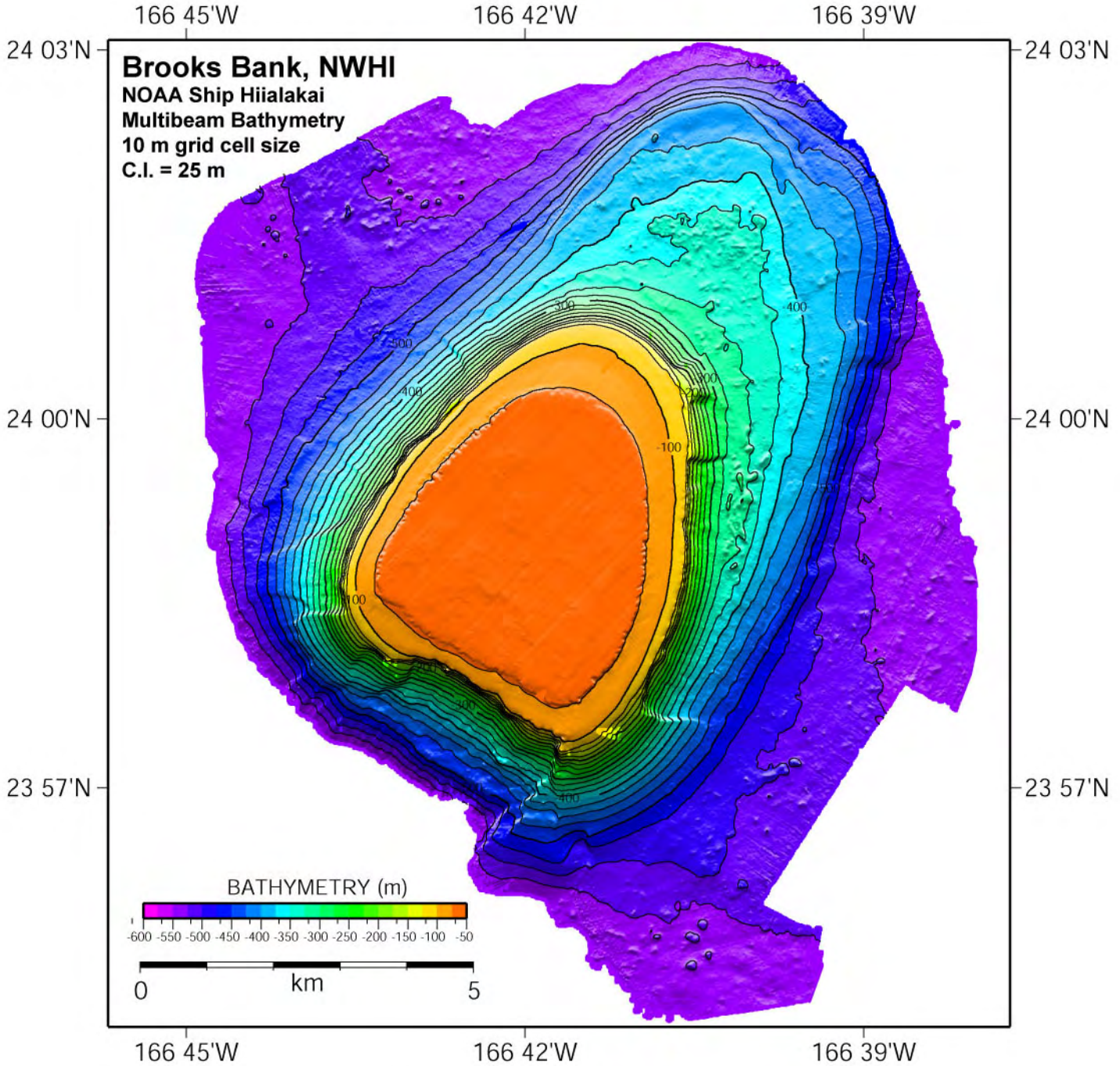


Map view of Brooks Bank, NWHI.



3D Perspective view of Brooks Bank, NWHI looking from 045 degrees. VE = 2x.

Brooks Bank was recently mapped by the NOAA Coral Reef Ecosystem Division (CRED) using the multibeam sonar systems on the NOAA Ship Hiialakai. The high resolution seafloor topography data reveals the flat-topped nature of many of the seamounts and atolls in the Northwestern Hawaiian Islands (NWHI) archipelago, which formed by erosion when their tops were near sea level. Brooks Bank has two distinct terraces at -75 and -125 m possibly indicating two distinct sea level stands. There is over 500 m of relief betwen the top of Brooks Bank and the surrounding seafloor and large submarine canyons characterize the steep slopes below the incised edges of the Bank top. Blocks of material at the base of the slopes are probably slumps or landslide deposits similar to material mapped around the Main Hawaiian Islands, believed to be deposited during catastrophic landslide events. Information gained from images like these give insight into the evolution of the Hawaiian Islands, provde base layers for benthic habitat mapping, and aid in NWHI Coral Reef Ecosystem Reserve boundary determination. CRED is currently undertaking the enormous task of mapping the Reserve, the largest offshore protected area in the United States.



Map view of Brooks Bank, NWHI.

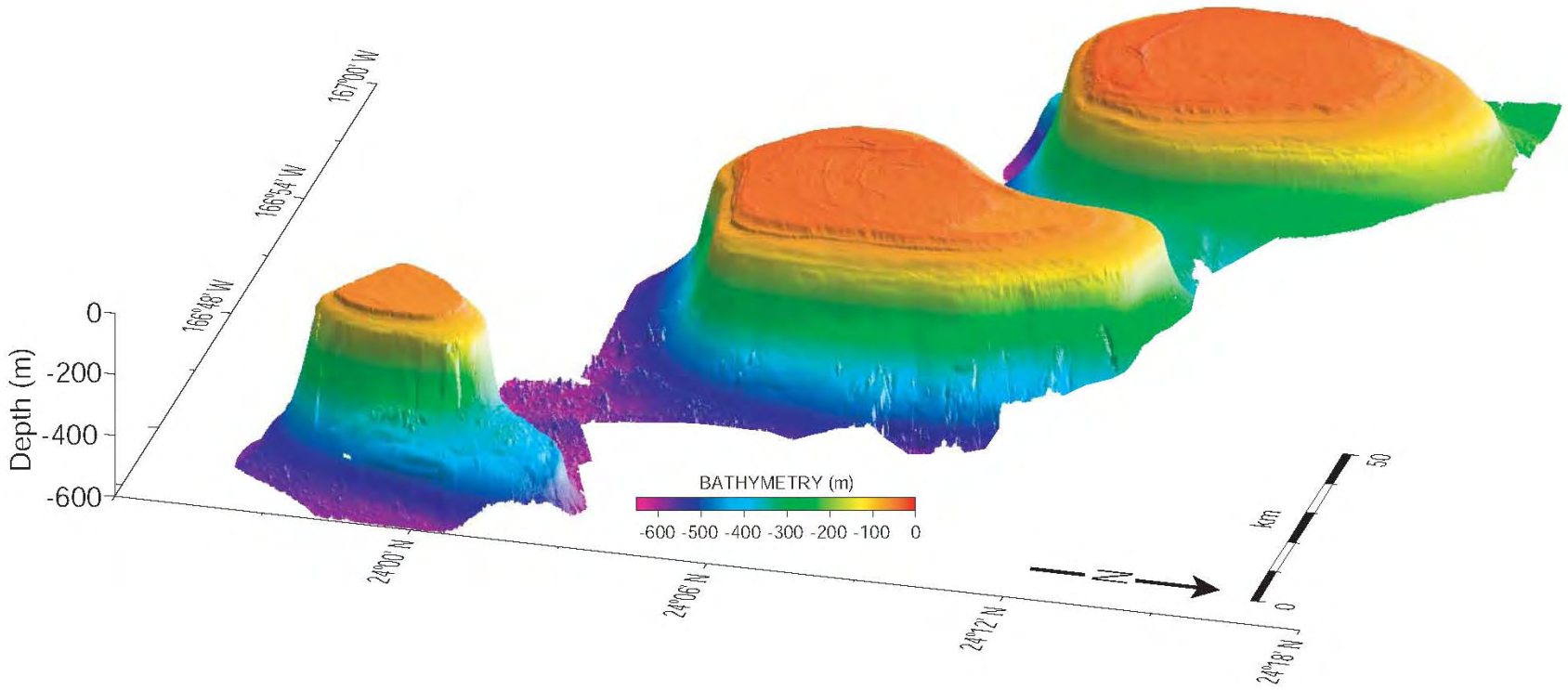
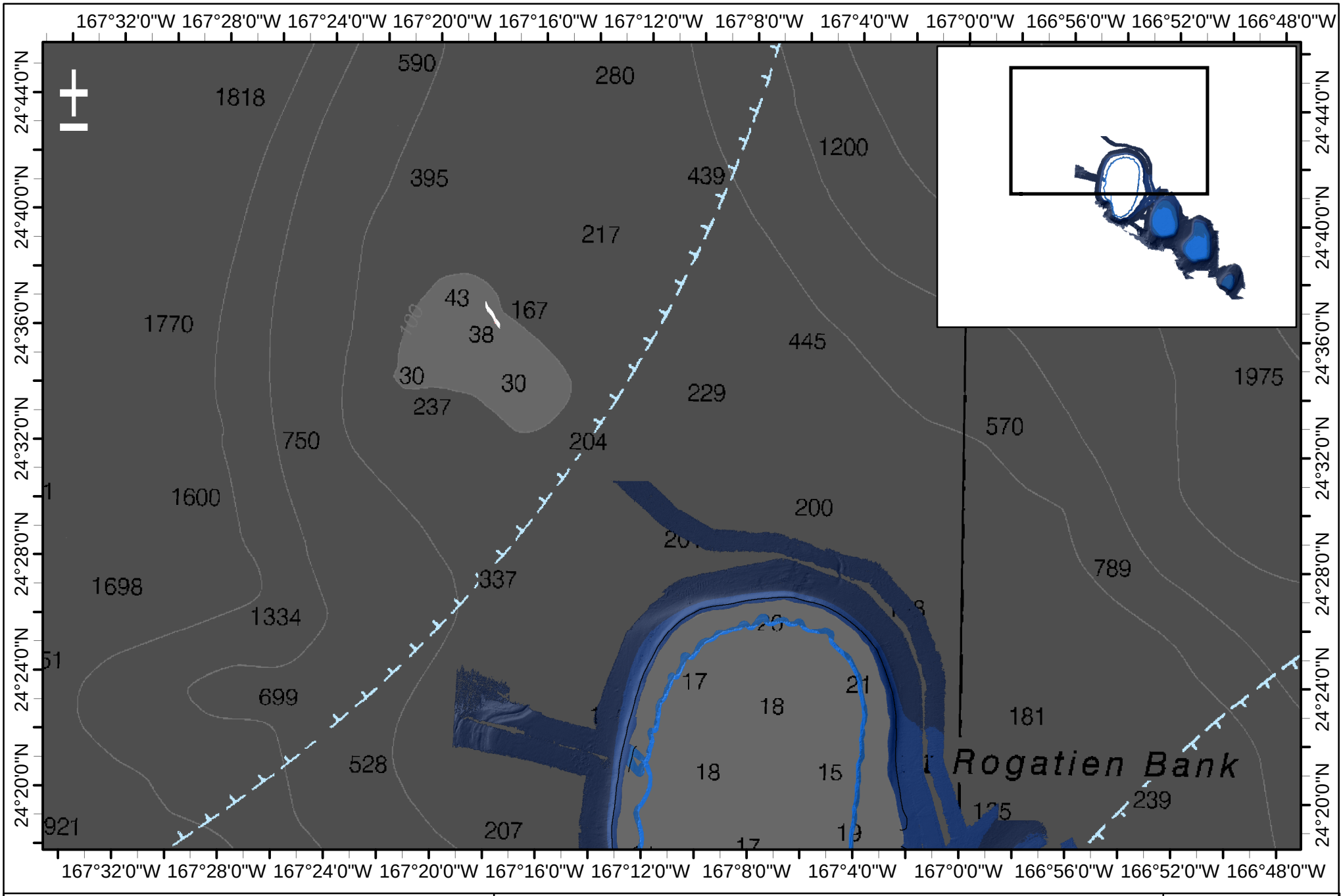


Figure by PIBHMC. 3D visualization of Brooks Banks.



St. Rogatien West Bank Optical Validation

Photo classification results plotted on NOAA chart 19019.

NOT FOR NAVIGATION

BATHYMETRY
- 5 m
- 10 m
- 25 m
- 50 m
- 100 m
- 250 m

Universal Transverse Mercator Projection, Zone 3N, Ellipsoid: WGS84

0 5 10 15 20 25 Km

PERCENT COVER OF SCLERACTINIAN CORAL

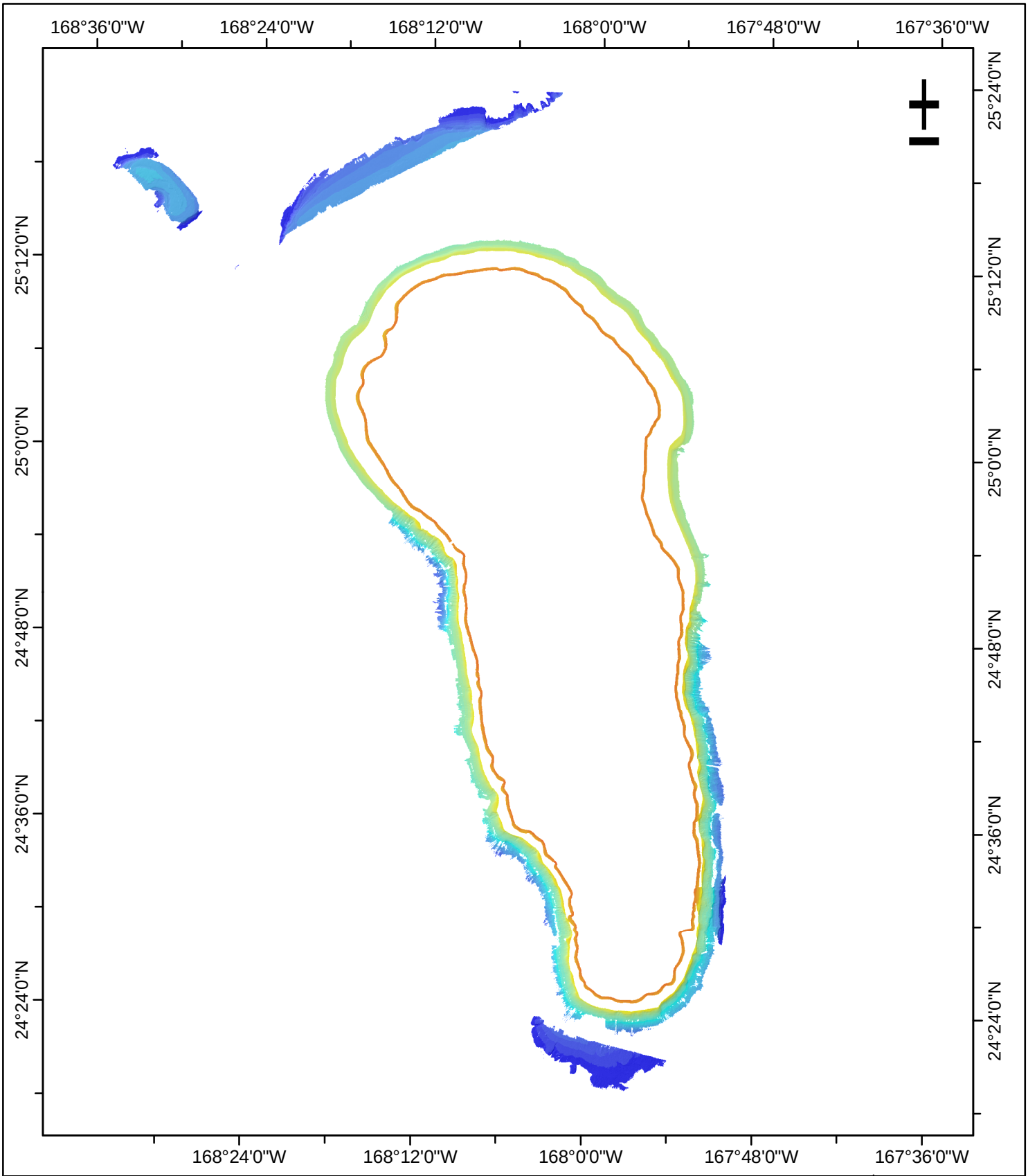
0 | 1-10 | 11-20 | 21-50 | 51-100

NOAA

Coral Reef Ecosystem Division

Gardner Pinnacle

Photo By Jean Kenyon



Gardner Pinnacles Bathymetry

20 m grid cell size

NOAA Coral Reef Ecosystem Division

Data include R/V Kilo Moana multibeam bathymetry

NOT FOR NAVIGATION

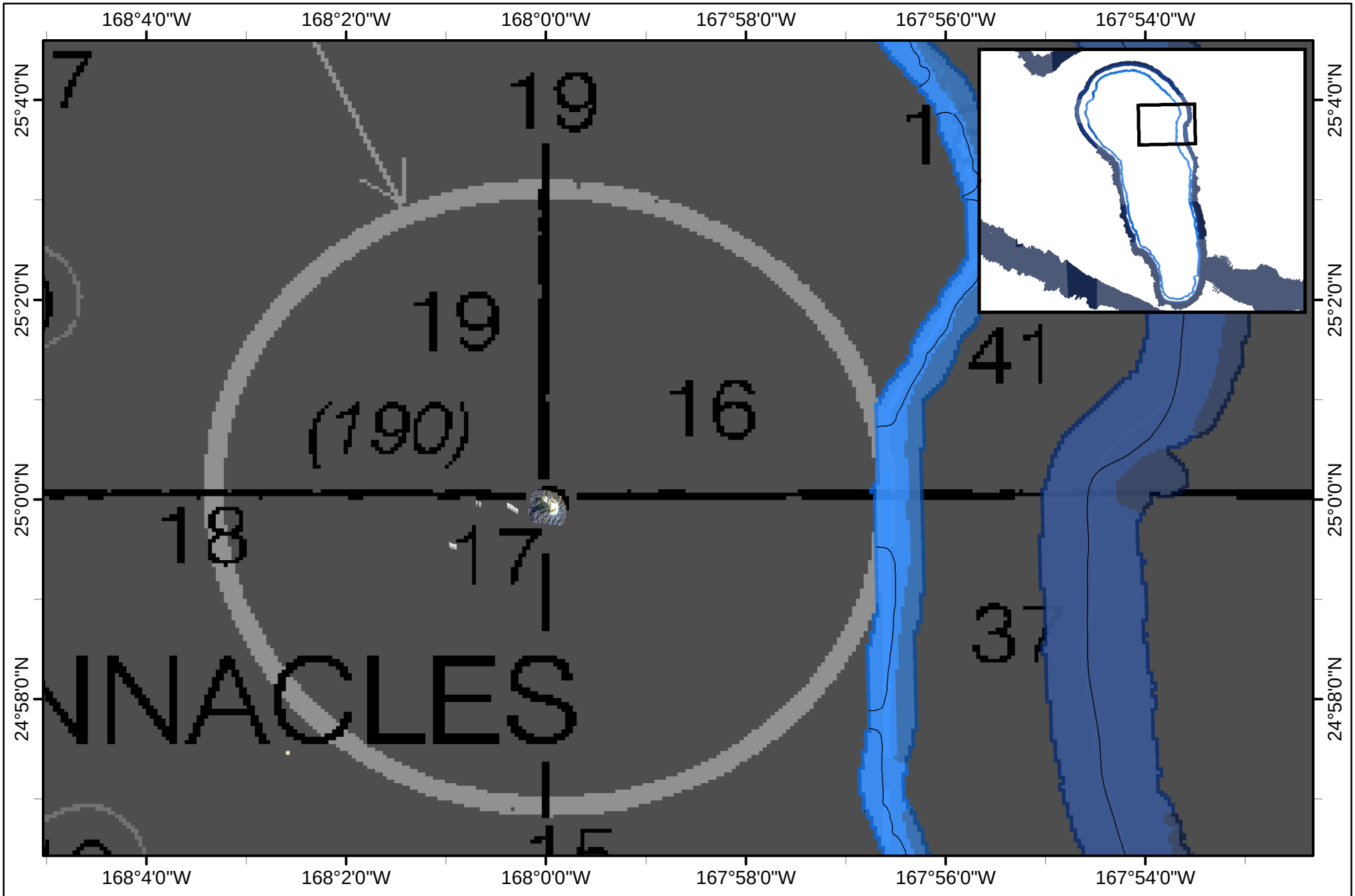
Universal Transverse Mercator Projection,
Zone 3N, Ellipsoid: WGS84

0 25 50 km

BATHYMETRY

0 -50 -100 -200 -500 -1000m

NOAA
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
U.S. DEPARTMENT OF COMMERCE



Gardner Pinnacles Optical Validation

Photo and video classification results plotted on multibeam bathymetry, IKONOS, and NOAA chart 19019 derived depths.

NOT FOR NAVIGATION

BATHYMETRY
- 5 m
- 10 m
- 25 m
- 50 m
- 100 m
- 250 m

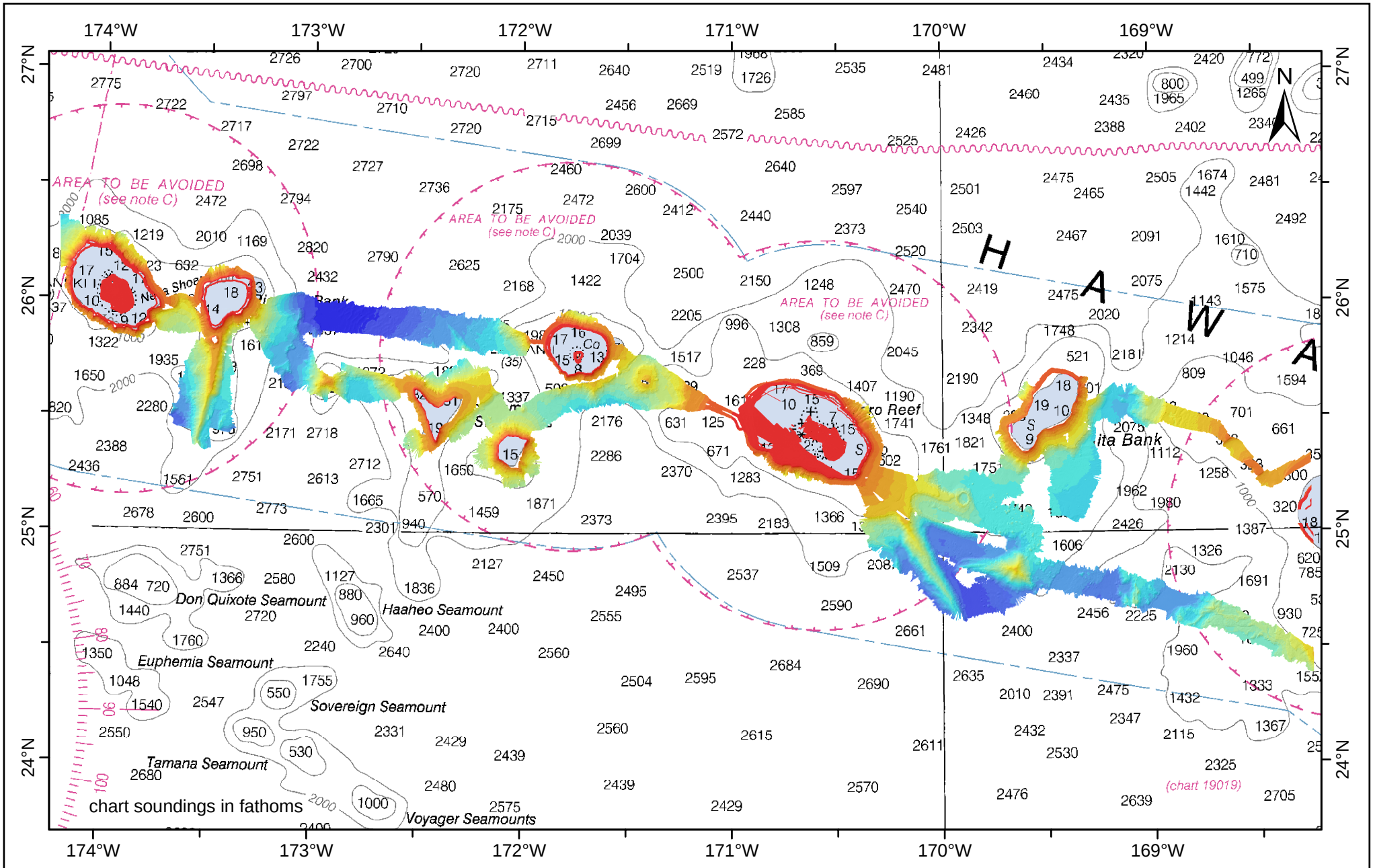
Universal Transverse Mercator Projection, Zone 2N, Ellipsoid: WGS84

0 1 2 3 4 5 Km

PERCENT COVER OF SCLERACTINIAN CORAL

0 | 1-10 | 11-20 | 21-50 | 51-100

Coral Reef Ecosystem Division



Northwestern Hawaiian Islands Bathymetry

UTM Zone 2N - 60 m Grid Cell Size

NOAA Coral Reef Ecosystem Division

Data include R/V Kilo Moana, NOAA Ship Hiialakai, and R/V AHI multibeam bathymetry and Ikonos derived depths

NOT FOR NAVIGATION

Universal Transverse Mercator Projection, Zone 2N, Ellipsoid: WGS84

0 25 50 100 150 200 km

BATHYMETRY

0 -1000 -2000 -3000 -4000 -5000 m

NOAA NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION U.S. DEPARTMENT OF COMMERCE

Raita Bank & Maro Reef

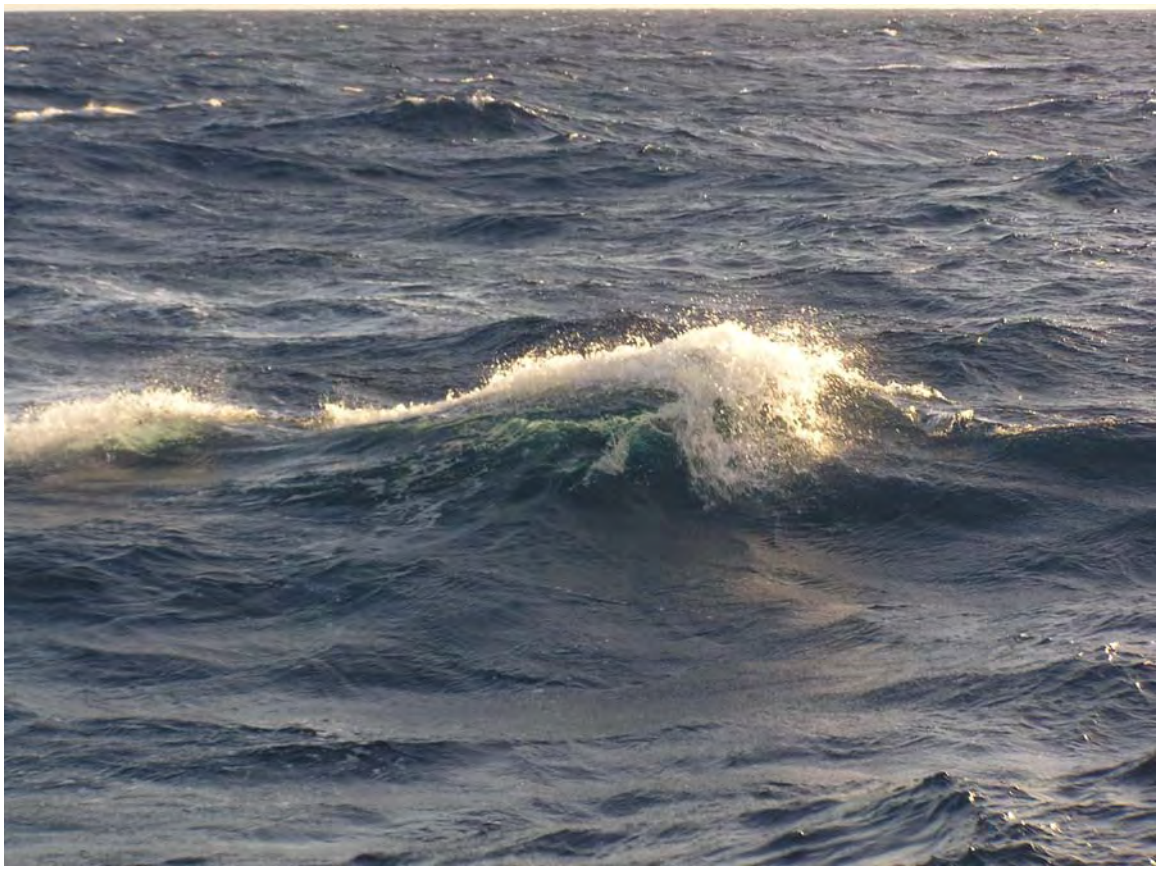
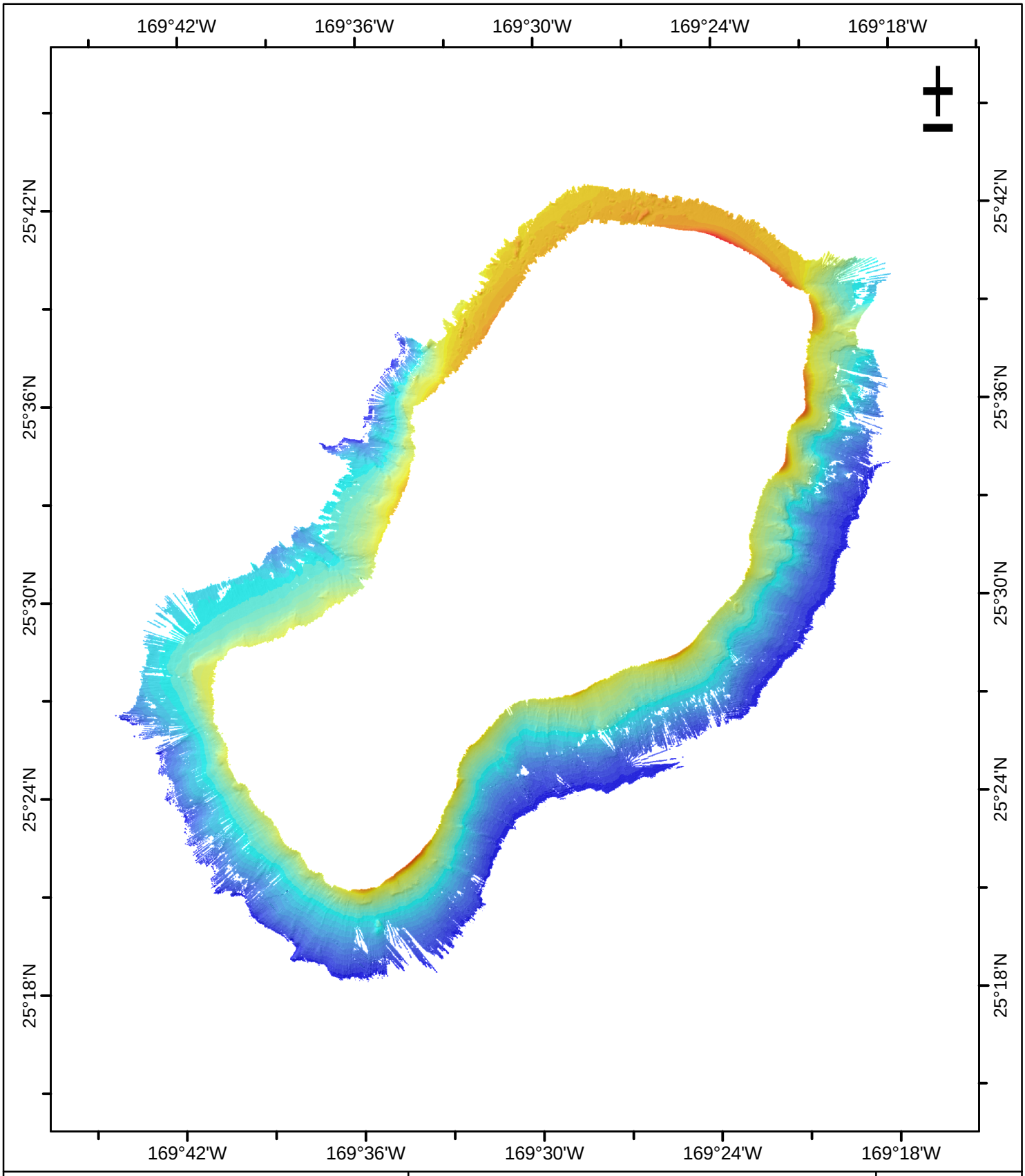


Photo By Jason Kehn



Raita Bank Bathymetry

20 m grid cell size

NOAA Coral Reef Ecosystem Division

Data include R/V Kilo Moana multibeam bathymetry

NOT FOR NAVIGATION

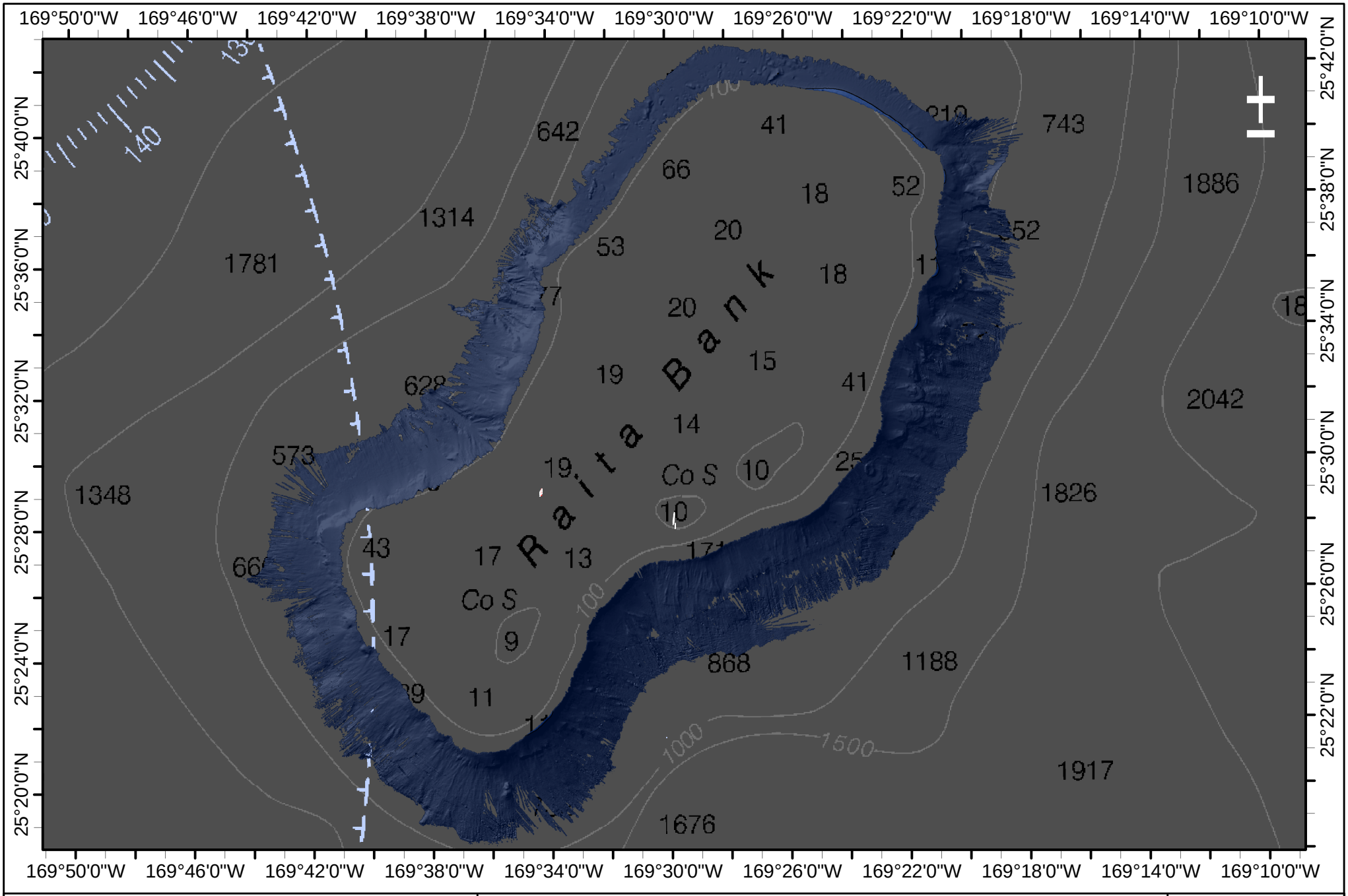
Universal Transverse Mercator Projection,
Zone 2N, Ellipsoid: WGS84

0 5 10 20 Km

BATHYMETRY

-160 -400 -1000 -1500m

NOAA
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
U.S. DEPARTMENT OF COMMERCE



Raita Bank Optical Validation

Photo classification results plotted on multibeam bathymetry and NOAA chart 19019 derived depths.

