**U.S. DEPARTMENT OF COMMERCE**
**National Oceanic and Atmospheric Administration**
**NATIONAL MARINE FISHERIES SERVICE**
**Pacific Islands Fisheries Science Center**
**1845 Wasp Blvd. Bldg. 176 • Honolulu, Hawaii 96818**
**(808) 725-5300**

# PROJECT REPORT

| | |
|---|---|
| Vessel: | NOAA Ship *Oscar Elton Sette*, Project SE-19-02 (MHI: Legs I – III) |
| Project Period: | Leg I: April 20 – May 7<br>Leg II: July 9 – 21<br>Leg III: July 23 – August 7, 2019 |
| Area of Operation: | Main Hawaiian Islands (MHI): Big Island (Hawaii), Maui-Nui (Kahoolawe, Maui, Molokai, Lanai), Oahu, Kauai, and Niihau |
| Type of Operation: | Personnel from: the Ecosystem Sciences Division (ESD) and Scientific Operations Division (SOD) of the NOAA Pacific Islands Fisheries Science Center (PIFSC), the Joint Institute for Marine and Atmospheric Research (JIMAR), the NOAA Diving Program (NDP) and NOAA Corps, the Department of Land and Natural Resources (DLNR), Division of Aquatic Resources (DAR), the University of Hawaiʻi at Mānoa (UH), the Hawaiʻi Institute of Marine Biology (HIMB), the University of Hawaii, Hilo (UH-Hilo) and the Nature Conservancy (TNC) conducted interdisciplinary surveys of benthos, fishes, and oceanographic parameters related to climate change in coastal waters of the main Hawaiian Islands (MHI). |

All activities described in this report were covered by the following permits and authorizations:

- State of Hawaiʻi Department of Land and Natural Resources, Division of Aquatic Resources, Special Activity Permit No. 2020-24 issued for 2019 MHI operations.
- Department of the Army Nationwide Permit Verification File No: POH-2009-00083. The installation and maintenance of scientific measurement devices associated with the Pacific RAMP project is currently authorized under U.S. Army Corps of Engineers (USACE) Nationwide Permit No. 5, Scientific Measurement Devices (authorization date: March 2014) and is authorized until modified, revoked, or reissued by USACE.
- National Environmental Policy Act (NEPA), Programmatic Environmental Assessment for Research Activities Conducted by the Coral Reef Ecosystem Division, PIFSC, 2010-2015*. A finding of No Significant Impact (FONSI) signed 7 May 2010. *It is noted that while this NEPA document was originally intended to carry out program-level research activities for a 5-year period, the analysis in the EA was intended to span an indefinite period of time, and is not limited to a 5 year period (see section 2.3 in EA)

### *1. Mission*

The Hawaiian Archipelago, Reef Assessment and Monitoring Program (HARAMP) cruise is a component of the integrated coral reef ecosystem assessment led by the ESD of the PIFSC at some 40 U.S.-affiliated Pacific Islands. This comprehensive, multi-agency research and education effort is sponsored by NOAA's Coral Reef Conservation Program (CRCP), a partnership between the National Marine Fisheries Service, National Ocean Service, and other NOAA agencies with the objective of improving understanding and management of coral reef ecosystems. The CRCP has made the strategic decision to invest a portion of its annual operating budget in perpetuity to support a National Coral Reef Monitoring Program (NCRMP). This Program is designed to assess and report the status and trends of environmental conditions, living reef resources, and the people and processes that interact with coral reef ecosystems. The NCRMP builds on a decade of CRCP-supported, nationwide coral reef monitoring and reporting efforts, such as the Pacific Reef Assessment and Monitoring Program (Pacific RAMP), and The State of Coral Reef Ecosystems of the United States and Pacific Freely Associated States, and a NOAA
Technical Memorandum compiled by the NOAA Center for Coastal Monitoring and Assessment.

Although the scope of NCRMP is broad, it is intended to assess the status of coral reef ecosystems and their conditions throughout U.S. states and territories and provide a steady, consistent, and comprehensive analytical context to gauge changes in conditions at the sub-jurisdictional scale of an island or atoll.

The NCRMP focuses on four priority themes: climate change and ocean acidification; coral populations and benthic communities; reef-associated fish populations and communities; and socioeconomics. Biological monitoring for benthic and fish communities are conducted throughout shallow water (0–30 m), hard-bottom coral reef habitats using a stratified random sampling design. Monitoring of climate change and ocean acidification is achieved by means of sustained, remotely sensed and in situ observations of ocean temperature; autonomous and discrete water sampling for analyses of near-reef and surface-seawater carbonate chemistry; and distinct biological installations designed to provide integrated, ecosystem-wide response data (e.g., biodiversity, calcification, and bioerosion) in the context of climate change. In the Pacific, biological (benthic and fish) and climate monitoring are conducted on a triennial basis. Socioeconomic monitoring is led by the CRCP at headquarters in Silver Spring, MD, and is outside the scope of the Pacific RAMP expeditions; therefore, it is not addressed in this cruise report.

### *2. Goals*

The project goals of SE-19-02 were to:

- Conduct ecosystem monitoring of the species composition, abundance, percent cover (%), size distribution, recruitment and general health of the fishes, corals, other invertebrates, and algae of the shallow water (< 35 m) coral reef ecosystems of the Hawaiian Archipelago.
- Deploy and retrieve long term oceanographic instrumentation secured to the benthos in shallow waters (<30 m), such as Subsurface Temperature Recorders (STRs), Calcification Accretion Units (CAUs), Bioerosion Monitoring Units (BMUs), to monitor environmental conditions affecting the coral reef ecosystems of the Hawaiian Archipelago.
- Temporarily deploy and retrieve a suite of oceanographic instrumentation which collects information to characterize nearshore physical, biological, and chemical variables associated with ocean acidification and near reef calcification/dissolution processes.
- Conduct general water quality studies, including analysis of seawater for salinity, temperature, dissolved oxygen, transmissivity, total alkalinity, and dissolved inorganic carbon. These parameters were measured via the collection of water in Niskin bottles and conductivity-temperature-depth (CTD) casts. Shallow-water CTDs were conducted from small boats to a depth of ~30 m.
- Use photomosaic technology to collect coral community composition data at biological monitoring and climate-based stations, and contextualize any physical and/or biological changes recorded at the climate stations over time.
- Determine the existence of threats to the health of these coral reef resources from anthropogenic sources, including marine debris.

## *3. Operating area*

The operating area of SE-19-02 is shown in Figure 1.