NOT FOR NAVIGATION

BATHYMETRY

- 5 m
- 10 m
- 25 m
- 50 m
- 100 m
- 250 m

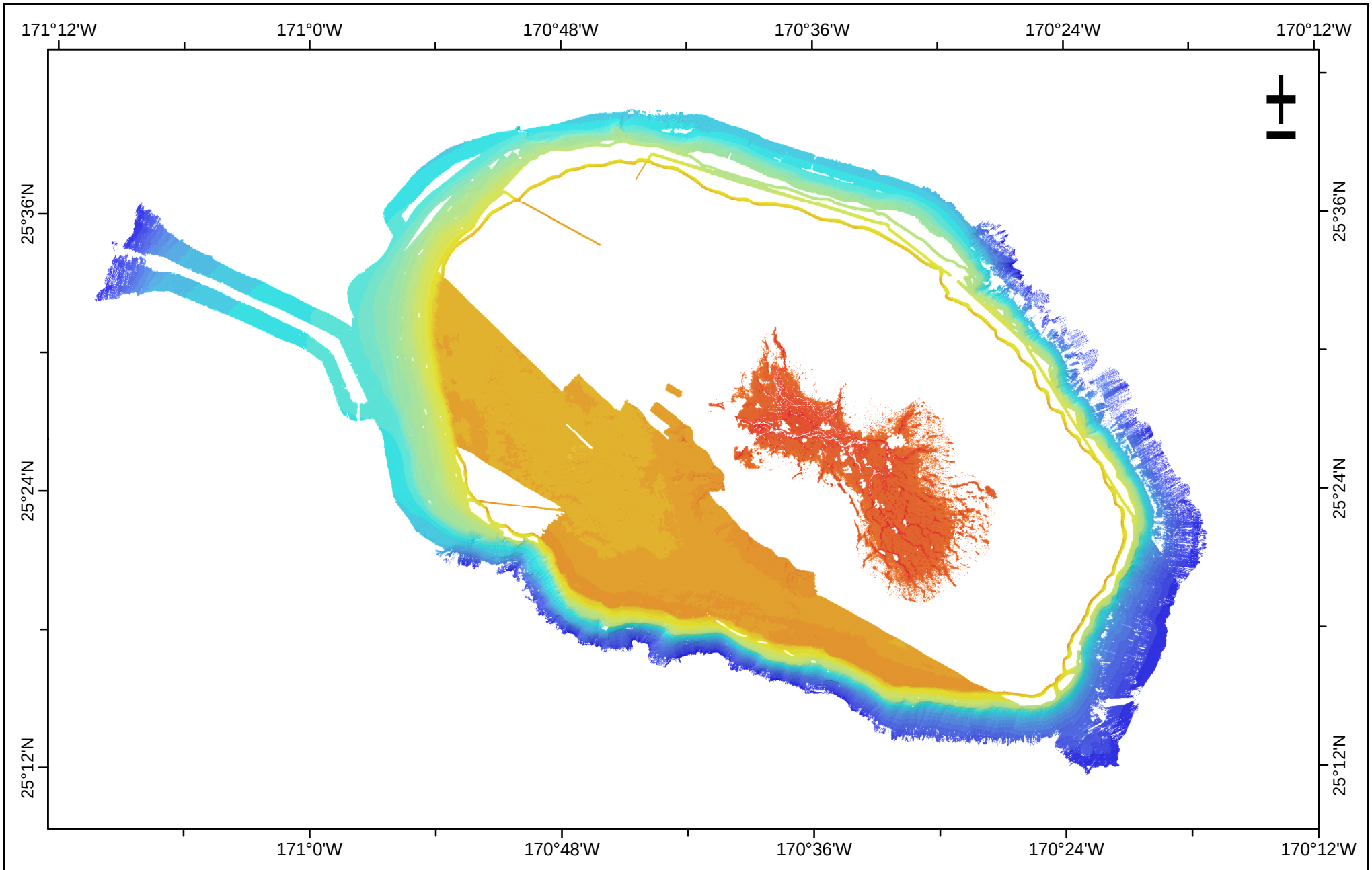
Universal Transverse Mercator Projection, Zone 2N, Ellipsoid: WGS84

0 5 10 15 20 25 Km

PERCENT COVER OF SCLERACTINIAN CORAL

0 | 1-10 | 11-20 | 21-50 | 51-100

Coral Reef Ecosystem Division



Maro Reef Bathymetry

20 m Grid Cell Size

NOAA Coral Reef Ecosystem Division

Data include R/V Kilo Moana, NOAA Ship Hiialakai,
and R/V AHI multibeam bathymetry and Ikonos derived depths

NOT FOR NAVIGATION

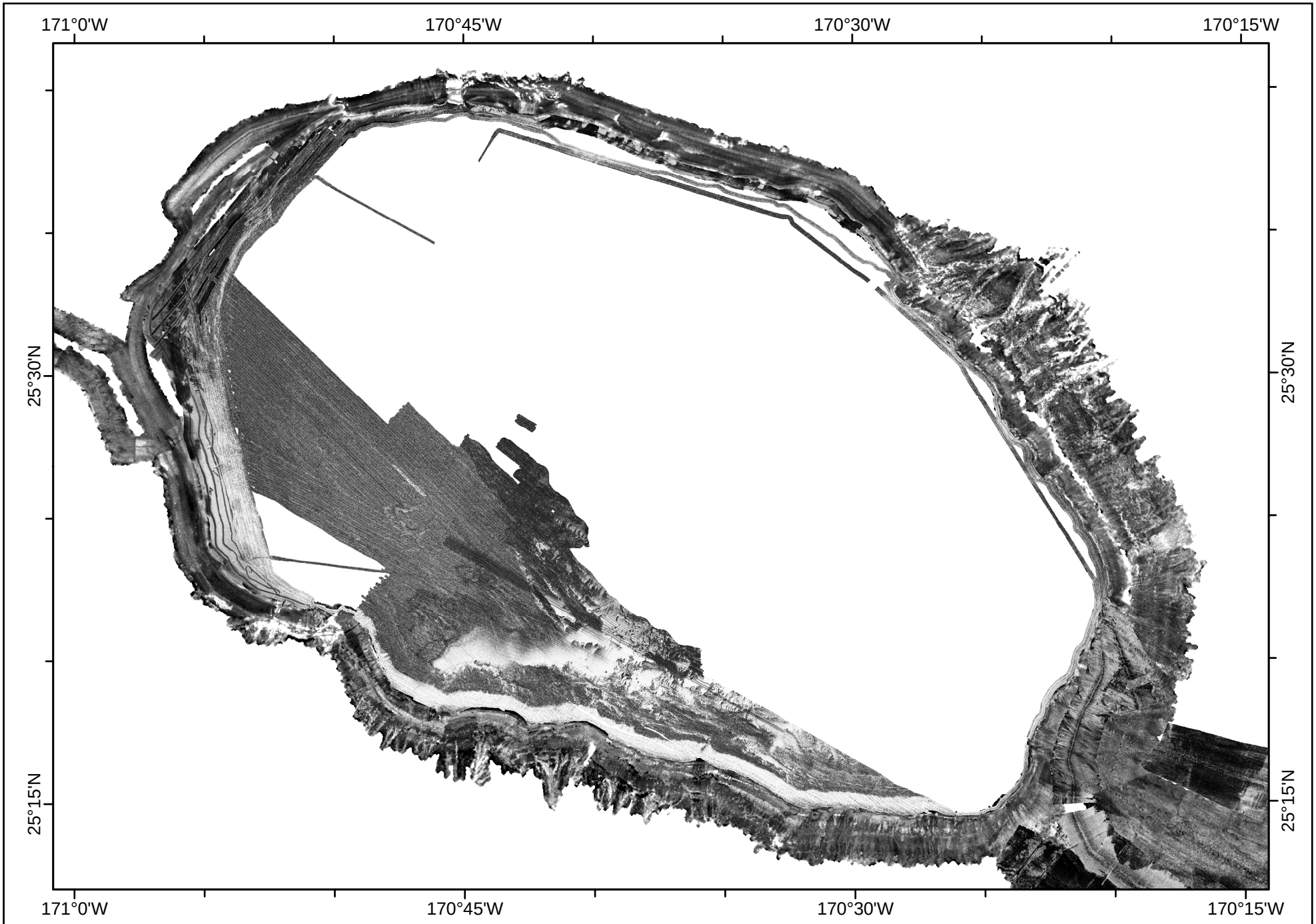
Universal Transverse Mercator Projection,Zone 2N, Ellipsoid: WGS84

0 4 8 16 24 32 40 km

BATHYMETRY

0 -50 -100 -200 -500 -800m

NOAA
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
U.S. DEPARTMENT OF COMMERCE



Maro Reef Backscatter Imagery

Multibeam backscatter data from:
R/V Kilo Moana, NOAA Ship Hiialakai and R/V AHI
NOAA Coral Reef Ecosystem Division
Not For Navigation

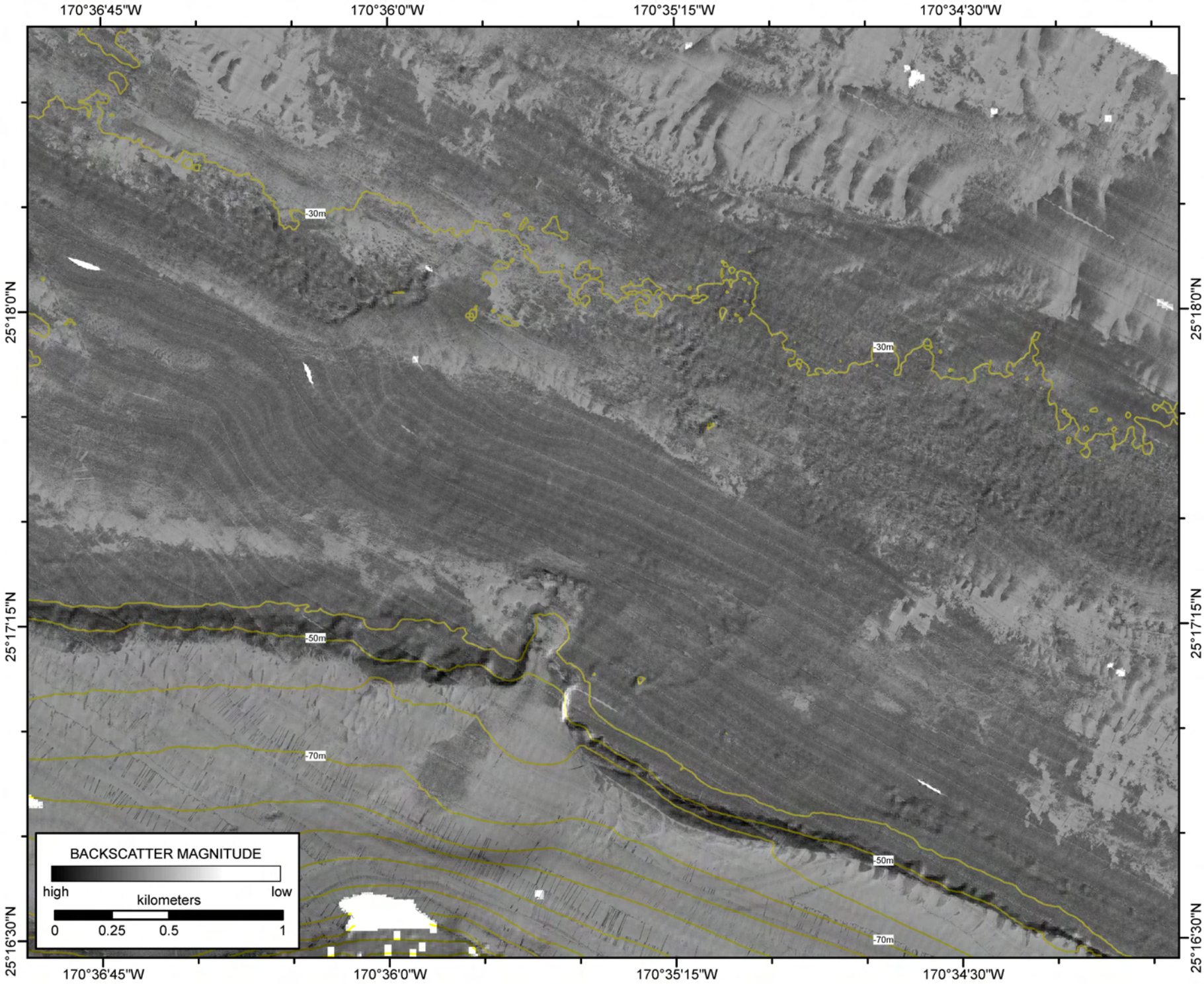
Universal Transverse Mercator Projection UTM Zone 02 N

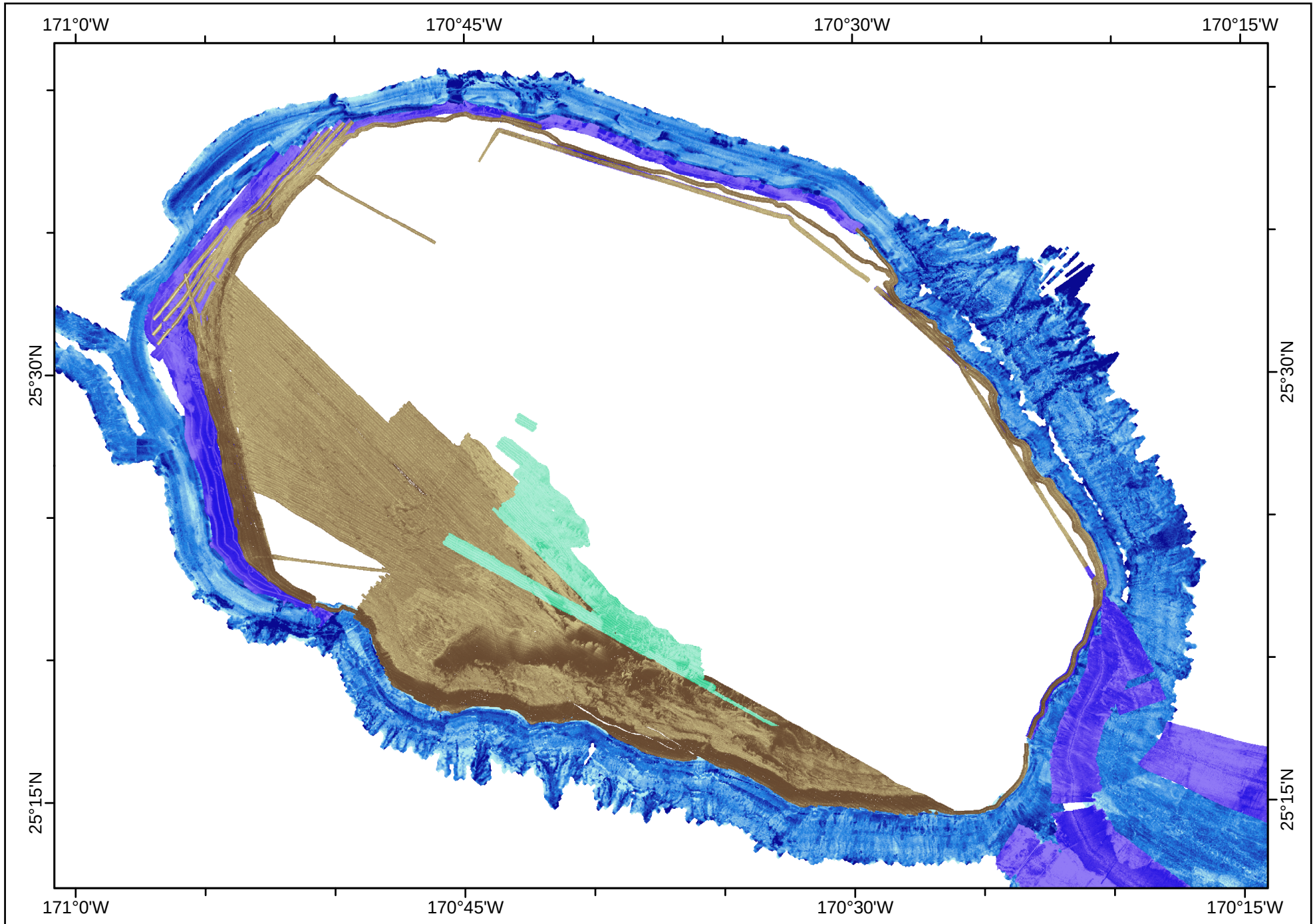
nautical miles
0 5 10

kilometers
0 10 20

low — Backscatter Magnitude — high

Grid Cell Size: Variable
Ellipsoid: WGS-84 Equipment: POS-MV CA-GPS


170°36'45"W
170°36'0"W
170°35'15"W
170°34'30"W
25°18'0"N
25°17'15"N
25°16'30"N
-30m
-30m
-50m
-70m
-50m
-70m
BACKSCATTER MAGNITUDE
high
low
kilometers
0
0.25
0.5
1



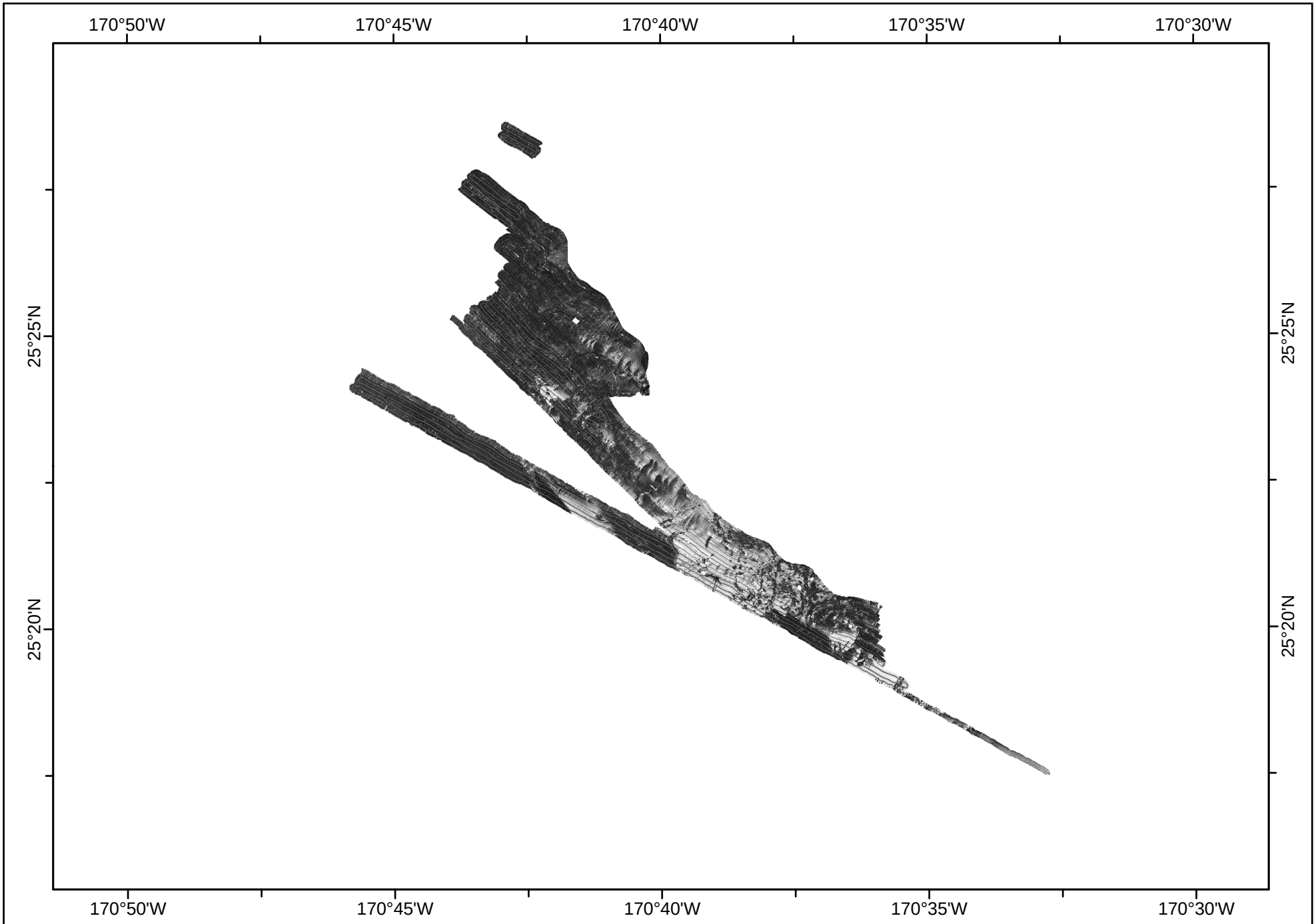
Maro Reef Backscatter Imagery

Multibeam backscatter data from:
R/V Kilo Moana, NOAA Ship Hiialakai and R/V AHI
NOAA Coral Reef Ecosystem Division
Not For Navigation

UTM Zone 02 N

nautical miles
0 2.5 5
kilometers
0 5 10

- R/V AHI Reson 8101 240 kHz
- NOAA Ship Hiialakai Simrad em3002d 300 kHz
- NOAA Ship Hiialakai Simrad em300 30 kHz
- R/V Kilo Moana Simrad em120 12 kHz



Maro Reef Backscatter Imagery

Multibeam backscatter data from:
R/V AHI Reson 8101 (240 kHz) sonar
NOAA Coral Reef Ecosystem Division
Not For Navigation

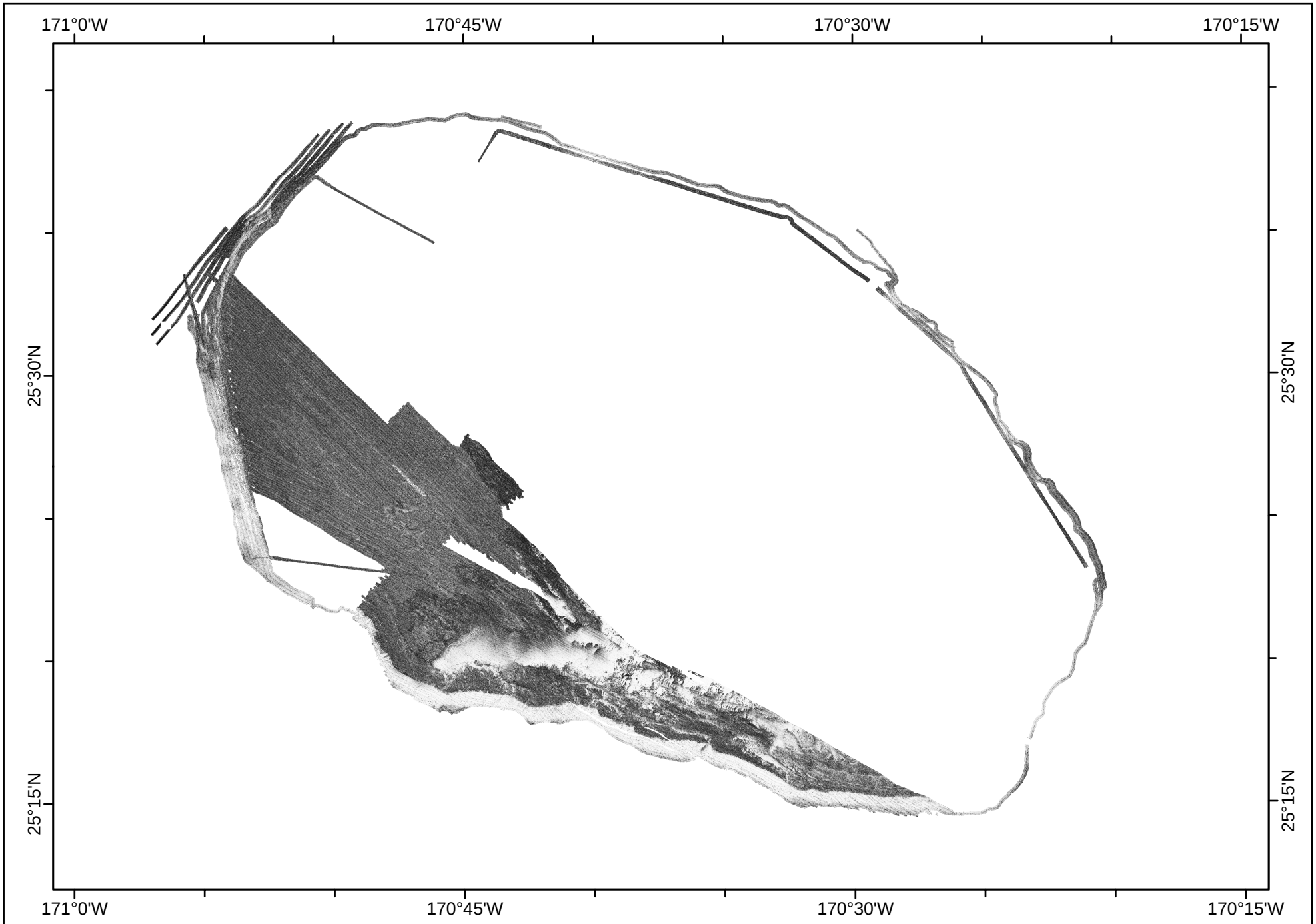
Universal Transverse Mercator Projection UTM Zone 02 N

nautical miles
0 2.5 5

kilometers
0 5 10

low — high
Backscatter Magnitude

Grid Cell Size: 1 meter
Ellipsoid: WGS-84 Equipment: POS-MV CA-GPS



Maro Reef Backscatter Imagery

Multibeam backscatter data from:
NOAA Ship Hiialakai Simrad em3002d (300 kHz) sonar
NOAA Coral Reef Ecosystem Division
Not For Navigation

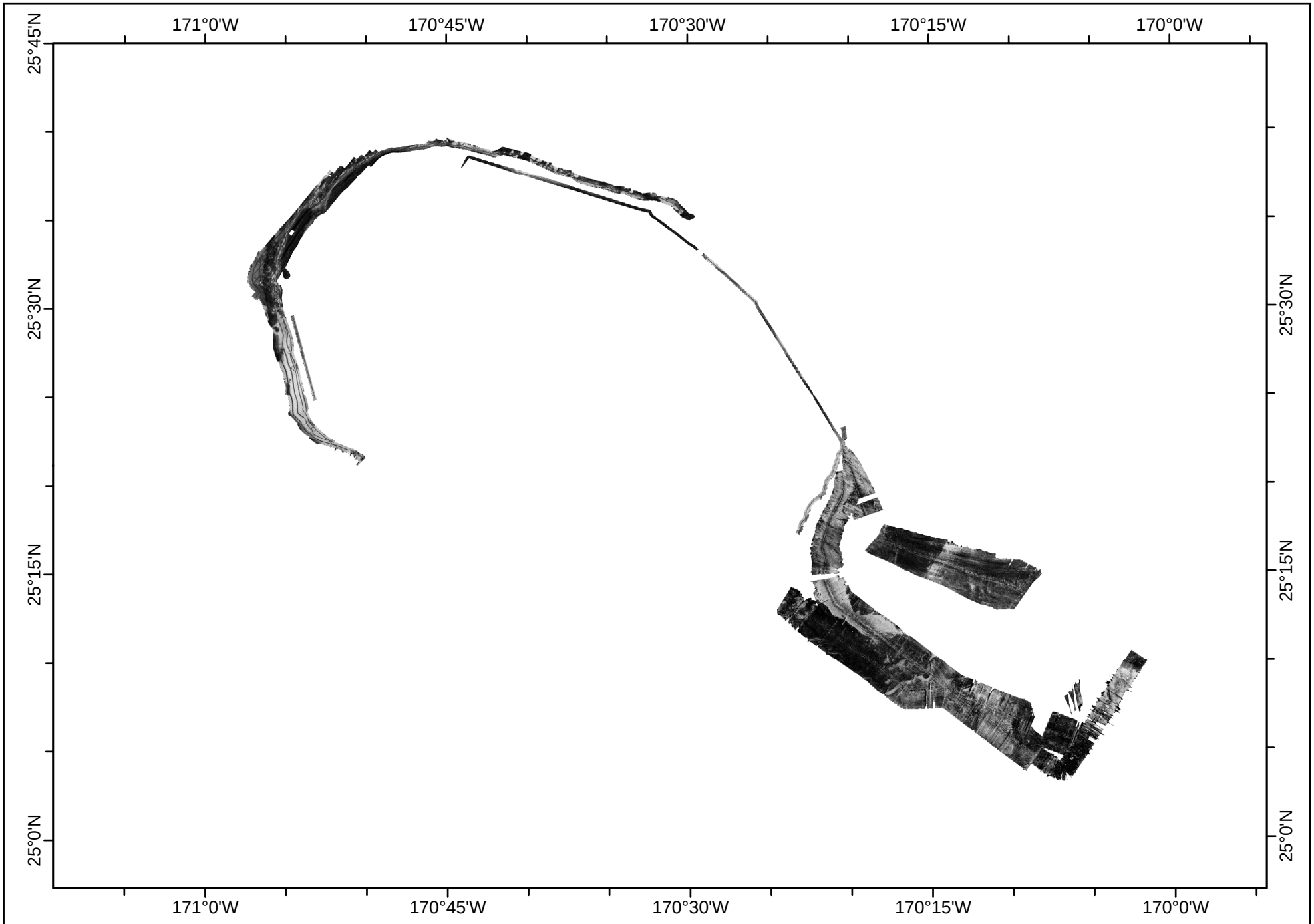
Universal Transverse Mercator Projection UTM Zone 02 N

nautical miles
0 5 10

kilometers
0 10 20

low — high
Backscatter Magnitude

Grid Cell Size: 1 meter
Ellipsoid: WGS-84 Equipment: POS-MV CA-GPS



Maro Reef Backscatter Imagery

Multibeam backscatter data from:
NOAA Ship Hiialakai Simrad em300 (30 kHz) sonar
NOAA Coral Reef Ecosystem Division
Not For Navigation

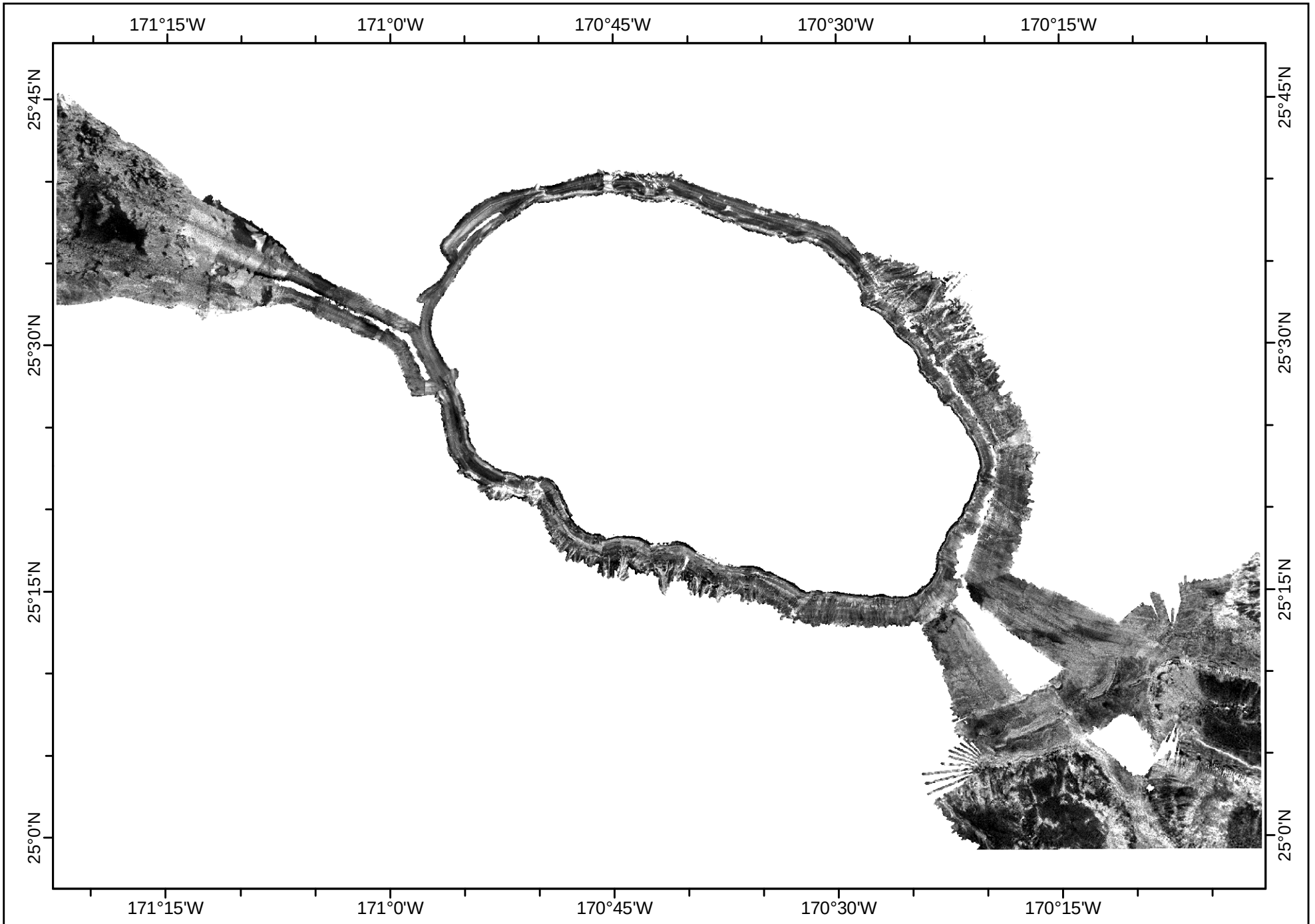
Universal Transverse Mercator Projection UTM Zone 02 N

nautical miles
0 10 20

kilometers
0 20 40

low — Backscatter Magnitude — high

Grid Cell Size: 5 meters
Ellipsoid: WGS-84 Equipment: POS-MV CA-GPS



Maro Reef Backscatter Imagery

Multibeam backscatter data from:
R/V Kilo Moana Simrad em120 (12 kHz) sonar
NOAA Coral Reef Ecosystem Division
Not For Navigation

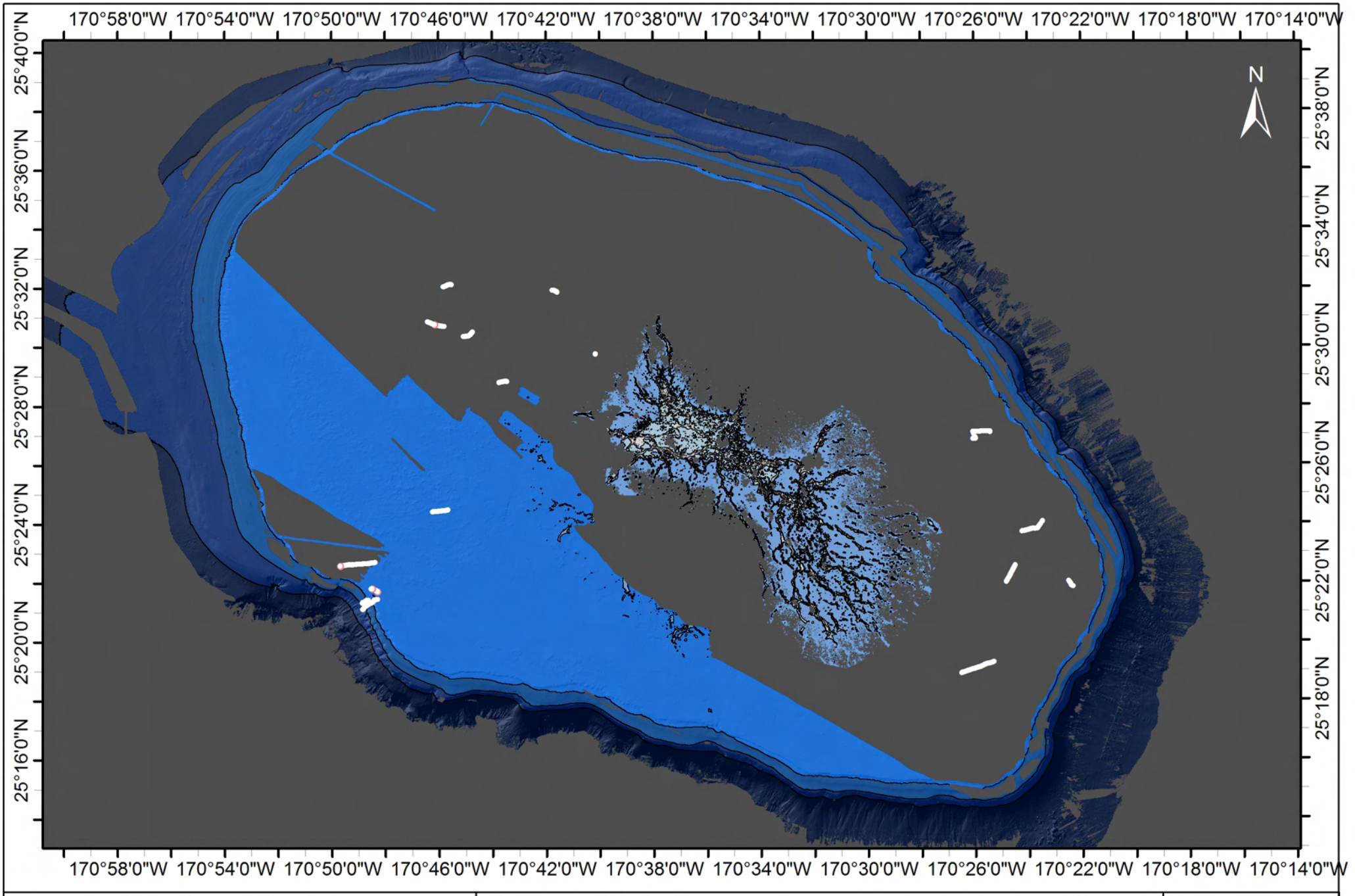
Universal Transverse Mercator Projection UTM Zone 02 N

nautical miles
0 10 20

kilometers
0 20 40

low — Backscatter Magnitude — high

Grid Cell Size: 30 meters
Ellipsoid: WGS-84 Equipment: POS-MV CA-GPS



Maro Reef Optical Validation

Photo and video classification results plotted on multibeam bathymetry and IKONOS derived depths.

NOT FOR NAVIGATION

BATHYMETRY
- 5 m
- 10 m
- 25 m
- 50 m
- 100 m
- 250 m

Universal Transverse Mercator Projection, Zone 2N, Ellipsoid: WGS84

0 6 12 18 24 30 Km

PERCENT COVER OF SCLERACTINIAN CORAL

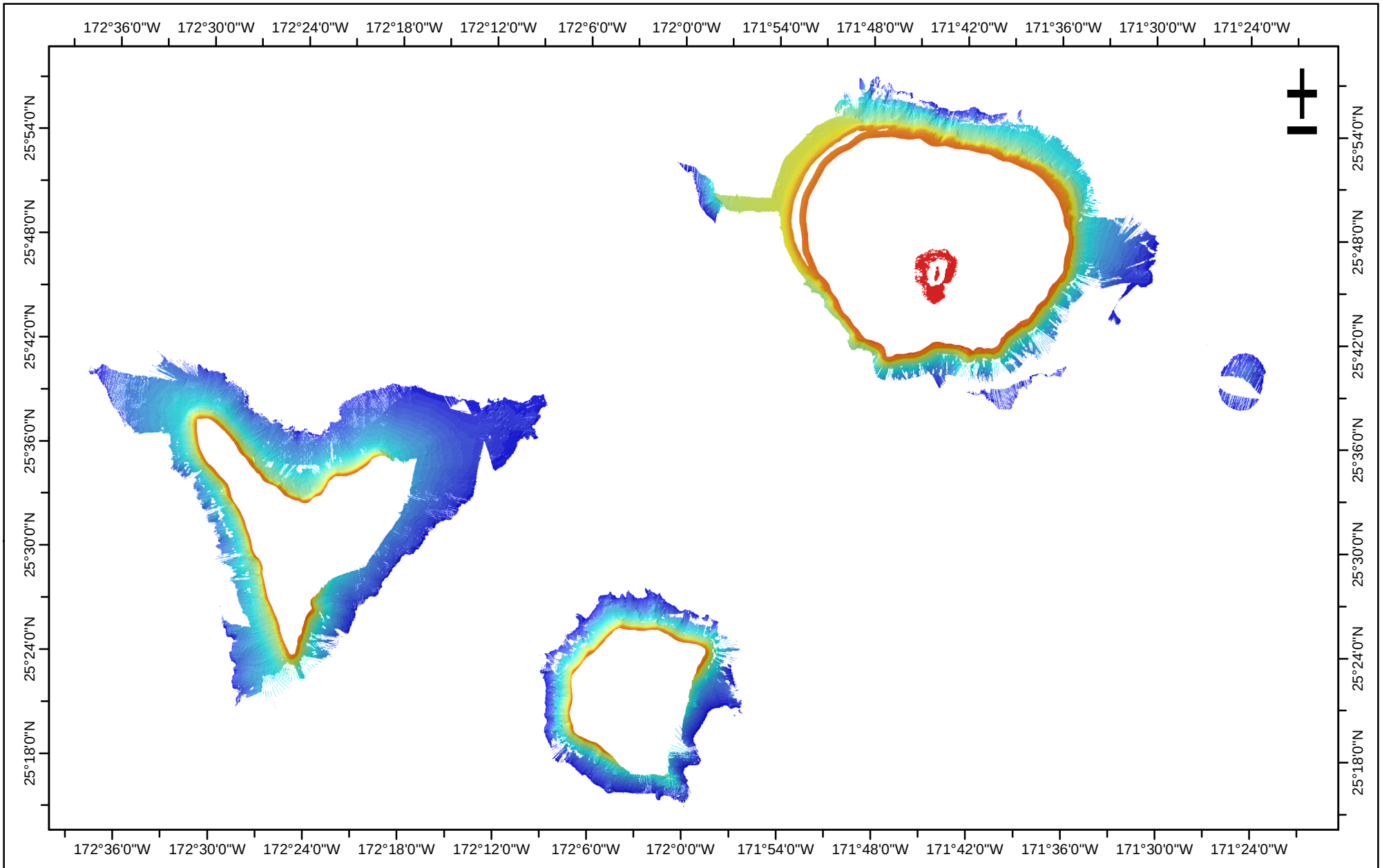
○ 0 ● 1-10 ● 11-20 ● 21-50 ● 51-100

NOAA

Coral Reef Ecosystem Division

Laysan Island & Northampton Seamounts

Photo From NOAA Pacific Islands Fisheries Science Center



Northampton Seamounts to Laysan Island Bathymetry

20 m grid cell size

NOAA Coral Reef Ecosystem Division

Data include R/V Kilo Moana multibeam bathymetry and Ikonos derived depths

NOT FOR NAVIGATION

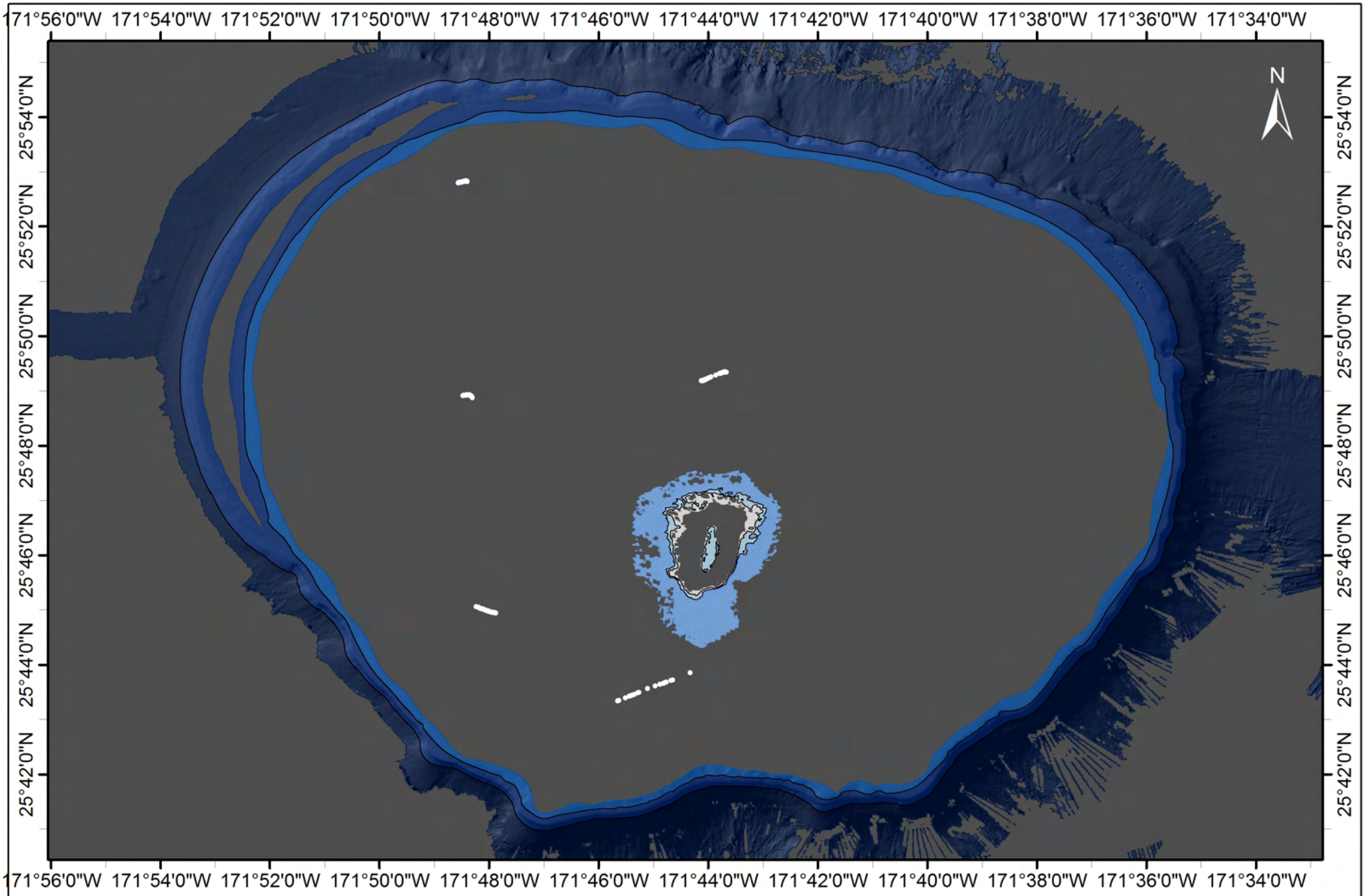
Universal Transverse Mercator Projection,Zone 2N, Ellipsoid: WGS84

0 30 60 km

BATHYMETRY

0 -100 -200 -400 -1000 -1500 m

NOAA NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION U.S. DEPARTMENT OF COMMERCE



Laysan Island Optical Validation

Photo and video classification results plotted on multibeam bathymetry and IKONOS derived depths.