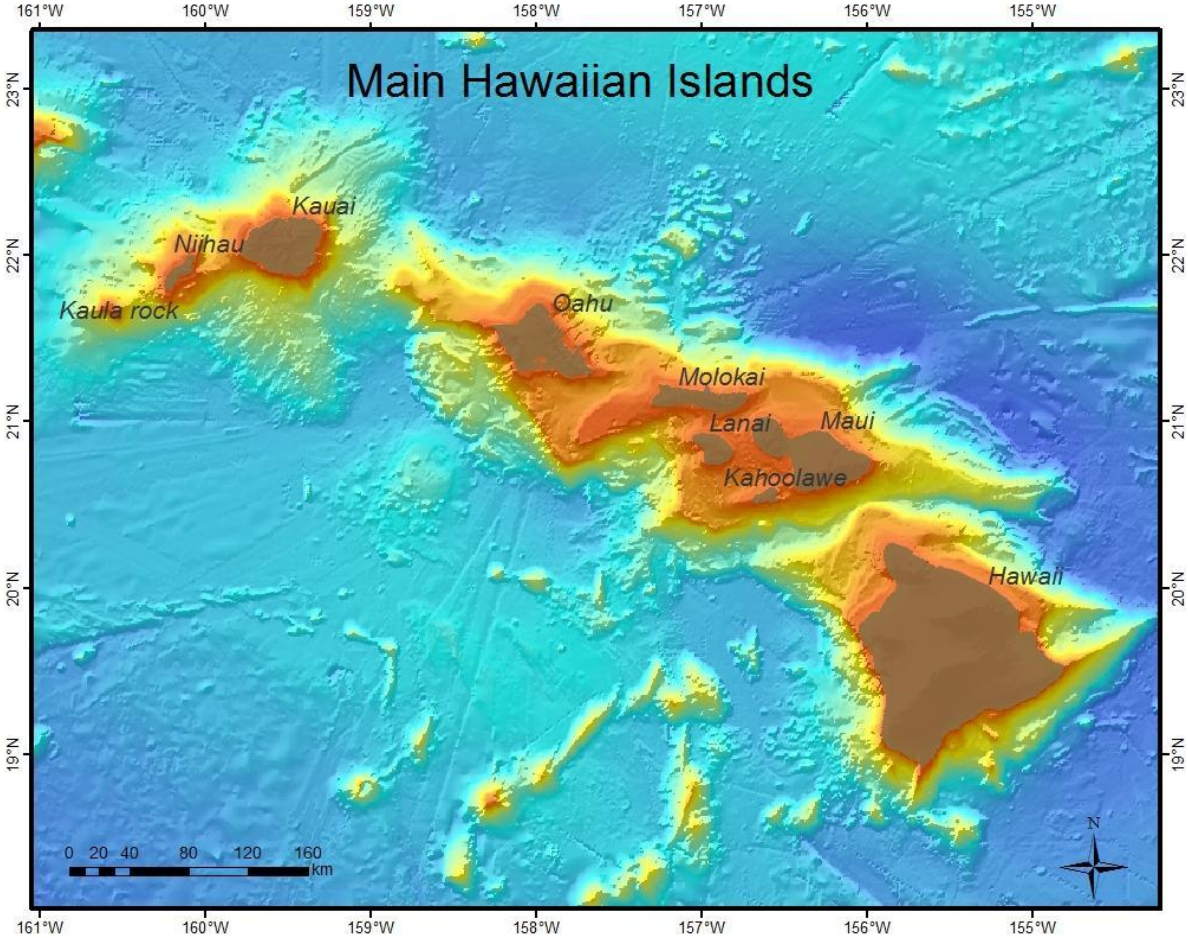


**Figure 1. Operating area of the NOAA Ship *Oscar Elton Sette* for SE-19-02. Note that Kaula rock was not surveyed.**

### *4. Itinerary*

**Leg I**

| | |
|---|---|
| April 20 | Departed Honolulu. Transited to Maui |
| April 21 – 24 | Conducted operations around Maui |
| April 25 | Conducted operations around Kahoolawe |
| April 26 | Aborted operations around Kahoolawe due to weather. Transited to Lanai for 4 hours of operations. |
| April 27 | Conducted operations around Maui |
| April 28 – 29 | Conducted operations around Molokai |
| April 30 | Rest day |
| May 1 – May 3 | Conducted operations around Molokai |
| May 4 | Conducted operations around the Big Island |
| May 5 | Weather day, no operations |
| May 6 | Conducted operations around Kahoolawe |
| May 7 | Conducted half-day of operations around Oahu (OCC only). Transited to Pearl Harbor, disembarked scientific personnel. End of Leg I. |

**Leg II**

| | |
|---|---|
| July 9 | Departed Honolulu. Transited to Lanai. |
| July 10 | Conducted operations around Lanai. |
| July 11 – 17 | Conducted operations around the Big Island |

| | |
|---|---|
| July 18 | Weather day, no operations |
| July 19 | Conducted operations around the Big Island |
| July 20 | Conducted operations around Lanai |
| July 21 | Conducted half-day of operations around Ohau (fish team only). Transited to Pearl Harbor, disembarked scientific personnel. End of Leg II. |

**Leg III**

| | |
|---|---|
| July 23 | Departed Honolulu. Transit to Kauai |
| July 24 | Conducted operations around Kauai |
| July 25 – 26 | Conducted operations around Niihau |
| July 27 – 28 | Conducted operations around Kauai |
| July 29 | Conducted operations around Lanai |
| July 30 – 31 | Conducted operations around Oahu |
| August 1 | Weather day, no operations |
| August 2 – 5 | Conducted operations around Oahu |
| August 6 | Conducted operations around Maui |
| August 7 | Transited to Pearl Harbor, disembarked scientific personnel. End of Leg III. End of HARAMP MHI mission. |

## *5. Results*

Background: The coral reef ecosystems of U.S.-affiliated Pacific islands have been surveyed biennially since 2000 and triennially starting in 2010 through Pacific RAMP. Herein, we present qualitative highlights from our observations during this latest expedition for select islands.

This report only highlights work conducted in the main Hawaiian Islands during SE-19-02 (HARAMP legs I-III). Work conducted as part of RA-19-03 (HARAMP leg IV) is presented in a separate project report. In brief, biological and climate monitoring surveys were conducted around 8 islands (Hawaii, Kahoolawe, Kauai, Lanai, Maui, Molokai, Niihau, and Oahu) in the main Hawaiian Islands (MHI). A total of 292 fish Rapid Ecological Assessment (REA) surveys and 188 benthic REA surveys were completed in the MHI. In addition, landscape photomosaics were collected at 321 random sites and 48 fixed climate sites (Figure 2).

This section also provides operational totals regarding research activities Table 1, specifics regarding data collected during cruise SE-19-02 and a summary of notable observations made while at sea. For climate monitoring surveys, a total of: 229 shallow-water CTD casts were completed: 235 shallow-water dissolved inorganic carbon (DIC)/Total Alkalinity (TA) water samples were collected; 40 subsurface temperature recorders (STRs) were retrieved and 55 deployed; 107 calcification accretion units (CAUs) were recovered and 95 deployed; 25 bioerosion monitoring units (BMUs) were recovered and 30 deployed; and two carbonate chemistry diel monitoring suites, consisting of portable underwater collectors (PUCs), an acoustic Doppler current profiler, a CTD, a SeaFET pH sensor, a dissolved oxygen sensor, and a Photosynthetically Active Radiation (PAR) sensor were deployed and recovered.

For more information pertaining to the data collected and methodology employed at the islands visited, see Appendices A and B.

***Highlights***

**General**

- In comparison with previous *Hi'ialakai*-based RAMP mission (using 5 small boats), MHI RAMP operations aboard the NOAA Ship *Oscar Elton Sette* utilized a 4 small model (25% reduction in general operational capacity from historic baseline).
- The OCC Team used new RBR CTDs for the first time on leg 2. These new CTDs represent smaller, lighter, and easier-to-use replacements for previous SeaBird CTDs, and worked very well during HARAMP.
- HARAMP 2019 marks the first inclusion of structure-from-motion spirals at all OCC fixed sites. The spirals collected this year are repeat surveys of the same locations in 2016, and will be used to measure changes in coral community structure following the ongoing MHI (September – October 2019) bleaching event.
- Weather days noted for legs I and II were a results of localized conditions (elevated trade winds and associated swells). The passage of the remnants from hurricanes Erick and Flossie resulted in one day of suspended operations during leg III.

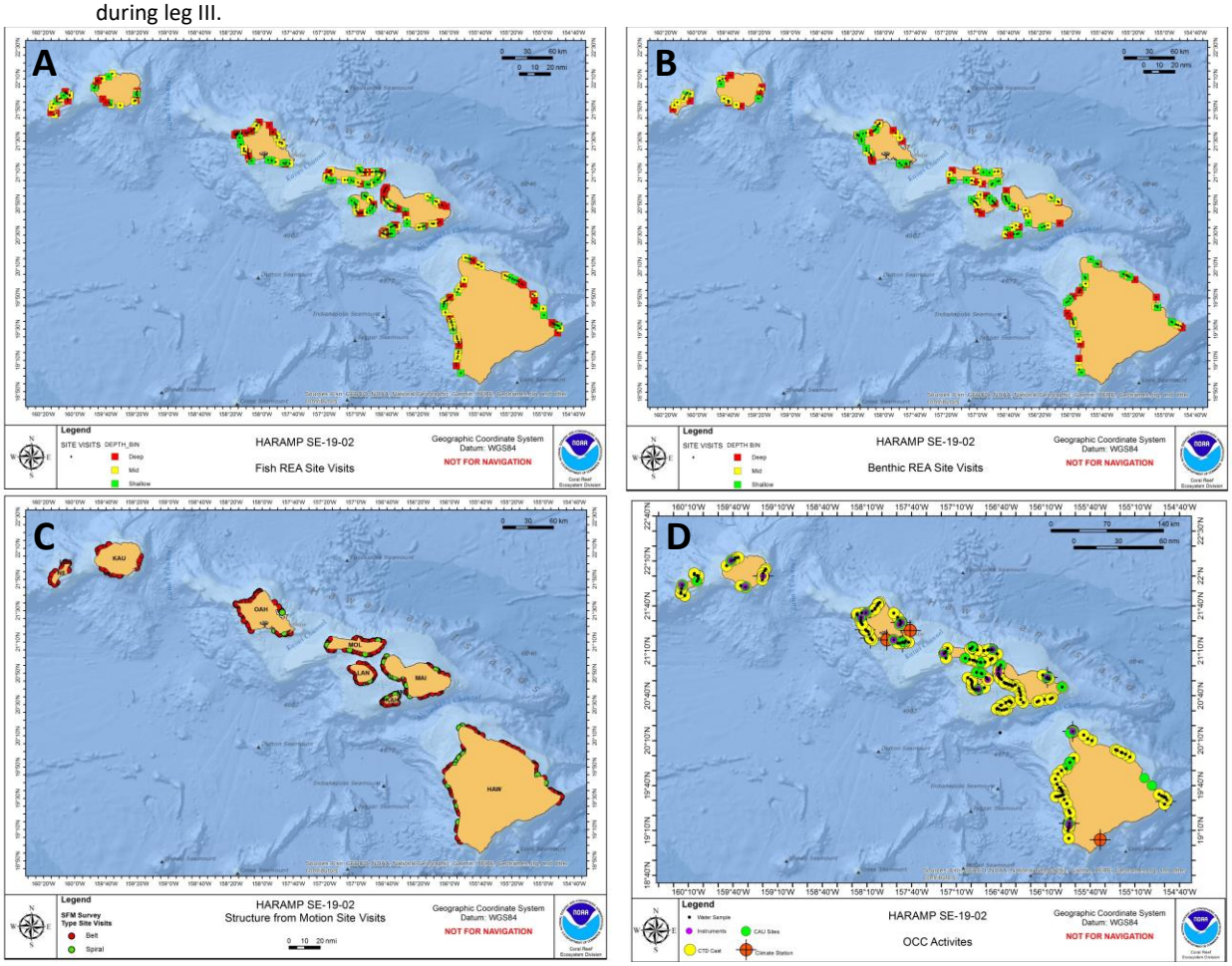


**Figure 2. Survey outputs from A) Fish SPC; B) Benthic REA; C) Structure-for-Motion; and D.) OCC teams.**

**Kahoolawe**

**Fish**

- 3-4 gray reef sharks, *Carcharhinus amblyrhynchos*, that returned several times into the transect area, we seen along the south coast of Kahoolawe. Large schools of the sleek unicornfish *Naso hexacanthus* were also noted.
- Overall fish biomass at Kahoolawe was higher than all other islands assessed. Kahoolawe and Niihau consistently recorded larger fish (20 – 50 cm, 50+ cm), along with higher numbers of piscivores (Figure 3).
- There were no sightings of unexploded ordinance (UXO) by SPC divers.

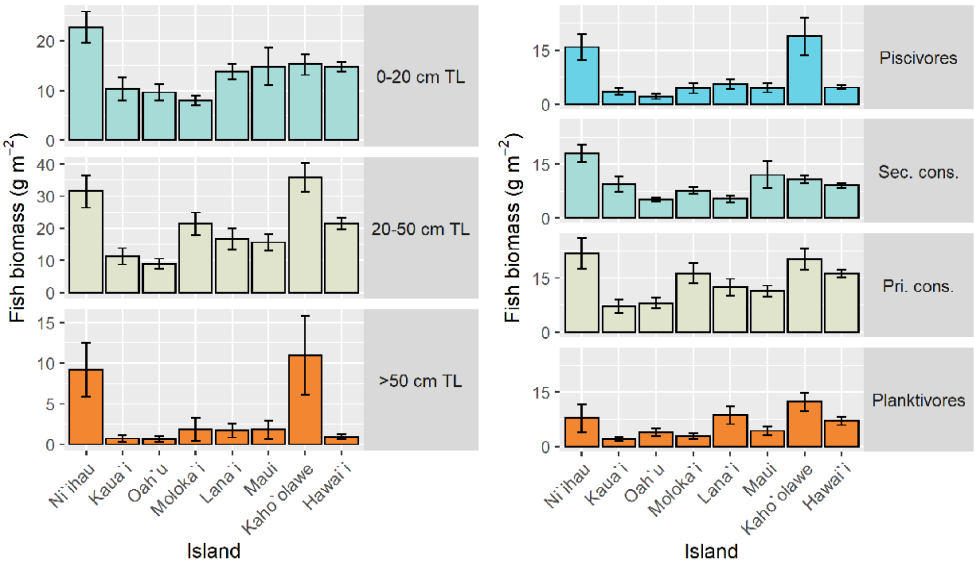


**Figure 3. Reef fish biomass depicted across the MHI, as delineated by A) size class, and B) functional group.**

**Benthic**

- Reefs vary in the two main areas surveyed around the island, with reefs off north Kahoolawe having the most structurally complex and communities. Divers noted the presence of high levels of coral cover along the northwestern coast, being largely dominated by *Montipora* and *Porites* species (Figure 4). The east windward exhibited primarily boulder habitat with both low coral cover and colony density.
- UXO was not detected by benthic divers.

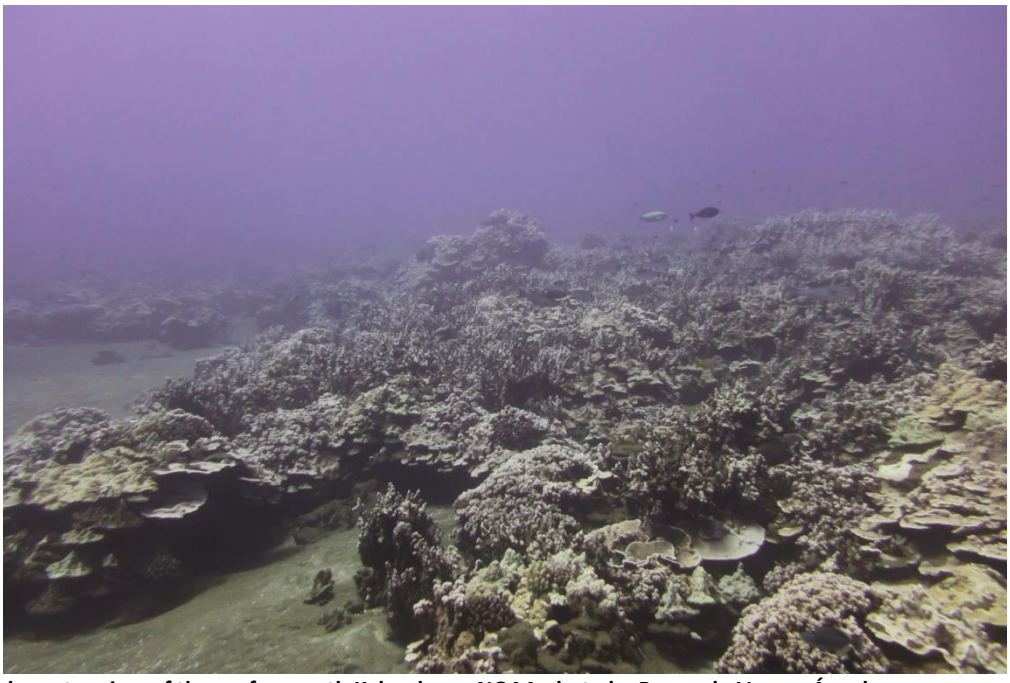

**Figure 4. Underwater view of the reef on north Kahoolawe. NOAA photo by Bernardo Vargas-Ángel.**

**OCC**

- No instrumentation were deployed or retrieved around Kahoolawe, as the OCC team was primarily tasked with collecting CTD/carbonate chemistry samples around the perimeter of the island.

**Maui**

**Fish**

- The sighting of Randall's puffer *Torquigener randalli* off NE Maui represents a new sighting record for ESD.
- Many of the primary, randomized SPC sites surrounding the perimeter of Maalaea Bay (Kihei area) were unsuitable for surveys (primarily sand flat habitats/*Halimeda* beds). While alternative survey sites were available, future surveys in the area would benefit from updated hard-bottom multibeam derivative maps.

**Benthic**

- Divers were able to survey the southeastern coast of Maui, which has been historically challenging to access due to surface conditions present along the Alenuihaha Channel. Divers noted coral communities bearing a strong resemblance to comparable communities along the Kona Coast of Hawaii.

**OCC**

- Divers noted standard operations, with no immediate highlights.

**Molokai**

**Fish**

- A single Galapagos shark, *Carcharhinus galapagensis*, was recorded off of west Molokai. In general, reef shark sightings remained uncommon during HARAMP 2019, which is consistent with previous RAMP cruises in the Main Hawaiian Islands.

**Benthic**

- Southern coastlines were typified by aggregate reef environs consisting largely of *Montipora* colonies. Despite the impacts from the 2016 bleaching event, the reef on south Molokai continues to be among the most coral rich and complex reef systems state-wide.
- In contrast, the northern coastline, which consisted primarily of rock and boulder habitats, had low coral cover and colony density, which is consistent with previous studies.

**OCC**

The OCC team encountered seven scalloped hammerhead sharks (*Sphyrna lewini*) off the NE Molokai coast (Figure 5).

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**Figure 5. School of scalloped hammerheads (Sphyrna lewini) sighed off of NE Molokai. Photograph by Noah Pomeroy.**

**Lanai**

**Fish**

- *Thalassoma quinquevittatum* was spotted off of west Lanai. While very common in other parts of the pacific this species has only been sighted in Hawaii a handful of times by ESD divers.

**Benthic**

- The benthic team recorded *Psammocora obstusangula* at two different sites (two sightings total). *P. obstusangula* is a rare shallow water coral that we found at depths ranging from 21 to 36 ft.
- Along East Lanai, the benthic team encountered well-developed reefs and recorded the early signs of what would likely be mass bleaching at the 6 sites that were surveyed. Bleaching varied along the coastline as well as depth and we estimate that 10-20% were partially bleached (surveys conducted on July 10$^{th}$). At the time of the surveys colonies were not fully bleached and *Montipora apitate*, *Montipora patula*, and *Pocillopora meandrina* were the only affected taxa. We recorded bleaching down to70', and noted that it was more severe at 70' vs. 12'.
- Along West Lanai, the benthic team recorded signs of 2015 bleaching as well as sediment-related mortality across species and depths. However, this coastline showed considerable potential for coral community recovery with 20-50 juveniles/m$^2$ at many of the sites from 20 – 60' in depth.