NOT FOR NAVIGATION

BATHYMETRY
- 5 m
- 10 m
- 25 m
- 50 m
- 100 m
- 250 m

Universal Transverse Mercator Projection, Zone 2N, Ellipsoid: WGS84

0 3 6 9 12 15 Km

PERCENT COVER OF SCLERACTINIAN CORAL

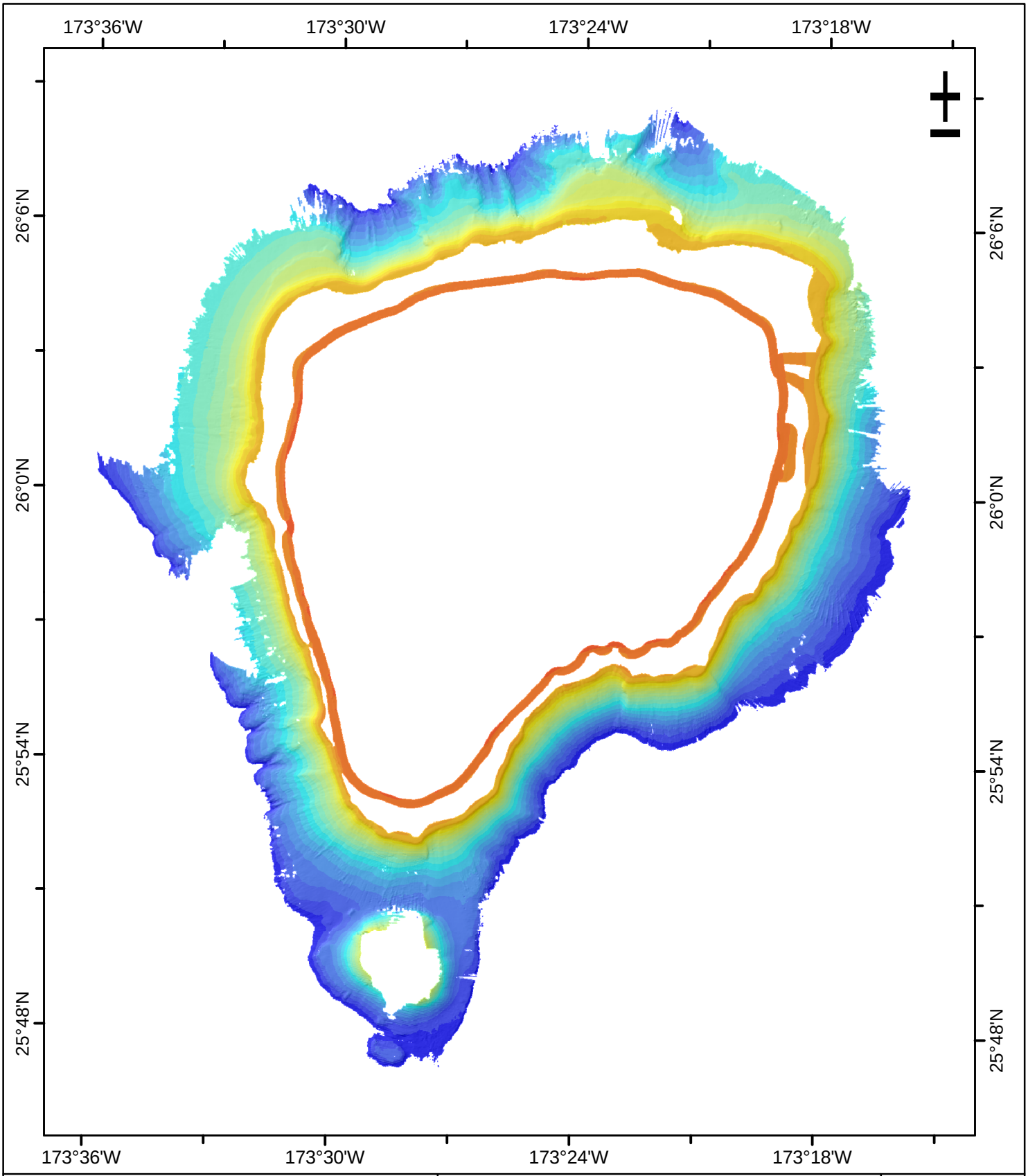
○ 0 ● 1-10 ● 11-20 ● 21-50 ● 51-100

NOAA

Coral Reef Ecosystem Division

Pioneer Bank

Photo By Kelly Curtis



Pioneer Bank Bathymetry

20 m grid cell size

NOAA Coral Reef Ecosystem Division

Data include R/V Kilo Moana multibeam bathymetry

NOT FOR NAVIGATION

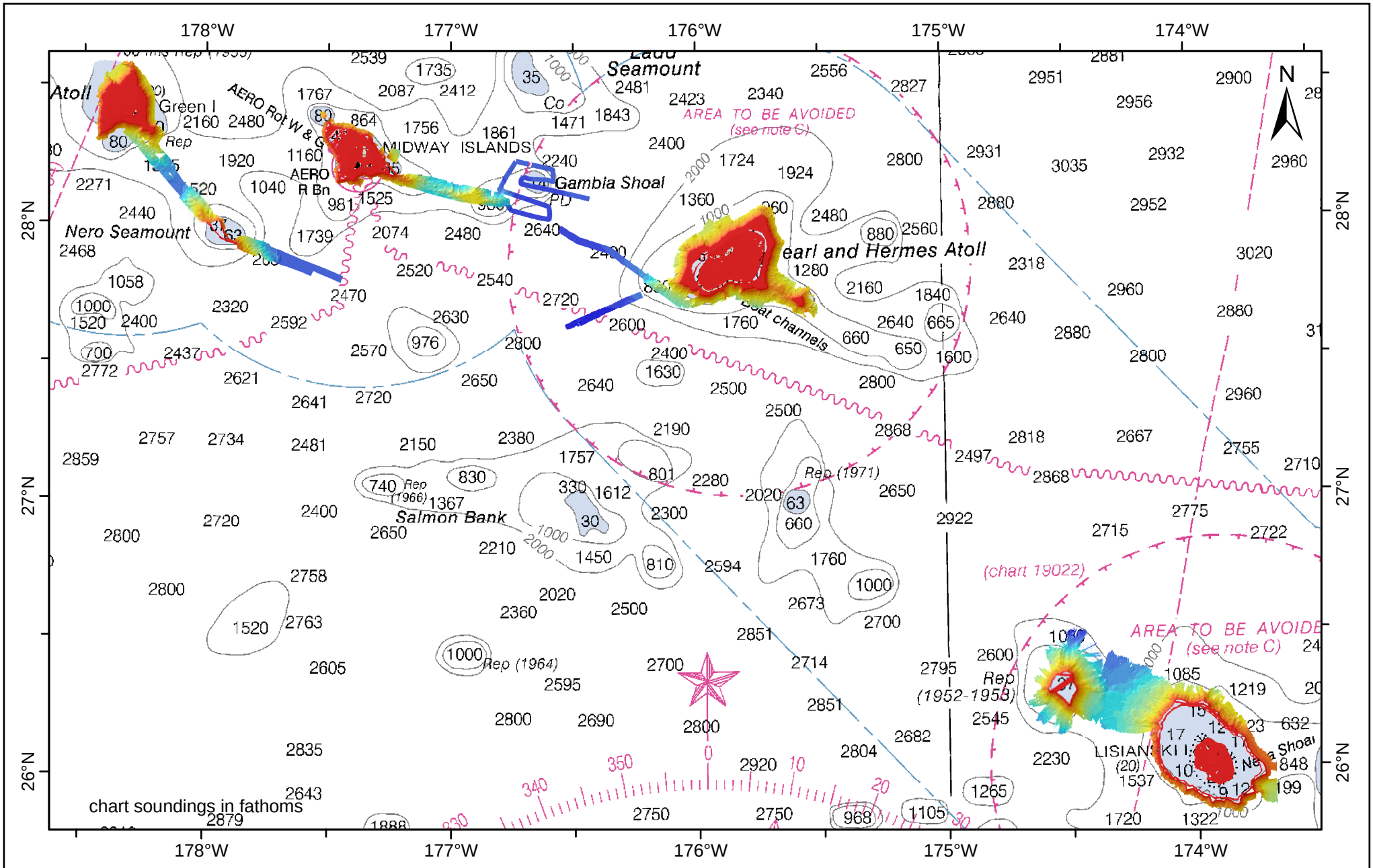
Universal Transverse Mercator Projection,
Zone 2N, Ellipsoid: WGS84

0 2.5 5 10 15 km

BATHYMETRY

0 -100 -500 -1000m

NOAA NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION · U.S. DEPARTMENT OF COMMERCE



Northwestern Hawaiian Islands Bathymetry

UTM Zone 1N - 60 m Grid Cell Size

NOAA Coral Reef Ecosystem Division

Data include R/V Kilo Moana, NOAA Ship Hiialakai, and R/V AHI multibeam bathymetry and Ikonos derived depths

NOT FOR NAVIGATION

Universal Transverse Mercator Projection, Zone 1N, Ellipsoid: WGS84

km: 0 25 50 100 150 200

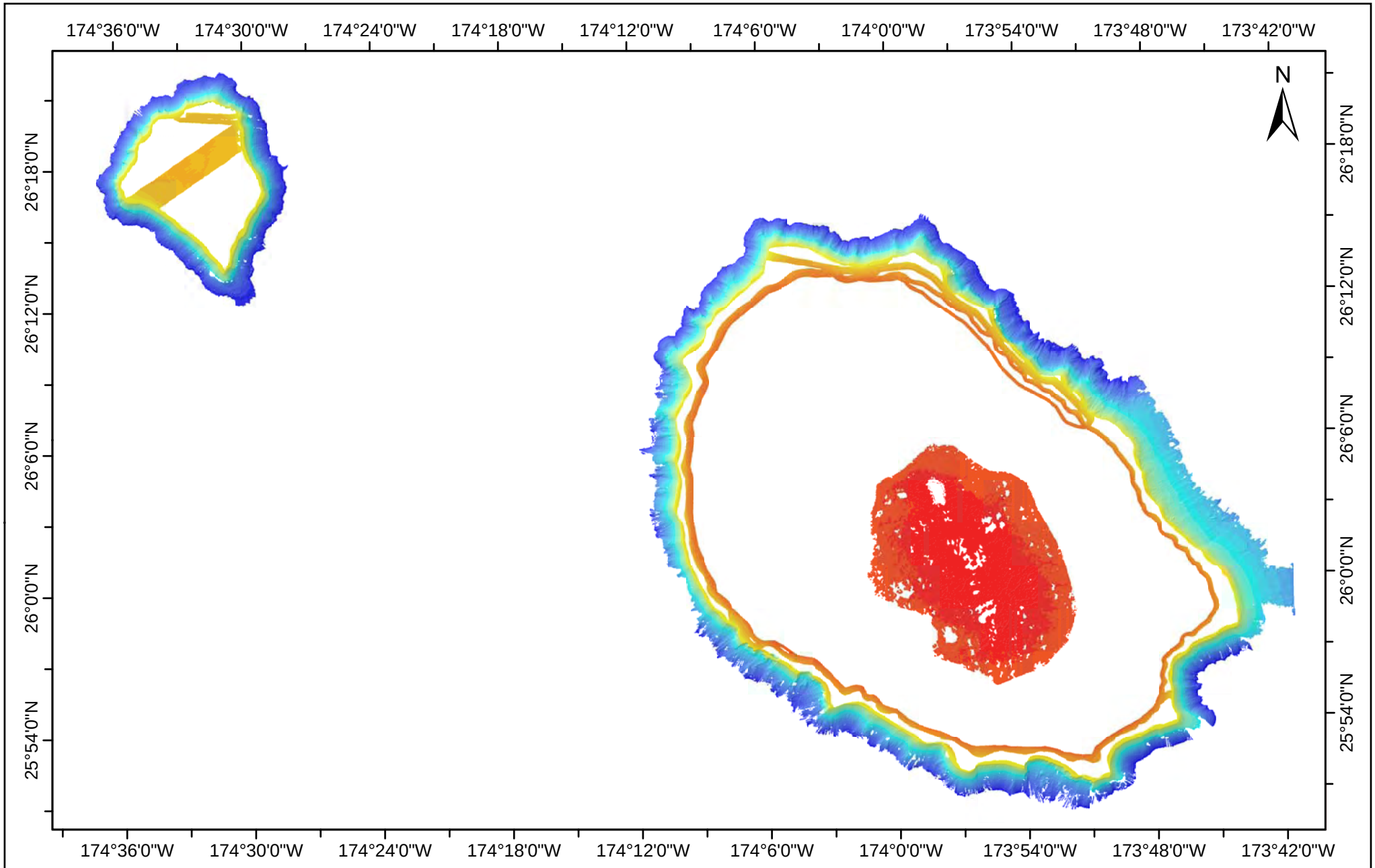
BATHYMETRY

m: 0 -1000 -2000 -3000 -4000 -5000

NOAA NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION U.S. DEPARTMENT OF COMMERCE

Lisianski Island

Photo By Amy Hall



Lisianski Island Bathymetry

20 m grid cell size

NOAA Coral Reef Ecosystem Division

Data include R/V Kilo Moana, NOAA Ship Hiialakai, and R/V AHI multibeam bathymetry and Ikonos derived depths

NOT FOR NAVIGATION

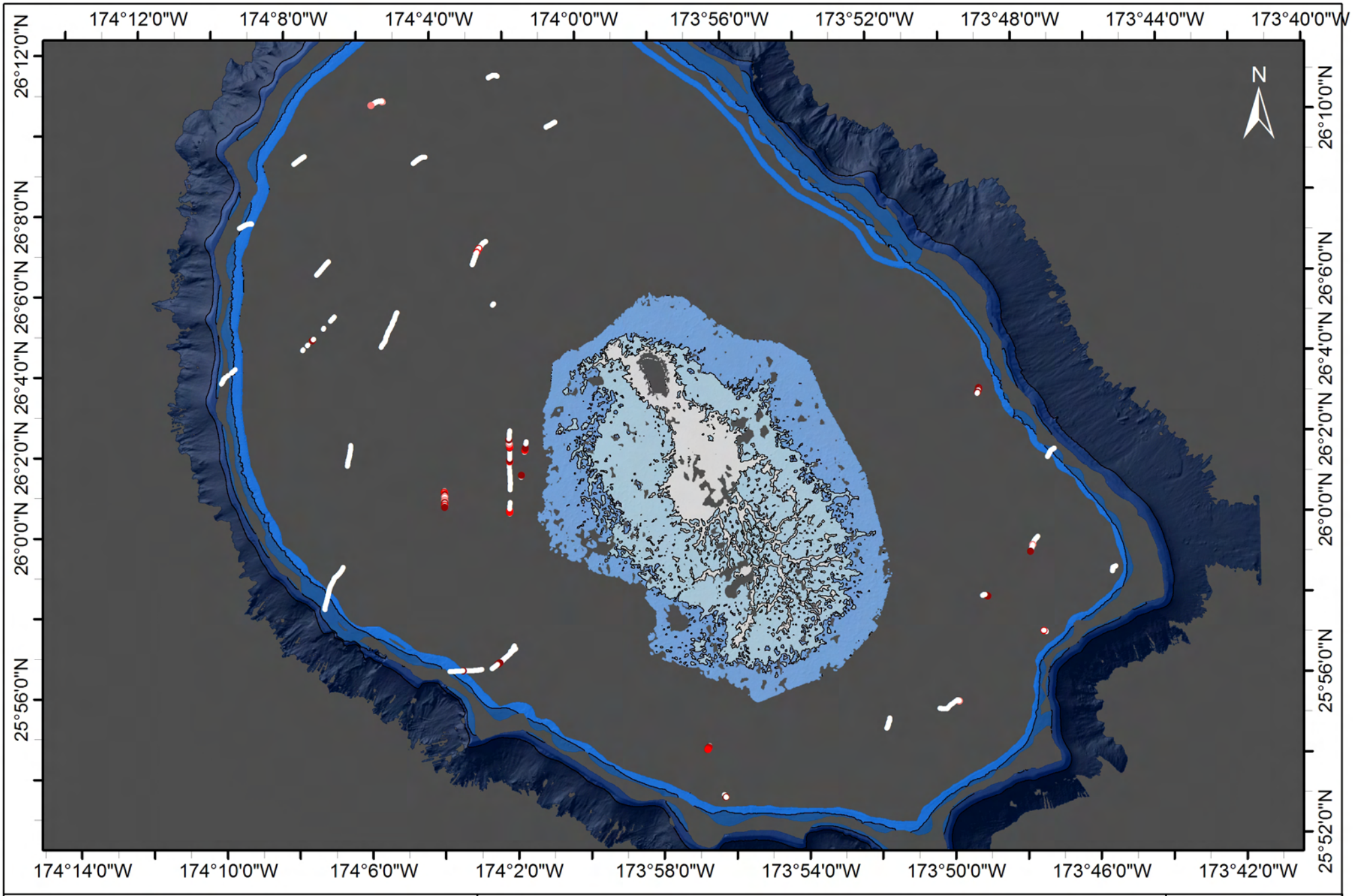
Universal Transverse Mercator Projection,Zone 1N, Ellipsoid: WGS84

0 5 10 20 30 40 km

BATHYMETRY

0 -100 -200 -400 -1000m

NOAA NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION U.S. DEPARTMENT OF COMMERCE



Lisianski Island Optical Validation

Photo and video classification results plotted on multibeam bathymetry and IKONOS derived depths.

NOT FOR NAVIGATION

BATHYMETRY
- 5 m
- 10 m
- 25 m
- 50 m
- 100 m
- 250 m

Universal Transverse Mercator Projection, Zone 1N, Ellipsoid: WGS84

0 4 8 12 16 20 Km

PERCENT COVER OF SCLERACTINIAN CORAL

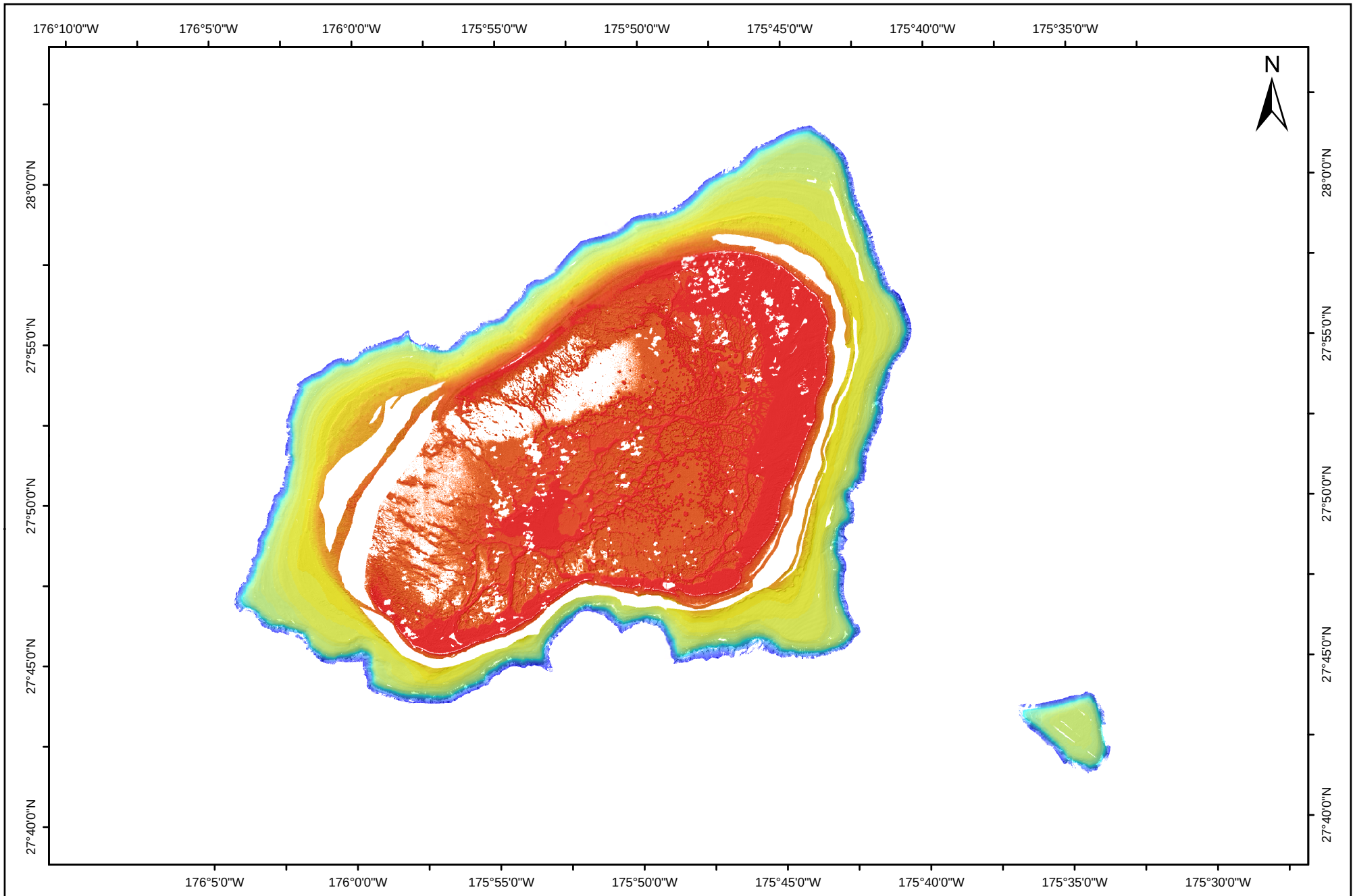
○ 0 ● 1-10 ● 11-20 ● 21-50 ● 51-100

NOAA

Coral Reef Ecosystem Division

Pearl and Hermes Atoll

Photo By Claire Johnson



Pearl and Hermes Atoll Bathymetry

5 m grid cell size

NOAA Coral Reef Ecosystem Division

Data include NOAA Ship Hiialakai and R/V AHI multibeam bathymetry and IKONOS derived depths

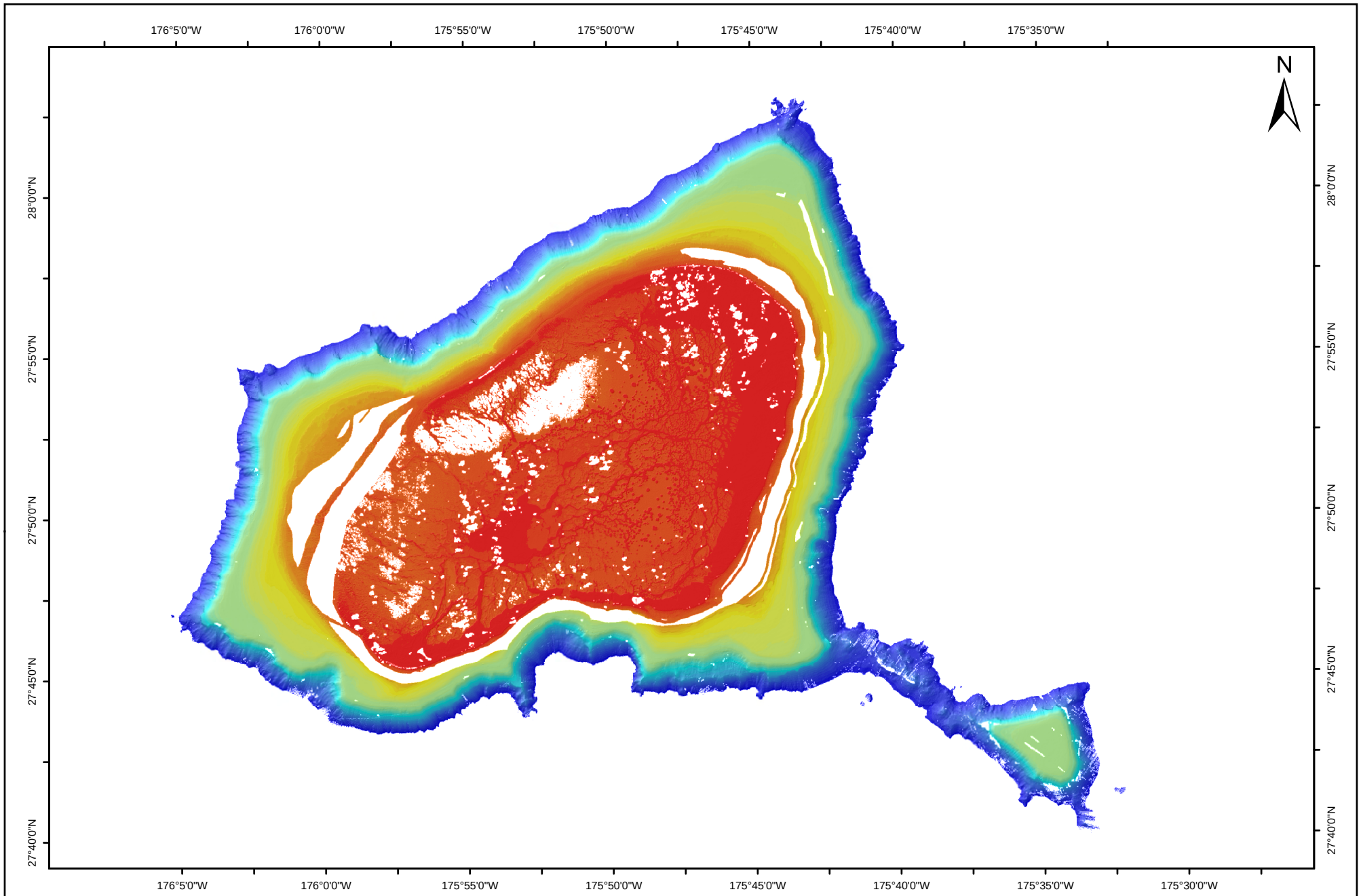
NOT FOR NAVIGATION

Universal Transverse Mercator Projection,Zone 1N, Ellipsoid: WGS84

0 15 30 km

BATHYMETRY

0 -10 -50 -100 -200 -300 -400m



Pearl and Hermes Atoll Bathymetry

20 m grid cell size

NOAA Coral Reef Ecosystem Division

Data include NOAA Ship Hiialakai and R/V AHI multibeam bathymetry and Ikonos derived depths

NOT FOR NAVIGATION

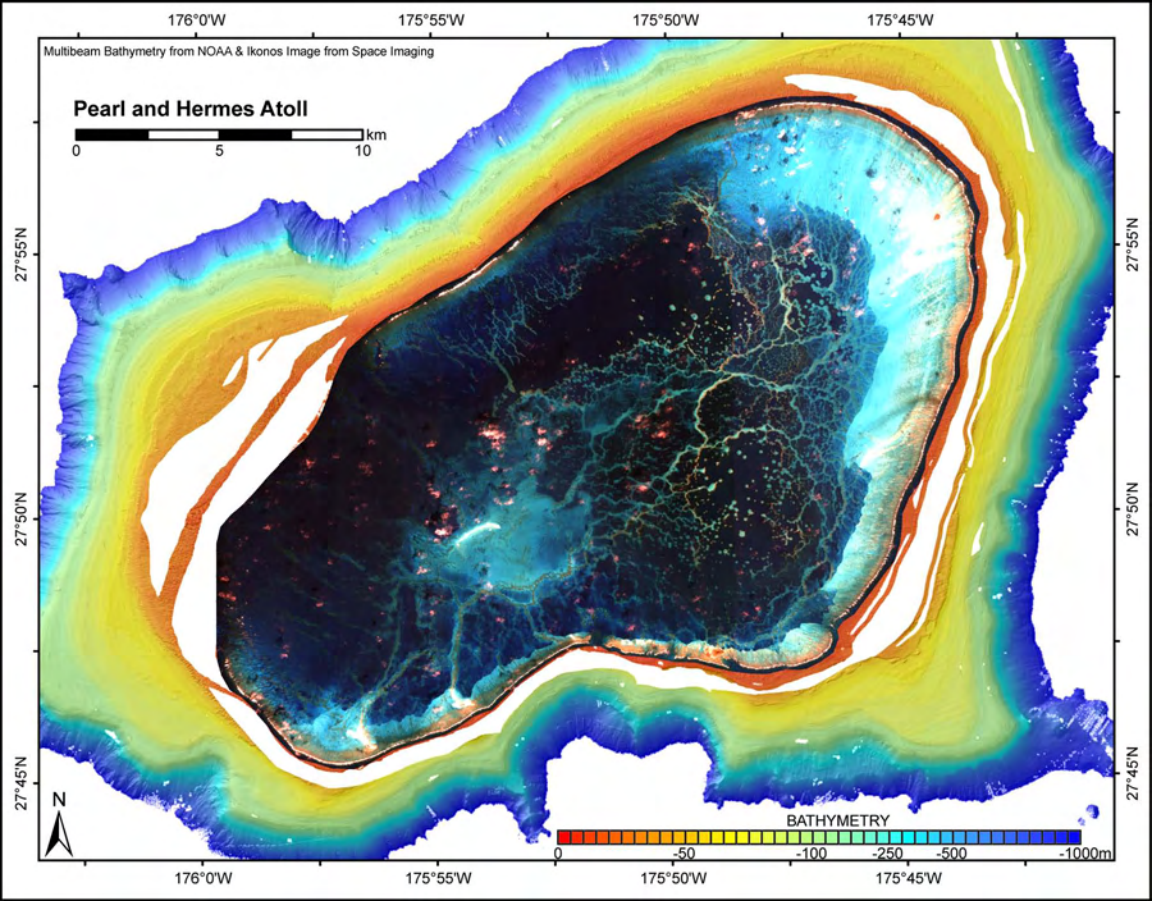
Universal Transverse Mercator Projection,Zone 1N, Ellipsoid: WGS84

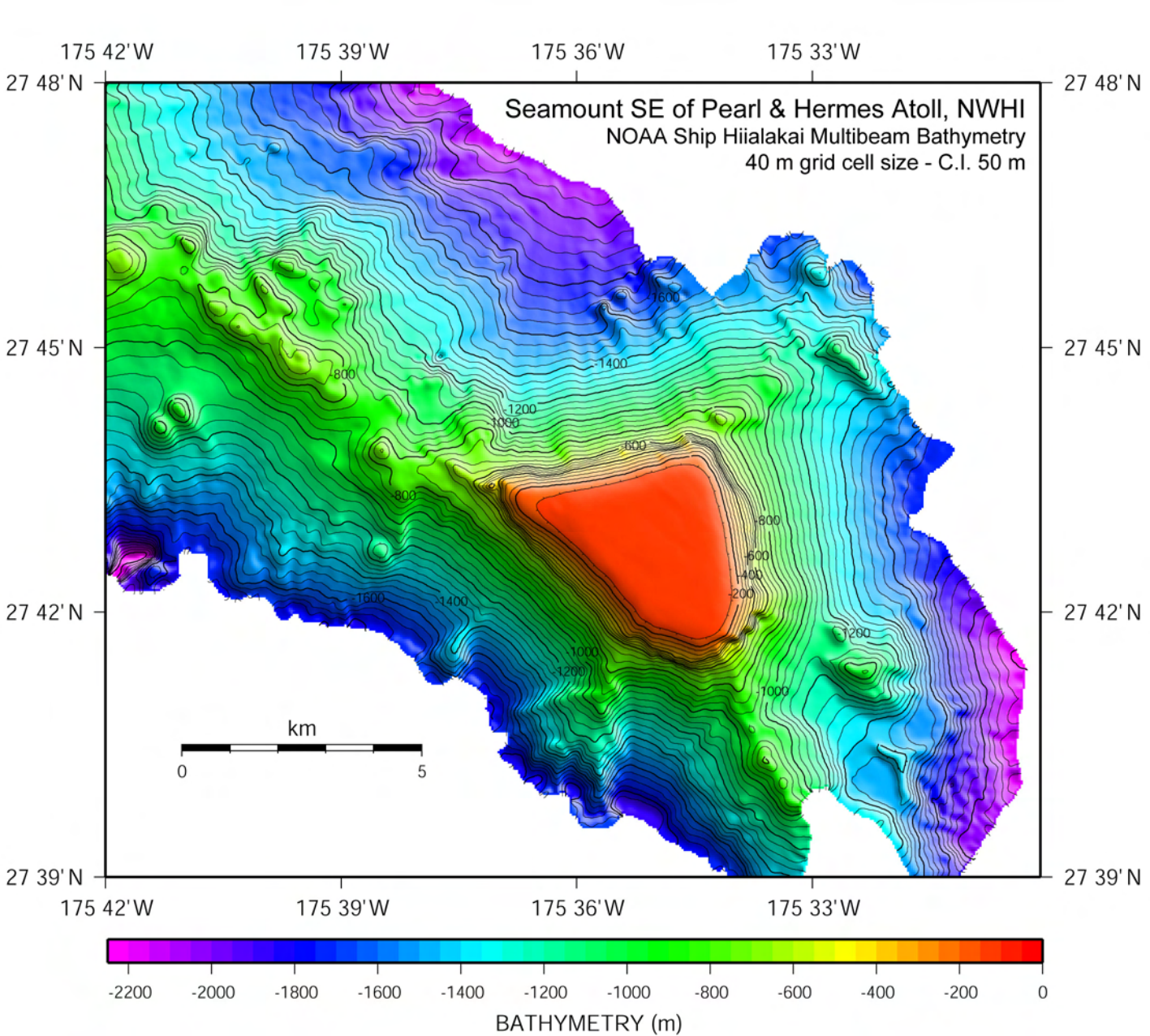
0 15 30 km

BATHYMETRY

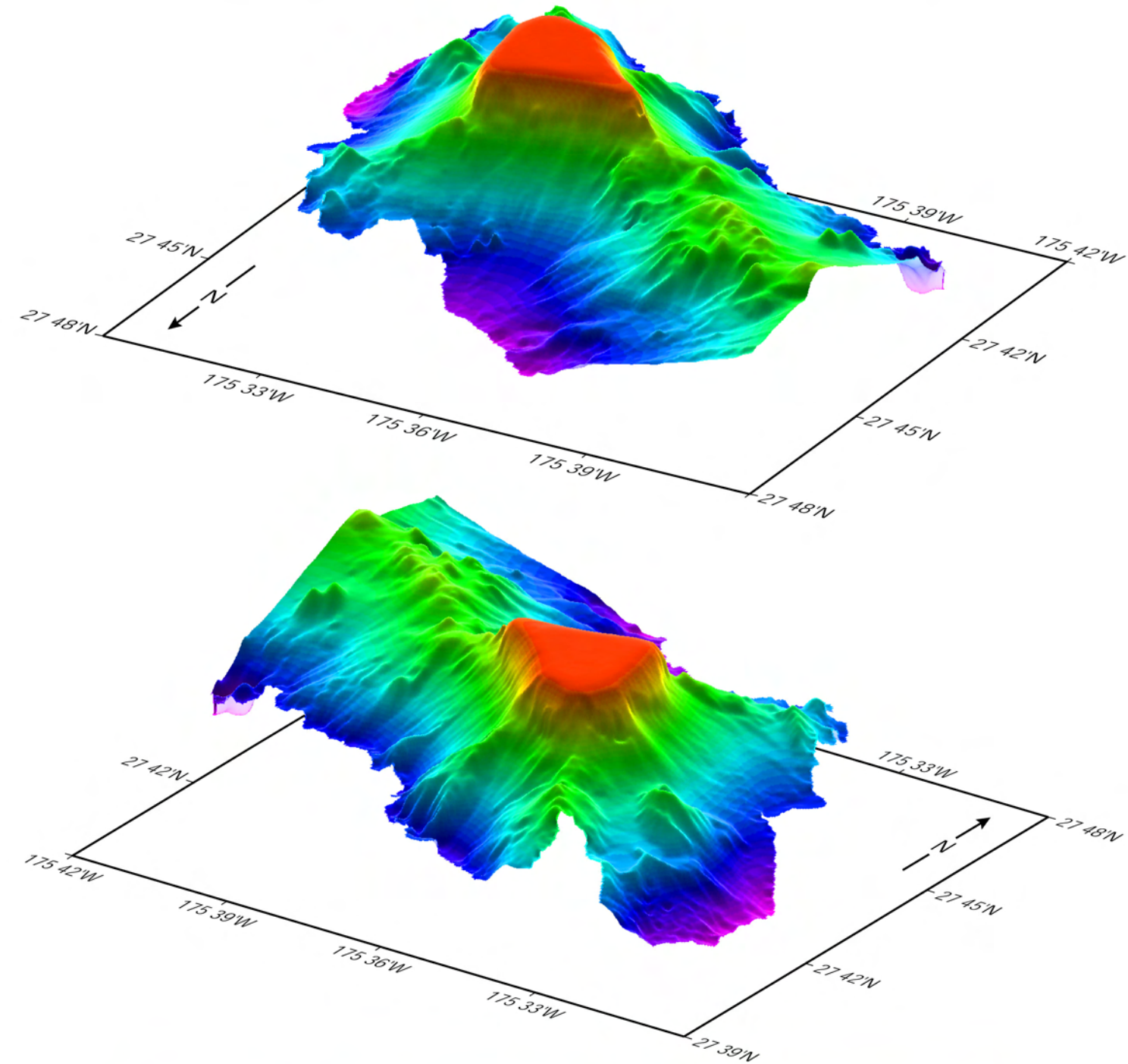
0 -50 -100 -250 -500 -1000m

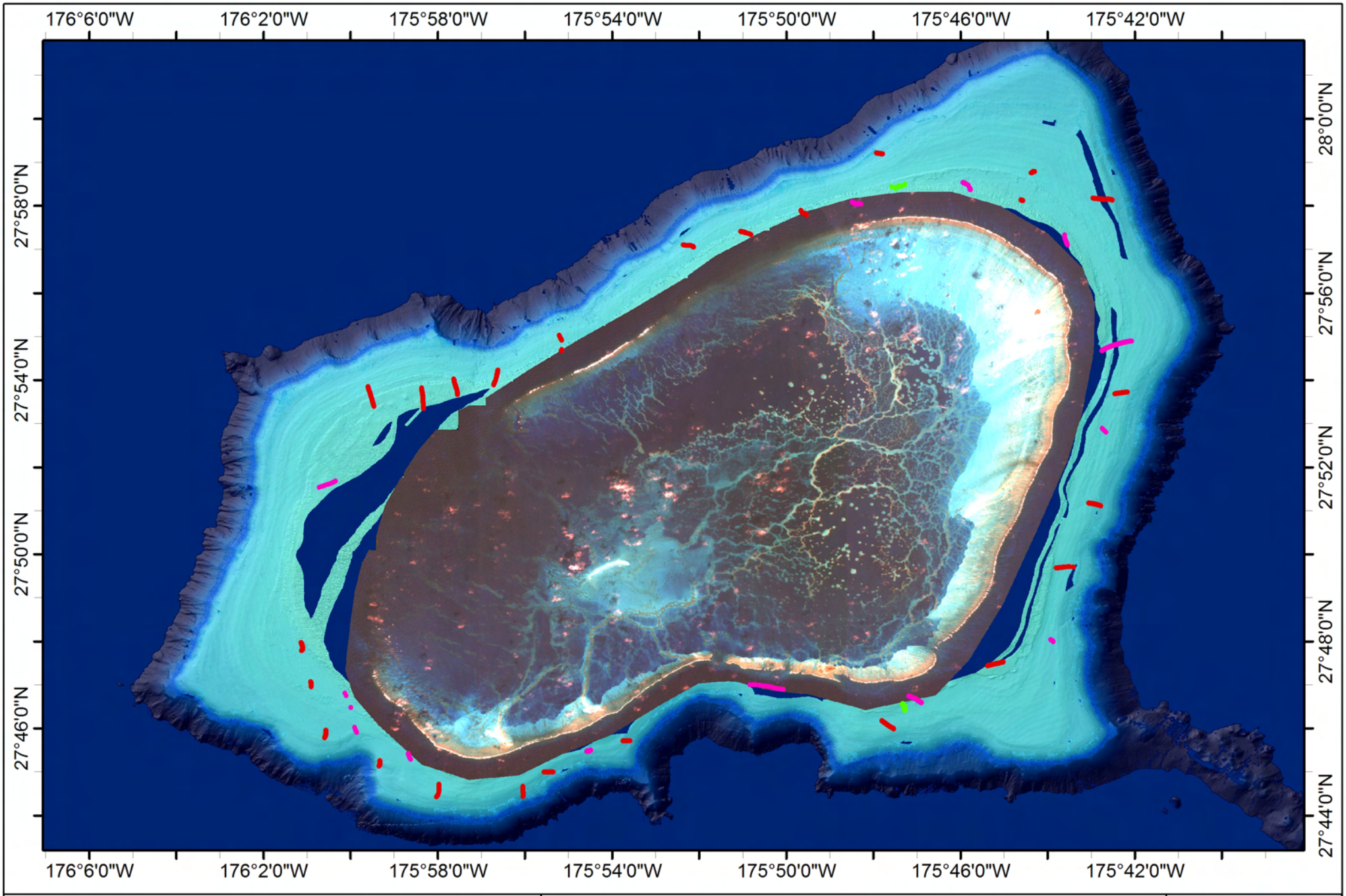
NOAA NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION U.S. DEPARTMENT OF COMMERCE


Multibeam Bathymetry from NOAA & Ikonos Image from Space Imaging
Pearl and Hermes Atoll
km
0
5
10
176°0'W
175°55'W
175°50'W
175°45'W
27°55'N
27°50'N
27°45'N
N
BATHYMETRY
0
-50
-100
-250
-500
-1000m


Seamount SE of Pearl & Hermes Atoll, NWHI
NOAA Ship Hiialakai Multibeam Bathymetry
40 m grid cell size - C.I. 50 m
175 42'W
175 39'W
175 36'W
175 33'W
27 48'N
27 45'N
27 42'N
27 39'N
km
0
5
-2200
-2000
-1800
-1600
-1400
-1200
-1000
-800
-600
-400
-200
0
BATHYMETRY (m)

3D Perspective Views of a Seamount SE of Pearl & Hermes Atoll, NWHI, V.E. = 2x





Pearl & Hermes Optical Validation Data

Optical data type: Geo-referenced photos and videos

NOAA Coral Reef Ecosystem Division

NOT FOR NAVIGATION

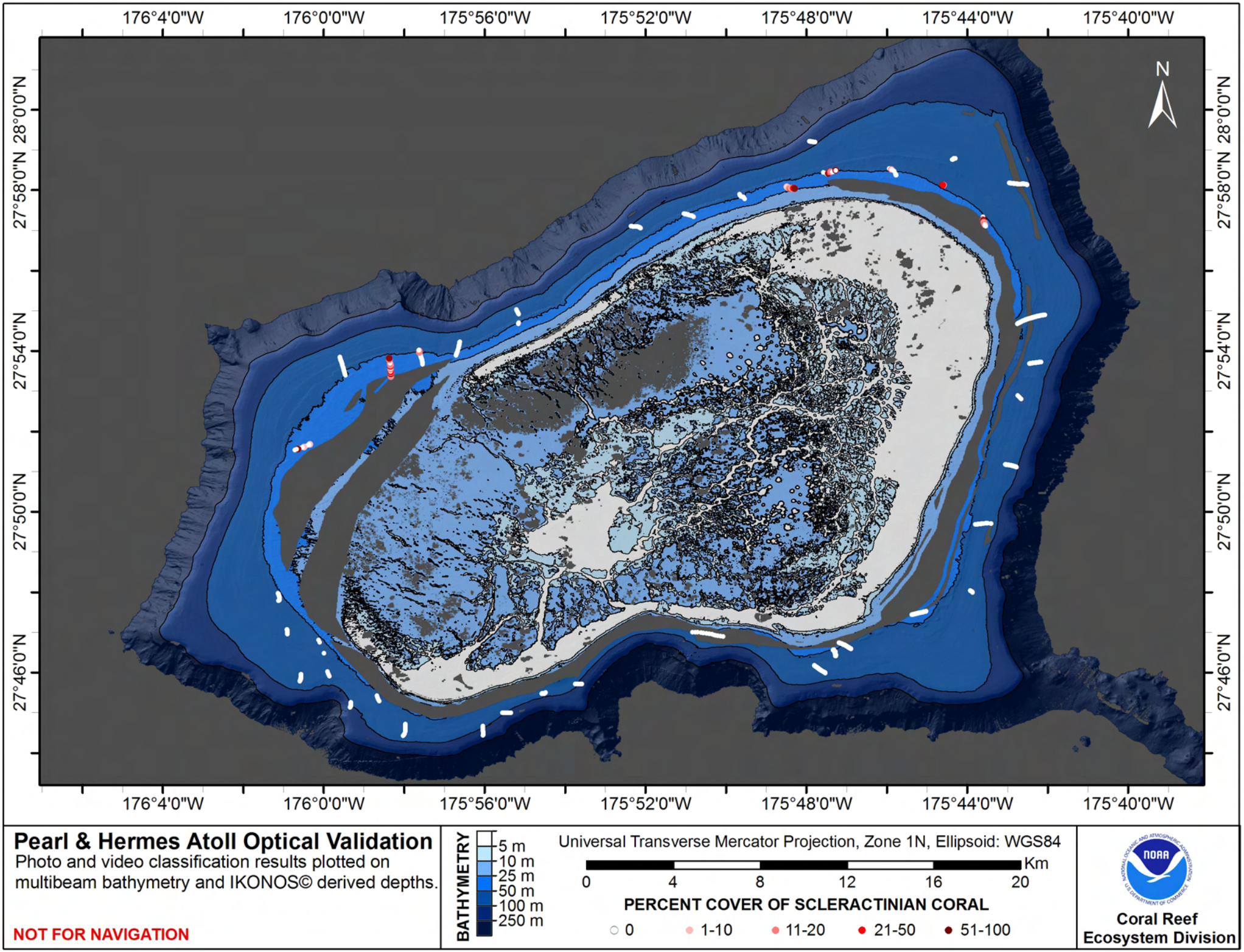
Universal Transverse Mercator Projection, Zone 2S, Ellipsoid: WGS84

Km

0 2.5 5 7.5 10 12.5

YEARS OF DATA COLLECTION

- 2002
- 2003
- 2004



Pearl & Hermes Atoll Optical Validation

Photo and video classification results plotted on multibeam bathymetry and IKONOS© derived depths.