**OCC**

- The OCC team was contacted by PacIOOS personnel regarding an EMM-68 buoy that was lost off the coast of the Big Island during Hurricane Lane, and was sighted along the northern coastline of Lanai. A dedicated search by the OCC team was unable to locate the buoy.

**Hawaii (Big Island)**

**Fish**

- New ESD sighting of the dusky driftfish juvenile, *Psenes arafurensis*, a normally pelagic species, at a site on the Hamakua coast with the jellyfish *Cephea cephea*, its commensal.
- A 4.5m whale shark (*Rhincodon typus*) was spotted by the fish team off of south Kona (Figure 6).
- A fish team diver spotted a school of 6 *Sectator ocyurus* (Bluestripe Chub) off of Puna. These occasionally show up to Hawaii in waves and have never been recorded in during HARAMP by ESD divers.
- Fish divers surveyed two sites in the area of new lava flow off of Puna. While the substrate consisted of almost entirely bare basalt the fish biomass was relatively high and all of the most common fish families were represented.

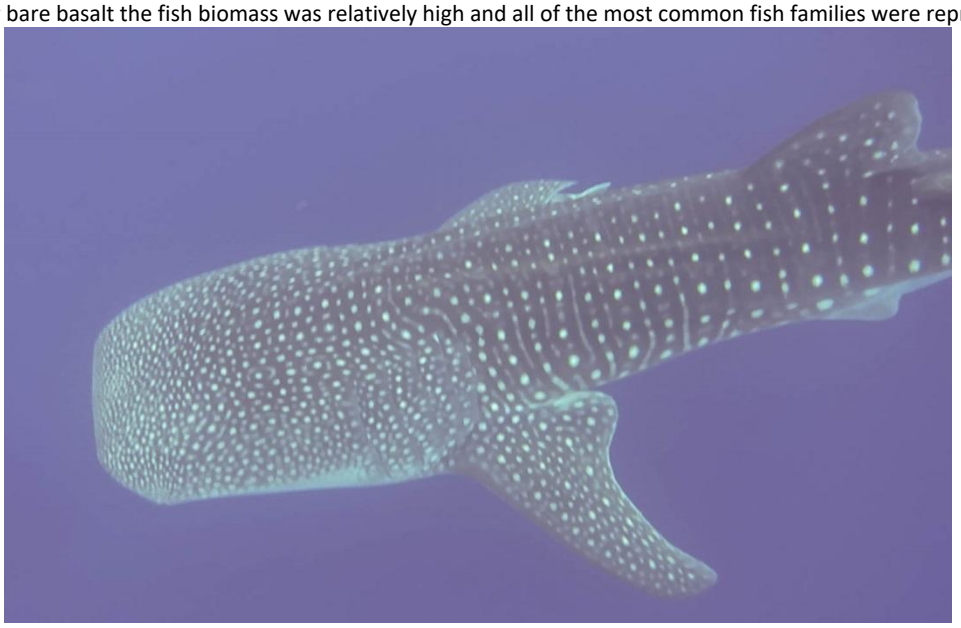

**Figure 6. Whaleshark (Rhincodon typus) spotted by a SPC fish team diver. Photograph by Tate Wester.**

**Benthic**

- Benthic scientists reported the sighting of the scleractinian coral *Cycloseris mokai* (Hoeksema 1989). The coral was found in at approximately 22 m of water, off the west coast of the Island of Hawaii (Figure 7). This sighting is significant because it expands the geographical range extension of the species from the Coral Triangle and Micronesia into the central Pacific.

**Figure 7. The scleractinian coral Cycloseris mokai sighted off of Hawaii (Big Island).**

- The Kona coast experienced severe and widespread bleaching in 2015 that resulted in partial and complete mortality across taxa. Consistent with data from Hawaii's Division of Aquatic resources, the benthic team reported very few live adult *Pocillopora meandrina* and *Porites lutea* colonies along the coast. Patterns of mortality and signs of recovery remain highly varied along the coast. In some regions of South Kohala and North Kona (especially around Kailua-Kona), there has been continued decline in coral cover and increased bioerosion. This increased fragility of the reef has been also noted by West Hawaii partners. Coral juvenile density is also low across much of the Kona coast with the exception of regions of South Kona.
- The Hamakua coastline, which consisted primarily of rock and boulder habitats, had low coral cover and colony density, which is consistent with previous studies along this coastline.
- The Puna district also consisted primarily of rock and boulder habitats and clearly experienced mortality of *P.meandrina* similar to other areas of Hawaii Island. However, unlike the Kona coastline we observed a higher number of adult *P.meandrina* colonies that survived the bleaching event as well as high juvenile density.
- Overall, while divers did observe some bleaching in *Montipora capitata*, bleaching prevalence across Hawaii Island appeared to be low at the time of these surveys.

**OCC**

- Temperature time series from recovered STRs in north and west Hawaii showed that temperatures were already quite warm (~28C; Figure8). The MHI had not yet reached the warmest months of the year, and it was projected that temperatures would continue to rise above bleaching thresholds through October/November 2019.

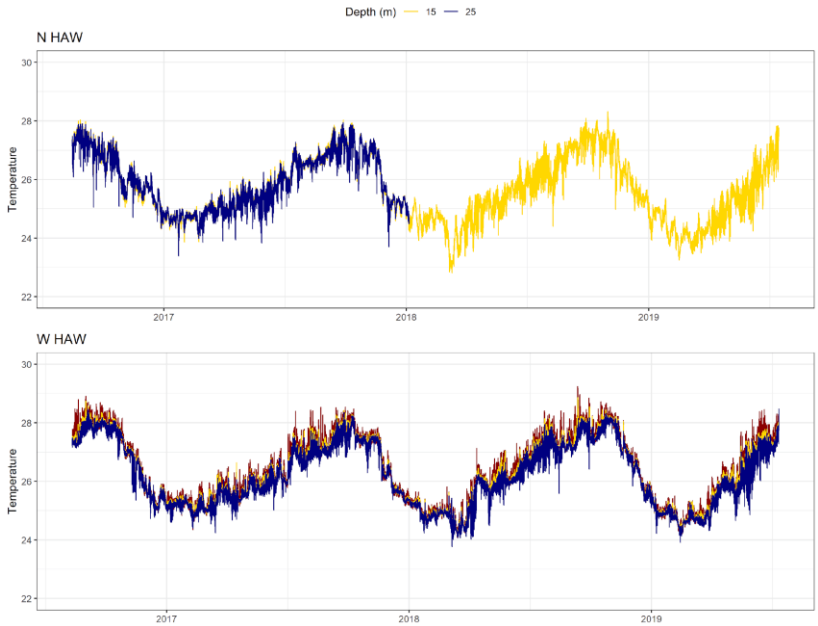


**Figure 8. STR temperature time series from north and west Big Island (Hawaii).**

- CAUs recovered from north and west Hawaii recorded very little crustose coralline algae accretion or coral recruitment. This is typical for the region, where calcium carbonate accretion rates tend to be among the lowest measured in the Pacific.
- Due to unfavorable weather conditions along the SE Big Island coastline, the OCC team was unable to recover 2 STRs, 5 CAUs, and 5 BMUs. Exclusion of this sector also resulted in the loss of one SfM spiral survey and two+ CTD/DIC water samples. In addition, all OCC instrumentation deployed in the Puna/Pahoa area (2 STRs, 5 CAUs, 5 BMUs) was lost due to the 2018 Kilauea rift zone eruption.

**Kauai/Niihau**

**Fish**

- Fish biomass at Kauai, although higher than Oahu was generally low in comparison to other of the MHI, which may be related to largely poor habitat quality. The highest biomass seen around Kauai tended to be in mid and deep forereef areas in the Napali sector.
- One SPC diver pair encountered the remains of a shipwreck (22.02642N 159.33347W) proximal to an SPC site off eastern Kauai, in about 30-ft right off the golf course. This was identified as the freighter Andrea F. Luckenbach, which was lost 1951.
- Niihau had highest biomass of any island surveyed, including being higher than Kahoolawe. Although piscivores biomass was slightly higher at Kahoolawe than Niihau, the total biomass at Niihau was higher due to high abundance of parrotfishes and snappers, including highest numbers of uku (*Aprion virescens*) seen at any of the MHI.
- A school of ~ 70 *Scarus rubroviolaceus* (parrotfishes) were observed at a deep forereef site (NII-01855).

**Benthic**

- Coral cover and general species diversity around Niihau remained generally low island-wide, which remained consistent within historic norms.

**OCC**

- Instrument retrieval success was low around the islands of Kauai and Niihau due to high energy events likely resulting from large winter North-Northwest swells.