NOT FOR NAVIGATION

BATHYMETRY
- 5 m
- 10 m
- 25 m
- 50 m
- 100 m
- 250 m

Universal Transverse Mercator Projection, Zone 1N, Ellipsoid: WGS84

0 4 8 12 16 20 Km

PERCENT COVER OF SCLERACTINIAN CORAL

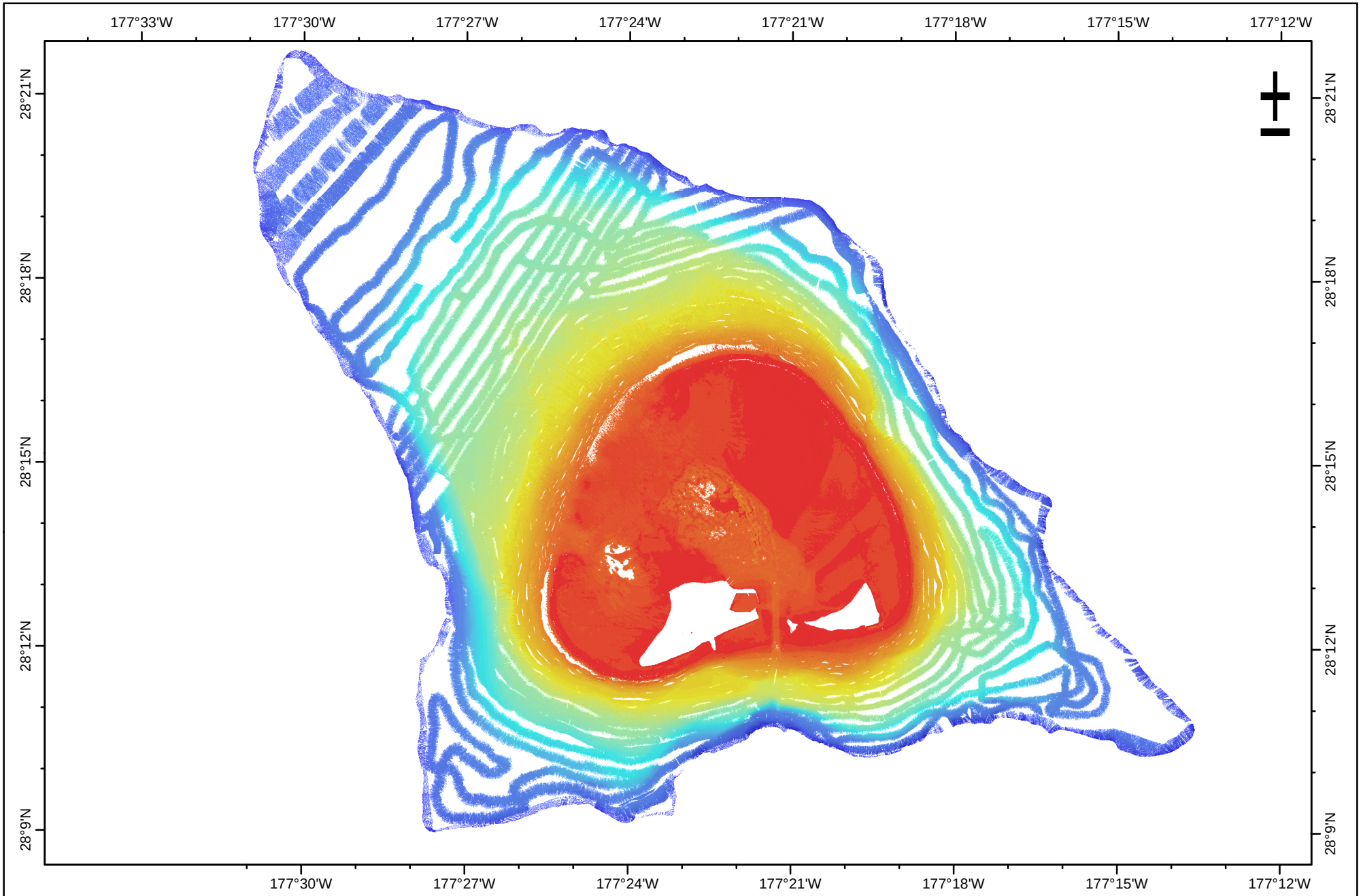
○ 0 ● 1-10 ● 11-20 ● 21-50 ● 51-100

NOAA

Coral Reef Ecosystem Division

Midway Atoll

Photo By Claire Johnson



Midway Atoll Bathymetry

5 m grid cell size

NOAA Coral Reef Ecosystem Division

Data include NOAA Ship Hiialakai and R/V AHI multibeam bathymetry and IKONOS derived depths

NOT FOR NAVIGATION

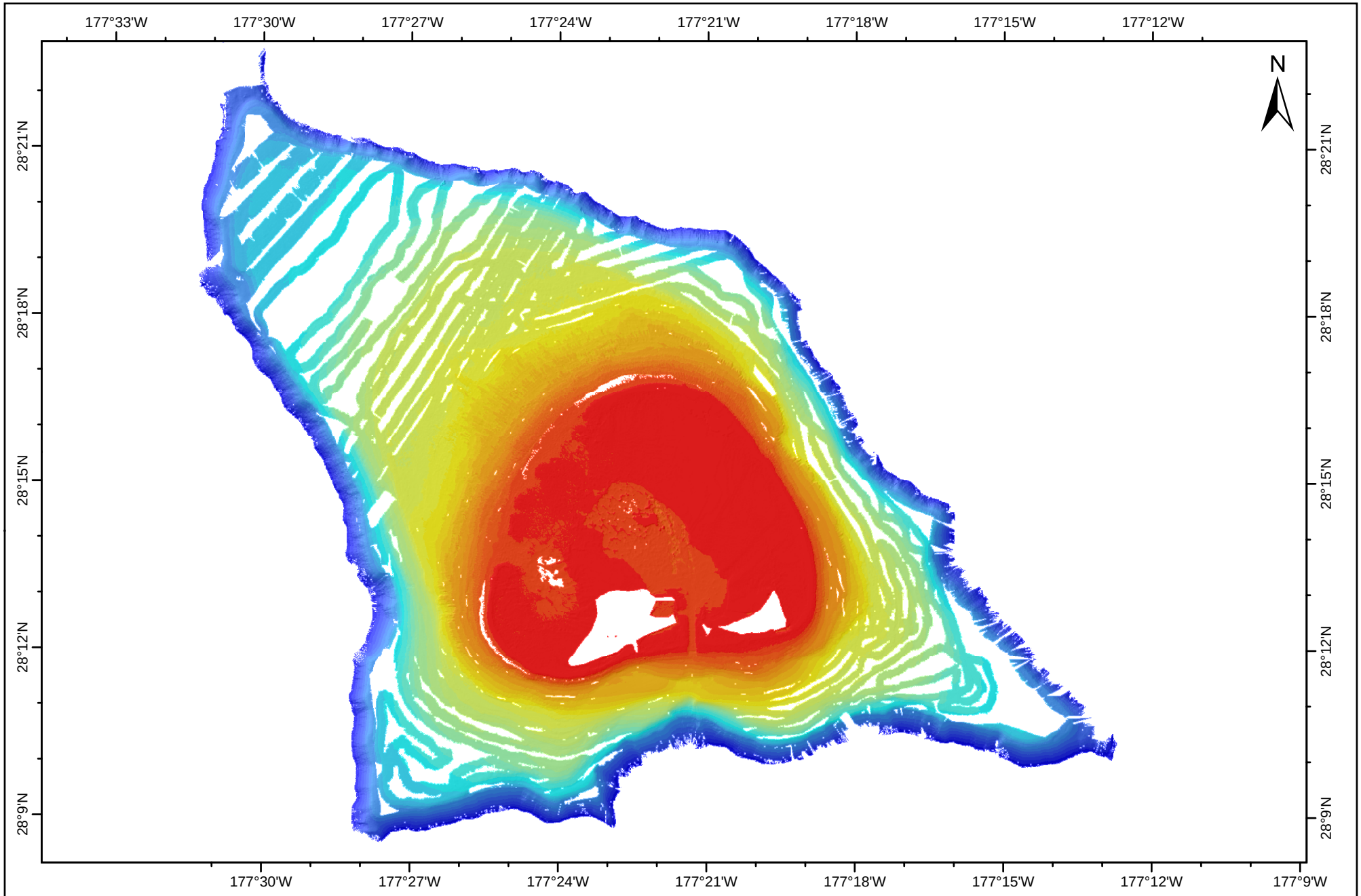
Universal Transverse Mercator Projection,Zone 1N, Ellipsoid: WGS84

0 10 20 km

BATHYMETRY

0 -10 -20 -30 -40 -50 -60 -70 -80 -90 -100 -200 m

NOAA NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION U.S. DEPARTMENT OF COMMERCE



Midway Atoll Bathymetry

20 m grid cell size

NOAA Coral Reef Ecosystem Division

Data include NOAA Ship Hiialakai and R/V AHI multibeam bathymetry and IKONOSderived depths

NOT FOR NAVIGATION

Universal Transverse Mercator Projection,Zone 1N, Ellipsoid: WGS84

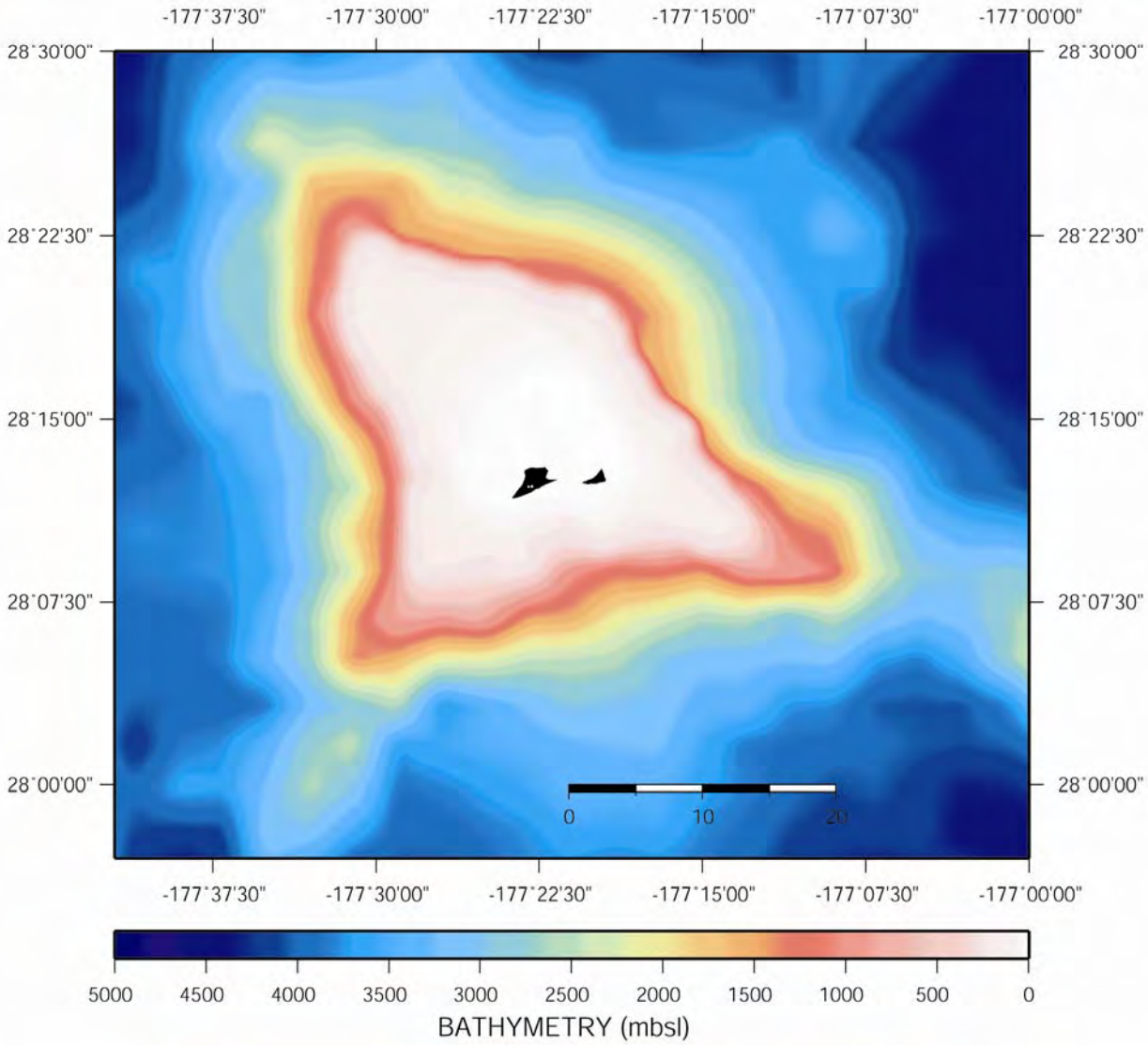
0 2.5 5 10 15 20 km

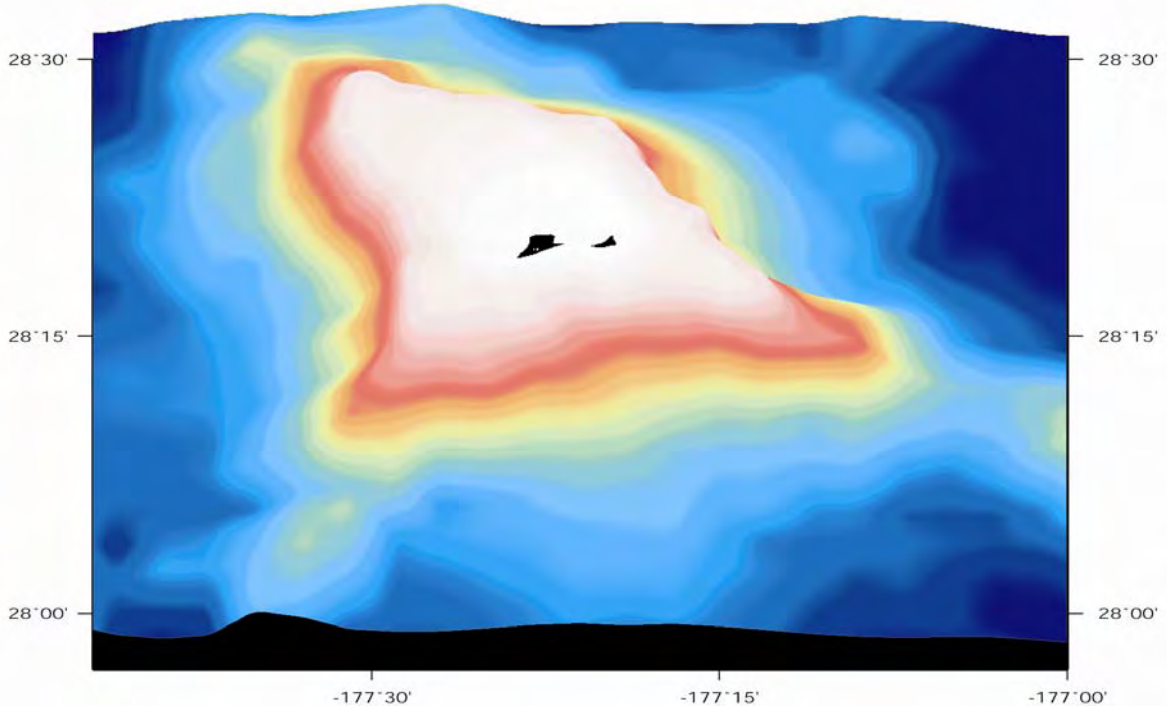
BATHYMETRY

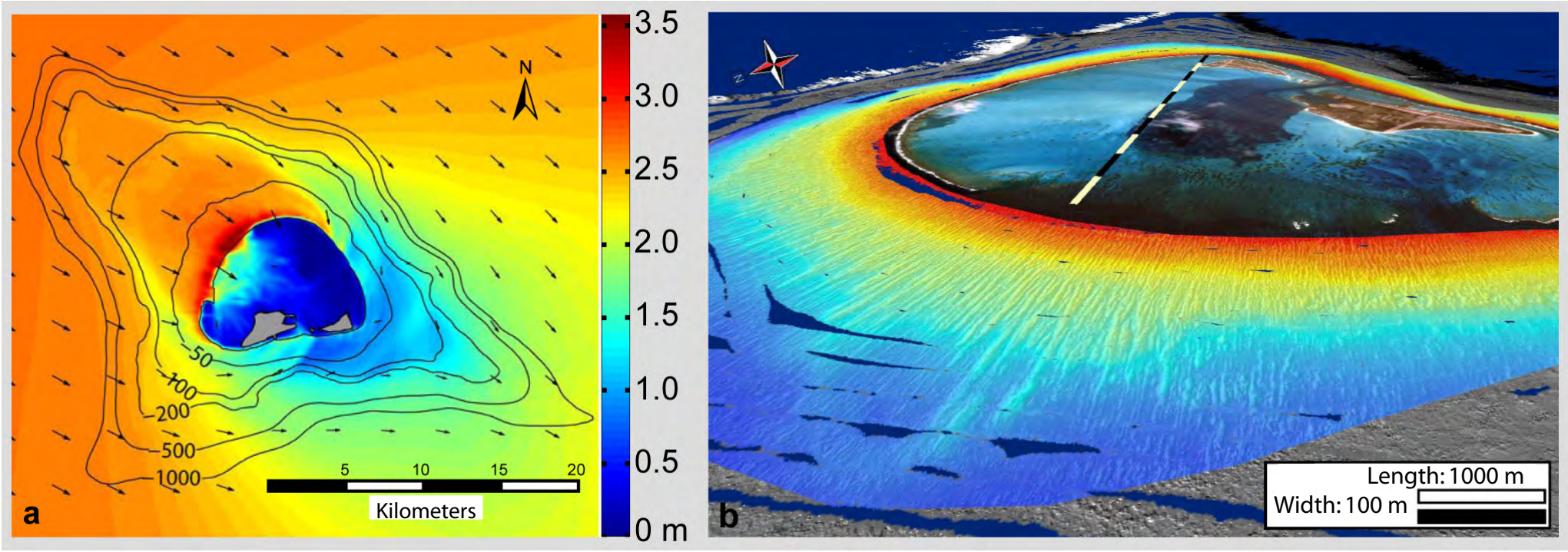
0 -50 -100 -150 -250 -500 m

Midway Island Seafloor Bathymetry

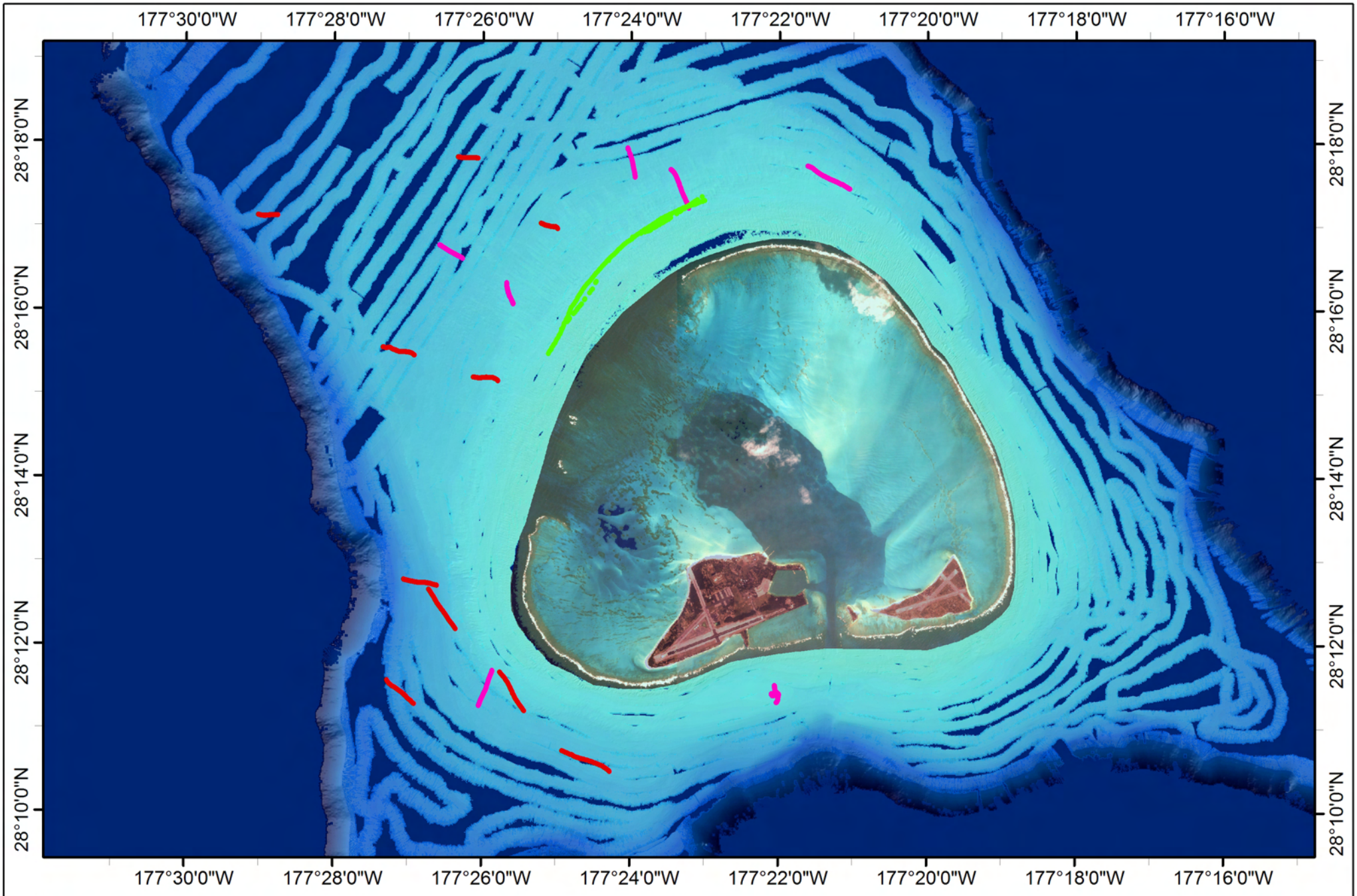
R/V AHI, NOAA Ship Hiialakai multibeam bathymetry
Smith & Sandwell derived bathymetry
20 m grid cell size







(a) A plot of significant wave height generated by a typical northwest storm swell at Midway Atoll, as calculated by the Simulating Waves Nearshore (SWAN, http://vlm089.citg.tudelft.nl/swan/index.htm) model, version 40.51. The northwest swell is the most powerful wave field in the north central Pacific, and consistent with that, model results show high wave energy concentrated on the northwest side of the atoll. Note the wave shadow (in blue) to the southeast of the atoll. (b) A perspective view of Midway from the northwest illustrates preferential spur and groove development in the area most exposed to the northwest swell. Color indicates depth. Spurs extend to a depth of 60 meters (blue). For scale, the 1 km long black and white bars shown in the foreground are overlain across the top of the atoll and indicate a lagoon diameter of approximately 10 km.



Midway Atoll Optical Validation Data

Optical data type: Geo-referenced photos and videos

NOAA Coral Reef Ecosystem Division

NOT FOR NAVIGATION

Universal Transverse Mercator Projection, Zone 2S, Ellipsoid: WGS84

N

0 2 4 6 8 10 Km

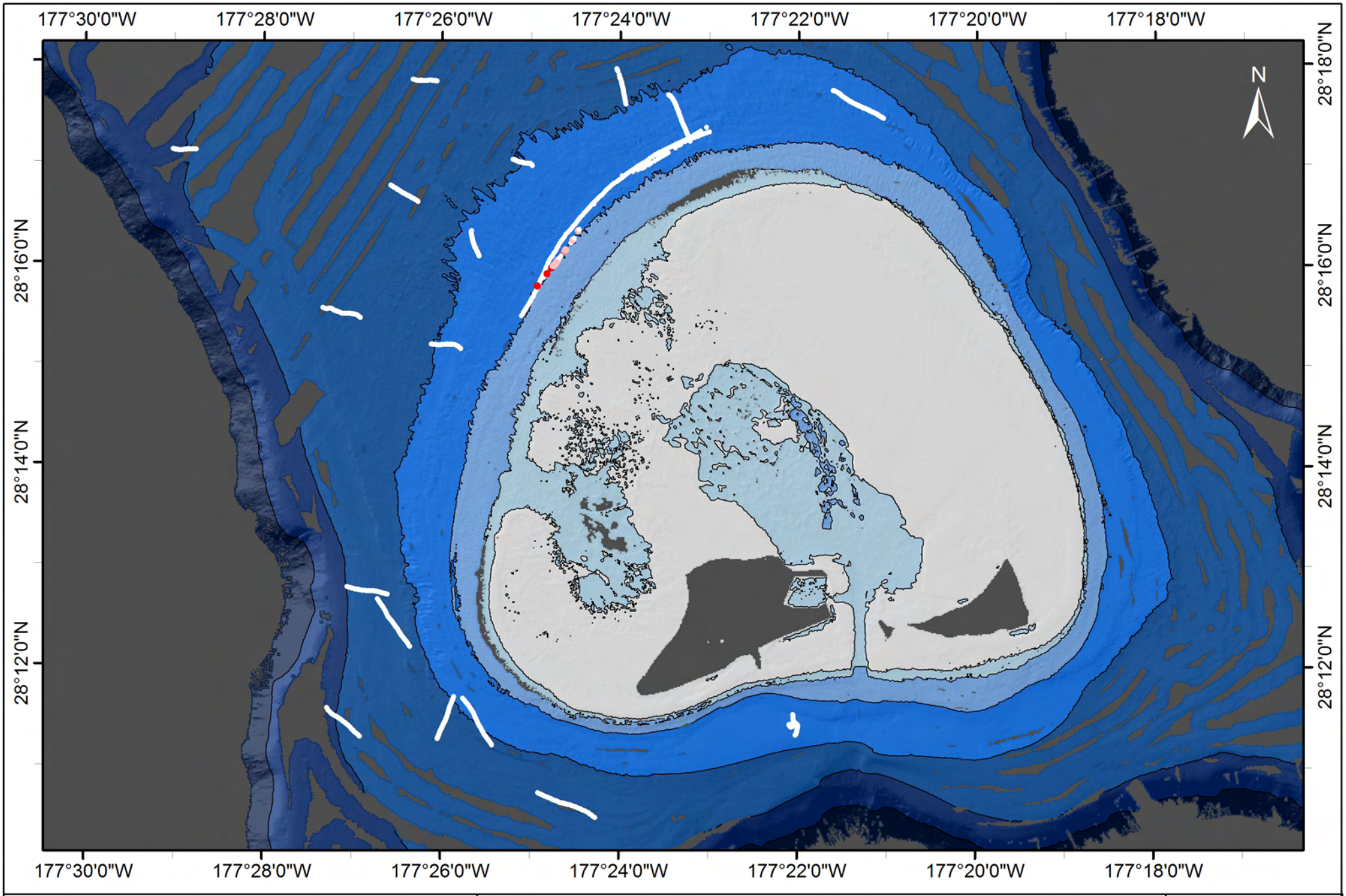
YEARS OF DATA COLLECTION

2002 2003 2004

NOAA

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

U.S. DEPARTMENT OF COMMERCE



Midway Atoll Optical Validation

Photo and video classification results plotted on multibeam bathymetry and IKONOS© derived depths.

NOT FOR NAVIGATION

BATHYMETRY
- 5 m
- 10 m
- 25 m
- 50 m
- 100 m
- 250 m

Universal Transverse Mercator Projection, Zone 1N, Ellipsoid: WGS84

0 2 4 6 8 Km

PERCENT COVER OF SCLERACTINIAN CORAL

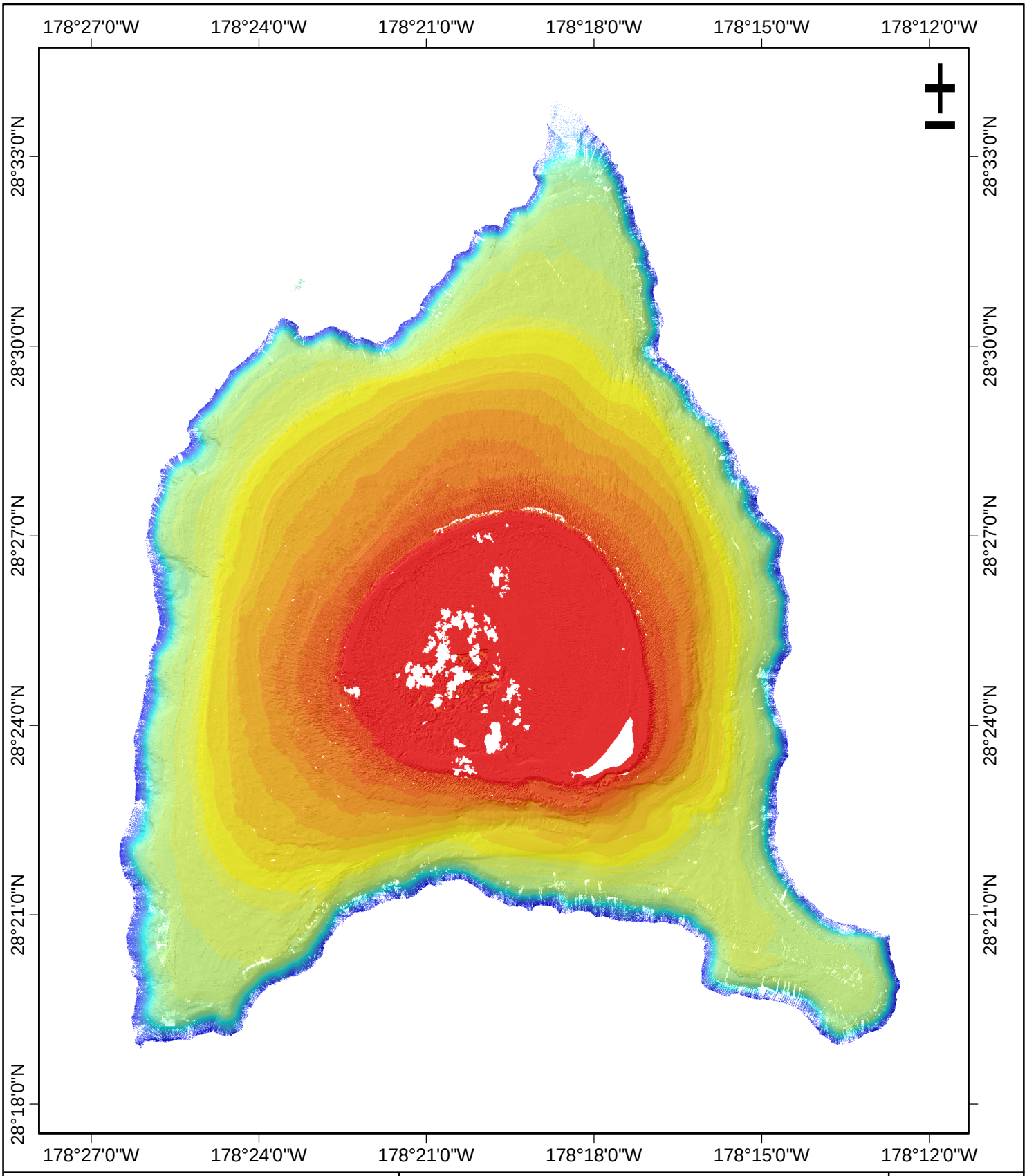
○ 0 ● 1-10 ● 11-20 ● 21-50 ● 51-100

NOAA

Coral Reef Ecosystem Division

Kure Atoll

Photo By Claire Johnson



Kure Atoll Bathymetry

5 m grid cell size

NOAA Coral Reef Ecosystem Division

Data include NOAA Ship Hiialakai and R/V AHI multibeam bathymetry and IKONOS derived depths

NOT FOR NAVIGATION

Universal Transverse Mercator Projection,
Zone 1N, Ellipsoid: WGS84

Km

0 6 12

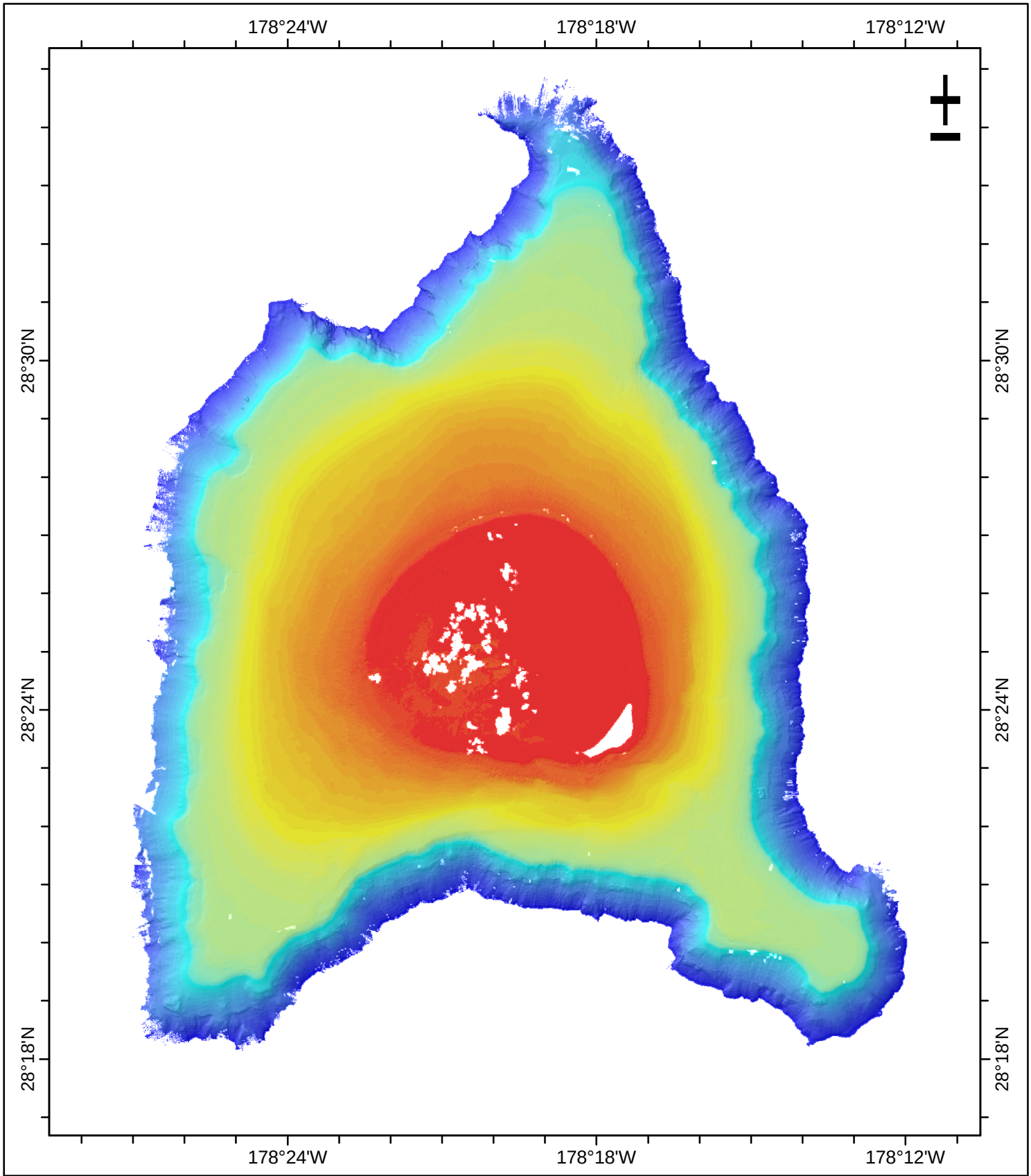
BATHYMETRY

0 -100 -200 -300 -400m

NOAA

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

U.S. DEPARTMENT OF COMMERCE



Kure Atoll Bathymetry

20 m grid cell size

NOAA Coral Reef Ecosystem Division

Data include NOAA Ship Hiialakai and R/V AHI multibeam bathymetry and Ikonos derived depths