**Oahu**

**Fish**

- Overall, Oahu biomass was lowest of the MHI (32.1 ± 4.1 g/m$^2$; in contrast Lanai, Maui, Big Island biomass was ~50gm$^2$; and Kahoolawe and Niihau were 80-90gm$^2$).
- One notable standout site around Oahu was site OAH-291 (Portlock area, Lanai Lookout), which had abundant fishes of multiple groups, including several jacks, uku (*Aprion virescens*), along with large groups of planktivores. A monk seal (*Neomonachus schauinslandi*) was also observed during this survey and recorded in the SPC cylinders.

**OCC**

- Instrument retrieval success was low around Oahu due to high energy events likely occurring as a byproduct from large winter North-Northwest swells (Figure 9).

**Figure 9. Strewn, 70 lb. OCC lead anchor bars, NW Oahu – Mokuleia.**

**Table 1. Summary statistics for SE-19-02 for the main Hawaiian Islands. Totals for scuba dives include all dives carried out for all activities at each island.**

| Research Activity | LAN | MAI | HAW | KAU | NII | OAH | MOL | KAH |
|---|---|---|---|---|---|---|---|---|
| SCUBA DIVES | 120 | 179 | 343 | 99 | 80 | 199 | 168 | 65 |
| BENTHIC-REA-SITES | 20 | 28 | 49 | 15 | 9 | 36 | 21 | 10 |
| FISH-REA-SITES | 27 | 42 | 73 | 22 | 17 | 50 | 40 | 20 |
| CAUS DEPLOYED | 5 | 10 | 10 | 10 | 10 | 15 | 25 | 0 |
| CAUS RECOVERED | 14 | 13 | 30 | 8 | 9 | 13 | 19 | 0 |
| BMUS DEPLOYED | 0 | 0 | 10 | 0 | 0 | 15 | 0 | 0 |
| BMUS RECOVERED | 0 | 0 | 13 | 0 | 0 | 9 | 0 | 0 |
| Shallow-water CTD Casts | 20 | 39 | 49 | 12 | 11 | 35 | 28 | 14 |
| Shallow-water Water Samples | 21 | 40 | 69 | 12 | 12 | 37 | 28 | 15 |
| STR Deployment | 3 | 4 | 7 | 10 | 1 | 14 | 7 | 0 |

| Research Activity | LAN | MAI | HAW | KAU | NII | OAH | MOL | KAH |
|---|---|---|---|---|---|---|---|---|
| STR Recovered | 2 | 5 | 5 | 6 | 1 | 10 | 5 | 0 |
| ADP Deployment | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| PAR Deployment | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| PH Deployment | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| ADP Recovered | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| PAR Recovered | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| PH Recovered | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |

### *6. Data Streams*

The following data and samples were collected during this expedition:

**Climate Change and Ocean Acidification**
*Oceanographic Instrumentation and Biological Installations*

- Seawater temperature
- $CaCO_3$ deposition rates by collection of calcifying organisms from retrieved CAUs
- Bioerosion rates from retrieved BMUs

*Nearshore Oceanography from Small Boats*

- Shallow-water CTD profiles to depth < 30 m
- Water samples for dissolved inorganic carbon (DIC) and total alkalinity (TA) collected in concert with shallow-water CTD casts

*Shipboard Oceanography*

- Transects of profiles of ocean current velocity and direction collected using a shipboard ADCP

**Biological Monitoring**
*Benthic REA surveys:*

- Digital still photographs of overall site character and typical benthos
- Digital still photographs of the benthos along transect lines
- Digital still photographs of the benthos covering a 18 m x 2 m plot at select sites
- Number, species or genus, size, and condition (% mortality, disease, bleaching) of all coral colonies observed within belt transects of known area
- Digital still photographs of diseased corals and coralline algae

*Fish REA surveys:*

- Number, species, and estimated sizes of all fishes observed within visually estimated 7.5 m radius, stationary-point-count surveys

**Photomosaics**
*Benthic Photomosaics (randomized sites):*

- Digital photographs of the benthos covering 13 – 20 m belt transects at randomized benthic REA and fish SPC sites.

*Benthic Photomosaics (climate stations):*

- Digital photographs of the benthos covering a 12-m diameter circle at fixed climate stations

*Scientific personnel*

**Table 2. MHI HARAMP leg I staffing list. JIMAR: Joint Institute for Marine and Atmospheric Science; ESD: Ecosystem Sciences Division; TNC: The Nature Conservancy; DLNR DAR: Department of Land and Natural Resources, Division of Aquatic Resources; NDC: NOAA Diving Center.**

| Name (Last, First) | Title | Gender | Affiliation | Nationality |
|---|---|---|---|---|
| Asher, Jacob | Fish Diver/Chief Scientist | Male | JIMAR | US |
| Gray, Andrew | Fish Diver | Male | JIMAR | US |
| Ayotte, Paula | Fish Diver | Female | JIMAR | US |
| McCoy, Kaylyn | Fish Diver/Team Lead | Female | JIMAR | US |
| Wester, Tate | Instrumentation Diver | Male | JIMAR | US |
| Rose, Julia | Fish Diver | Female | TNC | US |
| Sanderlin, Nikki | Fish Diver | Female | DLNR DAR | US |
| Vargas-Angel Bernardo | Benthic Diver/Team Lead | Male | JIMAR | US |
| Suka, Rhonda | Benthic Diver | Female | JIMAR | US |
| Oliver, Thomas | Benthic Diver | Male | NOAA ESD | US |
| Garriques, Joao | Operations Lead/Benthic Diver | Male | JIMAR | US |
| Pomeroy, Noah | Instrumentation Diver/Team Lead | Male | JIMAR | US |
| Halperin, Ariel | Instrumentation Diver | Male | JIMAR | US |
| O'Brien, Kevin | Instrumentation Diver | Male | JIMAR | US |
| Wester, Tate | Instrumentation Diver | Male | JIMAR | US |
| Olenski, Brooke | Data Manager (Training) | Female | JIMAR | US |
| Akridge, Michael | Data Manager | Male | JIMAR | US |
| Zach Hileman | Chamber Operator | Male | NDC | US |

**Table 3. MHI HARAMP leg II staffing list. JIMAR: Joint Institute for Marine and Atmospheric Science; ESD: Ecosystem Sciences Division; SOD: Science Operations Division; QUEST: University of Hawaii Quantitative Underwater Ecological Surveying Techniques Program; NDC: NOAA Diving Center.**

| Name (Last, First) | Title | Gender | Affiliation | Nationality |
|---|---|---|---|---|
| Asher, Jacob | Fish Diver/Chief Scientist | Male | JIMAR | US |
| Gray, Andrew | Fish Diver/Team Lead | Male | JIMAR | US |
| Kindinger, Tye | Fish Diver | Female | JIMAR | US |
| Wester, Tate | Fish Diver | Male | JIMAR | US |
| Runyan, Alexa | Fish Diver | Female | QUEST | US |
| Williams, Taylor | Fish Diver | Female | QUEST | US |
| Asbury, Mollie | Benthic Diver | Female | NOAA ESD | US |
| Vargas-Angel Bernardo | Benthic Diver | Male | JIMAR | US |
| Suka, Rhonda | Benthic Diver | Female | JIMAR | US |
| Winston, Morgan | Benthic Diver | Female | JIMAR | US |
| Couch, Courtney | Benthic Diver/Team Lead | Female | JIMAR | US |
| Barkley, Hannah | Instrumentation Diver/Team Lead | Female | JIMAR | US |
| Halperin, Ariel | Instrumentation Diver | Male | JIMAR | US |
| Garriques, Joao | Operations Lead/Instrumentation Diver | Male | JIMAR | US |
| Rock, Laura | Instrumentation Diver | Female | NOAA SOD; NOAA Corps | US |
| Olenski, Brooke | Data Manager | Female | JIMAR | US |
| Mahaffey, Katie | Chamber Operator | Female | NDC | US |
| Keller, Jess | Chamber Operator | Female | NDC | US |

**Table 4. . MHI HARAMP Leg III Staffing list. JIMAR: Joint Institute for Marine and Atmospheric Science; ESD: Ecosystem Sciences Division; SOD: Science Operations Division; QUEST: University of Hawaii Quantitative Underwater Ecological Surveying Techniques Program; PIRO: Pacific Islands Regional Office; UH GA: University of Hawaii Graduate Assistant; DLNR DAR: Department of Land and Natural Resources, Division of Aquatic Resources; NDC: NOAA Diving Center.**

| Name (Last, First) | Title | Gender | Affiliation | Nationality |
|---|---|---|---|---|
| Asher, Jacob | Fish Diver/Chief Scientist | Male | JIMAR | US |
| Wester, Tate | Fish Diver/Team Lead | Male | JIMAR | US |
| Boland, Raymond | Fish Diver | Male | NOAA ESD | US |
| Weible, Rebecca | Fish Diver | Female | UH GA | US |
| Fuller, Kimberly | Fish Diver | Female | DLNR DAR | US |
| Rock, Laura | Fish Diver | Female | NOAA SOD; NOAA Corps | US |
| Lamirand, Mia | Fish Diver | Female | QUEST | US |
| Moribe, Joel | Fish Diver | TBD | NOAA PIRO | US |
| Suka, Rhonda | Benthic Diver | Female | JIMAR | US |
| Winston, Morgan | Benthic Diver/Team Lead | Female | JIMAR | US |
| Asbury, Mollie | Benthic Diver | Female | NOAA ESD | US |
| Huntington, Brittany | Benthic Diver | Female | JIMAR | US |
| Knor, Lucie | Instrumentation Diver | Female | UH GA | Germany |
| Halperin, Ariel | Instrumentation Diver/Team Lead | Male | JIMAR | US |
| Garriques, Joao | Instrumentation Diver | Male | JIMAR | US |
| Pomeroy, Noah | Instrumentation Diver | Male | JIMAR | US |
| Olenski, Brooke | Data Manager | Female | JIMAR | US |
| Keller, Jess | Chamber Operator | Female | NDC | US |

Submitted by: ASHER.JACOB.MARCUS. Digitally signed by ASHER.JACOB.MARCUS.. Date: 2019.11.29 14:54:51 -10'00'

Jacob Asher
Chief Scientist
HARAMP POC, 2019

Approved by: SEKI.MICHAEL.PAUL YUKIO. Digitally signed by SEKI.MICHAEL.PAUL YUKIO. Date: 2019.12.23 16:00:35 -10'00'

Michael P. Seki, PhD
Science Director
Pacific Islands Fisheries Science Center

***Appendices***

***Appendix A. Methods***

This appendix describes the methods and procedures used by the ESD during its Pacific RAMP cruise SE-18-02 (Legs I – III) aboard the NOAA Ship *Oscar Elton Sette*.

A.1. Biological monitoring: underwater visual censuses

*A.1.1. Benthic composition and coral demographics*
A one-stage stratified random sampling design was employed to survey Rapid Ecological Assessment (REA) sites. The survey domain encompassed reef and hard bottom habitat, and was divided into strata based upon depth. Depth categories of shallow (0–6 m), mid (> 6–18 m) and deep (> 18–30 m) were also incorporated into the stratification scheme. Allocation of sampling effort was proportional to strata area. Sites were randomly selected within each stratum.

Surveys at each site were conducted within two, 18-m belt transects. Adult coral colonies (≥ 5 cm) were surveyed within four segments that were 1.0-m wide by 2.5-m long. Along the transect tape the segments were located at 0 – 2.5 m, 5.0 – 7.5m, 10 – 12.5 m, and 15 – 17.5 m. All colonies whose center fell within 0.5 m on either side of each transect line were identified to lowest taxonomic level possible (species or genus), measured for size (maximum diameter to nearest cm), and morphology was noted. In addition, partial mortality and condition of each colony was assessed. Partial mortality was estimated as percent of the colony in terms of 'old dead' and 'recent dead' and the cause of recent mortality was identified if possible. The condition of each colony, including disease and bleaching, was noted along with the extent (percent of colony affected) and severity (semi-quantitative scale from mild to acute).

Juvenile coral colonies (< 5 cm) were surveyed within three segments along the same two transects. Juvenile segments were 1.0-m wide by 1.0-m long, and were located within the segments used for adults at 0–1.0 m, 5.0–6.0 m, and 10.0–11.0 m (covering 3 $m^2$ per transect). Juvenile colonies were distinguished in the field by a distinct tissue and skeletal boundary (not a fragment of larger colony). Each juvenile colony was identified to lowest taxonomic level (genus or species) and measured for size by recording both the maximum and perpendicular diameter to the nearest 2 mm.

Still photographs were collected to record the benthic community composition at predetermined points along the same 2 transect lines with a high-resolution digital camera mounted on a pole. Photographs were taken every 1 m from the 1 m to the 15-m mark. This work generated 30 photographs per site, which are later analyzed by ESD staff and partners using the computer program CoralNet. This analysis is the basis for estimating benthic cover and composition at each site (benthic habitat photographs at sites surveyed by the fish team are also analyzed using CoralNet).

*A.1.2. Surveys of Reef Fishes*
Divers conducted fish REA surveys using the stationary-point-count (SPC) method at preselected REA sites. All fish REA sites visited were selected using a stratified random sampling design in shallow (0–6 m), mid (6–18 m), or deep (18–30 m) depth strata, in the forereef habitat strata. Surveys were performed using a 30-m transect line set along a single depth contour. The REA sites selected for fish surveys typically differ in location from the REA sites where benthic surveys were conducted.
Each fish REA site consists of a team of two divers conducting two adjacent and simultaneous SPC surveys. Once a transect line was deployed, the 2 divers moved to the 7.5-m and 22.5-m marks on this transect line to start their SPC surveys.

Each of these marks or points, with 1 diver at each, served as the center of a visually estimated cylindrical survey area with a radius of 7.5 m. During the first 5 min, divers created a list of all fish species found within their cylinder. Afterwards, divers went down their respective species lists, which were created from their work during the initial 5 min of a survey, sizing and counting all individuals within their cylinder, one species at a time. Cryptic species missed during the initial 5 min of a survey could still be counted, sized, and added to the original species list. Fish species observed at a REA site but not recorded during the SPCs were recorded for presence data.

After a survey was completed, divers recorded benthic habitat information within their respective cylindrical survey areas. Divers visually estimated habitat complexity, habitat type, and percentage of cover for hard corals, macroalgae, crustose coralline red algae, turf algae, and sand. Urchin densities were also estimated. Every meter along the transect line still photographs were taken of the benthos to the right side of the line. This work generates 30 photographs per site, which are analyzed later using CoralNet to estimate the benthic cover and composition at each site.

A.2. Moored Instrumentation

ESD conducts long-term oceanographic assessment and monitoring through the deployment and incorporate a variety of installations that record *in-situ* measurements or facilitate biological recruitment/growth on fabricated structures. The following types of oceanographic instruments and biological installations were retrieved or deployed during this cruise.

*A.2.1. Calcification Accretion Units (CAUs)*

These are paired 10 cm x 10 cm PVC plates mounted on stainless steel stakes installed into the reef substrate, which allow for spatial and temporal evaluation of coral reef net calcification and productivity. These analyses are made by measuring the settlement of sessile organisms including stony corals, crustose coralline algae, and macroalgae.

*A.2.2. Bioerosion Monitoring Units (BMU)*

These are calcium carbonate blocks (5 cm x 2 cm x 1 cm) attached to each installed CAU that measure bioerosion rates. The total number of blocks at each island will not exceed 25. These blocks act as settling substrate for bioeroding organisms.

*A.2.3. Subsurface Temperature Recorder (STR)*

These instruments provide high-resolution temperature data (SBE 56 or RBR solo$^3$). STRs are deployed at depths of 0.5–35 m and record temperature every 5 minutes. All loggers retrieved were SBE 56s; loggers deployed were a mix of SBE 56 and RBR solo$^3$ sensors. Paired SBE 56 and RBR solo$^3$ loggers were deployed at all 15m sites.

A.3. Oceanographic Surveys

Water samples are collected at reef study sites to assess total alkalinity (TA) and dissolved inorganic carbon (DIC). Conductivity, temperature and depth (CTD) casts are completed concurrently with water sample collection. At select locations, a special investigation known as a "Diurnal Suite" is conducted, and includes autonomous water samples and a variety of instruments that collect samples over a multi-day period to quantify the diel carbonate chemistry cycle on the reef.

*A.3.1. Hydrographic Surveys*

Paired CTD casts and carbonate chemistry water sampling were conducted from the small boats (nearshore) using the following sampling techniques and equipment.

Conductivity, Temperature, and Depth Casts: a CTD profiler (RBR concerto$^3$) deployed from a small boat or ship provides water column data on temperature, conductivity (used to calculate salinity), and pressure (used to calculate depth). The CTD is lowered by hand at descent rates of ~ 0.5–0.75 m/s to depths up to 30 m. Nearshore CTD profiles are collected at all climate sites and, opportunistically, at random sites. Offshore casts are conducted >15nm from land.

Water Chemistry: Surface seawater samples are collected at 1-m depth using a 5-L Niskin bottle, stored in 500-mL glass bottles, and poisoned with saturated mercuric chloride. Samples are analyzed for dissolved inorganic carbon (DIC) and total alkalinity (TA) at the NOAA Pacific Marine Environmental Laboratory (PMEL). Full carbon system chemistry—including pH and aragonite saturation state ($\Omega_{ar}$)—is calculated from TA and DIC using temperature and salinity values from paired CTD casts.

Ship-based ADCP surveys were also conducted to provide information on current speed and direction to all field teams prior to initiating operations.