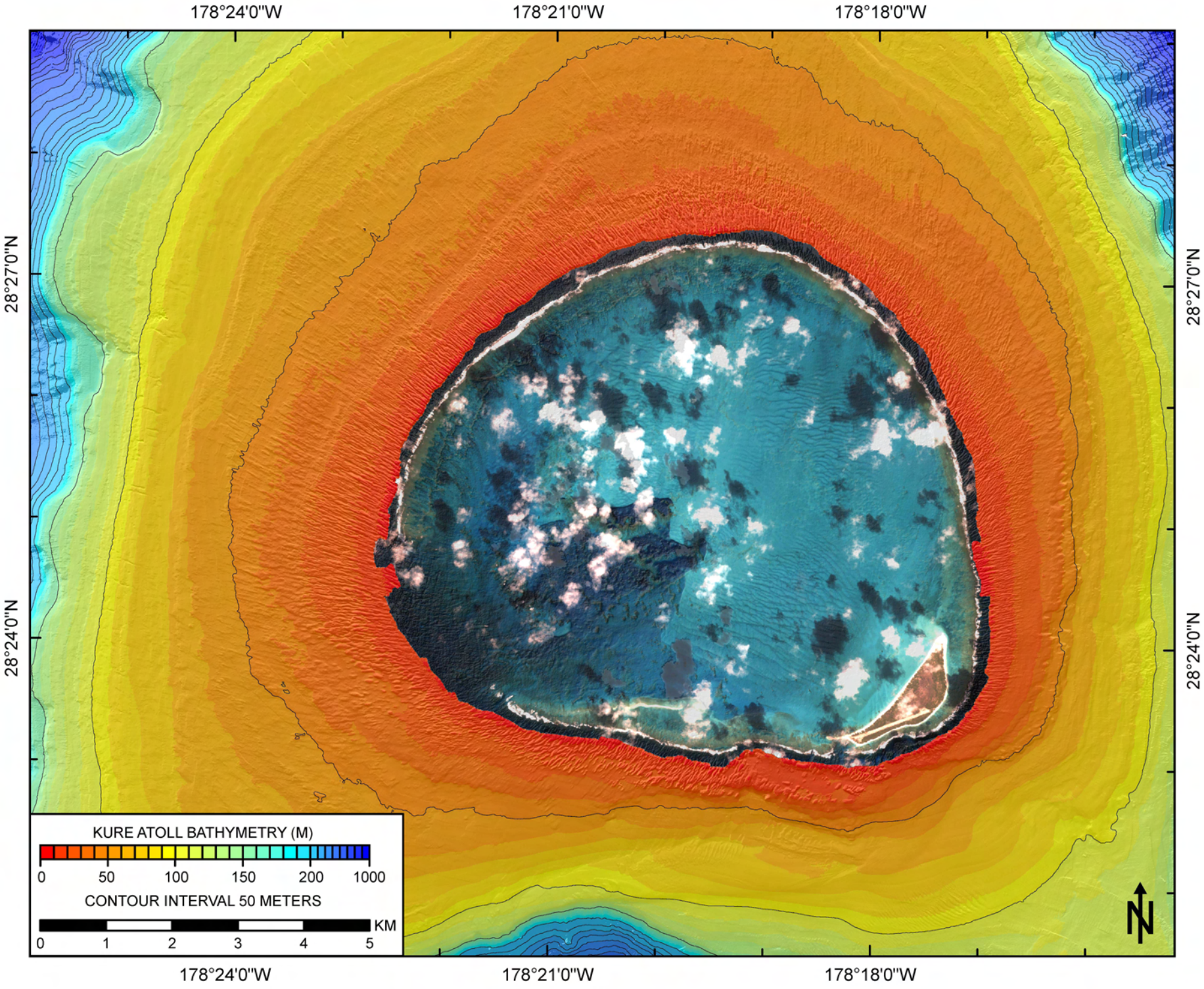
NOT FOR NAVIGATION

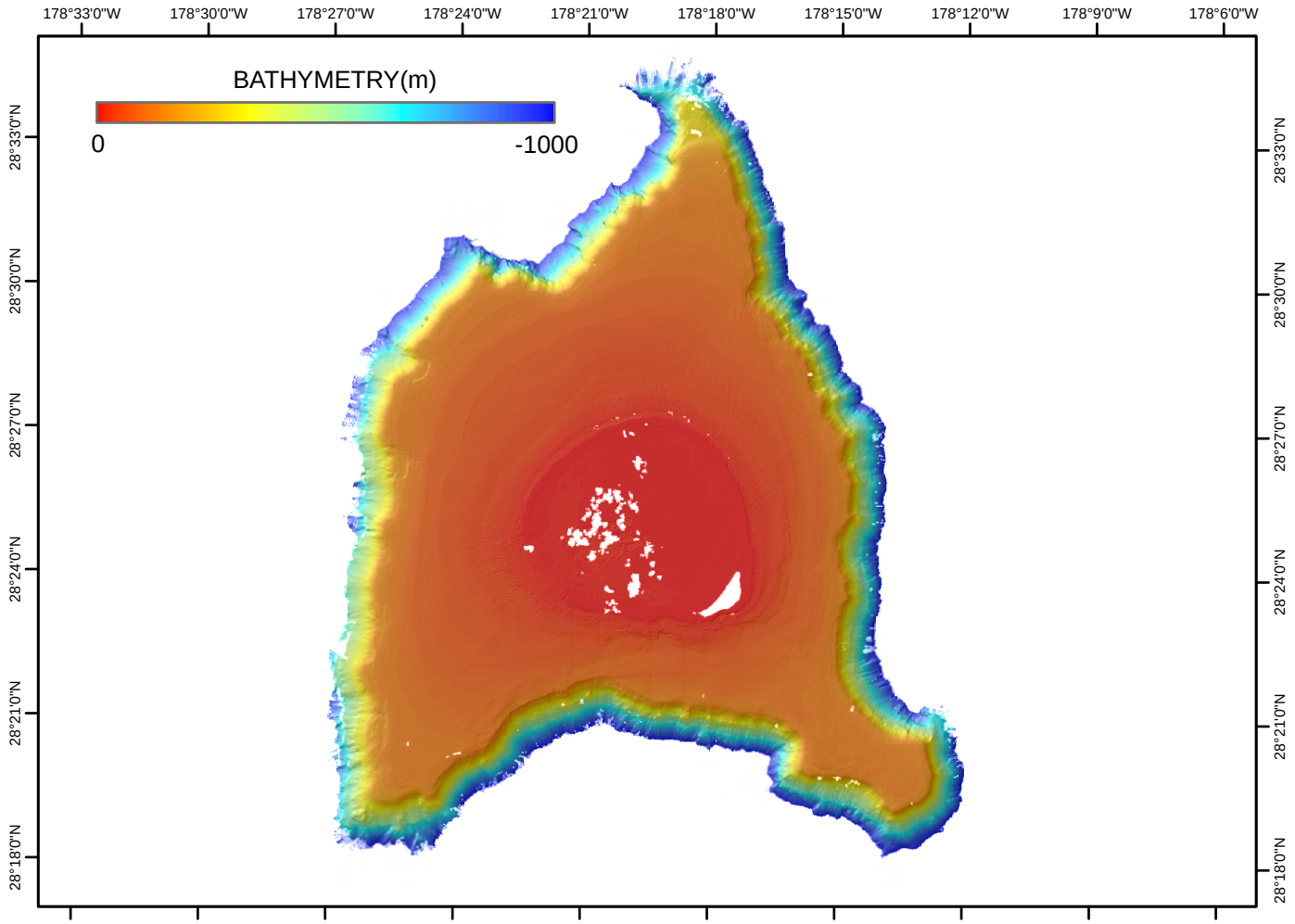
Universal Transverse Mercator Projection,
Zone 1N, Ellipsoid: WGS84

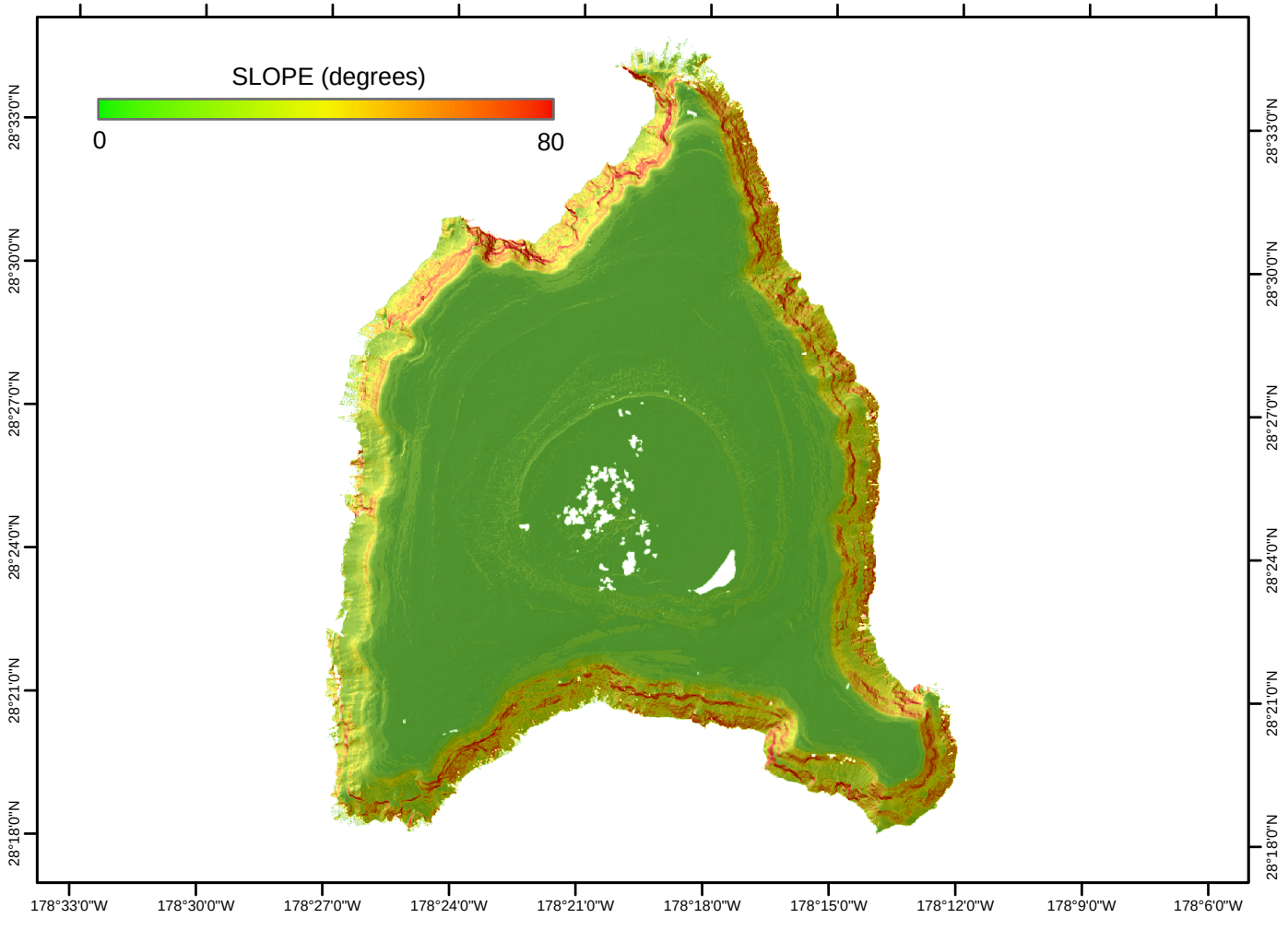
Km
0 2.5 5 10 15

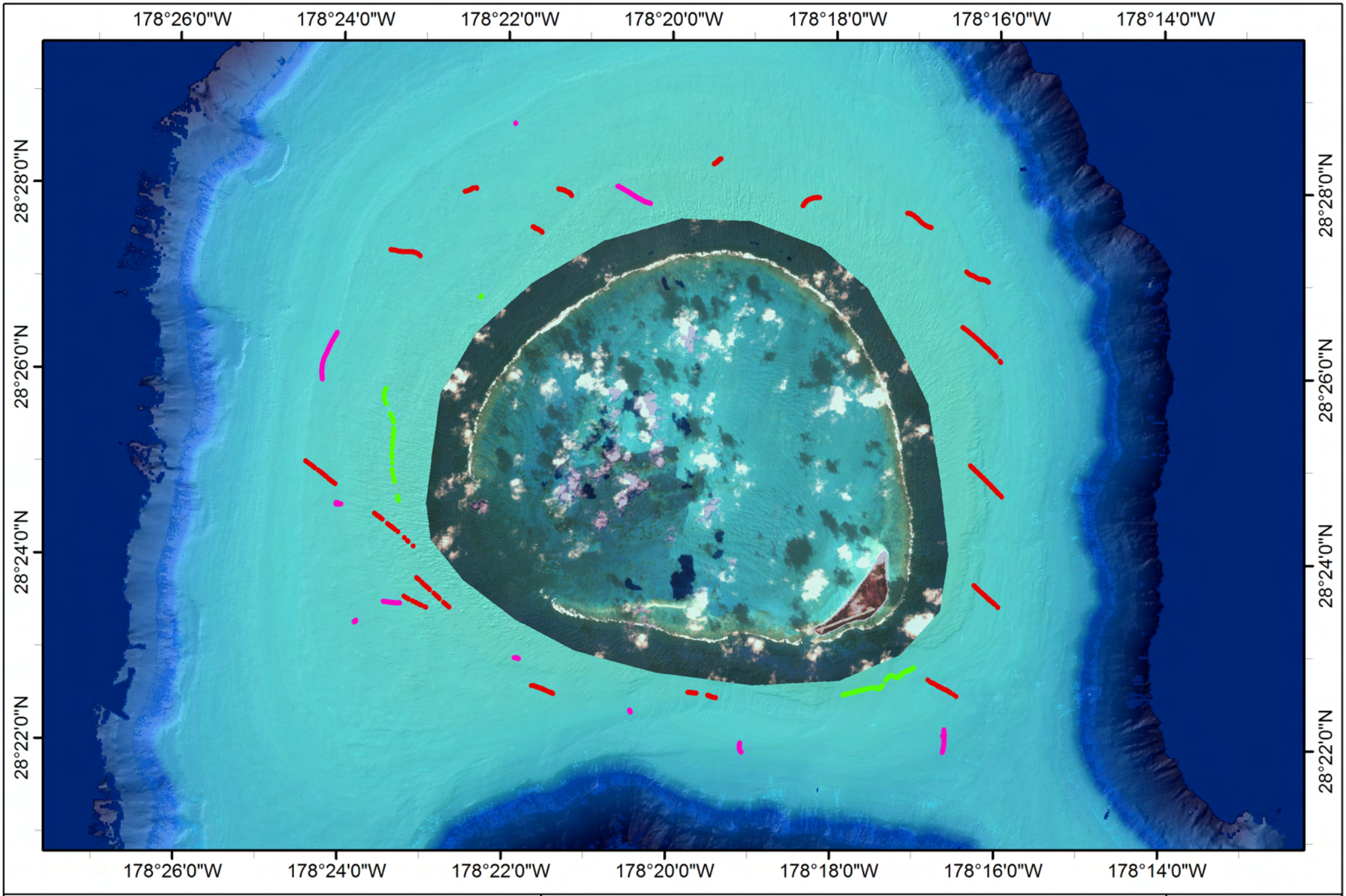
BATHYMETRY
0 -50 -100 -150 -200 -500 -1000m

NOAA
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
U.S. DEPARTMENT OF COMMERCE


178°24'0"W
178°21'0"W
178°18'0"W
28°27'0"N
28°24'0"N
KURE ATOLL BATHYMETRY (M)
0
50
100
150
200
1000
CONTOUR INTERVAL 50 METERS
KM
0
1
2
3
4
5
N


BATHYMETRY(m)
0
-1000
178°33'0"W
178°30'0"W
178°27'0"W
178°24'0"W
178°21'0"W
178°18'0"W
178°15'0"W
178°12'0"W
178°9'0"W
178°6'0"W
28°33'0"N
28°30'0"N
28°27'0"N
28°24'0"N
28°21'0"N
28°18'0"N


SLOPE (degrees)
0
80
178°33'0"W
178°30'0"W
178°27'0"W
178°24'0"W
178°21'0"W
178°18'0"W
178°15'0"W
178°12'0"W
178°9'0"W
178°6'0"W
28°33'0"N
28°30'0"N
28°27'0"N
28°24'0"N
28°21'0"N
28°18'0"N



Kure Atoll Optical Validation Data

Optical data type: Geo-referenced photos and videos

NOAA Coral Reef Ecosystem Division

NOT FOR NAVIGATION

Universal Transverse Mercator Projection, Zone 2S, Ellipsoid: WGS84

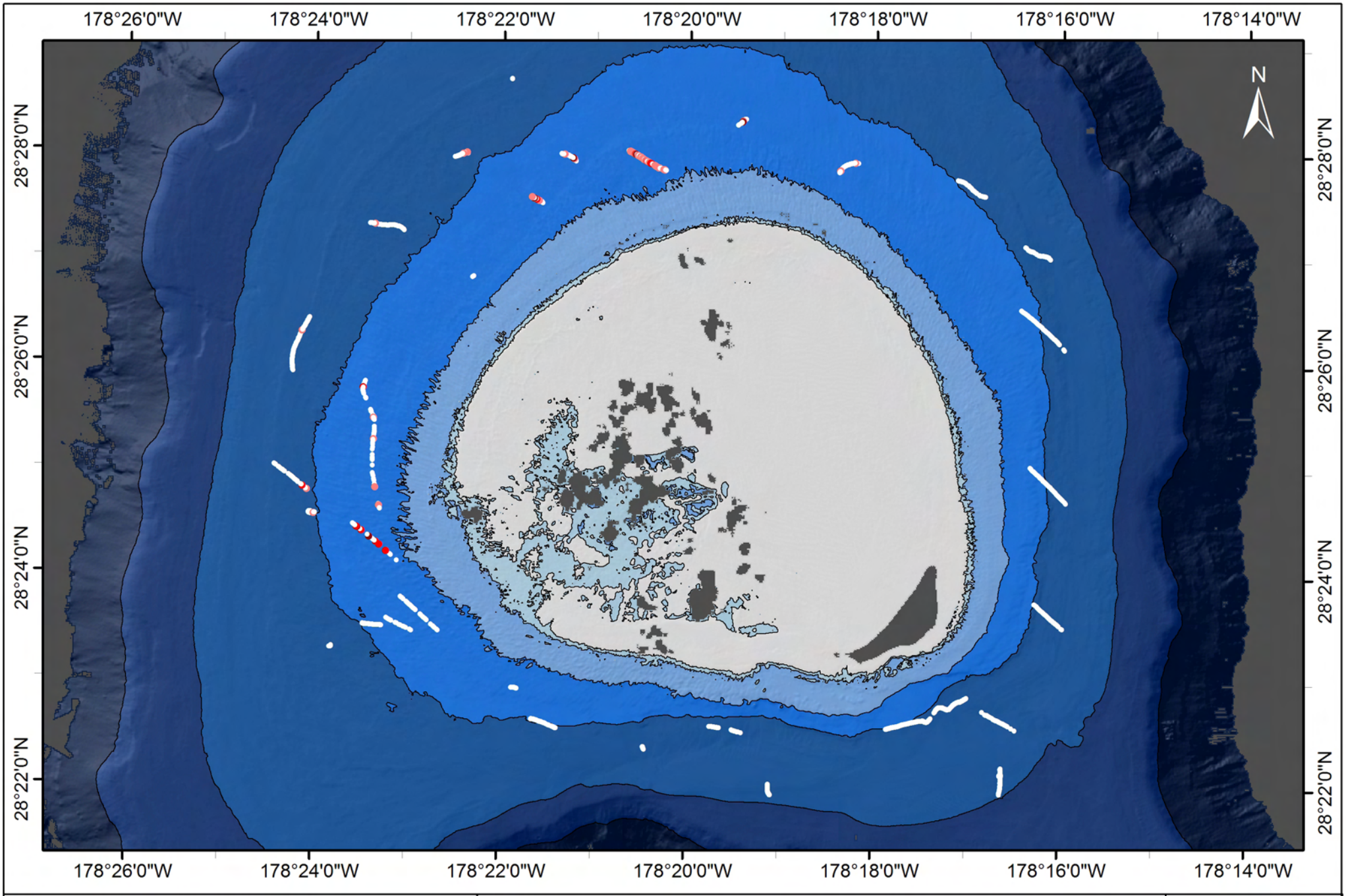
N

0 2 4 6 8 10 Km

YEARS OF DATA COLLECTION

2002 2003 2004

NOAA NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION U.S. DEPARTMENT OF COMMERCE



Kure Atoll Optical Validation

Photo and video classification results plotted on multibeam bathymetry and IKONOS© derived depths.

NOT FOR NAVIGATION

BATHYMETRY
- 5 m
- 10 m
- 25 m
- 50 m
- 100 m
- 250 m

Universal Transverse Mercator Projection, Zone 1N, Ellipsoid: WGS84

0 2 4 6 8 Km

PERCENT COVER OF SCLERACTINIAN CORAL

○ 0 ● 1-10 ● 11-20 ● 21-50 ● 51-100

NOAA

Coral Reef Ecosystem Division

Metadata

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Metadata Contents

Cruise Metadata

This collection includes metadata for most cruises that included mapping and optical validation missions around the Northwest Hawaiian Islands. The following platforms were used for mapping and optical validation missions:
University of Hawaii R/V Kilo Moana (KM)
NOAA Survey Launch R/V Acoustic Habitat Investigator (AHI)
NOAA Ship Hi'ialakai (HI)*
NOAA Ship Thompson Cromwell (TC)*
NOAA Ship Oscar Elton Sette (OES)*

- KM0206
- AHI0306
- AHI0501
- HI0501
- HI0503
- HI0507
- AHI0508
- HI0508
- AHI0609
- HI0609
- AHI0612
- HI0612

*TC0110, TC0111, TC0227, OES0306, HI0401 cruise metadata not included.

Product Metadata

The following product metadata are available for download from www.soest.hawaii.edu/pibhmc/pibhmc_nwhi.htm. They are listed as links with the data sets they are associated with. To control the capacity of this collection, the metadata are not in print.

NWHI UTM Zone 4 Regional Bathymetry
Nihoa Bathymetry – 20 meter

NWHI UTM Zone 3 Regional Bathymetry
Twin Banks Bathymetry – 20 meter
Necker Island Bathymetry – 20 meter
Necker Island Optical Validation by year (tc0207, hi0401)
Necker Island Optical Validation by Scleractinian Coral Cover (all)
French Frigate Shoals Bathymetry – 5 meter
French Frigate Shoals Bathymetry – 20 meter
French Frigate Shoals Slope – 5 meter
French Frigate Shoals Rugosity – 5 meter

French Frigate Shoals Bathymetric Position Index Zones – 5 meter
French Frigate Shoals Bathymetric Position Index Structures – 5 meter
French Frigate Shoals Optical Validation by year (tc0110, tc0111, tc0207, oes0306, hi0401, hi0503)
French Frigate Shoals Optical Validation by Scleractinian Coral Cover (all)
French Frigate Shoals Backscatter – Reson 8101, 1 meter
French Frigate Shoals Backscatter – Simrad em3002d, 1 meter
St. Rogatien and Brooks Banks – 5 meter
St. Rogatien and Brooks Banks – 20 meter
St. Rogatien Bank Optical Validation by Scleractinian Coral Cover (tc0110, all)
Gardner Pinnacles Bathymetry – 20 meter
Gardner Pinnacles Optical Validation by Scleractinian Coral Cover (oes0306, map)

NWHI UTM Zone 2 Regional Bathymetry
Raita Bank Bathymetry – 20 meter
Raita Bank Optical Validation by Scleractinian Coral Cover (tc0110, all)
Maro Reef Bathymetry – 20 meter
Maro Reef Backscatter – Reson 8101, 1 meter
Maro Reef Backscatter – Simrad em3002d, 1 meter
Maro Reef Backscatter – Simrad em300, 1 meter
Maro Reef Backscatter – Simrad em120, 30 meter
Maro Reef Optical Validation by year (tc0110, tc0207, oes0306, hi0401)
Maro Reef Optical Validation by Scleractinian Coral Cover (all)
Northampton Seamounts & Laysan Island Bathymetry – 20 meter
Laysan Island Optical Validation by year (tc0207, hi0401)
Laysan Island Optical Validation by Scleractinian Coral Cover (all)
Pioneer Bank Bathymetry – 20 meter

NWHI UTM Zone 1 Regional Bathymetry
Lisianski Island Bathymetry – 20 meter
Lisianski Island Optical Validation by year (tc0110, tc0207, oes0306, hi0401)
Lisianski Island Optical Validation by Scleractinian Coral Cover (all)
Pearl & Hermes Atoll Bathymetry – 5 meter
Pearl & Hermes Atoll Bathymetry – 20 meter
Pearl & Hermes Atoll Optical Validation by year (tc0207, oes0306, hi0401)
Pearl & Hermes Atoll Optical Validation by Scleractinian Coral Cover (all)
Midway Atoll Bathymetry – 5 meter
Midway Atoll Bathymetry – 20 meter
Midway Atoll Optical Validation by year (tc0207, oes0306, hi0401)
Midway Atoll Optical Validation by Scleractinian Coral Cover (all)
Kure Atoll Bathymetry – 5 meter
Kure Atoll Bathymetry – 20 meter
Kure Atoll Optical Validation by year (tc0207, oes0306, hi0401)
Kure Atoll Optical Validation by Scleractinian Coral Cover (all)

Cruise Metadata

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Identification_Information:
  Citation:
    Citation_Information:
      Originator: Joyce E. Miller
      Publication_Date: 200411
      Title: EM1002 and EM120 Multibeam Sonar Data from Cruise Kilo Moana 0206
      Geospatial_Data_Presentation_Form: ***Generic Sensor Format (GSF) digital data***
      Online_Linkage: http://crei.nmfs.hawaii.edu/BathyAtlas
  Description:
    Abstract: EM1002 and EM120 multibeam Data were collected in October/November 2002 aboard R/V Kilo Moana Cruise KM0206 between Kauai Island and Lisianski Island
    in the Northwestern Hawaiian Islands (NWHI). Multibeam data were collected using Simrad Neptune software, transferred to the Generic Sensor Format, and
    processed using SABER editing software. Sound velocity corrections from CTD's and motion corrections from a POS-MV vertical reference were applied to the data
    in real time. No tidal correctors were applied in real-time or in post-processing. The EM1002 has heave artifacts (~0.6m) in shallow bank-top data.
    Horizontal accuracy is 20m (no differential GPS correctors applied), vertical accuracy is depth dependent (~1% of water depth), WGS84 datum.
    These data are not to be used for navigation.
    Purpose: The data were collected to provide information on the 25, 50, and 100 fm contours in the NWHI, which are important for establishing management boundaries
    for the NWHI Coral Reef Ecosystem Reserve. The data are also being used for benthic habitat mapping, location of Essential Fish Habitat, and to study the
    geologic features of the area.
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        Ending_Date: 20021116
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    Maintenance_and_Update_Frequency: As needed
  Spatial_Domain:
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      East_Bounding_Coordinate: -158.00
      North_Bounding_Coordinate: 26.66
      South_Bounding_Coordinate: 21.00
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    Theme:

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Theme_Keyword: EARTH SCIENCE > Oceans > Bathymetry/Seafloor Topography > Bathymetry
Theme:
Theme_Keyword_Thesaurus: None
Theme_Keyword: Bathymetry
Theme_Keyword: Multibeam sonar
Place:
Place_Keyword_Thesaurus: None
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Place_Keyword: Pacific
Place_Keyword: Islands
Place:
Place_Keyword_Thesaurus: CoRIS Place Thesaurus Version 1.0
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Place_Keyword: COUNTRY/TERRITORY > United States of America > Hawaii > Honolulu
Access_Constraints: None.
Use_Constraints: These data are NOT TO BE USED FOR NAVIGATION
Point_of_Contact:
Contact_Information:
Contact_Person_Primary:
Contact_Person: Joyce E. Miller
Contact_Organization: Joint Institute for Marine and Atmospheric Research/NOAA Coral Reef Ecosystem Division
Contact_Position: Oceanographer
Contact_Address:
Address_Type: mailing and physical address
Address: Kewalo Research Facility, 1125B Ala Moana Blvd
City: Honolulu
State_or_Province: Hawaii
Postal_Code: 96814
Country: USA
Contact_Voice_Telephone: (808) 956-5239
Contact_Facsimile_Telephone: (808) 592-7013
Contact_Electronic_Mail_Address: Joyce.Miller@noaa.gov
Browse_Graphic:
Browse_Graphic_File_Name: None
Browse_Graphic_File_Description: None
Browse_Graphic_File_Type: None
Data_Set_Credit: Joyce E. Miller, Joint Institute for Marine and Atmospheric Research, University of Hawaii/ Coral Reef Ecosystem Division, NOAA Pacific
Islands Fisheries Science Center and Dr. Bruce Appelgate and Paul Johnson, Hawaii Mapping Research Group, University of Hawaii

Native_Data_Set_Environment: ***Generic Sensor Format multibeam data processed with SAIC SABER processing software on LINUX operating system computers***
Cross_Reference:
Citation_Information:
Originator: Coral Reef Ecosystem Division, Pacific Islands Fisheries Science Center
Publication_Date: 200411
Title: Bathymetric Atlas of the Northwestern Hawaiian Islands: A Planning Document for Benthic Habitat Mapping,
Edition: Draft
Online_Linkage: http://crei.nmfs.hawaii.edu/BathyAtlas
Data_Quality_Information:
Attribute_Accuracy:
Attribute_Accuracy_Report: Horizontal accuracy is ~20 m as data were collected using GPS with no differential corrections.
Vertical accuracy of multibeam data is estimated at 1% of water depth; no tidal corrections were applied.
Logical_Consistency_Report: These data are believed to be logically consisten though no tests were performed
Completeness_Report: Varies
Positional_Accuracy:
Horizontal_Positional_Accuracy:
Horizontal_Positional_Accuracy_Report: Variable
Quantitative_Horizontal_Positional_Accuracy_Assessment:
Horizontal_Positional_Accuracy_Value: 20
Horizontal_Positional_Accuracy_Explanation: Multibeam sonar data. No DGPS corrections applied; 20 m accuracy
Vertical_Positional_Accuracy:
Vertical_Positional_Accuracy_Report: Variable
Quantitative_Vertical_Positional_Accuracy_Assessment:
Vertical_Positional_Accuracy_Value: 1
Vertical_Positional_Accuracy_Explanation: Accuracy varies with water depth. No tide correctors applied; multibeam data vertical accuracy is ~1% of water depth.
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Source_Citation:
Citation_Information:
Originator: Dr. Bruce Appelgate, University of Hawaii, and Joyce E. Miller, Joint Institute for Marine and Atmospheric Research
Publication_Date: 20041130
Title: Simrad EM 120 multibeam bathymetric data
Type_of_Source_Media: Digital data
Source_Time_Period_of_Content:
Time_Period_Information:

Single_Date/Time:
Calendar_Date: 2002
Source_Currentness_Reference: ground condition
Source_Citation_Abbreviation: Simrad EM 120
Source_Contribution: Simrad EM 120 (12 kHz) bathymetry and imagery data were collected in depths of ~100m and greater.
The EM 120 system was placed in stand-by mode in shallower water due to high noise levels.
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Source_Citation:
Citation_Information:
Originator: Dr. Bruce Appelgate & Paul Johnson, University of Hawaii
Publication_Date: Unknown
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Time_Period_Information:
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Calendar_Date: 2002
Source_Currentness_Reference: ground condition
Source_Citation_Abbreviation: Simrad EM1002
Source_Contribution: Simrad EM 1002 (95 kHz) bathymetry and imagery data were collected in depths of ~20-1000m.
The EM 1002 system was placed in stand-by mode in water depths greater than ~500 m. EM1002 bathymetric data have ~0.6 m heave artifacts 0n shallow bank-tops.
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Direct_Spatial_Reference_Method: Point ***Generic Sensor Format???

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Latitude_Resolution: ***
Longitude_Resolution: ***
Geographic_Coordinate_Units: ***
Geodetic_Model:
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Ellipsoid_Name: WGS_1984
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Denominator_of_Flattening_Ratio: 298.257224
Distribution_Information:
Distributor:
Contact_Information:
Contact_Person_Primary:
Contact_Person: Joyce E. Miller

Contact_Organization: Joint Institute for Marine and Atmospheric Research/NOAA Coral Reef Ecosystem Division
Contact_Position: Oceanographer
Contact_Address:
Address_Type: mailing and physical address
Address: Kewalo Research Facility, 1125B Ala Moana Blvd
City: Honolulu
State_or_Province: Hawaii
Postal_Code: 96814
Country: USA
Contact_Voice_Telephone: (808) 956-5239
Contact_Facsimile_Telephone: (808) 592-7013
Contact_Electronic_Mail_Address: Joyce.Miller@noaa.gov
Resource_Description: ***EM1002 and EM120 Multibeam Sonar Data from Cruise Kilo Moana 0206***
Distribution_Liability: These data are not to be used for navigational purposes.
NOAA makes no warranty regarding these data, expressed or implied, nor does the fact of distribution constitute
such a warranty. NOAA cannot assume liability for any damages caused by any errors or omissions in these data,
nor as a result of the failure of these data to function on a particular system.
Standard_Order_Process:
Digital_Form:
Digital_Transfer_Information:
Format_Name: Generic Sensor Format, as described in http://www.ldeo.columbia.edu/res/pi/MB-System/formatdoc/gsf_spec.pdf***
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Digital_Transfer_Option:
Online_Option:
Computer_Contact_Information:
Network_Address:
Network_Resource_Name:
Fees: None
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Metadata_Date: 20041130
Metadata_Contact:
Contact_Information:
Contact_Organization_Primary:
Contact_Organization: Joint Institute for Marine and Atmospheric Research/NOAA Coral Reef Ecosystem Division
Contact_Person: Joyce E. Miller
Contact_Address:
Address_Type: Kewalo Research Facility, 1125B Ala Moana Blvd

City: Honolulu
State_or_Province: Hawaii
Postal_Code: 96814
Contact_Voice_Telephone: (808) 956-5239
Contact_Facsimile_Telephone: (808) 592-7013
Contact_Electronic_Mail_Address: Joyce.Miller@noaa.gov
Metadata_Standard_Name: FGDC Content Standards for Digital Geospatial Metadata
Metadata_Standard_Version: FGDC-STD-001-1998
Metadata_Time_Convention: Local Time

Identification_Information:
Citation:
Citation_Information:
Originator: Joyce E. Miller
Publication_Date: 20060907
Title: Reson 8101ER Multibeam Sonar Data from Cruise
OES-03-06/AHI-03-06, Data Set Name Midway.
Geospatial_Data_Presentation_Form:
Generic Sensor Format (GSF) digital data
Online_Linkage: http://soest.hawaii.edu/pibhmc
Description:
Abstract: Reson 8101ER multibeam Data were collected between
29 July - 8 August 2003 (JD 210-220) aboard NOAA Survey
Launch Acoustic Habitat Investigator (AHI) at Midway Islands
in the Northwestern Hawaiian Islands in the north Pacific
during cruise OES-03-06/AHI-03-06. The AHI was deployed
independently from the NOAA Ship Oscar Elton Sette (OES).

The multibeam data were logged into data set Midway
and collected using SAIC ISS-2000 software in the Generic Sensor Format
and processed using SABER editing software. Sound velocity
corrections from a Seabird SBE19 CTD sensor and motion
corrections from a POS-MV vertical reference were applied
to the data in real time. Observed tides from Midway tide gauge
(1619910) were applied using SABER postprocessing software.

Horizontal accuracy is 20m (no differential GPS correctors
applied), vertical accuracy is depth dependent (~1% of
water depth), WGS84 datum. These data are not to be used
for navigation. Depths mapped range from 10 - 300 m.

These multibeam bathymetric data in generic sensor format from AHI0402
were submitted to NOAA's National Geophysical Data Center (NGDC)
in Boulder, CO, for distribution in 2005.

Purpose: The data were collected in support of Coral Reef
Conservation Program goals to map all shallow (0-30 m)coral
reefs in US Pacific waters and priority moderate (> 30 m)
depth areas by 2009. The data are being used to provide
bathymetric and backscatter data for previously unmapped
areas; in support of ecosystem management requirements for
benthic habitat mapping and location of Essential Fish

Habitat; and to study the geologic features of the area.

Supplemental_Information:
Data were collected aboard the R/V AHI (Acoustic Habitat Investigator), a 8 m (25') survey launch owned and operated by the NOAA Pacific Islands Fisheries Science Center in Honolulu, HI. The R/V AHI's survey sensors include a 240 kHz RESON 8101-ER sonar which measures bathymetry and acoustic backscatter imagery, a TSS/Applanix POS/MV Model 320 which measures time, position, velocity, attitude and heading, and a Seabird SBE 19 CTD used to measure sound velocity profiles.

The AHI's equipment serial numbers, software versions and sensor configuration settings are as follows:

RESON 8101-ER multibeam echosounder
DOC inventory #: CD0000537418
Transducer serial #: 201004
Firmware, dry: 8101-2.07-2D4D
Firmware, wet: 8101-1.06-2F6B

R/V AHI POS/MV Model 320, version 3
DOC inventory #: CD0000476647
PCS serial #: 474
IMU serial #: 203
Controller software: v 1.0.5.0
PCS Firmware: 2.16

Seabird SBE19 CTD:
Serial #: 3029

R/V AHI Lever Arm Distances and Alignment Offsets
The R/V AHI Reference Point (RP) is defined to be the intersection of the vessel's centerline, the cabin deck and the bulkhead immediately aft of the transducer. This is marked by a punch in the deck weld at that location. Positive X means the point is forward of the RP, positive Y means the point is to starboard of the RP, positive Z means the point is below the RP. The loaded waterline is defined as the intersection of the vessel's performance wing with the hull at the transom.

Antenna Baseline Distance, m: 1.229
Transducer depth below waterline, m 0.62

RP to IMU 0.80 0.00 0.08
RP to Primary GPS Antenna -3.55 -0.61 -1.88
RP to Vessel 0.16 0.00 0.77
RP to Sensor 1(MB transducer) 0.16 0.00 0.77
RP to Sensor 2 0 0 0
RP to Aux. GPS Antenna 0 0 0
RP to Heave lever arm(deg) -0.67 0.00 0.00
IMU rotation Ref. Frame, deg 0 0 0
Sensor 1 rotation Ref. Frame, deg 0 0 0
Sensor 2 rotation Ref. Frame, deg 0 0 0

Roll offset: +0.5 deg
Pitch offset: 0.0 deg
Gyro offset: 0.0 deg

Time_Period_of_Content:
Time_Period_Information:
Range_of_Dates/Times:
Beginning_Date: 20030729
Ending_Date: 20030808
Currentness_Reference: ground condition
Status:
Progress: In Work
Maintenance_and_Update_Frequency: As needed
Spatial_Domain:
Bounding_Coordinates:
West_Bounding_Coordinate: -177.503335
East_Bounding_Coordinate: -177.251627
North_Bounding_Coordinate: 28.346451
South_Bounding_Coordinate: 28.151728
Keywords:
Theme:
Theme_Keyword_Thesaurus: CoRIS Theme Thesaurus Version 1.0
Theme_Keyword: EARTH SCIENCE > Oceans > Bathymetry/Seafloor Topography > Bathymetry
Theme:
Theme_Keyword_Thesaurus: None
Theme_Keyword: Bathymetry
Theme_Keyword: Multibeam sonar
Place:
Place_Keyword_Thesaurus: None
Place_Keyword: Midway Island
Place_Keyword: Northwestern Hawaiian Islands

Place_Keyword: Islands
Place:
Place_Keyword_Thesaurus: CoRIS Place Thesaurus Version 1.0
Place_Keyword: OCEAN BASIN > Pacific Ocean > North Pacific Ocean > Northwestern Hawaiian Islands > Midway > Islands
Place_Keyword: COUNTRY > United States of America > Hawaii > Honolulu
Access_Constraints: None.
Use_Constraints: These data are NOT TO BE USED FOR NAVIGATION.
Point_of_Contact:
Contact_Information:
Contact_Person_Primary:
Contact_Person: Joyce E. Miller
Contact_Organization: Coral Reef Ecosystem Division,
Pacific Islands Fisheries Science Center
Contact_Position: Oceanographer
Contact_Address:
Address_Type: mailing and physical address
Address: Kewalo Research Facility, 1125B Ala Moana Blvd
City: Honolulu
State_or_Province: Hawaii
Postal_Code: 96814
Country: USA
Contact_Voice_Telephone: (808) 956-5239
Contact_Facsimile_Telephone: (808) 983-3730
Contact_Electronic_Mail_Address: Joyce.Miller@noaa.gov
Data_Set_Credit: Joyce E. Miller Coral Reef Ecosystem Division,
NOAA Pacific Islands Fisheries Science Center
Native_Data_Set_Environment: Generic Sensor Format multibeam
data processed with SAIC SABER processing software on LINUX
operating system computers

Data_Quality_Information:
Attribute_Accuracy:
Attribute_Accuracy_Report: Horizontal accuracy is ~20 m as
data were collected using GPS with no differential
corrections. Vertical accuracy of multibeam data is
estimated at 1% of water depth; predicted tidal corrections
were applied.
Logical_Consistency_Report: These data are believed to be
logically consistent though no tests were performed
Completeness_Report: Varies
Positional_Accuracy:
Horizontal_Positional_Accuracy:

Horizontal_Positional_Accuracy_Report: Variable
Quantitative_Horizontal_Positional_Accuracy_Assessment:
Horizontal_Positional_Accuracy_Value: 20
Horizontal_Positional_Accuracy_Explanation: Multibeam sonar data. No DGPS corrections applied; 20 m accuracy
Vertical_Positional_Accuracy:
Vertical_Positional_Accuracy_Report: Variable
Quantitative_Vertical_Positional_Accuracy_Assessment:
Vertical_Positional_Accuracy_Value: 1
Vertical_Positional_Accuracy_Explanation: Accuracy varies with water depth. Observed tide correctors from Midway tide station 1619910 applied; multibeam data vertical accuracy is ~1% of water depth.
Lineage:
Source_Information:
Source_Citation:
Citation_Information:
Originator: Joyce E. Miller,
Coral Reef Ecosystem Division, NOAA Pacific Islands Fisheries Science Center
Publication_Date: 20060907
Title: Reson 8101ER multibeam bathymetric data
Type_of_Source_Media: Digital data
Source_Time_Period_of_Content:
Time_Period_Information:
Single_Date/Time:
Calendar_Date: 2003
Source_Currentness_Reference: ground condition
Source_Citation_Abbreviation: Reson 8101ER
Source_Contribution: Reson 8101ER (240 kHz) bathymetry and imagery data were collected in depths of ~10-250 m.
Process Step:
Process Description: Generic Sensor Format multibeam data were processed with SAIC SABER processing software and converted to gridded bathymetry products. See product metadata for detailed processing steps.
Process Date: 20030808

Metadata_Reference_Information:
Metadata_Date: 20060907
Metadata_Contact:
Contact_Information:
Contact_Organization_Primary:

Contact_Organization: Coral Reef Ecosystem Division,
NOAA Pacific Islands Fisheries Science Center
Contact_Person: Joyce E. Miller
Contact_Address:
Address_Type: Kewalo Research Facility, 1125B Ala Moana Blvd
City: Honolulu
State_or_Province: Hawaii
Postal_Code: 96814
Contact_Voice_Telephone: (808) 956-5239
Contact_Facsimile_Telephone: (808) 983-3730
Contact_Electronic_Mail_Address: Joyce.Miller@noaa.gov
Metadata_Standard_Name: FGDC Content Standards for Digital
Geospatial Metadata
Metadata_Standard_Version: FGDC-STD-001-1998
Metadata_Time_Convention: Universal Time
Metadata_Access_Constraints: None
Metadata_Use_Constraints: None

Identification_Information:
Citation:
Citation_Information:
Originator: Joyce E. Miller
Publication_Date: 200607
Title: Reson 8101ER Multibeam Sonar Data from Cruise AHI-05-01
Geospatial_Data_Presentation_Form:
Generic Sensor Format (GSF) digital data
Online_Linkage: ftp://ftp.soest.hawaii.edu/pibhmc
Description:
Abstract: Reson 8101ER multibeam Data were collected from 4-23 April 2005 aboard NOAA Survey Launch Acoustic Habitat Investigator (AHI) at French Frigate Shoals in Northwestern Hawaiian Islands during cruise AHI-05-01. These multibeam data were collected using SAIC ISS-2000 software in the Generic Sensor Format and processed using SABER editing software. Sound velocity corrections from a Seabird SBE19 CTD sensor and motion corrections from a POS-MV vertical reference were applied to the data in real time. Predicted tides were applied to the data in real time.