A.4. Photogrammetry

*A.4.0. Benthic photomosaics (benthic REA/fish SPC sites)*

Photomosaic imagery was collected at a subset of randomized benthic REA and fish SPC sites. To obtain continuous coverage of the reef floor within a plot, divers operating a single Canon SL2 took a series of overlapping imagery within 13 – 20 m belt transects, maintaining a distance of 1 m off the benthic substrate and approximately 1 m to either side of the transect. Divers completed between 4 – 6 overlapping passes or reciprocal "laps" along the transect (dependent on environmental conditions, time available for benthic surveys), collecting imagery in both directions.

*A.4.1. Benthic photomosaics (Climate stations)*

Photomosaic imagery was collected at a subset of 15 m fixed climate sites that were previously surveyed on prior missions. To obtain continuous coverage of the reef floor within a plot, divers operating a single Canon SL2 took a series of overlapping imagery within a 12m diameter cylinder maintaining a distance of 1m off the substrate. The divers swam in a spiral pattern around a stationary central drum, collecting imagery in both directions.

A. 5. Data Management

Data Management operations are conducted using laptops connecting to a Microsoft Server running an Oracle database which also provides file management and backup services. Once data is collected in the field, photos and videos are copied to the file server, while Fish and Benthic observations and partner field data is entered nightly into an in-house Mission Application built with Application Express (APEX) which interfaces with the Oracle database. Oceanography data is tracked currently using a Microsoft Access database.

*Appendix B. Data Streams*

**Table 5. Summary of sites where benthic StRS belt transect surveys were conducted. Island abbreviations are: Hawaii (HAW; Big Island), Kahoolawe (KAH), Lanai (LAN), Maui (MAI), Molokai (MOL), Oahu (OAH), Kauai (KAU), and Niihau (NII).**

| Site | Depth bin | Reef zone | Depth (feet) | Latitude | Longitude | Photos taken |
|---|---|---|---|---|---|---|
| MAI-2664 | Deep | Forereef | 61 | 20.629946 | -156.111358 | Yes |
| MAI-2706 | Mid | Forereef | 54 | 20.626842 | -156.117587 | Yes |
| MAI-2709 | Shallow | Forereef | 20 | 20.593114 | -156.279849 | Yes |
| MAI-2666 | Deep | Forereef | 64 | 20.593871 | -156.272201 | Yes |
| MAI-2686 | Shallow | Forereef | 19 | 20.582409 | -156.305525 | Yes |
| MAI-2685 | Mid | Forereef | 53 | 20.606902 | -156.241445 | Yes |
| OAH-3288 | Shallow | Forereef | 19 | 21.249555 | -157.808296 | Yes |
| OAH-3292 | Shallow | Forereef | 15 | 21.27008 | -157.8273 | Yes |
| OAH-3301 | Shallow | Forereef | 16 | 21.269619 | -157.757898 | Yes |
| OAH-3265 | Mid | Forereef | 54 | 21.256857 | -157.762622 | Yes |
| OAH-3259 | Deep | Forereef | 78 | 21.252589 | -157.750743 | Yes |
| OAH-3284 | Shallow | Forereef | 21 | 21.267457 | -157.829619 | Yes |
| OAH-3088 | Deep | Forereef | 77 | 21.618522 | -157.89518 | Yes |
| OAH-3078 | Deep | Forereef | 75 | 21.50332 | -157.796254 | Yes |
| OAH-3087 | Mid | Forereef | 48 | 21.585349 | -157.865782 | Yes |
| OAH-3084 | Mid | Forereef | 45 | 21.538795 | -157.823184 | Yes |
| OAH-3243 | Shallow | Forereef | 16 | 21.62903 | -158.077318 | Yes |
| OAH-3242 | Shallow | Forereef | 13 | 21.617556 | -158.091785 | Yes |
| OAH-3234 | Mid | Forereef | 28 | 21.684098 | -158.042318 | Yes |
| OAH-3233 | Mid | Forereef | 27 | 21.656095 | -158.063551 | Yes |
| OAH-3232 | Mid | Forereef | 27 | 21.633314 | -158.079568 | Yes |
| OAH-3110 | Deep | Forereef | 73 | 21.67636 | -158.059481 | Yes |
| OAH-3112 | Deep | Forereef | 77 | 21.695809 | -158.038111 | Yes |
| OAH-4002 | Shallow | Forereef | 20 | 21.502444 | -158.232263 | Yes |
| OAH-3065 | Shallow | Forereef | 22 | 21.561565 | -158.260918 | Yes |
| OAH-3052 | Mid | Forereef | 31 | 21.570787 | -158.277027 | Yes |
| OAH-3043 | Deep | Forereef | 98 | 21.56665 | -158.281518 | Yes |
| OAH-4000 | Deep | Forereef | 65 | 21.559305 | -158.264141 | Yes |
| OAH-4001 | Shallow | Forereef | 10 | 21.570429 | -158.272413 | Yes |
| OAH-3279 | Mid | Forereef | 47 | 21.523808 | -158.23403 | Yes |
| OAH-3051 | Shallow | Forereef | 19 | 21.58246 | -158.218192 | Yes |
| OAH-3057 | Mid | Forereef | 46 | 21.591253 | -158.184679 | Yes |
| OAH-3122 | Deep | Forereef | 64 | 21.592143 | -158.146568 | Yes |
| OAH-3235 | Mid | Forereef | 27 | 21.60814 | -158.108096 | No |
| OAH-3235 | Mid | Forereef | 27 | 21.60814 | -158.108096 | Yes |
| OAH-3267 | Mid | Forereef | 30 | 21.36308 | -158.13631 | Yes |
| OAH-3000 | Mid | Forereef | 32 | 21.380155 | -158.152649 | Yes |
| OAH-3272 | Mid | Forereef | 25 | 21.32858 | -158.1273 | Yes |
| OAH-3282 | Mid | Forereef | 34 | 21.3991 | -158.180481 | Yes |

| Site | Depth bin | Reef zone | Depth (feet) | Latitude | Longitude | Photos taken |
|---|---|---|---|---|---|---|
| OAH-3286 | Shallow | Forereef | 12 | 21.350555 | -158.130857 | Yes |
| OAH-3293 | Deep | Forereef | 72 | 21.306927 | -158.126354 | Yes |
| OAH-3296 | Shallow | Forereef | 20 | 21.427689 | -158.183038 | Yes |
| OAH-3262 | Deep | Forereef | 72 | 21.287911 | -158.114198 | Yes |
| LAN-1785 | Shallow | Forereef | 21 | 20.897379 | -156.868382 | Yes |
| LAN-1789 | Mid | Forereef | 28 | 20.932909 | -156.961339 | Yes |
| LAN-1783 | Mid | Forereef | 36 | 20.923624 | -156.923681 | Yes |
| LAN-1767 | Deep | Forereef | 65 | 20.922491 | -156.896249 | Yes |
| KAU-2100 | Deep | Forereef | 88 | 22.076976 | -159.297917 | Yes |
| KAU-2113 | Shallow | Forereef | 14 | 21.956434 | -159.337983 | Yes |
| KAU-2118 | Deep | Forereef | 71 | 22.002109 | -159.32247 | Yes |
| KAU-2133 | Mid | Forereef | 59 | 22.040952 | -159.311087 | Yes |
| KAU-2160 | Mid | Forereef | 52 | 22.146988 | -159.750268 | Yes |
| KAU-2164 | Mid | Forereef | 49 | 22.163459 | -159.72309 | Yes |
| KAU-2146 | Deep | Forereef | 70 | 22.171172 | -159.692323 | Yes |
| KAU-2145 | Deep | Forereef | 90 | 22.203572 | -159.634819 | Yes |
| KAU-2166 | Shallow | Forereef | 13 | 22.11205 | -159.73892 | No |
| KAU-2166 | Shallow | Forereef | 13 | 22.11205 | -159.73892 | Yes |
| NII-2572 | Deep | Forereef | 80 | 21.842666 | -160.251839 | Yes |
| NII-2580 | Mid | Forereef | 40 | 21.951717 | -160.137183 | Yes |
| NII-2584 | Mid | Forereef | 34 | 21.884451 | -160.236959 | No |
| NII-2584 | Mid | Forereef | 34 | 21.884451 | -160.236959 | Yes |
| NII-2583 | Mid | Forereef | 38 | 21.915757 | -160.205899 | Yes |
| NII-2504 | Deep | Forereef | 77 | 21.930355 | -160.069049 | Yes |
| NII-2547 | Mid | Forereef | 47 | 22.013878 | -160.099541 | Yes |
| NII-2552 | Mid | Forereef | 32 | 22.003468 | -160.065279 | Yes |
| NII-2559 | Shallow | Forereef | 15 | 21.995524 | -160.114841 | Yes |
| NII-2594 | Mid | Forereef | 47 | 21.970101 | -160.1269 | No |
| NII-2594 | Mid | Forereef | 47 | 21.970101 | -160.1269 | Yes |
| KAU-2119 | Mid | Forereef | 53 | 21.888873 | -159.572176 | Yes |
| KAU-2115 | Mid | Forereef | 32 | 21.927625 | -159.652355 | Yes |
| KAU-2105 | Deep | Forereef | 75 | 21.913054 | -159.659167 | Yes |
| KAU-2101 | Deep | Forereef | 68 | 21.875405 | -159.523047 | Yes |
| KAU-2127 | Mid | Forereef | 25 | 21.934153 | -159.662431 | Yes |
| KAU-2128 | Mid | Forereef | 26 | 21.953135 | -159.705824 | Yes |
| LAN-1809 | Deep | Forereef | 63 | 20.780128 | -156.992239 | Yes |
| LAN-1810 | Mid | Forereef | 37 | 20.860202 | -157.027821 | Yes |
| LAN-1811 | Shallow | Forereef | 9 | 20.883442 | -157.057024 | No |
| LAN-1811 | Shallow | Forereef | 9 | 20.883442 | -157.057024 | Yes |
| LAN-1813 | Mid | Forereef | 44 | 20.820918 | -156.990676 | Yes |
| LAN-1815 | Shallow | Forereef | 11 | 20.853104 | -157.013381 | Yes |
| LAN-1817 | Mid | Forereef | 32 | 20.846649 | -157.006896 | Yes |
| LAN-1818 | Mid | Forereef | 20 | 20.837106 | -156.998897 | Yes |