Horizontal accuracy is 20m (no differential GPS correctors applied), vertical accuracy is depth dependent (~1% of water depth), WGS84 datum. These data are not to be used for navigation. Depths mapped range from 10-150m. The AHI was deployed from the NOAA Ship Hi'ialakai and concurrent mapping was done using Simrad EM300 and EM3002D sonars aboard the ship; metadata for HI-05-01 are submitted separately.

Purpose: The data were collected in support of Coral Reef Conservation Program goals to map all shallow (0-30 m)coral reefs in US Pacific waters and priority moderate (> 30 m) depth areas by 2009. The data are being used to provide bathymetric and backscatter data for previously unmapped areas; in support of ecosystem management requirements for benthic habitat mapping and location of Essential Fish Habitat; and to study the geologic features of the area.

Supplemental_Information:
Data were collected aboard the R/V AHI (Acoustic Habitat

Investigator), a 8 m (25') survey launch owned and operated by the NOAA Pacific Islands Fisheries Science Center in Honolulu, HI. The R/V AHI's survey sensors include a 240 kHz RESON 8101-ER sonar which measures bathymetry and acoustic backscatter imagery, a TSS/Applanix POS/MV Model 320 which measures time, position, velocity, attitude and heading, and a Seabird SBE 19 CTD used to measure sound velocity profiles.

The AHI's equipment serial numbers, software versions and sensor configuration settings are as follows:

RESON 8101-ER multibeam echosounder
Transducer serial #: 201004
Firmware, dry: 8101-2.07-2D4D
Firmware, wet: 8101-1.06-2F6B

R/V AHI POS/MV Model 320, version 3
PCS serial #: 474
IMU serial #: 203
Controller software: v 2.1
PCS Firmware: 2.16, Sep 15, 2004

Seabird SBE19 CTD:
Serial #: 3029

R/V AHI Lever Arm Distances and Alignment Offsets: The R/V AHI Reference Point (RP) is defined to be the intersection of the vessel's centerline, the cabin deck and the bulkhead immediately aft of the transducer. This is marked by a punch in the deck weld at that location. Positive X means the point is forward of the RP, positive Y means the point is to starboard of the RP, positive Z means the point is below the RP. The loaded waterline is defined as the intersection of the vessel's performance wing with the hull at the transom.

POS/MV Settings:

RP to IMU, m	0.80	0.00	0.08
RP to Primary GPS(port),m	0.85	-0.50	-2.29
RP to Vessel, m	0.16	0.00	0.77
IMU w.r.t. Ref. Frame, deg	0.00	0.00	0.00
RP to Heave lever arm, m	-0.67	0.00	0.00

RP to Sensor 1(MB transducer), m 0.16 0.00 0.77
RP to Sensor 2 0 0 0
Sensor 1 rotation Ref. Frame, deg 0 0 0
Sensor 2 rotation Ref. Frame, deg 0 0 0
Antenna Baseline Distance: 1.229

ISS2000 Settings for RESON DTC:
Roll Bias, deg 0.58
Pitch Bias, deg 0.0
Gyro Bias, deg 0.0
Transducer depth, m 0.62

Time_Period_of_Content:
Time_Period_Information:
Range_of_Dates/Times:
Beginning_Date: 20050404
Ending_Date: 20050423
Currentness_Reference: ground condition
Status:
Progress: In Work
Maintenance_and_Update_Frequency: As needed
Spatial_Domain:
Bounding_Coordinates:
West_Bounding_Coordinate: -166.3504
East_Bounding_Coordinate: -166.1922
North_Bounding_Coordinate: 23.8498
South_Bounding_Coordinate: 23.6548
Keywords:
Theme:
Theme_Keyword_Thesaurus: CoRIS Theme Thesaurus Version 1.0
Theme_Keyword: EARTH SCIENCE > Oceans > Bathymetry/Seafloor Topography > Bathymetry
Theme:
Theme_Keyword_Thesaurus: None
Theme_Keyword: Bathymetry
Theme_Keyword: Multibeam sonar
Place:
Place_Keyword_Thesaurus: None
Place_Keyword: French Frigate Shoals
Place_Keyword: Northwestern Hawaiian Islands
Place_Keyword: Islands
Place:
Place_Keyword_Thesaurus: CoRIS Place Thesaurus Version 1.0
Place_Keyword: OCEAN BASIN > Pacific Ocean > Central Pacific Ocean > Northwestern

Hawaiian Islands > French Frigate Shoals
Place_Keyword: COUNTRY/TERRITORY > United States of America > Hawaii > Honolulu
Access_Constraints: None.
Use_Constraints: These data are NOT TO BE USED FOR NAVIGATION
Point_of_Contact:
Contact_Information:
Contact_Person_Primary:
Contact_Person: Joyce E. Miller
Contact_Organization: Coral Reef Ecosystem Division,
Pacific Islands Fisheries Science Center
Contact_Position: Oceanographer
Contact_Address:
Address_Type: mailing and physical address
Address: Kewalo Research Facility, 1125B Ala Moana Blvd
City: Honolulu
State_or_Province: Hawaii
Postal_Code: 96814
Country: USA
Contact_Voice_Telephone: (808) 956-5239
Contact_Facsimile_Telephone: (808) 592-7013
Contact_Electronic_Mail_Address: Joyce.Miller@noaa.gov
Browse_Graphic:
Browse_Graphic_File_Name: None
Browse_Graphic_File_Description: None
Browse_Graphic_File_Type: None
Data_Set_Credit: Joyce E. Miller Coral Reef Ecosystem Division,
NOAA Pacific Islands Fisheries Science Center
Native_Data_Set_Environment: Generic Sensor Format multibeam
data processed with SAIC SABER processing software on LINUX
operating system computers
Data_Quality_Information:
Attribute_Accuracy:
Attribute_Accuracy_Report: Horizontal accuracy is ~20 m as
data were collected using GPS with no differential
corrections. Vertical accuracy of multibeam data is
estimated at 1% of water depth; predicted tidal corrections
were applied.
Logical_Consistency_Report: These data are believed to be
logically consistent though no tests were performed
Completeness_Report: Varies
Positional_Accuracy:
Horizontal_Positional_Accuracy:
Horizontal_Positional_Accuracy_Report: Variable

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    Quantitative_Horizontal_Positional_Accuracy_Assessment:
      Horizontal_Positional_Accuracy_Value: 20
      Horizontal_Positional_Accuracy_Explanation: Multibeam
        sonar data.  No DGPS corrections applied; 20 m accuracy
    Vertical_Positional_Accuracy:
     Vertical_Positional_Accuracy_Report: Variable
     Quantitative_Vertical_Positional_Accuracy_Assessment:
      Vertical_Positional_Accuracy_Value: 1
      Vertical_Positional_Accuracy_Explanation: Accuracy
        varies with water depth. Predicted tides were applied to the
          data in real time. Tide zoning and offset values were provided
          by the NOAA NOS CO-OPS program and predicted tides for the
          appropriate tide gauges were downloaded from the NOAA CO-OPS
          website. SAIC's ISS2000 and SABER software were used to
          produce predicted tide files for each tide zone.
          Multibeam data vertical accuracy is ~1% of water depth.
 Lineage:
   Source_Information:
     Source_Citation:
       Citation_Information:
         Originator:  Joyce E. Miller,
           Coral Reef Ecosystem Division, NOAA Pacific Islands
           Fisheries Science Center
         Publication_Date: 200607
         Title: Reson 8101ER multibeam bathymetric data
     Type_of_Source_Media: Digital data
     Source_Time_Period_of_Content:
       Time_Period_Information:
         Single_Date/Time:
           Calendar_Date: 2005
       Source_Currentness_Reference: ground condition
     Source_Citation_Abbreviation: Reson 8101ER
     Source_Contribution: Reson 8101ER (240 kHz) bathymetry and
       imagery data were collected in depths of ~10-150 m.
Distribution_Information:
  Distributor:
    Contact_Information:
      Contact_Person_Primary:
        Contact_Person: Joyce E. Miller
        Contact_Organization: Coral Reef Ecosystem Division,
          NOAA Pacific Islands Fisheries Science Center
      Contact_Position: Oceanographer
      Contact_Address:
```

Address_Type: mailing and physical address
Address: Kewalo Research Facility, 1125B Ala Moana Blvd
City: Honolulu
State_or_Province: Hawaii
Postal_Code: 96814
Country: USA
Contact_Voice_Telephone: (808) 956-5239
Contact_Facsimile_Telephone: (808) 592-7013
Contact_Electronic_Mail_Address: Joyce.Miller@noaa.gov
Resource_Description: Reson 8101ER Multibeam Sonar Data from Cruise AHI-05-01 (R/V AHI)
Distribution_Liability: These data are not to be used for navigational purposes. NOAA makes no warranty regarding these data, expressed or implied, nor does the fact of distribution constitute such a warranty. NOAA cannot assume liability for any damages caused by any errors or omissions in these data, nor as a result of the failure of these data to function on a particular system.
Standard_Order_Process:
Digital_Form:
Digital_Transfer_Information:
Format_Name: Generic Sensor Format, as described in http://www.ldeo.columbia.edu/res/pi/MB-System/formatdoc/gsf_spec.pdf
Transfer_Size:
Digital_Transfer_Option:
Online_Option:
Computer_Contact_Information:
Network_Address:
Network_Resource_Name:
Fees: None
Metadata_Reference_Information:
Metadata_Date: 200607
Metadata_Contact:
Contact_Information:
Contact_Organization_Primary:
Contact_Organization: Coral Reef Ecosystem Division, NOAA Pacific Islands Fisheries Science Center
Contact_Person: Joyce E. Miller
Contact_Address:
Address_Type: Kewalo Research Facility, 1125B Ala Moana Blvd
City: Honolulu
State_or_Province: Hawaii
Postal_Code: 96814

Contact_Voice_Telephone: (808) 956-5239
Contact_Facsimile_Telephone: (808) 592-7013
Contact_Electronic_Mail_Address: Joyce.Miller@noaa.gov
Metadata_Standard_Name: FGDC Content Standards for Digital Geospatial Metadata
Metadata_Standard_Version: FGDC-STD-001-1998
Metadata_Time_Convention: Universal Time

Identification_Information:
Citation:
Citation_Information:
Originator: Joyce E. Miller
Publication_Date: 200607
Title: EM300 and EM3002D Multibeam Sonar Data from Cruise Hi'ialakai HI-05-01
Geospatial_Data_Presentation_Form:
Generic Sensor Format (GSF) digital data
Online_Linkage: ftp://ftp.soest.hawaii.edu/pibhmc
Description:
Abstract: EM300 and EM3002D multibeam Data were collected from 4-23 April aboard NOAA Ship Hi'ialakai at Necker and Nihoa Islands, French Frigate Shoals, and Brooks Bank in the Northwestern Hawaiian Islands during cruise HI-05-01. These multibeam data were collected using SAIC ISS-2000 software in the Generic Sensor Format and processed using SABER editing software. Surface sound velocity values were supplied by a Seabird SBE-45 MicroTSG and a SBE-38 remote temperature probe. Sound velocity corrections from a Seabird 911 CTD sensor and motion corrections from a POS-MV vertical reference were applied to the data in real time. Predicted tides were applied to the data in real time.

Horizontal accuracy is 20 m (no differential GPS correctors applied), vertical accuracy is depth dependent (~1% of water depth), WGS84 datum. These data are not to be used for navigation. Depths mapped range from ~20-3000 m. Concurrent mapping at French Frigate Shoals was done by the R/V AHI in water depths ranging from ~10-100 m with the data set being AHI-05-01; metadata for AHI-05-01 are submitted separately.

Purpose: The data were collected in support of Coral Reef Conservation Program goals to map all shallow (0-30 m) coral reefs in US Pacific waters and priority moderate (> 30 m) depth areas by 2009. The data are being used to provide bathymetric and backscatter data for previously unmapped areas; in support of ecosystem management requirements for benthic habitat mapping and location of Essential Fish Habitat; and to study the geologic features of the area.

Supplemental_Information:
Data were collected aboard the NOAA Ship Hi'ialakai, a 68 m (218') United States National Oceanographic and Atmospheric Agency (NOAA) research ship. The NOAA Ship Hiialakai's survey sensors include a 30 kHz Simrad EM300 sonar and a 300 kHz Simrad EM3002d sonar, which measures bathymetry and acoustic backscatter imagery, a TSS/Applanix POS/MV Model 320, which measures time, position, velocity, attitude and heading, and a Seabird SBE 9/11 plus CTD used to measure sound velocity profiles.

The Hi'ialakai's equipment serial numbers, software versions and sensor configuration settings are as follows:

SIMRAD EM300 multibeam echosounder
Serial #: 303
PU Software Versions:
1.1.3 040427,2.0.0 040614,2.3.2 040615,2.0.1 040629
SIS Software Version: 1.0, build 117, July 2, 2004

SIMRAD EM3002D multibeam echosounders
Serial #: 357 and 353
PU Software Versions:
HCT: 2.0.7 040906
BSP67 Master: 1.2.7 040830
BSP67 Slave: 1.2.7 040830
PU: 1.6.8 050118
DDS: 3.17 2004/06/11
SIS Software Version: 2.5, build 47, April 1, 2005

HI'IALAKAI POS/MV Model 320, version 3
PCS serial #: 817
IMU serial #: 1333
PCS Firmware: 2.16, Sep 15, 2004
Controller software: v 2.1

Seabird SBE 9/11 plus CTD:
Serial #: 09P35130-0737

Hi'ialakai Lever Arm Distances and Alignment Offsets:
The Hi'ialakai's Reference Point (RP) is a granite block situated 1.222 m starboard of the ship's centerline, 1.23 m above the ship's baseline/datum on the keel. The RP is

located under the forward deck, in the ship's laundry room. The ship's sensors, the sonar systems and permanent benchmarks are measured with respect to the RP. Positive X means the point is forward of the RP, positive Y means the point is to starboard of the RP, positive Z means the point is below the RP. The survey waterline is defined to be at the 15' draft mark on the vessel's starboard side.

POS/MV Settings:	X	Y	Z
RP to IMU, m	0.434	0.000	-0.117
RP to Primary GPS(port),m	-18.101	-2.011	-23.545
RP to Vessel, m	0.00	0.00	0.00
IMU w.r.t. Ref. Frame, deg	0.00	0.00	0.00
RP to Heave lever arm, m	-15.087	-1.222	-4.301
Sensor 1 & 2 lever arms & angles:	0	0	0
Antenna Baseline Distance:	1.781		

EM300 Settings:	X	Y	Z
Pos sensors 1 2 & 3, m	0	0	0
TX Transducer, m	-04.091	-2.217	1.727
RX Transducer, m	-06.065	-1.222	1.727
Attitude sensors 1 & 2, m	0	0	0
Waterline, m	-3.26		

	Roll	Pitch	Heading
TX Transducer, deg	0.00	0.00	359.96
RX Transducer, deg	0.00	0.00	0.05
Attitude 1, deg	-0.20	0.00	0.00
Attitude 2, deg	0	0	0
Stand-alone heading, deg	0		

EM3002D Settings:

Pos sensors 1 2 & 3, m	0	0	0
Sonar head 1 (port), m	04.439	-1.479	1.560
Sonar head 2 (stbd), m	04.441	-0.963	1.559
Attitude sensors 1 & 2, m	0	0	0
Waterline, m	-3.26		
Depth sensor, m	0	0	0

	Roll	Pitch	Heading
Sonar head 1 (port), deg	40.153	0.00	0.27
Sonar head 2 (stbd), deg	-39.918	0.00	358.18
Attitude 1, deg	-1.25	1.1	0.00
Attitude 2, deg	0	0	0
Stand-alone heading, deg	0		

Time_Period_of_Content:
Time_Period_Information:
Range_of_Dates/Times:
Beginning_Date: 20050404
Ending_Date: 20050423
Currentness_Reference: ground condition
Status:
Progress: In Work
Maintenance_and_Update_Frequency: As needed
Spatial_Domain:
Bounding_Coordinates:
West_Bounding_Coordinate: -166.8333
East_Bounding_Coordinate: -161.7000
North_Bounding_Coordinate: 24.0067
South_Bounding_Coordinate: 23.0000
Keywords:
Theme:
Theme_Keyword_Thesaurus: CoRIS Theme Thesaurus Version 1.0
Theme_Keyword: EARTH SCIENCE > Oceans > Bathymetry/Seafloor Topography > Bathymetry
Theme:
Theme_Keyword_Thesaurus: None
Theme_Keyword: Bathymetry
Theme_Keyword: Multibeam sonar
Place:
Place_Keyword_Thesaurus: None
Place_Keyword: Nihoa Island
Place_Keyword: Necker Island
Place_Keyword: French Frigate Shoals
Place_Keyword: Brooks Bank
Place_Keyword: Northwestern Hawaiian Islands
Place_Keyword: Islands
Place:
Place_Keyword_Thesaurus: CoRIS Place Thesaurus Version 1.0
Place_Keyword: OCEAN BASIN > Pacific Ocean > Central Pacific Ocean > Northwestern Hawaiian Islands > Necker, Nihoa Islands, French Frigate Shoals, Brooks Bank
Place_Keyword: COUNTRY/TERRITORY > United States of America > Hawaii > Honolulu
Access_Constraints: None.
Use_Constraints: These data are NOT TO BE USED FOR NAVIGATION
Point_of_Contact:
Contact_Information:
Contact_Person_Primary:
Contact_Person: Joyce E. Miller

```
      Contact_Organization: Coral Reef Ecosystem Division,
        Pacific Islands Fisheries Science Center
      Contact_Position: Oceanographer
      Contact_Address:
        Address_Type: mailing and physical address
        Address: Kewalo Research Facility, 1125B Ala Moana Blvd
        City: Honolulu
        State_or_Province: Hawaii
        Postal_Code: 96814
        Country: USA
      Contact_Voice_Telephone: (808) 956-5239
      Contact_Facsimile_Telephone: (808) 592-7013
      Contact_Electronic_Mail_Address: Joyce.Miller@noaa.gov
  Browse_Graphic:
    Browse_Graphic_File_Name: None
    Browse_Graphic_File_Description: None
    Browse_Graphic_File_Type: None
  Data_Set_Credit: Joyce E. Miller Coral Reef Ecosystem Division,
     NOAA Pacific Islands Fisheries Science Center
  Native_Data_Set_Environment: Generic Sensor Format multibeam
    data processed with SAIC SABER processing software on LINUX
    operating system computers
Data_Quality_Information:
  Attribute_Accuracy:
    Attribute_Accuracy_Report: Horizontal accuracy is ~20 m as
      data were collected using GPS with no differential
      corrections.  Vertical accuracy of multibeam data is
      estimated at 1% of water depth; predicted tidal corrections
      were applied.
  Logical_Consistency_Report: These data are believed to be
    logically consistent though no tests were performed
  Completeness_Report: Varies
  Positional_Accuracy:
    Horizontal_Positional_Accuracy:
      Horizontal_Positional_Accuracy_Report: Variable
      Quantitative_Horizontal_Positional_Accuracy_Assessment:
        Horizontal_Positional_Accuracy_Value: 20
        Horizontal_Positional_Accuracy_Explanation: Multibeam
          sonar data.  No DGPS corrections applied; 20 m accuracy
     Vertical_Positional_Accuracy:
      Vertical_Positional_Accuracy_Report: Variable
      Quantitative_Vertical_Positional_Accuracy_Assessment:
        Vertical_Positional_Accuracy_Value: 1
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Vertical_Positional_Accuracy_Explanation: Accuracy
varies with water depth. Predicted tides were applied to the
data in real time. Tide zoning and offset values were provided
by the NOAA NOS CO-OPS program and predicted tides for the
appropriate tide gauges were downloaded from the NOAA CO-OPS
website. SAIC's ISS2000 and SABER software were used to
produce predicted tide files for each tide zone.
Multibeam data vertical accuracy is ~1% of water depth.
Lineage:
Source_Information:
Source_Citation:
Citation_Information:
Originator: Joyce E. Miller,
Coral Reef Ecosystem Division, NOAA Pacific Islands
Fisheries Science Center
Publication_Date: 200607
Title: Simrad EM300 multibeam bathymetric data
Type_of_Source_Media: Digital data
Source_Time_Period_of_Content:
Time_Period_Information:
Single_Date/Time:
Calendar_Date: 2005
Source_Currentness_Reference: ground condition
Source_Citation_Abbreviation: Simrad EM300
Source_Contribution: Simrad EM 300 (30 kHz) bathymetry and
imagery data were collected in depths of ~100m-3000m. The
EM 300 system was placed in stand-by mode in shallower
water due to high noise levels.
Source_Information:
Source_Citation:
Citation_Information:
Originator: Joyce E. Miller,
Coral Reef Ecosystem Division, NOAA Pacific Islands
Fisheries Science Center
Publication_Date: 200607
Title: Simrad EM3002D Bathymetric Data
Type_of_Source_Media: Digital data
Source_Time_Period_of_Content:
Time_Period_Information:
Single_Date/Time:
Calendar_Date: 2005
Source_Currentness_Reference: ground condition
Source_Citation_Abbreviation: Simrad EM3002D

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    Source_Contribution: Simrad EM3002D (300 kHz) bathymetry
      and imagery data were collected in depths of ~20-150m.
      The EM3002D system was placed in stand-by mode in water
      depths greater than ~150 m.
Distribution_Information:
  Distributor:
    Contact_Information:
      Contact_Person_Primary:
        Contact_Person: Joyce E. Miller
        Contact_Organization: Coral Reef Ecosystem Division,
          NOAA Pacific Islands Fisheries Science Center
      Contact_Position: Oceanographer
      Contact_Address:
        Address_Type: mailing and physical address
        Address: Kewalo Research Facility, 1125B Ala Moana Blvd
        City: Honolulu
        State_or_Province: Hawaii
        Postal_Code: 96814
        Country: USA
      Contact_Voice_Telephone: (808) 956-5239
      Contact_Facsimile_Telephone: (808) 592-7013
      Contact_Electronic_Mail_Address: Joyce.Miller@noaa.gov
  Resource_Description: EM300 and EM3002D Multibeam Sonar Data
    from Cruise Hi'ialakai HI-05-01
  Distribution_Liability: These data are not to be used for
    navigational purposes. NOAA makes no warranty regarding these
    data, expressed or implied, nor does the fact of distribution
    constitute such a warranty. NOAA cannot assume liability for
    any damages caused by any errors or omissions in these data,
    nor as a result of the failure of these data to function on a
    particular system.
  Standard_Order_Process:
    Digital_Form:
      Digital_Transfer_Information:
        Format_Name: Generic Sensor Format, as described in
          http://www.ldeo.columbia.edu/res/pi/MB-System/formatdoc/gsf_spec.pdf
        Transfer_Size:
      Digital_Transfer_Option:
        Online_Option:
          Computer_Contact_Information:
            Network_Address:
              Network_Resource_Name:
    Fees: None
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Metadata_Reference_Information:
  Metadata_Date: 200607
  Metadata_Contact:
    Contact_Information:
      Contact_Organization_Primary:
        Contact_Organization: Coral Reef Ecosystem Division,
          NOAA Pacific Islands Fisheries Science Center
        Contact_Person: Joyce E. Miller
      Contact_Address:
        Address_Type: Kewalo Research Facility,
          1125B Ala Moana Blvd
        City: Honolulu
        State_or_Province: Hawaii
        Postal_Code: 96814
      Contact_Voice_Telephone: (808) 956-5239
      Contact_Facsimile_Telephone: (808) 592-7013
      Contact_Electronic_Mail_Address: Joyce.Miller@noaa.gov
  Metadata_Standard_Name: FGDC Content Standards for Digital
    Geospatial Metadata
  Metadata_Standard_Version: FGDC-STD-001-1998
  Metadata_Time_Convention: Universal Time

Identification_Information:
Citation:
Citation_Information:
Originator: Joyce E. Miller
Publication_Date: 200606
Title: EM300 and EM3002D Multibeam Sonar Data from Cruise Hi'ialakai HI-05-03
Geospatial_Data_Presentation_Form:
Generic Sensor Format (GSF) digital data
Online_Linkage: ftp://ftp.soest.hawaii.edu/pibhmc
Description:
Abstract: EM300 and EM3002D multibeam Data were collected in 14 May-7 June 2005 aboard NOAA Ship Hi'ialakai at French Frigate Shoals, Maro Reef, Pearl and Hermes Reef, Midway Island, and Kure Atoll in the Northwestern Hawaiian Islands during cruise HI-05-03. These multibeam data were collected using SAIC ISS-2000 software in the Generic Sensor Format and processed using SABER editing software. Surface sound velocity values were supplied by a Seabird SBE-45 MicroTSG and a SBE-38 remote temperature probe. Sound velocity corrections from a Seabird 911 CTD sensor and motion corrections from a POS-MV vertical reference were applied to the data in real time. Predicted tides were applied to the data in real time.

Horizontal accuracy is 20 m (no differential GPS correctors applied), vertical accuracy is depth dependent (~1% of water depth), WGS84 datum. These data are not to be used for navigation. Depths mapped range from ~20-3000 m.

Purpose: The data were collected in support of Coral Reef Conservation Program goals to map all shallow (0-30 m) coral reefs in US Pacific waters and priority moderate (> 30 m) depth areas by 2009. The data are being used to provide bathymetric and backscatter data for previously unmapped areas; in support of ecosystem management requirements for benthic habitat mapping and location of Essential Fish Habitat; and to study the geologic features of the area.

Supplemental_Information:
Data were collected aboard the NOAA Ship Hi’ialakai, a 68 m (218’) United States National Oceanographic and Atmospheric Agency (NOAA) research ship. The NOAA Ship Hiialakai's

survey sensors include a 30 kHz Simrad EM300 sonar and a 300 kHz Simrad EM3002d sonar, which measures bathymetry and acoustic backscatter imagery, a TSS/Applanix POS/MV Model 320, which measures time, position, velocity, attitude and heading, and a Seabird SBE 9/11 plus CTD used to measure sound velocity profiles.

The Hi'ialakai's equipment serial numbers, software versions and sensor configuration settings are as follows:

SIMRAD EM300 multibeam echosounder
Serial #: 303
PU Software Versions:
1.1.3 040427,2.0.0 040614,2.3.2 040615,2.0.1 040629
SIS Software Version: 1.0, build 117, July 2, 2004

SIMRAD EM3002D multibeam echosounders
Serial #: 357 and 353
PU Software Versions:
HCT: 2.0.7 040906
BSP67 Master: 1.2.7 040830
BSP67 Slave: 1.2.7 040830
PU: 1.6.8 050118
DDS: 3.17 2004/06/11
SIS Software Version: 2.5, build 47, April 1, 2005

HI'IALAKAI POS/MV Model 320, version 3
PCS serial #: 817
IMU serial #: 1333
PCS Firmware: 2.16, Sep 15, 2004
Controller software: v 2.1

Seabird SBE 9/11 plus CTD:
Serial #: 09P35130-0737

Hi’ialakai Lever Arm Distances and Alignment Offsets:
The Hi’ialakai's Reference Point (RP) is a granite block situated 1.222 m starboard of the ship's centerline, 1.23 m above the ship's baseline/datum on the keel. The RP is located under the forward deck, in the ship's laundry room. The ship's sensors, the sonar systems and permanent benchmarks are measured with respect to the RP. Positive X means the point is forward of the RP, positive Y means the

point is to starboard of the RP, positive Z means the point is below the RP. The survey waterline is defined to be at the 15' draft mark on the vessel's starboard side.

POS/MV Settings:	X	Y	Z
RP to IMU, m	0.434	0.000	-0.117
RP to Primary GPS(port),m	-18.101	-2.011	-23.545
RP to Vessel, m	0.00	0.00	0.00
IMU w.r.t. Ref. Frame, deg	0.00	0.00	0.00
RP to Heave lever arm, m	-15.087	-1.222	-4.301
Sensor 1 & 2 lever arms & angles:	0	0	0
Antenna Baseline Distance: 1.781			

EM300 Settings:	X	Y	Z
Pos sensors 1 2 & 3, m	0	0	0
TX Transducer, m	-04.091	-2.217	1.727
RX Transducer, m	-06.065	-1.222	1.727
Attitude sensors 1 & 2, m	0	0	0
Waterline, m	-3.26		

	Roll	Pitch	Heading
TX Transducer, deg	0.00	0.00	359.96
RX Transducer, deg	0.00	0.00	0.05
Attitude 1, deg	-0.20	0.00	0.00
Attitude 2, deg	0	0	0
Stand-alone heading, deg	0		

EM3002D Settings:			
Pos sensors 1 2 & 3, m	0	0	0
Sonar head 1 (port), m	04.439	-1.479	1.560
Sonar head 2 (stbd), m	04.441	-0.963	1.559
Attitude sensors 1 & 2, m	0	0	0
Waterline, m	-3.26		
Depth sensor, m	0	0	0

	Roll	Pitch	Heading
Sonar head 1 (port), deg	40.153	0.00	0.27
Sonar head 2 (stbd), deg	-39.918	0.00	358.18
Attitude 1, deg	-1.25	1.1	0.00
Attitude 2, deg	0	0	0
Stand-alone heading, deg	0		

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  Time_Period_Information:
    Range_of_Dates/Times:

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      Beginning_Date: 20050514
      Ending_Date: 20050607
    Currentness_Reference: ground condition
  Status:
    Progress: In Work
    Maintenance_and_Update_Frequency: As needed
  Spatial_Domain:
    Bounding_Coordinates:
      West_Bounding_Coordinate: -178.4667
      East_Bounding_Coordinate: -166.0000
      North_Bounding_Coordinate: 28.5750
      South_Bounding_Coordinate: 23.6000
  Keywords:
    Theme:
      Theme_Keyword_Thesaurus: CoRIS Theme Thesaurus Version 1.0
      Theme_Keyword: EARTH SCIENCE > Oceans > Bathymetry/Seafloor Topography > Bathymetry
    Theme:
      Theme_Keyword_Thesaurus: None
      Theme_Keyword: Bathymetry
      Theme_Keyword: Multibeam sonar
    Place:
      Place_Keyword_Thesaurus: None
      Place_Keyword: French Frigate Shoals
      Place_Keyword: Maro Reef
      Place_Keyword: Pearl and Hermes Atoll
      Place_Keyword: Midway Island
      Place_Keyword: Kure Atoll
      Place_Keyword: Northwestern Hawaiian Islands
      Place_Keyword: Islands
    Place:
      Place_Keyword_Thesaurus: CoRIS Place Thesaurus Version 1.0
      Place_Keyword: OCEAN BASIN > Pacific Ocean > Central Pacific Ocean > Northwestern
Hawaiian Islands > French Frigate Shoals, Maro Reef, Pearl and Hermes Atoll
      Place_Keyword: OCEAN BASIN > Pacific Ocean > Central Pacific Ocean > Northwestern
Hawaiian Islands > Midway Island, Kure Atoll
      Place_Keyword: COUNTRY/TERRITORY > United States of America > Hawaii > Honolulu
  Access_Constraints: None.
  Use_Constraints: These data are NOT TO BE USED FOR NAVIGATION
  Point_of_Contact:
    Contact_Information:
      Contact_Person_Primary:
        Contact_Person: Joyce E. Miller
        Contact_Organization: Coral Reef Ecosystem Division,
```

Pacific Islands Fisheries Science Center
Contact_Position: Oceanographer
Contact_Address:
Address_Type: mailing and physical address
Address: Kewalo Research Facility, 1125B Ala Moana Blvd
City: Honolulu
State_or_Province: Hawaii
Postal_Code: 96814
Country: USA
Contact_Voice_Telephone: (808) 956-5239
Contact_Facsimile_Telephone: (808) 592-7013
Contact_Electronic_Mail_Address: Joyce.Miller@noaa.gov
Browse_Graphic:
Browse_Graphic_File_Name: None
Browse_Graphic_File_Description: None
Browse_Graphic_File_Type: None
Data_Set_Credit: Joyce E. Miller Coral Reef Ecosystem Division, NOAA Pacific Islands Fisheries Science Center
Native_Data_Set_Environment: Generic Sensor Format multibeam data processed with SAIC SABER processing software on LINUX operating system computers
Data_Quality_Information:
Attribute_Accuracy:
Attribute_Accuracy_Report: Horizontal accuracy is ~20 m as data were collected using GPS with no differential corrections. Vertical accuracy of multibeam data is estimated at 1% of water depth; predicted tidal corrections were applied.
Logical_Consistency_Report: These data are believed to be logically consistent though no tests were performed
Completeness_Report: Varies
Positional_Accuracy:
Horizontal_Positional_Accuracy:
Horizontal_Positional_Accuracy_Report: Variable
Quantitative_Horizontal_Positional_Accuracy_Assessment:
Horizontal_Positional_Accuracy_Value: 20
Horizontal_Positional_Accuracy_Explanation: Multibeam sonar data. No DGPS corrections applied; 20 m accuracy
Vertical_Positional_Accuracy:
Vertical_Positional_Accuracy_Report: Variable
Quantitative_Vertical_Positional_Accuracy_Assessment:
Vertical_Positional_Accuracy_Value: 1
Vertical_Positional_Accuracy_Explanation: Accuracy

varies with water depth. Predicted tides were applied to the data in real time. Tide zoning and offset values were provided by the NOAA NOS CO-OPS program and predicted tides for the appropriate tide gauges were downloaded from the NOAA CO-OPS website. SAIC's ISS2000 and SABER software were used to produce predicted tide files for each tide zone. Multibeam data vertical accuracy is ~1% of water depth.

Lineage:
Source_Information:
Source_Citation:
Citation_Information:
Originator: Joyce E. Miller,
Coral Reef Ecosystem Division, NOAA Pacific Islands Fisheries Science Center
Publication_Date: 200607
Title: Simrad EM300 multibeam bathymetric data
Type_of_Source_Media: Digital data
Source_Time_Period_of_Content:
Time_Period_Information:
Single_Date/Time:
Calendar_Date: 2005
Source_Currentness_Reference: ground condition
Source_Citation_Abbreviation: Simrad EM300
Source_Contribution: Simrad EM 300 (30 kHz) bathymetry and imagery data were collected in depths of ~100-3000m. The EM 300 system was placed in stand-by mode in shallower water due to high noise levels.
Source_Information:
Source_Citation:
Citation_Information:
Originator: Joyce E. Miller,
Coral Reef Ecosystem Division, NOAA Pacific Islands Fisheries Science Center
Publication_Date: 200607
Title: Simrad EM3002D Bathymetric Data
Type_of_Source_Media: Digital data
Source_Time_Period_of_Content:
Time_Period_Information:
Single_Date/Time:
Calendar_Date: 2005
Source_Currentness_Reference: ground condition
Source_Citation_Abbreviation: Simrad EM3002D
Source_Contribution: Simrad EM3002D (300 kHz) bathymetry

and imagery data were collected in depths of ~20-150m.
The EM3002D system was placed in stand-by mode in water
depths greater than ~150 m.
Distribution_Information:
Distributor:
Contact_Information:
Contact_Person_Primary:
Contact_Person: Joyce E. Miller
Contact_Organization: Coral Reef Ecosystem Division,
NOAA Pacific Islands Fisheries Science Center
Contact_Position: Oceanographer
Contact_Address:
Address_Type: mailing and physical address
Address: Kewalo Research Facility, 1125B Ala Moana Blvd
City: Honolulu
State_or_Province: Hawaii
Postal_Code: 96814
Country: USA
Contact_Voice_Telephone: (808) 956-5239
Contact_Facsimile_Telephone: (808) 592-7013
Contact_Electronic_Mail_Address: Joyce.Miller@noaa.gov
Resource_Description: EM300 and EM3002D Multibeam Sonar Data
from Cruise Hi'ialakai HI-05-03
Distribution_Liability: These data are not to be used for
navigational purposes. NOAA makes no warranty regarding these
data, expressed or implied, nor does the fact of distribution
constitute such a warranty. NOAA cannot assume liability for
any damages caused by any errors or omissions in these data,
nor as a result of the failure of these data to function on a
particular system.
Standard_Order_Process:
Digital_Form:
Digital_Transfer_Information:
Format_Name: Generic Sensor Format, as described in
http://www.ldeo.columbia.edu/res/pi/MB-System/formatdoc/gsf_spec.pdf
Transfer_Size:
Digital_Transfer_Option:
Online_Option:
Computer_Contact_Information:
Network_Address:
Network_Resource_Name:
Fees: None
Metadata_Reference_Information:

Metadata_Date: 200607
Metadata_Contact:
  Contact_Information:
    Contact_Organization_Primary:
      Contact_Organization: Coral Reef Ecosystem Division,
        NOAA Pacific Islands Fisheries Science Center
      Contact_Person: Joyce E. Miller
    Contact_Address:
      Address_Type: Kewalo Research Facility,
        1125B Ala Moana Blvd
      City: Honolulu
      State_or_Province: Hawaii
      Postal_Code: 96814
    Contact_Voice_Telephone: (808) 956-5239
    Contact_Facsimile_Telephone: (808) 592-7013
    Contact_Electronic_Mail_Address: Joyce.Miller@noaa.gov
Metadata_Standard_Name: FGDC Content Standards for Digital
  Geospatial Metadata
Metadata_Standard_Version: FGDC-STD-001-1998
Metadata_Time_Convention: Universal Time

Identification_Information:
Citation:
Citation_Information:
Originator: Joyce E. Miller
Publication_Date: 200607
Title: EM300 and EM3002D Multibeam Sonar Data from Cruise Hi'ialakai HI-05-07
Geospatial_Data_Presentation_Form:
Generic Sensor Format (GSF) digital data
Online_Linkage: ftp://ftp.soest.hawaii.edu/pibhmc
Description:
Abstract: EM300 and EM3002D multibeam Data were collected from 08 August-01 October 2005 aboard NOAA Ship Hi'ialakai at Kure Atoll, Gambia Shoals, Pearl and Hermes Reef, west of Lisianski Island, and Maro Reef in the Northwestern Hawaiian Islands during cruise HI-05-07. These multibeam data were collected using SAIC ISS-2000 software in the Generic Sensor Format and processed using SABER editing software. Surface sound velocity values were supplied by a Seabird SBE-45 MicroTSG and a SBE-38 remote temperature probe. Sound velocity corrections from a Seabird 911 CTD sensor and motion corrections from a POS-MV vertical reference were applied to the data in real time. Predicted tides were applied to the data in real time.

Horizontal accuracy is 20 m (no differential GPS correctors applied), vertical accuracy is depth dependent (~1% of water depth), WGS84 datum. These data are not to be used for navigation. Depths mapped range from ~70-5000 m.

Purpose: The data were collected in support of Coral Reef Conservation Program goals to map all shallow (0-30 m) coral reefs in US Pacific waters and priority moderate (> 30 m) depth areas by 2009. The data are being used to provide bathymetric and backscatter data for previously unmapped areas; in support of ecosystem management requirements for benthic habitat mapping and location of Essential Fish Habitat; and to study the geologic features of the area.

Supplemental_Information:
Data were collected aboard the NOAA Ship Hi’ialakai, a 68 m (218’) United States National Oceanographic and Atmospheric Agency (NOAA) research ship. The NOAA Ship Hiialakai's

survey sensors include a 30 kHz Simrad EM300 sonar and a 300 kHz Simrad EM3002d sonar, which measures bathymetry and acoustic backscatter imagery, a TSS/Applanix POS/MV Model 320, which measures time, position, velocity, attitude and heading, and a Seabird SBE 9/11 plus CTD used to measure sound velocity profiles.

The Hi'ialakai's equipment serial numbers, software versions and sensor configuration settings are as follows:

SIMRAD EM300 multibeam echosounder
Serial #: 303
PU Software Versions:
1.1.3 040427,2.0.0 040614,2.3.2 040615,2.0.1 040629
SIS Software Version: 1.0, build 117, July 2, 2004

SIMRAD EM3002D multibeam echosounders
Serial #: 357 and 353
PU Software Versions:
HCT: 2.0.7 040906
BSP67 Master: 1.2.7 040830
BSP67 Slave: 1.2.7 040830
PU: 1.6.8 050118
DDS: 3.17 2004/06/11
SIS Software Version: 2.5, build 47, April 1, 2005

HI'IALAKAI POS/MV Model 320, version 3
PCS serial #: 817
IMU serial #: 1333
PCS Firmware: 2.16, Sep 15, 2004
Controller software: v 2.1

Seabird SBE 9/11 plus CTD:
Serial #: 09P35130-0737

Hi’ialakai Lever Arm Distances and Alignment Offsets:
The Hi’ialakai's Reference Point (RP) is a granite block situated 1.222 m starboard of the ship's centerline, 1.23 m above the ship's baseline/datum on the keel. The RP is located under the forward deck, in the ship's laundry room. The ship's sensors, the sonar systems and permanent benchmarks are measured with respect to the RP. Positive X means the point is forward of the RP, positive Y means the

point is to starboard of the RP, positive Z means the point is below the RP. The survey waterline is defined to be at the 15' draft mark on the vessel's starboard side.

POS/MV Settings:	X	Y	Z
RP to IMU, m	0.434	0.000	-0.117
RP to Primary GPS(port),m	-18.101	-2.011	-23.545
RP to Vessel, m	0.00	0.00	0.00
IMU w.r.t. Ref. Frame, deg	0.00	0.00	0.00
RP to Heave lever arm, m	-15.087	-1.222	-4.301
Sensor 1 & 2 lever arms & angles:	0	0	0
Antenna Baseline Distance: 1.781			

EM300 Settings:	X	Y	Z
Pos sensors 1 2 & 3, m	0	0	0
TX Transducer, m	-04.091	-2.217	1.727
RX Transducer, m	-06.065	-1.222	1.727
Attitude sensors 1 & 2, m	0	0	0
Waterline, m	-3.26		

	Roll	Pitch	Heading
TX Transducer, deg	0.00	0.00	359.96
RX Transducer, deg	0.00	0.00	0.05
Attitude 1, deg	-0.20	0.00	0.00
Attitude 2, deg	0	0	0
Stand-alone heading, deg	0		

EM3002D Settings:			
Pos sensors 1 2 & 3, m	0	0	0
Sonar head 1 (port), m	04.439	-1.479	1.560
Sonar head 2 (stbd), m	04.441	-0.963	1.559
Attitude sensors 1 & 2, m	0	0	0
Waterline, m	-3.26		
Depth sensor, m	0	0	0

	Roll	Pitch	Heading
Sonar head 1 (port), deg	40.153	0.00	0.27
Sonar head 2 (stbd), deg	-39.918	0.00	358.18
Attitude 1, deg	-1.25	1.1	0.00
Attitude 2, deg	0	0	0
Stand-alone heading, deg	0		

Time_Period_of_Content:
  Time_Period_Information:
    Range_of_Dates/Times:

Beginning_Date: 20050827
Ending_Date: 20051001
Currentness_Reference: ground condition
Status:
Progress: In Work
Maintenance_and_Update_Frequency: As needed
Spatial_Domain:
Bounding_Coordinates:
West_Bounding_Coordinate: -178.4757
East_Bounding_Coordinate: -170.2970
North_Bounding_Coordinate: 28.5773
South_Bounding_Coordinate: 25.1936
Keywords:
Theme:
Theme_Keyword_Thesaurus: CoRIS Theme Thesaurus Version 1.0
Theme_Keyword: EARTH SCIENCE > Oceans > Bathymetry/Seafloor Topography > Bathymetry
Theme:
Theme_Keyword_Thesaurus: None
Theme_Keyword: Bathymetry
Theme_Keyword: Multibeam sonar
Place:
Place_Keyword_Thesaurus: None
Place_Keyword: Kure Atoll
Place_Keyword: Gambia Shoals
Place_Keyword: Pearl and Hermes Reef
Place_Keyword: Lisianski Island
Place_Keyword: Maro Reef
Place_Keyword: Northwestern Hawaiian Islands
Place_Keyword: Islands
Place:
Place_Keyword_Thesaurus: CoRIS Place Thesaurus Version 1.0
Place_Keyword: OCEAN BASIN > Pacific Ocean > Central Pacific Ocean > Northwestern Hawaiian Islands > Kure Atoll, Gambia Shoals, Pearl and Hermes Reef
Place_Keyword: OCEAN BASIN > Pacific Ocean > Central Pacific Ocean > Northwestern Hawaiian Islands > Lisianski Island, Maro Reef
Place_Keyword: COUNTRY/TERRITORY > United States of America > Hawaii > Honolulu
Access_Constraints: None.
Use_Constraints: These data are NOT TO BE USED FOR NAVIGATION
Point_of_Contact:
Contact_Information:
Contact_Person_Primary:
Contact_Person: Joyce E. Miller
Contact_Organization: Coral Reef Ecosystem Division,

Pacific Islands Fisheries Science Center
Contact_Position: Oceanographer
Contact_Address:
Address_Type: mailing and physical address
Address: Kewalo Research Facility, 1125B Ala Moana Blvd
City: Honolulu
State_or_Province: Hawaii
Postal_Code: 96814
Country: USA
Contact_Voice_Telephone: (808) 956-5239
Contact_Facsimile_Telephone: (808) 592-7013
Contact_Electronic_Mail_Address: Joyce.Miller@noaa.gov
Browse_Graphic:
Browse_Graphic_File_Name: None
Browse_Graphic_File_Description: None
Browse_Graphic_File_Type: None
Data_Set_Credit: Joyce E. Miller Coral Reef Ecosystem Division, NOAA Pacific Islands Fisheries Science Center
Native_Data_Set_Environment: Generic Sensor Format multibeam data processed with SAIC SABER processing software on LINUX operating system computers
Data_Quality_Information:
Attribute_Accuracy:
Attribute_Accuracy_Report: Horizontal accuracy is ~20 m as data were collected using GPS with no differential corrections. Vertical accuracy of multibeam data is estimated at 1% of water depth; predicted tidal corrections were applied.
Logical_Consistency_Report: These data are believed to be logically consistent though no tests were performed
Completeness_Report: Varies
Positional_Accuracy:
Horizontal_Positional_Accuracy:
Horizontal_Positional_Accuracy_Report: Variable
Quantitative_Horizontal_Positional_Accuracy_Assessment:
Horizontal_Positional_Accuracy_Value: 20
Horizontal_Positional_Accuracy_Explanation: Multibeam sonar data. No DGPS corrections applied; 20 m accuracy
Vertical_Positional_Accuracy:
Vertical_Positional_Accuracy_Report: Variable
Quantitative_Vertical_Positional_Accuracy_Assessment:
Vertical_Positional_Accuracy_Value: 1
Vertical_Positional_Accuracy_Explanation: Accuracy

varies with water depth. Predicted tides were applied to the
data in real time. Tide zoning and offset values were provided
by the NOAA NOS CO-OPS program and predicted tides for the
appropriate tide gauges were downloaded from the NOAA CO-OPS
website. SAIC's ISS2000 and SABER software were used to
produce predicted tide files for each tide zone.
Multibeam data vertical accuracy is ~1% of water depth.

Lineage:
Source_Information:
Source_Citation:
Citation_Information:
Originator: Joyce E. Miller,
Coral Reef Ecosystem Division, NOAA Pacific Islands
Fisheries Science Center
Publication_Date: 200607
Title: Simrad EM300 multibeam bathymetric data
Type_of_Source_Media: Digital data
Source_Time_Period_of_Content:
Time_Period_Information:
Single_Date/Time:
Calendar_Date: 2005
Source_Currentness_Reference: ground condition
Source_Citation_Abbreviation: Simrad EM300
Source_Contribution: Simrad EM 300 (30 kHz) bathymetry and
imagery data were collected in depths of ~100m-5000m. The
EM 300 system was placed in stand-by mode in shallower
water due to high noise levels.
Source_Information:
Source_Citation:
Citation_Information:
Originator: Joyce E. Miller,
Coral Reef Ecosystem Division, NOAA Pacific Islands
Fisheries Science Center
Publication_Date: Unknown
Title: Simrad EM3002D Bathymetric Data
Type_of_Source_Media: Digital data
Source_Time_Period_of_Content:
Time_Period_Information:
Single_Date/Time:
Calendar_Date: 2005
Source_Currentness_Reference: ground condition
Source_Citation_Abbreviation: Simrad EM3002D
Source_Contribution: Simrad EM3002D (300 kHz) bathymetry

and imagery data were collected in depths of ~70-150m.
The EM3002D system was placed in stand-by mode in water
depths greater than ~150 m.
Distribution_Information:
Distributor:
Contact_Information:
Contact_Person_Primary:
Contact_Person: Joyce E. Miller
Contact_Organization: Coral Reef Ecosystem Division,
NOAA Pacific Islands Fisheries Science Center
Contact_Position: Oceanographer
Contact_Address:
Address_Type: mailing and physical address
Address: Kewalo Research Facility, 1125B Ala Moana Blvd
City: Honolulu
State_or_Province: Hawaii
Postal_Code: 96814
Country: USA
Contact_Voice_Telephone: (808) 956-5239
Contact_Facsimile_Telephone: (808) 592-7013
Contact_Electronic_Mail_Address: Joyce.Miller@noaa.gov
Resource_Description: EM300 and EM3002D Multibeam Sonar Data
from Cruise Hi'ialakai HI-05-07
Distribution_Liability: These data are not to be used for
navigational purposes. NOAA makes no warranty regarding these
data, expressed or implied, nor does the fact of distribution
constitute such a warranty. NOAA cannot assume liability for
any damages caused by any errors or omissions in these data,
nor as a result of the failure of these data to function on a
particular system.
Standard_Order_Process:
Digital_Form:
Digital_Transfer_Information:
Format_Name: Generic Sensor Format, as described in
http://www.ldeo.columbia.edu/res/pi/MB-System/formatdoc/gsf_spec.pdf
Transfer_Size:
Digital_Transfer_Option:
Online_Option:
Computer_Contact_Information:
Network_Address:
Network_Resource_Name:
Fees: None
Metadata_Reference_Information:

Metadata_Date: 200607
Metadata_Contact:
  Contact_Information:
    Contact_Organization_Primary:
      Contact_Organization: Coral Reef Ecosystem Division,
        NOAA Pacific Islands Fisheries Science Center
      Contact_Person: Joyce E. Miller
    Contact_Address:
      Address_Type: Kewalo Research Facility,
        1125B Ala Moana Blvd
      City: Honolulu
      State_or_Province: Hawaii
      Postal_Code: 96814
    Contact_Voice_Telephone: (808) 956-5239
    Contact_Facsimile_Telephone: (808) 592-7013
    Contact_Electronic_Mail_Address: Joyce.Miller@noaa.gov
Metadata_Standard_Name: FGDC Content Standards for Digital
  Geospatial Metadata
Metadata_Standard_Version: FGDC-STD-001-1998
Metadata_Time_Convention: Universal Time

Identification_Information:
Citation:
Citation_Information:
Originator: Joyce E. Miller
Publication_Date: 200607
Title: Reson 8101ER Multibeam Sonar Data from Cruise AHI-05-08
Geospatial_Data_Presentation_Form:
Generic Sensor Format (GSF) digital data
Online_Linkage: ftp://ftp.soest.hawaii.edu/pibhmc
Description:
Abstract: Reson 8101ER multibeam Data were collected from 11-31 October 2006 aboard NOAA Survey Launch Acoustic Habitat Investigator (AHI) at at Maro Reef in the Northwestern Hawaiian Islands during cruise HI-05-08. These multibeam data were collected using SAIC ISS-2000 software in the Generic Sensor Format and processed using SABER editing software. Sound velocity corrections from a Seabird SBE19 CTD sensor and motion corrections from a POS-MV vertical reference were applied to the data in real time. Predicted tides were applied to the data in real time.

Horizontal accuracy is 20m (no differential GPS correctors applied), vertical accuracy is depth dependent (~1% of water depth), WGS84 datum. These data are not to be used for navigation. Depths mapped range from 10 - 250 m. The AHI was deployed from the NOAA Ship Hi'ialakai and concurrent mapping was done using Simrad EM300 and EM3002D sonars aboard the ship; metadata for HI-05-08 are submitted separately.

Purpose: The data were collected in support of Coral Reef Conservation Program goals to map all shallow (0-30 m)coral reefs in US Pacific waters and priority moderate (> 30 m) depth areas by 2009. The data are being used to provide bathymetric and backscatter data for previously unmapped areas; in support of ecosystem management requirements for benthic habitat mapping and location of Essential Fish Habitat; and to study the geologic features of the area.

Supplemental_Information:
Data were collected aboard the R/V AHI (Acoustic Habitat

Investigator), a 8 m (25') survey launch owned and operated by the NOAA Pacific Islands Fisheries Science Center in Honolulu, HI. The R/V AHI's survey sensors include a 240 kHz RESON 8101-ER sonar which measures bathymetry and acoustic backscatter imagery, a TSS/Applanix POS/MV Model 320 which measures time, position, velocity, attitude and heading, and a Seabird SBE 19 CTD used to measure sound velocity profiles.

The AHI's equipment serial numbers, software versions and sensor configuration settings are as follows:

RESON 8101-ER multibeam echosounder
Transducer serial #: 201004
Firmware, dry: 8101-2.07-2D4D
Firmware, wet: 8101-1.06-2F6B

R/V AHI POS/MV Model 320, version 3
PCS serial #: 474
IMU serial #: 203
Controller software: v 2.1
PCS Firmware: 2.16, Sep 15, 2004

Seabird SBE19 CTD:
Serial #: 3029

R/V AHI Lever Arm Distances and Alignment Offsets: The R/V AHI Reference Point (RP) is defined to be the intersection of the vessel's centerline, the cabin deck and the bulkhead immediately aft of the transducer. This is marked by a punch in the deck weld at that location. Positive X means the point is forward of the RP, positive Y means the point is to starboard of the RP, positive Z means the point is below the RP. The loaded waterline is defined as the intersection of the vessel's performance wing with the hull at the transom.

POS/MV Settings:

RP to IMU, m	0.80	0.00	0.08
RP to Primary GPS(port),m	0.85	-0.50	-2.29
RP to Vessel, m	0.16	0.00	0.77
IMU w.r.t. Ref. Frame, deg	0.00	0.00	0.00
RP to Heave lever arm, m	-0.67	0.00	0.00

RP to Sensor 1(MB transducer), m 0.16 0.00 0.77
RP to Sensor 2 0 0 0
Sensor 1 rotation Ref. Frame, deg 0 0 0
Sensor 2 rotation Ref. Frame, deg 0 0 0
Antenna Baseline Distance: 1.229

ISS2000 Settings for RESON DTC:
Roll Bias, deg 0.42
Pitch Bias, deg 0.0
Gyro Bias, deg 0.0
Transducer depth, m 0.62

Time_Period_of_Content:
Time_Period_Information:
Range_of_Dates/Times:
Beginning_Date: 20051011
Ending_Date: 20051031
Currentness_Reference: ground condition
Status:
Progress: In Work
Maintenance_and_Update_Frequency: As needed
Spatial_Domain:
Bounding_Coordinates:
West_Bounding_Coordinate: -171.1952
East_Bounding_Coordinate: -170.0921
North_Bounding_Coordinate: 25.6856
South_Bounding_Coordinate: 25.0087
Keywords:
Theme:
Theme_Keyword_Thesaurus: CoRIS Theme Thesaurus Version 1.0
Theme_Keyword: EARTH SCIENCE > Oceans > Bathymetry/Seafloor Topography > Bathymetry
Theme:
Theme_Keyword_Thesaurus: None
Theme_Keyword: Bathymetry
Theme_Keyword: Multibeam sonar
Place:
Place_Keyword_Thesaurus: None
Place_Keyword: Maro Reef
Place_Keyword: Northwestern Hawaiian Islands
Place_Keyword: Islands
Place:
Place_Keyword_Thesaurus: CoRIS Place Thesaurus Version 1.0
Place_Keyword: OCEAN BASIN > Pacific Ocean > Central Pacific Ocean > Northwestern

Hawaiian Islands > Maro Reef
Place_Keyword: COUNTRY/TERRITORY > United States of America > Hawaii > Honolulu
Access_Constraints: None.
Use_Constraints: These data are NOT TO BE USED FOR NAVIGATION
Point_of_Contact:
Contact_Information:
Contact_Person_Primary:
Contact_Person: Joyce E. Miller
Contact_Organization: Coral Reef Ecosystem Division,
Pacific Islands Fisheries Science Center
Contact_Position: Oceanographer
Contact_Address:
Address_Type: mailing and physical address
Address: Kewalo Research Facility, 1125B Ala Moana Blvd
City: Honolulu
State_or_Province: Hawaii
Postal_Code: 96814
Country: USA
Contact_Voice_Telephone: (808) 956-5239
Contact_Facsimile_Telephone: (808) 592-7013
Contact_Electronic_Mail_Address: Joyce.Miller@noaa.gov
Browse_Graphic:
Browse_Graphic_File_Name: None
Browse_Graphic_File_Description: None
Browse_Graphic_File_Type: None
Data_Set_Credit: Joyce E. Miller Coral Reef Ecosystem Division,
NOAA Pacific Islands Fisheries Science Center
Native_Data_Set_Environment: Generic Sensor Format multibeam
data processed with SAIC SABER processing software on LINUX
operating system computers
Data_Quality_Information:
Attribute_Accuracy:
Attribute_Accuracy_Report: Horizontal accuracy is ~20 m as
data were collected using GPS with no differential
corrections. Vertical accuracy of multibeam data is
estimated at 1% of water depth; predicted tidal corrections
were applied.
Logical_Consistency_Report: These data are believed to be
logically consistent though no tests were performed
Completeness_Report: Varies
Positional_Accuracy:
Horizontal_Positional_Accuracy:
Horizontal_Positional_Accuracy_Report: Variable

Quantitative_Horizontal_Positional_Accuracy_Assessment:
Horizontal_Positional_Accuracy_Value: 20
Horizontal_Positional_Accuracy_Explanation: Multibeam sonar data. No DGPS corrections applied; 20 m accuracy
Vertical_Positional_Accuracy:
Vertical_Positional_Accuracy_Report: Variable
Quantitative_Vertical_Positional_Accuracy_Assessment:
Vertical_Positional_Accuracy_Value: 1
Vertical_Positional_Accuracy_Explanation: Accuracy varies with water depth. Predicted tides were applied to the data in real time. Tide zoning and offset values were provided by the NOAA NOS CO-OPS program and predicted tides for the appropriate tide gauges were downloaded from the NOAA CO-OPS website. SAIC's ISS2000 and SABER software were used to produce predicted tide files for each tide zone.
Multibeam data vertical accuracy is ~1% of water depth.
Lineage:
Source_Information:
Source_Citation:
Citation_Information:
Originator: Joyce E. Miller,
Coral Reef Ecosystem Division, NOAA Pacific Islands Fisheries Science Center
Publication_Date: 200607
Title: Reson 8101ER multibeam bathymetric data
Type_of_Source_Media: Digital data
Source_Time_Period_of_Content:
Time_Period_Information:
Single_Date/Time:
Calendar_Date: 2005
Source_Currentness_Reference: ground condition
Source_Citation_Abbreviation: Reson 8101ER
Source_Contribution: Reson 8101ER (240 kHz) bathymetry and imagery data were collected in depths of ~10-250 m.
Distribution_Information:
Distributor:
Contact_Information:
Contact_Person_Primary:
Contact_Person: Joyce E. Miller
Contact_Organization: Coral Reef Ecosystem Division, NOAA Pacific Islands Fisheries Science Center
Contact_Position: Oceanographer
Contact_Address:

Address_Type: mailing and physical address
Address: Kewalo Research Facility, 1125B Ala Moana Blvd
City: Honolulu
State_or_Province: Hawaii
Postal_Code: 96814
Country: USA
Contact_Voice_Telephone: (808) 956-5239
Contact_Facsimile_Telephone: (808) 592-7013
Contact_Electronic_Mail_Address: Joyce.Miller@noaa.gov
Resource_Description: Reson 8101ER Multibeam Sonar Data from Cruise AHI-05-08 (R/V AHI)
Distribution_Liability: These data are not to be used for navigational purposes. NOAA makes no warranty regarding these data, expressed or implied, nor does the fact of distribution constitute such a warranty. NOAA cannot assume liability for any damages caused by any errors or omissions in these data, nor as a result of the failure of these data to function on a particular system.
Standard_Order_Process:
Digital_Form:
Digital_Transfer_Information:
Format_Name: Generic Sensor Format, as described in http://www.ldeo.columbia.edu/res/pi/MB-System/formatdoc/gsf_spec.pdf
Transfer_Size:
Digital_Transfer_Option:
Online_Option:
Computer_Contact_Information:
Network_Address:
Network_Resource_Name:
Fees: None
Metadata_Reference_Information:
Metadata_Date: 200607
Metadata_Contact:
Contact_Information:
Contact_Organization_Primary:
Contact_Organization: Coral Reef Ecosystem Division, NOAA Pacific Islands Fisheries Science Center
Contact_Person: Joyce E. Miller
Contact_Address:
Address_Type: Kewalo Research Facility, 1125B Ala Moana Blvd
City: Honolulu
State_or_Province: Hawaii
Postal_Code: 96814

Contact_Voice_Telephone: (808) 956-5239
Contact_Facsimile_Telephone: (808) 592-7013
Contact_Electronic_Mail_Address: Joyce.Miller@noaa.gov
Metadata_Standard_Name: FGDC Content Standards for Digital Geospatial Metadata
Metadata_Standard_Version: FGDC-STD-001-1998
Metadata_Time_Convention: Universal Time

Identification_Information:
Citation:
Citation_Information:
Originator: Joyce E. Miller
Publication_Date: 200607
Title: EM300 and EM3002D Multibeam Sonar Data from Cruise Hi'ialakai HI-05-08
Geospatial_Data_Presentation_Form:
Generic Sensor Format (GSF) digital data
Online_Linkage: ftp://ftp.soest.hawaii.edu/pibhmc
Description:
Abstract: EM300 and EM3002D multibeam Data were collected from 11-31 October 2005 aboard NOAA Ship Hi'ialakai at Maro Reef and a seamount east of Nihoa Island in the Northwestern Hawaiian Islands during cruise HI-05-08. These multibeam data were collected using SAIC ISS-2000 software in the Generic Sensor Format and processed using SABER editing software. Surface sound velocity values were supplied by a Seabird SBE-45 MicroTSG and a SBE-38 remote temperature probe. Sound velocity corrections from a Seabird 911 CTD sensor and motion corrections from a POS-MV vertical reference were applied to the data in real time. Predicted tides were applied to the data in real time.

Horizontal accuracy is 20 m (no differential GPS correctors applied), vertical accuracy is depth dependent (~1% of water depth), WGS84 datum. These data are not to be used for navigation. Depths mapped range from ~30-3000m. Concurrent mapping at Maro Reef was done by the R/V AHI in water depths ranging from 30-100m with the data set being AHI-05-08; metadata for AHI-05-08 are submitted separately.

Purpose: The data were collected in support of Coral Reef Conservation Program goals to map all shallow (0-30 m) coral reefs in US Pacific waters and priority moderate (> 30 m) depth areas by 2009. The data are being used to provide bathymetric and backscatter data for previously unmapped areas; in support of ecosystem management requirements for benthic habitat mapping and location of Essential Fish Habitat; and to study the geologic features of the area.

Supplemental_Information:

Data were collected aboard the NOAA Ship Hi'ialakai, a 68 m (218') United States National Oceanographic and Atmospheric Agency (NOAA) research ship. The NOAA Ship Hiialakai's survey sensors include a 30 kHz Simrad EM300 sonar and a 300 kHz Simrad EM3002d sonar, which measures bathymetry and acoustic backscatter imagery, a TSS/Applanix POS/MV Model 320, which measures time, position, velocity, attitude and heading, and a Seabird SBE 9/11 plus CTD used to measure sound velocity profiles.

The Hi'ialakai's equipment serial numbers, software versions and sensor configuration settings are as follows:

SIMRAD EM300 multibeam echosounder
Serial #: 303
PU Software Versions:
1.1.3 040427,2.0.0 040614,2.3.2 040615,2.0.1 040629
SIS Software Version: 1.0, build 117, July 2, 2004

SIMRAD EM3002D multibeam echosounders
Serial #: 357 and 353
PU Software Versions:
HCT: 2.0.7 040906
BSP67 Master: 1.2.7 040830
BSP67 Slave: 1.2.7 040830
PU: 1.6.8 050118
DDS: 3.17 2004/06/11
SIS Software Version: 2.5, build 47, April 1, 2005

HI'IALAKAI POS/MV Model 320, version 3
PCS serial #: 817
IMU serial #: 1333
PCS Firmware: 2.16, Sep 15, 2004
Controller software: v 2.1

Seabird SBE 9/11 plus CTD:
Serial #: 09P35130-0737

Hi'ialakai Lever Arm Distances and Alignment Offsets:
The Hi'ialakai's Reference Point (RP) is a granite block situated 1.222 m starboard of the ship's centerline, 1.23 m above the ship's baseline/datum on the keel. The RP is located under the forward deck, in the ship's laundry room.

The ship's sensors, the sonar systems and permanent benchmarks are measured with respect to the RP. Positive X means the point is forward of the RP, positive Y means the point is to starboard of the RP, positive Z means the point is below the RP. The survey waterline is defined to be at the 15' draft mark on the vessel's starboard side.

POS/MV Settings:	X	Y	Z
RP to IMU, m	0.434	0.000	-0.117
RP to Primary GPS(port),m	-18.101	-2.011	-23.545
RP to Vessel, m	0.00	0.00	0.00
IMU w.r.t. Ref. Frame, deg	0.00	0.00	0.00
RP to Heave lever arm, m	-15.087	-1.222	-4.301

Sensor 1 & 2 lever arms & angles: 0 0 0
Antenna Baseline Distance: 1.781

EM300 Settings:	X	Y	Z
Pos sensors 1 2 & 3, m	0	0	0
TX Transducer, m	-04.091	-2.217	1.727
RX Transducer, m	-06.065	-1.222	1.727
Attitude sensors 1 & 2, m	0	0	0

Waterline, m -3.26

	Roll	Pitch	Heading
TX Transducer, deg	0.00	0.00	359.96
RX Transducer, deg	0.00	0.00	0.05
Attitude 1, deg	-0.20	0.00	0.00
Attitude 2, deg	0	0	0

Stand-alone heading, deg 0

EM3002D Settings:

Pos sensors 1 2 & 3, m	0	0	0
Sonar head 1 (port), m	04.439	-1.479	1.560
Sonar head 2 (stbd), m	04.441	-0.963	1.559
Attitude sensors 1 & 2, m	0	0	0

Waterline, m -3.26
Depth sensor, m 0 0 0

	Roll	Pitch	Heading
Sonar head 1 (port), deg	40.153	0.00	0.27
Sonar head 2 (stbd), deg	-39.918	0.00	358.18
Attitude 1, deg	-1.25	1.1	0.00
Attitude 2, deg	0	0	0

Stand-alone heading, deg 0

Time_Period_of_Content:
Time_Period_Information:
Range_of_Dates/Times:
Beginning_Date: 20051011
Ending_Date: 20051031
Currentness_Reference: ground condition
Status:
Progress: In Work
Maintenance_and_Update_Frequency: As needed
Spatial_Domain:
Bounding_Coordinates:
West_Bounding_Coordinate: -171.1952
East_Bounding_Coordinate: -160.8333
North_Bounding_Coordinate: 25.6856
South_Bounding_Coordinate: 22.5000
Keywords:
Theme:
Theme_Keyword_Thesaurus: CoRIS Theme Thesaurus Version 1.0
Theme_Keyword: EARTH SCIENCE > Oceans > Bathymetry/Seafloor Topography > Bathymetry
Theme:
Theme_Keyword_Thesaurus: None
Theme_Keyword: Bathymetry
Theme_Keyword: Multibeam sonar
Place:
Place_Keyword_Thesaurus: None
Place_Keyword: Maro Reef
Place_Keyword: Nihoa Island
Place_Keyword: Northwestern Hawaiian Islands
Place_Keyword: Islands
Place:
Place_Keyword_Thesaurus: CoRIS Place Thesaurus Version 1.0
Place_Keyword: OCEAN BASIN > Pacific Ocean > Central Pacific Ocean > Northwestern Hawaiian Islands > Maro Reef, Nihoa Island
Place_Keyword: COUNTRY/TERRITORY > United States of America > Hawaii > Honolulu
Access_Constraints: None.
Use_Constraints: These data are NOT TO BE USED FOR NAVIGATION
Point_of_Contact:
Contact_Information:
Contact_Person_Primary:
Contact_Person: Joyce E. Miller
Contact_Organization: Coral Reef Ecosystem Division,
Pacific Islands Fisheries Science Center
Contact_Position: Oceanographer

Contact_Address:
Address_Type: mailing and physical address
Address: Kewalo Research Facility, 1125B Ala Moana Blvd
City: Honolulu
State_or_Province: Hawaii
Postal_Code: 96814
Country: USA
Contact_Voice_Telephone: (808) 956-5239
Contact_Facsimile_Telephone: (808) 592-7013
Contact_Electronic_Mail_Address: Joyce.Miller@noaa.gov
Browse_Graphic:
Browse_Graphic_File_Name: None
Browse_Graphic_File_Description: None
Browse_Graphic_File_Type: None
Data_Set_Credit: Joyce E. Miller Coral Reef Ecosystem Division, NOAA Pacific Islands Fisheries Science Center
Native_Data_Set_Environment: Generic Sensor Format multibeam data processed with SAIC SABER processing software on LINUX operating system computers
Data_Quality_Information:
Attribute_Accuracy:
Attribute_Accuracy_Report: Horizontal accuracy is ~20 m as data were collected using GPS with no differential corrections. Vertical accuracy of multibeam data is estimated at 1% of water depth; predicted tidal corrections were applied.
Logical_Consistency_Report: These data are believed to be logically consistent though no tests were performed
Completeness_Report: Varies
Positional_Accuracy:
Horizontal_Positional_Accuracy:
Horizontal_Positional_Accuracy_Report: Variable
Quantitative_Horizontal_Positional_Accuracy_Assessment:
Horizontal_Positional_Accuracy_Value: 20
Horizontal_Positional_Accuracy_Explanation: Multibeam sonar data. No DGPS corrections applied; 20 m accuracy
Vertical_Positional_Accuracy:
Vertical_Positional_Accuracy_Report: Variable
Quantitative_Vertical_Positional_Accuracy_Assessment:
Vertical_Positional_Accuracy_Value: 1
Vertical_Positional_Accuracy_Explanation: Accuracy varies with water depth. Predicted tides were applied to the data in real time. Tide zoning and offset values were provided

by the NOAA NOS CO-OPS program and predicted tides for the appropriate tide gauges were downloaded from the NOAA CO-OPS website. SAIC's ISS2000 and SABER software were used to produce predicted tide files for each tide zone.
Multibeam data vertical accuracy is ~1% of water depth.

Lineage:
Source_Information:
Source_Citation:
Citation_Information:
Originator: Joyce E. Miller,
Coral Reef Ecosystem Division, NOAA Pacific Islands Fisheries Science Center
Publication_Date: 200607
Title: Simrad EM300 multibeam bathymetric data
Type_of_Source_Media: Digital data
Source_Time_Period_of_Content:
Time_Period_Information:
Single_Date/Time:
Calendar_Date: 2005
Source_Currentness_Reference: ground condition
Source_Citation_Abbreviation: Simrad EM300
Source_Contribution: Simrad EM 300 (30 kHz) bathymetry and imagery data were collected in depths of ~100m-3000m. The EM 300 system was placed in stand-by mode in shallower water due to high noise levels.
Source_Information:
Source_Citation:
Citation_Information:
Originator: Joyce E. Miller,
Coral Reef Ecosystem Division, NOAA Pacific Islands Fisheries Science Center
Publication_Date: Unknown
Title: Simrad EM3002D Bathymetric Data
Type_of_Source_Media: Digital data
Source_Time_Period_of_Content:
Time_Period_Information:
Single_Date/Time:
Calendar_Date: 2005
Source_Currentness_Reference: ground condition
Source_Citation_Abbreviation: Simrad EM3002D
Source_Contribution: Simrad EM3002D (300 kHz) bathymetry and imagery data were collected in depths of ~20-150m. The EM3002D system was placed in stand-by mode in water

depths greater than ~150 m.
Distribution_Information:
Distributor:
Contact_Information:
Contact_Person_Primary:
Contact_Person: Joyce E. Miller
Contact_Organization: Coral Reef Ecosystem Division,
NOAA Pacific Islands Fisheries Science Center
Contact_Position: Oceanographer
Contact_Address:
Address_Type: mailing and physical address
Address: Kewalo Research Facility, 1125B Ala Moana Blvd
City: Honolulu
State_or_Province: Hawaii
Postal_Code: 96814
Country: USA
Contact_Voice_Telephone: (808) 956-5239
Contact_Facsimile_Telephone: (808) 592-7013
Contact_Electronic_Mail_Address: Joyce.Miller@noaa.gov
Resource_Description: EM300 and EM3002D Multibeam Sonar Data
from Cruise Hi'ialakai HI-05-08
Distribution_Liability: These data are not to be used for
navigational purposes. NOAA makes no warranty regarding these
data, expressed or implied, nor does the fact of distribution
constitute such a warranty. NOAA cannot assume liability for
any damages caused by any errors or omissions in these data,
nor as a result of the failure of these data to function on a
particular system.
Standard_Order_Process:
Digital_Form:
Digital_Transfer_Information:
Format_Name: Generic Sensor Format, as described in
http://www.ldeo.columbia.edu/res/pi/MB-System/formatdoc/gsf_spec.pdf
Transfer_Size:
Digital_Transfer_Option:
Online_Option:
Computer_Contact_Information:
Network_Address:
Network_Resource_Name:
Fees: None
Metadata_Reference_Information:
Metadata_Date: 200607
Metadata_Contact:

Contact_Information:
Contact_Organization_Primary:
Contact_Organization: Coral Reef Ecosystem Division,
NOAA Pacific Islands Fisheries Science Center
Contact_Person: Joyce E. Miller
Contact_Address:
Address_Type: Kewalo Research Facility,
1125B Ala Moana Blvd
City: Honolulu
State_or_Province: Hawaii
Postal_Code: 96814
Contact_Voice_Telephone: (808) 956-5239
Contact_Facsimile_Telephone: (808) 592-7013
Contact_Electronic_Mail_Address: Joyce.Miller@noaa.gov
Metadata_Standard_Name: FGDC Content Standards for Digital
Geospatial Metadata
Metadata_Standard_Version: FGDC-STD-001-1998
Metadata_Time_Convention: Universal Time

Identification_Information:
Citation:
Citation_Information:
Originator: National Oceanic and Atmospheric Administration
Pacific Islands Fisheries Science Center Coral Reef
Ecosystem Division Pacific Islands Benthic Habitat
Mapping Center
Publication_Date: 20070406
Title: Reson 8101ER Multibeam Sonar Data from Cruise
AHI-06-09
Geospatial_Data_Presentation_Form:
Generic Sensor Format (GSF) digital data
Description:
Abstract: Reson 8101ER multibeam Data were collected from
23 June to 19 July 2006 aboard NOAA Survey Launch Acoustic
Habitat Investigator (AHI) at Kure Atoll, Pearl and Hermes
Atoll, and Kaua'i Island in the Central Pacific during cruise
HI-06-09. These multibeam data were collected using SAIC
ISS-2000 software in the Generic Sensor Format and processed
using SABER editing software. Sound velocity corrections from
a Seabird SBE19 CTD sensor and motion corrections from a POS-MV
vertical reference were applied to the data in real time.

Predicted tides were applied to the data in real time using tide
zoning and predicted tides supplied by NOAA's National Ocean Service
Center for Operational Oceanographic Products and Services (CO-OPS).
At Kure Atoll, Sand Island (1619910) predicted tides were used in
zone HI48. At Pearl and Hermes Atoll, Sand Island (1619910)
predicted tides were used in zones HI46 and HI47. At Kauai Island,
Nawiliwili (1611400) predicted tides were used in zones HI137,
HI138, and HI139.

Horizontal accuracy is 20m (no differential GPS correctors applied),
vertical accuracy is depth dependent (~1% of water depth), WGS84
datum. These data are not to be used for navigation. Depths mapped
range from 10 - 300 m. The AHI was deployed from the NOAA Ship
Hi'ialakai and concurrent mapping was done using the Simrad EM300
and EM3002D sonars aboard the ship; metadata for HI-06-09 are
submitted separately.

Purpose: The data were collected in support of Coral Reef Conservation
Program goals to map all shallow (0-30 m)coral reefs in US Pacific

waters and priority moderate (> 30 m)depth areas by 2009. The data are being used to provide bathymetric and backscatter data for previously unmappedareas; in support of ecosystem management requirements for benthic habitat mapping and location of Essential Fish Habitat; and to study the geologic features of the area.

Supplemental_Information:
Data were collected aboard the R/V AHI (Acoustic Habitat Investigator), a 8 m (25') survey launch owned and operated by the NOAA Pacific Islands Fisheries Science Center in Honolulu, HI. The R/V AHI's survey sensors include a 240 kHz RESON 8101-ER sonar which measures bathymetry and acoustic backscatter, a TSS/Applanix POS/MV Model 320 which measures time, position, velocity, attitude and heading, and a Seabird SBE 19 CTD used to measure sound velocity profiles.

The AHI's equipment serial numbers, software versions and sensor configuration settings are as follows:

RESON 8101-ER multibeam echosounder
Transducer serial #: 201004
Firmware, dry: 8101-2.07-2D4D
Firmware, wet: 8101-1.06-2F6B

R/V AHI POS/MV Model 320, version 3
PCS serial #: 474
IMU serial #: 203
Controller software: v 2.1
PCS Firmware: 2.16

Seabird SBE19 CTD:
Serial #: 3029

R/V AHI Lever Arm Distances and Alignment Offsets: The R/V AHI Reference Point (RP) is defined to be the intersection of the vessel's centerline, the cabin deck and the bulkhead immediately aft of the transducer. This is marked by a punch in the deck weld at that location. Positive X means the point is forward of the RP, positive Y means the point is to starboard of the RP, positive Z means the point is below the RP. The loaded waterline is defined as the intersection of the vessel's performance wing with the hull

at the transom.

POS/MV Settings:
RP to IMU, m 0.80 0.00 0.08
RP to Primary GPS(port),m 0.85 -0.50 -2.29
RP to Vessel, m 0.16 0.00 0.77
IMU w.r.t. Ref. Frame, deg 0.00 0.00 0.00
RP to Heave lever arm, m -0.67 0.00 0.00
RP to Sensor 1(MB transducer), m 0.16 0.00 0.77
RP to Sensor 2 0 0 0
Sensor 1 rotation Ref. Frame, deg 0 0 0
Sensor 2 rotation Ref. Frame, deg 0 0 0
Antenna Baseline Distance: 1.229

ISS2000 Settings for RESON DTC:
Roll Bias, deg 0.15
Pitch Bias, deg 0.025
Gyro Bias, deg 0.0
Transducer depth, m 0.62

Time_Period_of_Content:
Time_Period_Information:
Range_of_Dates/Times:
Beginning_Date: 20060623
Ending_Date: 20060720
Currentness_Reference: ground condition
Status:
Progress: In Work
Maintenance_and_Update_Frequency: As needed
Spatial_Domain:
Bounding_Coordinates:
West_Bounding_Coordinate: -159
East_Bounding_Coordinate: -178.46
North_Bounding_Coordinate: 28.57
South_Bounding_Coordinate: 22
Keywords:
Theme:
Theme_Keyword_Thesaurus: CoRIS Theme Thesaurus Version 1.0
Theme_Keyword: EARTH SCIENCE > Oceans > Bathymetry/Seafloor Topography > Bathymetry
Theme:
Theme_Keyword_Thesaurus: None
Theme_Keyword: Bathymetry
Theme_Keyword: Multibeam sonar

Place:
Place_Keyword_Thesaurus: None
Place_Keyword: Kure Atoll
Place_Keyword: Pearl and Hermes Atoll
Place_Keyword: Kauai Island
Place_Keyword: Northwestern Hawaiian Islands
Place_Keyword: Main Hawaiian Islands
Place_Keyword: Islands
Place:
Place_Keyword_Thesaurus: CoRIS Place Thesaurus Version 1.0
Place_Keyword: OCEAN BASIN > Pacific Ocean > Central Pacific Ocean > Pacific Remote Island Areas > Kure Atoll, Pearl and Hermes Atoll, and Kauai Islands
Place_Keyword: COUNTRY/TERRITORY > United States of America > Hawaii > Honolulu
Access_Constraints: None.
Use_Constraints: These data are NOT TO BE USED FOR NAVIGATION
Point_of_Contact:
Contact_Information:
Contact_Person_Primary:
Contact_Person: Joyce E. Miller
Contact_Organization: National Oceanic and Atmospheric Administration (NOAA) Pacific Islands Fisheries Science Center (PIFSC) Coral Reef Ecosystem Division (CRED) Pacific Islands Benthic Habitat Mapping Center (PIBHMC) and the Joint Institute for Marine and Atmospheric Research (JIMAR)
Contact_Position: Oceanographer
Contact_Address:
Address_Type: mailing and physical address
Address: 1680 East-West Road, POST Bldg, Rm 833
City: Honolulu
State_or_Province: Hawaii
Postal_Code: 96822
Country: USA
Contact_Voice_Telephone: (808) 956-5239
Contact_Facsimile_Telephone: (808) 956-6530
Contact_Electronic_Mail_Address: Joyce.Miller@noaa.gov
Browse_Graphic:
Browse_Graphic_File_Name: None
Browse_Graphic_File_Description: None
Browse_Graphic_File_Type: None
Data_Set_Credit: NOAA PIFSC CRED PIBHMC and JIMAR
Native_Data_Set_Environment: Generic Sensor Format multibeam data processed with SAIC SABER processing software on LINUX operating system computers

Data_Quality_Information:
  Attribute_Accuracy:
    Attribute_Accuracy_Report: Horizontal accuracy is ~20 m as
      data were collected using GPS with no differential
      corrections. Vertical accuracy of multibeam data is
      estimated at 1% of water depth; predicted tidal corrections
      were applied.
  Logical_Consistency_Report: These data are believed to be
    logically consistent though no tests were performed
  Completeness_Report: Varies
  Positional_Accuracy:
    Horizontal_Positional_Accuracy:
      Horizontal_Positional_Accuracy_Report: Variable
      Quantitative_Horizontal_Positional_Accuracy_Assessment:
        Horizontal_Positional_Accuracy_Value: 20
        Horizontal_Positional_Accuracy_Explanation: Multibeam
          sonar data. No DGPS corrections applied; 20 m accuracy
     Vertical_Positional_Accuracy:
      Vertical_Positional_Accuracy_Report: Variable
      Quantitative_Vertical_Positional_Accuracy_Assessment:
        Vertical_Positional_Accuracy_Value: 1
        Vertical_Positional_Accuracy_Explanation: Accuracy
          varies with water depth. Multibeam data vertical
          accuracy is ~1% of water depth.
 Lineage:
    Source_Information:
      Source_Citation:
        Citation_Information:
          Originator: NOAA PIFSC CRED Pacific Islands
        Benthic Habitat Mapping Center and JIMAR
          Publication_Date: 20070115
          Title: Reson 8101ER multibeam bathymetric data
      Type_of_Source_Media: Digital data
      Source_Time_Period_of_Content:
        Time_Period_Information:
          Single_Date/Time:
            Calendar_Date: 2006
        Source_Currentness_Reference: ground condition
      Source_Citation_Abbreviation: Reson 8101ER
      Source_Contribution: Reson 8101ER (240 kHz) bathymetry and
        imagery data were collected in depths of ~2-300 m.
Distribution_Information:
  Distributor:

```
    Contact_Information:
      Contact_Person_Primary:
        Contact_Person: Joyce E. Miller
        Contact_Organization: NOAA PIFSC CRED PIBHMC and JIMAR
      Contact_Position: Oceanographer
      Contact_Address:
        Address_Type: mailing and physical address
        Address: 1680 East-West Road, POST Bldg, Rm 833
        City: Honolulu
        State_or_Province: Hawaii
        Postal_Code: 96822
        Country: USA
      Contact_Voice_Telephone: (808) 956-5239
      Contact_Facsimile_Telephone: (808) 956-6530
      Contact_Electronic_Mail_Address: Joyce.Miller@noaa.gov
  Resource_Description: Reson 8101ER Multibeam Sonar Data from
    Cruise AHI-06-09 (R/V AHI)
  Distribution_Liability: These data are not to be used for
    navigational purposes. NOAA makes no warranty regarding these
    data, expressed or implied, nor does the fact of distribution
    constitute such a warranty. NOAA cannot assume liability for
    any damages caused by any errors or omissions in these data,
    nor as a result of the failure of these data to function on a
    particular system.
  Standard_Order_Process:
    Digital_Form:
      Digital_Transfer_Information:
        Format_Name: Generic Sensor Format, as described in
          http://www.ldeo.columbia.edu/res/pi/MB-System/formatdoc/gsf_spec.pdf
        Transfer_Size:
      Digital_Transfer_Option:
        Online_Option:
          Computer_Contact_Information:
            Network_Address:
              Network_Resource_Name:
    Fees: None
Metadata_Reference_Information:
  Metadata_Date: 20070110
  Metadata_Contact:
    Contact_Information:
      Contact_Organization_Primary:
        Contact_Organization: NOAA PIFSC CRED PIBHMC and JIMAR
        Contact_Person: Emily LUndblad
```

Contact_Position: GIS Specialist
Contact_Address:
Address_Type: mailing and physical address
Address: 1680 East-West Road, POST Bldg, Rm 833
City: Honolulu
State_or_Province: Hawaii
Postal_Code: 96822
Country: USA
Contact_Voice_Telephone: (808) 956-2698
Contact_Facsimile_Telephone: (808) 956-6530
Contact_Electronic_Mail_Address: Emily.Lundblad@noaa.gov
Metadata_Standard_Name: FGDC Content Standards for Digital Geospatial Metadata
Metadata_Standard_Version: FGDC-STD-001-1998
Metadata_Time_Convention: Universal Time

Identification_Information:
Citation:
Citation_Information:
Originator: National Oceanic and Atmospheric Administration
Pacific Islands Fisheries Science Center Coral Reef
Ecosystem Division Pacific Islands Benthic Habitat
Mapping Center
Publication_Date: 20070406
Title: EM300 and EM3002D Multibeam Sonar Data from Cruise
Hi'ialakai HI-06-09
Geospatial_Data_Presentation_Form:
Generic Sensor Format (GSF) digital data
Description:
Abstract: EM300 and EM3002D multibeam data were collected from
23 June to 20 July 2006 aboard NOAA Ship Hi'ialakai at Kure
Atoll, Pearl and Hermes Atoll, Midway Island, and Kaua'i Island
in the Central Pacific during cruise HI-06-09. These multibeam
data were collected using SAIC ISS-2000 software in the Generic
Sensor Format and processed using SABER editing software. Surface
sound velocity values were supplied by a Seabird SBE-45 MicroTSG
and a SBE-38 remote temperature probe. Sound velocity corrections
from a Seabird 911 CTD sensor and motion corrections from a
POS-MV vertical reference were applied to the data in real time.

Predicted tides were applied to the data in real time using tide
zoning and predicted tides supplied by NOAA's National Ocean Service
Center for Operational Oceanographic Products and Services (CO-OPS).
At Kure Atoll, Sand Island (1619910) predicted tides were used in
zone HI48. At Pearl and Hermes Atoll, Sand Island (1619910) predicted
tides were used for zones HI46 and HI47. At Midway island, Sand
Island (1619910) predicted tides were used for tide zone HI47. At
Kauai Island, Nawiliwili (1611400) predicted tides were used for tide
zones HI137, HI139, HI152, HI153, HI154, and HI155.

Horizontal accuracy is 20m (no differential GPS correctors applied),
vertical accuracy is depth dependent (~1% of water depth), WGS84
datum. These data are not to be used for navigation. Depths mapped
range from 2 to 3050 m. Concurrent mapping was done by the R/V AHI
in water depths ranging from ~2-300 m with the data set being
AHI-06-09; metadata for AHI-06-09 are submitted separately.

Purpose: The data were collected in support of Coral Reef Conservation

Program goals to map all shallow (0-30 m)coral reefs in US Pacific waters and priority moderate (> 30 m)depth areas by 2009. The data are being used to provide bathymetric and backscatter data for previously unmappedareas; in support of ecosystem management requirements for benthic habitat mapping and location of Essential Fish Habitat; and to study the geologic features of the area.

Supplemental_Information:
Data were collected aboard the 68 m (218') NOAA Ship Hi'ialakai. The Hi'ialakai's survey sensors include a 30 kHz Simrad EM300 sonar and a 300 kHz Simrad EM3002d sonar, both of which measure bathymetry and acoustic backscatter, a TSS/Applanix POS/MV Model 320, which measures time, position, velocity, attitude and heading, and a Seabird SBE 9/11 plus CTD used to measure sound velocity profiles.

The Hi'ialakai's equipment serial numbers, software versions and sensor configuration settings are as follows:

SIMRAD EM300 multibeam echosounder
Serial #: 303
PU Software Versions:
1.1.3 040427,2.0.0 040614,2.3.2 040615,2.0.1 040629
SIS Software Version: 1.0, build 117, July 2, 2004

SIMRAD EM3002D multibeam echosounders
Serial #: 357 and 353
PU Software Versions:
HCT: 2.0.7 040906
BSP67 Master: 1.2.7 040830
BSP67 Slave: 1.2.7 040830
PU: 1.6.8 050118
DDS: 3.17 2004/06/11

SIS Software Version: 2.5, build 47, April 1, 2005

HI'IALAKAI POS/MV Model 320, version 3
PCS serial #: 295
IMU serial #: 1333
PCS Firmware: 2.21, Feb 02, 2006
Controller software: v 2.1

Seabird SBE 9/11 plus CTD:

Serial #: 09P35130-0737

Hi'ialakai Lever Arm Distances and Alignment Offsets: The Hi'ialakai's Reference Point (RP) is a granite block situated 1.222 m starboard of the ship's centerline, 1.23 m above the ship's baseline/datum on the keel. The RP is located under the forward deck, in the ship's laundry room. The ship's sensors, the sonar systems and permanent benchmarks are measured with respect to the RP. Positive X means the point is forward of the RP, positive Y means the point is to starboard of the RP, positive Z means the point is below the RP. The survey waterline is defined to be at the 15' draft mark on the vessel's starboard side.

POS/MV Settings:	X	Y	Z
RP to IMU, m	0.434	0.000	-0.117
RP to Primary GPS(port),m	-18.101	-2.011	-23.545
RP to Vessel, m	0.00	0.00	0.00
IMU w.r.t. Ref. Frame, deg	0.00	0.00	0.00
RP to Heave lever arm, m	-15.087	-1.222	-4.301
Sensor 1 & 2 lever arms & angles:	0	0	0
Antenna Baseline Distance: 1.777			

EM300 Settings:	X	Y	Z
Pos sensors 1 2 & 3, m	0	0	0
TX Transducer, m	-04.091	-2.217	1.727
RX Transducer, m	-06.065	-1.222	1.727
Attitude sensors 1 & 2, m	0	0	0
Waterline, m	-3.26		

	Roll	Pitch	Heading
TX Transducer, deg	0.00	0.00	359.96
RX Transducer, deg	0.00	0.00	0.05
Attitude 1, deg	-0.20	0.00	0.00
Attitude 2, deg	0	0	0
Stand-alone heading, deg	0		

Time_Period_of_Content:
  Time_Period_Information:
    Range_of_Dates/Times:
      Beginning_Date: 20060623
      Ending_Date: 20060721
  Currentness_Reference: ground condition
Status:

Progress: In Work
Maintenance_and_Update_Frequency: As needed
Spatial_Domain:
Bounding_Coordinates:
West_Bounding_Coordinate: -178.46
East_Bounding_Coordinate: -159
North_Bounding_Coordinate: 22
South_Bounding_Coordinate: 28.57
Keywords:
Theme:
Theme_Keyword_Thesaurus: CoRIS Theme Thesaurus Version 1.0
Theme_Keyword: EARTH SCIENCE > Oceans > Bathymetry/Seafloor Topography > Bathymetry
Theme:
Theme_Keyword_Thesaurus: None
Theme_Keyword: Bathymetry
Theme_Keyword: Multibeam sonar
Place:
Place_Keyword_Thesaurus: None
Place_Keyword: Kure Atoll
Place_Keyword: Pearl and Hermes Atoll
Place_Keyword: Midway Island
Place_Keyword: Kauai Island
Place_Keyword: Northwestern Hawaiian Islands
Place_Keyword: Main Hawaiian Islands
Place_Keyword: Islands
Place:
Place_Keyword_Thesaurus: CoRIS Place Thesaurus Version 1.0
Place_Keyword: OCEAN BASIN > Pacific Ocean > Central Pacific Ocean > Pacific Remote Island Areas > Kure Atoll, Pearl and Hermes Atoll, Midway and Kauai Islands
Place_Keyword: COUNTRY/TERRITORY > United States of America > Hawaii > Honolulu
Access_Constraints: None.
Use_Constraints: These data are NOT TO BE USED FOR NAVIGATION
Point_of_Contact:
Contact_Information:
Contact_Person_Primary:
Contact_Person: Joyce E. Miller
Contact_Organization: National Oceanic and Atmospheric Administration (NOAA) Pacific Islands Fisheries Science Center (PIFSC) Coral Reef Ecosystem Division (CRED) Pacific Islands Benthic Habitat Mapping Center (PIBHMC) and the Joint Institute for Marine and Atmospheric Research (JIMAR)
Contact_Position: Oceanographer

```
      Contact_Address:
        Address_Type: mailing and physical address
        Address: 1680 East-West Road, POST Bldg, Rm 833
        City: Honolulu
        State_or_Province: Hawaii
        Postal_Code: 96822
        Country: USA
      Contact_Voice_Telephone: (808) 956-5239
      Contact_Facsimile_Telephone: (808) 956-6530
      Contact_Electronic_Mail_Address: Joyce.Miller@noaa.gov
  Browse_Graphic:
    Browse_Graphic_File_Name: None
    Browse_Graphic_File_Description: None
    Browse_Graphic_File_Type: None
  Data_Set_Credit:NOAA PIFSC CRED PIBHMC and JIMAR
  Native_Data_Set_Environment: Generic Sensor Format multibeam
    data processed with SAIC SABER processing software on LINUX
    operating system computers
Data_Quality_Information:
  Attribute_Accuracy:
    Attribute_Accuracy_Report: Horizontal accuracy is ~20 m as
      data were collected using GPS with no differential
      corrections.  Vertical accuracy of multibeam data is
      estimated at 1% of water depth.
  Logical_Consistency_Report: These data are believed to be
    logically consistent though no tests were performed
  Completeness_Report: Varies
  Positional_Accuracy:
    Horizontal_Positional_Accuracy:
      Horizontal_Positional_Accuracy_Report: Variable
      Quantitative_Horizontal_Positional_Accuracy_Assessment:
        Horizontal_Positional_Accuracy_Value: 20
        Horizontal_Positional_Accuracy_Explanation: Multibeam
          sonar data.  No DGPS corrections applied; 20 m accuracy
     Vertical_Positional_Accuracy:
      Vertical_Positional_Accuracy_Report: Variable
      Quantitative_Vertical_Positional_Accuracy_Assessment:
        Vertical_Positional_Accuracy_Value: 1
        Vertical_Positional_Accuracy_Explanation: Accuracy
          varies with water depth.  Predicted tide correctors applied;
          multibeam data vertical accuracy is ~1% of water depth.
 Lineage:
    Source_Information:
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    Source_Citation:
      Citation_Information:
        Originator: NOAA PIFSC CRED PIBHMC and JIMAR
          Fisheries Science Center
        Publication_Date: 20070130
        Title: Simrad EM300 multibeam bathymetric data
      Type_of_Source_Media: Digital data
      Source_Time_Period_of_Content:
        Time_Period_Information:
          Single_Date/Time:
            Calendar_Date: 2006
        Source_Currentness_Reference: ground condition
      Source_Citation_Abbreviation: Simrad EM300 and EM3002D
      Source_Contribution: Simrad EM 300 (30 kHz) and Simrad
        EM 3002D (300 kHz) bathymetry and imagery data were
        collected in depths of ~100m-5000m. The EM 300
        system was placed in stand-by mode in shallow water
        (<100 m) due to high noise levels.
Distribution_Information:
  Distributor:
    Contact_Information:
      Contact_Person_Primary:
        Contact_Person: Joyce E. Miller
        Contact_Organization: NOAA PIFSC CRED PIBHMC and JIMAR
      Contact_Position: Oceanographer
      Contact_Address:
        Address_Type: mailing and physical address
        Address: 1680 East-West Road, POST Bldg, Rm 833
        City: Honolulu
        State_or_Province: Hawaii
        Postal_Code: 96822
        Country: USA
      Contact_Voice_Telephone: (808) 956-5239
      Contact_Facsimile_Telephone: (808) 956-6530
      Contact_Electronic_Mail_Address: Joyce.Miller@noaa.gov
  Resource_Description: EM300 and EM3002D Multibeam Sonar Data
    from Cruise Hi'ialakai HI-06-09
  Distribution_Liability: These data are not to be used for
    navigational purposes. NOAA makes no warranty regarding these
    data, expressed or implied, nor does the fact of distribution
    constitute such a warranty. NOAA cannot assume liability for
    any damages caused by any errors or omissions in these data,
    nor as a result of the failure of these data to function on a
```

particular system.
Standard_Order_Process:
Digital_Form:
Digital_Transfer_Information:
Format_Name: Generic Sensor Format, as described in
http://www.ldeo.columbia.edu/res/pi/MB-System/formatdoc/gsf_spec.pdf
Transfer_Size:
Digital_Transfer_Option:
Online_Option:
Computer_Contact_Information:
Network_Address:
Network_Resource_Name:
Fees: None
Metadata_Reference_Information:
Metadata_Date: 20070110
Metadata_Contact:
Contact_Information:
Contact_Organization_Primary:
Contact_Organization: NOAA PIFSC CRED PIBHMC and JIMAR
Contact_Person: Emily LUndblad
Contact_Position: GIS Specialist
Contact_Address:
Address_Type: mailing and physical address
Address: 1680 East-West Road, POST Bldg, Rm 833
City: Honolulu
State_or_Province: Hawaii
Postal_Code: 96822
Country: USA
Contact_Voice_Telephone: (808) 956-2698
Contact_Facsimile_Telephone: (808) 956-6530
Contact_Electronic_Mail_Address: Emily.Lundblad@noaa.gov
Metadata_Standard_Name: FGDC Content Standards for Digital
Geospatial Metadata
Metadata_Standard_Version: FGDC-STD-001-1998
Metadata_Time_Convention: Universal Time

Identification_Information:
Citation:
Citation_Information:
Originator: National Oceanic and Atmospheric Administration
Pacific Islands Fisheries Science Center Coral Reef
Ecosystem Division Pacific Islands Benthic Habitat
Mapping Center
Publication_Date: 20070406
Title: Reson 8101ER Multibeam Sonar Data from Cruise
AHI-06-12
Geospatial_Data_Presentation_Form:
Generic Sensor Format (GSF) digital data
Description:
Abstract: Reson 8101ER multibeam Data were collected between
13-15 October 2006 aboard NOAA Survey Launch Acoustic
Habitat Investigator (AHI) Brooks Banks in the Northwestern
Hawaiian Islands during cruise AHI-06-12. These multibeam
data were collected using SAIC ISS-2000 software in the
Generic Sensor Format and processed using SABER editing
software. Sound velocity corrections from a Seabird SBE19
CTD sensor and motion corrections from a POS-MV vertical
reference were applied to the data in real time.

Predicted tides were applied to the data in real time using
tide zoning and predicted tides supplied by NOAA's National
Ocean Service Center for Operational Oceanographic Products
and Services (CO-OPS).

Horizontal accuracy is 20m (no differential GPS correctors
applied), vertical accuracy is depth dependent (~1% of water
depth), WGS84 datum. These data are not to be used for
navigation. Depths mapped range from 30 - 150 m. The AHI was
deployed from the NOAA Ship Hi'ialakai and concurrent mapping
was done using the Simrad EM300 and EM3002D sonars aboard the
ship; metadata for HI-06-12 are submitted separately.

Purpose: The data were collected in support of Coral Reef Conservation
Program goals to map all shallow (0-30 m)coral reefs in US Pacific
waters and priority moderate (> 30 m)depth areas by 2009. The data
are being used to provide bathymetric and backscatter data for
previously unmappedareas; in support of ecosystem management
requirements for benthic habitat mapping and location of Essential

Fish Habitat; and to study the geologic features of the area.

Supplemental_Information:
Data were collected aboard the R/V AHI (Acoustic Habitat Investigator), a 8 m (25') survey launch owned and operated by the NOAA Pacific Islands Fisheries Science Center in Honolulu, HI. The R/V AHI's survey sensors include a 240 kHz RESON 8101-ER sonar which measures bathymetry and acoustic backscatter imagery, a TSS/Applanix POS/MV Model 320 which measures time, position, velocity, attitude and heading, and a Seabird SBE 19 CTD used to measure sound velocity profiles.

The AHI's equipment serial numbers, software versions and sensor configuration settings are as follows:

RESON 8101-ER multibeam echosounder
Transducer serial #: 201004
Firmware, dry: 8101-2.07-2D4D
Firmware, wet: 8101-1.06-2F6B

R/V AHI POS/MV Model 320, version 3
PCS serial #: 474
IMU serial #: 203
Controller software: v 2.1
PCS Firmware: 2.16

Seabird SBE19 CTD:
Serial #: 3029

R/V AHI Lever Arm Distances and Alignment Offsets: The R/V AHI Reference Point (RP) is defined to be the intersection of the vessel's centerline, the cabin deck and the bulkhead immediately aft of the transducer. This is marked by a punch in the deck weld at that location. Positive X means the point is forward of the RP, positive Y means the point is to starboard of the RP, positive Z means the point is below the RP. The loaded waterline is defined as the intersection of the vessel's performance wing with the hull at the transom.

POS/MV Settings:
RP to IMU, m 0.80 0.00 0.08

RP to Primary GPS(port),m 0.85 -0.50 -2.29
RP to Vessel, m 0.16 0.00 0.77
IMU w.r.t. Ref. Frame, deg 0.00 0.00 0.00
RP to Heave lever arm, m -0.67 0.00 0.00
RP to Sensor 1(MB transducer), m 0.16 0.00 0.77
RP to Sensor 2 0 0 0
Sensor 1 rotation Ref. Frame, deg 0 0 0
Sensor 2 rotation Ref. Frame, deg 0 0 0
Antenna Baseline Distance: 1.229

ISS2000 Settings for RESON DTC:
Roll Bias, deg 0.15
Pitch Bias, deg 0.025
Gyro Bias, deg 0.0
Transducer depth, m 0.62

Time_Period_of_Content:
Time_Period_Information:
Range_of_Dates/Times:
Beginning_Date: 20061013
Ending_Date: 20061015
Currentness_Reference: ground condition
Status:
Progress: In Work
Maintenance_and_Update_Frequency: As needed
Spatial_Domain:
Bounding_Coordinates:
West_Bounding_Coordinate: -179.050000
East_Bounding_Coordinate: -179.750000
North_Bounding_Coordinate: 24.300000
South_Bounding_Coordinate: 24.050000
Keywords:
Theme:
Theme_Keyword_Thesaurus: CoRIS Theme Thesaurus Version 1.0
Theme_Keyword: EARTH SCIENCE > Oceans > Bathymetry/Seafloor Topography > Bathymetry
Theme:
Theme_Keyword_Thesaurus: None
Theme_Keyword: Bathymetry
Theme_Keyword: Multibeam sonar
Place:
Place_Keyword_Thesaurus: None
Place_Keyword: Brooks Banks
Place_Keyword: Northwestern Hawaiian Islands

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    Place_Keyword: Banks
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    Place_Keyword_Thesaurus: CoRIS Place Thesaurus Version 1.0
    Place_Keyword: OCEAN BASIN > Pacific Ocean > North Pacific Ocean > Northwestern Hawaiian
Islands > Brooks Banks
    Place_Keyword: COUNTRY/TERRITORY > United States of America > Hawaii > Honolulu
  Access_Constraints: None.
  Use_Constraints: These data are NOT TO BE USED FOR NAVIGATION
  Point_of_Contact:
   Contact_Information:
    Contact_Person_Primary:
     Contact_Person: Joyce E. Miller
     Contact_Organization:  National Oceanic and Atmospheric Administration
     (NOAA) Pacific Islands Fisheries Science Center (PIFSC)
     Coral Reef Ecosystem Division (CRED) Pacific Islands Benthic
     Habitat Mapping Center (PIBHMC) and the Joint Institute for
     Marine and Atmospheric Research (JIMAR)
    Contact_Position: Oceanographer
    Contact_Address:
     Address_Type: mailing and physical address
     Address: 1680 East-West Road, POST Bldg, Rm 833
     City: Honolulu
     State_or_Province: Hawaii
     Postal_Code: 96822
     Country: USA
    Contact_Voice_Telephone: (808) 956-5239
    Contact_Facsimile_Telephone: (808) 956-6530
    Contact_Electronic_Mail_Address: Joyce.Miller@noaa.gov
  Browse_Graphic:
   Browse_Graphic_File_Name: None
   Browse_Graphic_File_Description: None
   Browse_Graphic_File_Type: None
  Data_Set_Credit: NOAA PIFSC CRED PIBHMC and JIMAR
  Native_Data_Set_Environment: Generic Sensor Format multibeam
   data processed with SAIC SABER processing software on LINUX
   operating system computers
Data_Quality_Information:
  Attribute_Accuracy:
   Attribute_Accuracy_Report: Horizontal accuracy is ~20 m as
    data were collected using GPS with no differential
    corrections.  Vertical accuracy of multibeam data is
    estimated at 1% of water depth; predicted tidal corrections
    were applied.
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Logical_Consistency_Report: These data are believed to be
logically consistent though no tests were performed
Completeness_Report: Varies
Positional_Accuracy:
Horizontal_Positional_Accuracy:
Horizontal_Positional_Accuracy_Report: Variable
Quantitative_Horizontal_Positional_Accuracy_Assessment:
Horizontal_Positional_Accuracy_Value: 20
Horizontal_Positional_Accuracy_Explanation: Multibeam
sonar data. No DGPS corrections applied; 20 m accuracy
Vertical_Positional_Accuracy:
Vertical_Positional_Accuracy_Report: Variable
Quantitative_Vertical_Positional_Accuracy_Assessment:
Vertical_Positional_Accuracy_Value: 1
Vertical_Positional_Accuracy_Explanation: Accuracy
varies with water depth. Predicted tide correctors applied
Using data supplied by the NOAA CO-OPs program;
multibeam data vertical accuracy is ~1% of water depth.
Lineage:
Source_Information:
Source_Citation:
Citation_Information:
Originator: NOAA PIFSC CRED PIBHMC and JIMAR
Publication_Date: 20060907
Title: Reson 8101ER multibeam bathymetric data
Type_of_Source_Media: Digital data
Source_Time_Period_of_Content:
Time_Period_Information:
Single_Date/Time:
Calendar_Date: 2006
Source_Currentness_Reference: ground condition
Source_Citation_Abbreviation: Reson 8101ER
Source_Contribution: Reson 8101ER (240 kHz) bathymetry and
imagery data were collected in depths of ~10-300 m.
Distribution_Information:
Distributor:
Contact_Information:
Contact_Person_Primary:
Contact_Person: Joyce E. Miller
Contact_Organization: NOAA PIFSC CRED PIBHMC and JIMAR
Contact_Position: Oceanographer
Contact_Address:
Address_Type: mailing and physical address

Address: 1680 East-West Road, POST Bldg, Rm 833
City: Honolulu
State_or_Province: Hawaii
Postal_Code: 96822
Country: USA
Contact_Voice_Telephone: (808) 956-5239
Contact_Facsimile_Telephone: (808) 956-6530
Contact_Electronic_Mail_Address: Joyce.Miller@noaa.gov
Resource_Description: Reson 8101ER Multibeam Sonar Data from Cruise AHI-06-12 (R/V AHI)
Distribution_Liability: These data are not to be used for navigational purposes. NOAA makes no warranty regarding these data, expressed or implied, nor does the fact of distribution constitute such a warranty. NOAA cannot assume liability for any damages caused by any errors or omissions in these data, nor as a result of the failure of these data to function on a particular system.
Standard_Order_Process:
Digital_Form:
Digital_Transfer_Information:
Format_Name: Generic Sensor Format, as described in http://www.ldeo.columbia.edu/res/pi/MB-System/formatdoc/gsf_spec.pdf
Transfer_Size:
Digital_Transfer_Option:
Online_Option:
Computer_Contact_Information:
Network_Address:
Network_Resource_Name:
Fees: None
Metadata_Reference_Information:
Metadata_Date: 20070406
Metadata_Contact:
Contact_Information:
Contact_Person_Primary:
Contact_Person: Joyce E. Miller
Contact_Organization: NOAA PIFSC CRED PIBHMC and JIMAR
Contact_Position: Oceanographer
Contact_Address:
Address_Type: mailing and physical address
Address: 1680 East-West Road, POST Bldg, Rm 833
City: Honolulu
State_or_Province: Hawaii
Postal_Code: 96822

Country: USA
Contact_Voice_Telephone: (808) 956-5239
Contact_Facsimile_Telephone: (808) 956-6530
Contact_Electronic_Mail_Address: Joyce.Miller@noaa.gov
Metadata_Standard_Name: FGDC Content Standards for Digital Geospatial Metadata
Metadata_Standard_Version: FGDC-STD-001-1998
Metadata_Time_Convention: Universal Time

Identification_Information:
Citation:
Citation_Information:
Originator: National Oceanic and Atmospheric Administration
Pacific Islands Fisheries Science Center Coral Reef
Ecosystem Division Pacific Islands Benthic Habitat
Mapping Center
Publication_Date: 20070406
Title: EM300 Multibeam Sonar Data from Cruise
Hi'ialakai HI-06-12
Geospatial_Data_Presentation_Form:
Generic Sensor Format (GSF) digital data
Description:
Abstract: EM300 and EM3002D multibeam data were collected between 10-29 October 2006 aboard NOAA Ship Hi'ialakai at Brooks Banks, St. Rogatien Bank, and West Nihoa Island in the Northwestern Hawaiian Islands during cruise HI-06-12. These multibeam data were collected using SAIC ISS-2000 software in the Generic Sensor Format and processed using SABER editing software. Surface sound velocity values were supplied by a Seabird SBE-45 MicroTSG and a SBE-38 remote temperature probe. Sound velocity corrections from a Seabird 911 CTD sensor and motion corrections from a POS-MV vertical reference were applied to the data in real time.

Predicted tides were applied to the data in real time using tide zoning and predicted tides supplied by NOAA's National Ocean Service Center for Operational Oceanographic Products and Services (CO-OPS).

Horizontal accuracy is 20m (no differential GPS correctors applied), vertical accuracy is depth dependent (~1% of water depth), WGS84 datum. These data are not to be used for navigation. Depths mapped range from 30 to 1000 m. Concurrent mapping was done by the R/V AHI in water depths ranging from 30-150 m with the data set being AHI-06-12; metadata for AHI-06-12 are submitted separately.

Purpose: The data were collected in support of Coral Reef Conservation Program goals to map all shallow (0-30 m)coral reefs in US Pacific waters and priority moderate (> 30 m)depth areas by 2009. The data are being used to provide bathymetric and backscatter data for

previously unmappedareas; in support of ecosystem management requirements for benthic habitat mapping and location of Essential Fish Habitat; and to study the geologic features of the area.

Supplemental_Information:
Data were collected aboard the NOAA Ship Hi'ialakai, a 68 m (218') United States National Oceanographic and Atmospheric Administration (NOAA) research ship. The NOAA Ship Hi'ialakai's survey sensors include a 30 kHz Simrad EM300 sonar and a 300 kHz Simrad EM3002d sonar, both of which measure bathymetry and acoustic backscatter imagery, a TSS/Applanix POS/MV Model 320, which measures time, position, velocity, attitude and heading, and a Seabird SBE 9/11 plus CTD used to measure sound velocity profiles.

The Hi'ialakai's equipment serial numbers, software versions and sensor configuration settings are as follows:

SIMRAD EM300 multibeam echosounder
Serial #: 303
PU Software Versions:
PU: 2.0.1 040629
DDS: 3.17 040611
BSP: 2.3.2 040615
SPRX: 1.1.3 040427
SPTX: 2.0.0 040614
SIS Software Version: 3.2.2, build 54, Sept 7 2006

SIMRAD EM3002D multibeam echosounders
Serial #: 357 and 353
PU Software Versions:
HCT: 2.0.7 040906
BSP67 Master: 1.2.7 040830
BSP67 Slave: 1.2.7 040830
PU: 1.6.8 050118
DDS: 3.17 2004/06/11
SIS Software Version: 3.2.2, build 54, Sept 7 2006

HI'IALAKAI POS/MV Model 320, version 3
PCS serial #: 295
IMU serial #: 1333
PCS Firmware: 2.21, Feb 02, 2006
Controller software: v 2.1

Seabird SBE 9/11 plus CTD:
Serial #: 09P35130-0737

Hi'ialakai Lever Arm Distances and Alignment Offsets: The Hi'ialakai's Reference Point (RP) is a granite block situated 1.222 m starboard of the ship's centerline, 1.23 m above the ship's baseline/datum on the keel. The RP is located under the forward deck, in the ship's laundry room. The ship's sensors, the sonar systems and permanent benchmarks are measured with respect to the RP. Positive X means the point is forward of the RP, positive Y means the point is to starboard of the RP, positive Z means the point is below the RP. The survey waterline is defined to be at the 15' draft mark on the vessel's starboard side.

POS/MV Settings:	X	Y	Z
RP to IMU, m	0.434	0.000	-0.117
RP to Primary GPS(port),m	-18.101	-2.011	-23.545
RP to Vessel, m	0.00	0.00	0.00
IMU w.r.t. Ref. Frame, deg	0.00	0.00	0.00
RP to Heave lever arm, m	-15.087	-1.222	-4.301
Sensor 1 & 2 lever arms & angles:	0	0	0
Antenna Baseline Distance: 1.777			

EM300 Settings:	X	Y	Z
Pos sensors 1 2 & 3, m	0	0	0
TX Transducer, m	-04.091	-2.217	1.727
RX Transducer, m	-06.065	-1.222	1.727
Attitude sensors 1 & 2, m	0	0	0
Waterline, m	-3.26		

	Roll	Pitch	Heading
TX Transducer, deg	0.00	0.00	359.96
RX Transducer, deg	0.00	0.00	0.05
Attitude 1, deg	-0.20	0.00	0.00
Attitude 2, deg	0	0	0
Stand-alone heading, deg	0		

EM3002D Settings:			
Pos sensors 1 2 & 3, m	0	0	0
Sonar head 1 (port), m	04.439	-1.479	1.560
Sonar head 2 (stbd), m	04.441	-0.963	1.559

Attitude sensors 1 & 2, m 0 0 0
Waterline, m -3.26
Depth sensor, m 0 0 0

	Roll	Pitch	Heading
Sonar head 1 (port), deg	40.153	0.00	0.27
Sonar head 2 (stbd), deg	-39.918	0.00	358.18
Attitude 1, deg	-1.25	1.1	0.00
Attitude 2, deg	0	0	0
Stand-alone heading, deg			

Time_Period_of_Content:
Time_Period_Information:
Range_of_Dates/Times:
Beginning_Date: 20061010
Ending_Date: 20061029
Currentness_Reference: ground condition
Status:
Progress: In Work
Maintenance_and_Update_Frequency: As needed
Spatial_Domain:
Bounding_Coordinates:
West_Bounding_Coordinate: -179.300000
East_Bounding_Coordinate: -162.100000
North_Bounding_Coordinate: 24.400000
South_Bounding_Coordinate: 24.866667
Keywords:
Theme:
Theme_Keyword_Thesaurus: CoRIS Theme Thesaurus Version 1.0
Theme_Keyword: EARTH SCIENCE > Oceans > Bathymetry/Seafloor Topography > Bathymetry
Theme:
Theme_Keyword_Thesaurus: None
Theme_Keyword: Bathymetry
Theme_Keyword: Multibeam sonar
Place:
Place_Keyword_Thesaurus: None
Place_Keyword: Brooks Banks
Place_Keyword: St. Rogatien Bank
Place_Keyword: West Nihoa Bank
Place_Keyword: Northwestern Hawaiian Islands
Place_Keyword: Banks
Place:
Place_Keyword_Thesaurus: CoRIS Place Thesaurus Version 1.0
Place_Keyword: OCEAN BASIN > Pacific Ocean > North Pacific Ocean > Northwestern

Hawaiian Islands > Brooks, St. Rogatien, West Nihoa Banks
Place_Keyword: COUNTRY/TERRITORY > United States of America > Hawaii > Honolulu
Access_Constraints: None.
Use_Constraints: These data are NOT TO BE USED FOR NAVIGATION
Point_of_Contact:
Contact_Information:
Contact_Person_Primary:
Contact_Person: Joyce E. Miller
Contact_Organization: National Oceanic and Atmospheric Administration (NOAA) Pacific Islands Fisheries Science Center (PIFSC) Coral Reef Ecosystem Division (CRED) Pacific Islands Benthic Habitat Mapping Center (PIBHMC) and the Joint Institute for Marine and Atmospheric Research (JIMAR)
Contact_Position: Oceanographer
Contact_Address:
Address_Type: mailing and physical address
Address: 1680 East-West Road, POST Bldg, Rm 833
City: Honolulu
State_or_Province: Hawaii
Postal_Code: 96822
Country: USA
Contact_Voice_Telephone: (808) 956-5239
Contact_Facsimile_Telephone: (808) 956-6530
Contact_Electronic_Mail_Address: Joyce.Miller@noaa.gov
Browse_Graphic:
Browse_Graphic_File_Name: None
Browse_Graphic_File_Description: None
Browse_Graphic_File_Type: None
Data_Set_Credit: NOAA PIFSC CRED PIBHMC and JIMAR
Native_Data_Set_Environment: Generic Sensor Format multibeam data processed with SAIC SABER processing software on LINUX operating system computers
Data_Quality_Information:
Attribute_Accuracy:
Attribute_Accuracy_Report: Horizontal accuracy is ~20 m as data were collected using GPS with no differential corrections. Vertical accuracy of multibeam data is estimated at 1% of water depth. Predicted tides were applied to the data in real time using tide zones and correctors supplied by the NOAA CO-OPs program.
Logical_Consistency_Report: These data are believed to be logically consistent though no tests were performed
Completeness_Report: Varies

Positional_Accuracy:
Horizontal_Positional_Accuracy:
Horizontal_Positional_Accuracy_Report: Variable
Quantitative_Horizontal_Positional_Accuracy_Assessment:
Horizontal_Positional_Accuracy_Value: 20
Horizontal_Positional_Accuracy_Explanation: Multibeam sonar data. No DGPS corrections applied; 20 m accuracy
Vertical_Positional_Accuracy:
Vertical_Positional_Accuracy_Report: Variable
Quantitative_Vertical_Positional_Accuracy_Assessment:
Vertical_Positional_Accuracy_Value: 1
Vertical_Positional_Accuracy_Explanation: Accuracy varies with water depth. Predicted tide correctors applied Using data supplied by the NOAA CO-OPs program; multibeam data vertical accuracy is ~1% of water depth.
Lineage:
Source_Information:
Source_Citation:
Citation_Information:
Originator: NOAA PIFSC CRED PIBHMC and JIMAR
Publication_Date: 20070406
Title: Simrad EM300 and Simrad EM3002D multibeam bathymetric data
Type_of_Source_Media: Digital data
Source_Time_Period_of_Content:
Time_Period_Information:
Single_Date/Time:
Calendar_Date: 2006
Source_Currentness_Reference: ground condition
Source_Citation_Abbreviation: Simrad EM300 and Simrad EM3002D
Source_Contribution: Simrad EM 300 (30 kHz) bathymetry and imagery data were collected in depths of ~100m-1000m. The EM 300 system was placed in stand-by mode in shallower water due to high noise levels. Simrad EM3002D (300 kHz) bathymetry and imagery data were collected in depths of ~20-150m. The EM3002D system was placed in stand-by mode in water depths greater than ~150 m

Distribution_Information:
Distributor:
Contact_Information:
Contact_Person_Primary:
Contact_Person: Joyce E. Miller
Contact_Organization: NOAA PIFSC CRED PIBHMC and JIMAR

```
    Contact_Position: Oceanographer
    Contact_Address:
      Address_Type: mailing and physical address
      Address: 1680 East-West Road, POST Bldg, Rm 833
      City: Honolulu
      State_or_Province: Hawaii
      Postal_Code: 96822
      Country: USA
    Contact_Voice_Telephone: (808) 956-5239
    Contact_Facsimile_Telephone: (808) 956-6530
    Contact_Electronic_Mail_Address: Joyce.Miller@noaa.gov
  Resource_Description: EM300 and EM3002D Multibeam Sonar Data
    from Cruise Hi'ialakai HI-06-12
  Distribution_Liability: These data are not to be used for
    navigational purposes. NOAA makes no warranty regarding these
    data, expressed or implied, nor does the fact of distribution
    constitute such a warranty. NOAA cannot assume liability for
    any damages caused by any errors or omissions in these data,
    nor as a result of the failure of these data to function on a
    particular system.
  Standard_Order_Process:
    Digital_Form:
      Digital_Transfer_Information:
        Format_Name: Generic Sensor Format, as described in
          http://www.ldeo.columbia.edu/res/pi/MB-System/formatdoc/gsf_spec.pdf
        Transfer_Size:
      Digital_Transfer_Option:
        Online_Option:
          Computer_Contact_Information:
            Network_Address:
              Network_Resource_Name:
    Fees: None
Metadata_Reference_Information:
  Metadata_Date: 200607
  Metadata_Contact:
    Contact_Information:
      Contact_Person: Joyce E. Miller
        Contact_Organization:  NOAA PIFSC CRED PIBHMC and JIMAR
      Contact_Position: Oceanographer
      Contact_Address:
        Address_Type: mailing and physical address
        Address: 1680 East-West Road, POST Bldg, Rm 833
        City: Honolulu
```

State_or_Province: Hawaii
Postal_Code: 96822
Country: USA
Contact_Voice_Telephone: (808) 956-5239
Contact_Facsimile_Telephone: (808) 956-6530
Contact_Electronic_Mail_Address: Joyce.Miller@noaa.gov
Metadata_Standard_Name: FGDC Content Standards for Digital Geospatial Metadata
Metadata_Standard_Version: FGDC-STD-001-1998
Metadata_Time_Convention: Universal Time

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