| Site | Depth bin | Reef zone | Depth (feet) | Latitude | Longitude | Photos taken |
|---|---|---|---|---|---|---|
| LAN-1823 | Shallow | Forereef | 12 | 20.865607 | -157.037924 | Yes |
| HAW-4299 | Shallow | Forereef | 14 | 19.451268 | -155.921941 | Yes |
| HAW-4259 | Deep | Forereef | 73 | 19.340351 | -155.887944 | Yes |
| HAW-4292 | Mid | Forereef | 44 | 19.391824 | -155.908866 | Yes |
| HAW-4299 | Shallow | Forereef | 14 | 19.451268 | -155.921941 | No |
| HAW-4292 | Mid | Forereef | 44 | 19.391824 | -155.908866 | No |
| HAW-4304 | Deep | Forereef | 83 | 19.673376 | -156.034139 | Yes |
| HAW-4287 | Shallow | Forereef | 11 | 19.59316 | -155.97189 | Yes |
| HAW-4280 | Shallow | Forereef | 10 | 19.579364 | -155.969723 | Yes |
| HAW-4268 | Mid | Forereef | 32 | 19.566983 | -155.970355 | Yes |
| HAW-4264 | Shallow | Forereef | 21 | 19.551252 | -155.965955 | Yes |
| HAW-4243 | Mid | Forereef | 58 | 19.607508 | -155.983174 | Yes |
| HAW-4294 | Mid | Forereef | 50 | 19.561026 | -155.967373 | Yes |
| HAW-4296 | Deep | Forereef | 75 | 19.641879 | -156.013599 | Yes |
| HAW-4260 | Shallow | Forereef | 17 | 19.78536 | -156.042101 | Yes |
| HAW-4240 | Mid | Forereef | 22 | 19.828205 | -156.001287 | Yes |
| HAW-4241 | Shallow | Forereef | 20 | 19.798083 | -156.021233 | Yes |
| HAW-4254 | Deep | Forereef | 76 | 19.850164 | -155.972788 | Yes |
| HAW-4222 | Deep | Forereef | 71 | 20.192699 | -155.700986 | Yes |
| HAW-4234 | Shallow | Forereef | 19 | 20.201779 | -155.724604 | Yes |
| HAW-4219 | Mid | Forereef | 36 | 20.196579 | -155.713916 | Yes |
| HAW-4203 | Shallow | Forereef | 15 | 20.246042 | -155.783357 | Yes |
| HAW-4249 | Shallow | Forereef | 18 | 19.573559 | -154.907607 | Yes |
| HAW-4232 | Deep | Forereef | 75 | 19.51626 | -154.804172 | Yes |
| HAW-4231 | Mid | Forereef | 35 | 19.553661 | -154.8712 | Yes |
| HAW-4231 | Mid | Forereef | 35 | 19.553661 | -154.8712 | - |
| HAW-4227 | Mid | Forereef | 48 | 19.549169 | -154.860281 | Yes |
| HAW-4224 | Mid | Forereef | 43 | 19.542266 | -154.84331 | Yes |
| HAW-4220 | Deep | Forereef | 78 | 19.532548 | -154.819135 | Yes |
| HAW-4208 | Shallow | Forereef | 16 | 19.58264 | -154.92026 | Yes |
| HAW-4221 | Mid | Forereef | 21 | 19.745762 | -155.066556 | No |
| HAW-4221 | Mid | Forereef | 21 | 19.745762 | -155.066556 | Yes |
| HAW-4237 | Mid | Forereef | 28 | 19.747905 | -155.08926 | Yes |
| HAW-4239 | Deep | Forereef | 68 | 19.841398 | -155.079881 | Yes |
| HAW-4247 | Shallow | Forereef | 12 | 19.731735 | -155.068138 | Yes |
| HAW-4283 | Shallow | Forereef | 13 | 20.056914 | -155.844993 | Yes |
| HAW-4285 | Shallow | Backreef | 5 | 19.949277 | -155.866257 | Yes |
| HAW-4253 | Deep | Forereef | 63 | 19.912586 | -155.901428 | Yes |
| HAW-4252 | Deep | Forereef | 69 | 19.891443 | -155.90992 | Yes |
| HAW-4283 | Shallow | Forereef | 13 | 20.056914 | -155.844993 | No |
| HAW-4257 | Mid | Forereef | 35 | 19.920873 | -155.89325 | Yes |
| HAW-4278 | Mid | Forereef | 33 | 20.044184 | -155.837756 | Yes |
| HAW-4267 | Mid | Forereef | 48 | 19.986201 | -155.835354 | Yes |

| Site | Depth bin | Reef zone | Depth (feet) | Latitude | Longitude | Photos taken |
|---|---|---|---|---|---|---|
| HAW-4272 | Mid | Forereef | 47 | 19.904344 | -155.90619 | Yes |
| HAW-4278 | Mid | Forereef | 33 | 20.044184 | -155.837756 | No |
| HAW-4245 | Shallow | Forereef | 18 | 19.041389 | -155.882028 | Yes |
| HAW-4263 | Mid | Forereef | 42 | 19.162636 | -155.914784 | Yes |
| HAW-4277 | Mid | Forereef | 41 | 19.076322 | -155.904967 | Yes |
| HAW-4300 | Deep | Forereef | 70 | 19.190762 | -155.908649 | Yes |
| LAN-1768 | Mid | Forereef | 44 | 20.869365 | -156.833874 | Yes |
| LAN-1788 | Shallow | Forereef | 14 | 20.866011 | -156.833808 | Yes |
| LAN-1829 | Shallow | Forereef | 11 | 20.861626 | -156.830342 | Yes |
| LAN-1814 | Mid | Forereef | 37 | 20.854233 | -156.820285 | Yes |
| LAN-1816 | Mid | Forereef | 29 | 20.829301 | -156.805223 | Yes |
| LAN-1800 | Deep | Forereef | 72 | 20.838688 | -156.809913 | Yes |
| KAH-646 | Deep | Forereef | 73 | 20.50115 | -156.677237 | Yes |
| KAH-608 | Mid | Forereef | 53 | 20.514866 | -156.694125 | Yes |
| KAH-672 | Deep | Forereef | 71 | 20.50412 | -156.640723 | Yes |
| KAH-663 | Shallow | Forereef | 21 | 20.517361 | -156.554569 | Yes |
| KAH-662 | Shallow | Forereef | 20 | 20.513373 | -156.572995 | Yes |
| KAH-632 | Mid | Forereef | 49 | 20.513488 | -156.606224 | Yes |
| HAW-3436 | Deep | Forereef | 72 | 20.030422 | -155.308065 | Yes |
| HAW-3451 | Mid | Forereef | 54 | 20.07739 | -155.403639 | Yes |
| HAW-3465 | Shallow | Forereef | 18 | 20.054534 | -155.363257 | Yes |
| HAW-3441 | Mid | Forereef | 44 | 20.065206 | -155.381868 | Yes |
| HAW-3445 | Shallow | Forereef | 13 | 20.089567 | -155.436063 | Yes |
| HAW-3433 | Mid | Forereef | 35 | 20.088132 | -155.429411 | Yes |
| HAW-3434 | Deep | Forereef | 72 | 20.069002 | -155.391537 | Yes |
| MOL-2263 | Mid | Forereef | 53 | 21.079063 | -156.762611 | Yes |
| MOL-2276 | Shallow | Forereef | 5 | 21.05343 | -156.83035 | Yes |
| MOL-2275 | Shallow | Forereef | 12 | 21.074587 | -156.775917 | Yes |
| MOL-2255 | Mid | Forereef | 39 | 21.03949 | -156.842741 | Yes |
| MOL-2266 | Mid | Forereef | 39 | 21.06394 | -156.983005 | Yes |
| MOL-2265 | Deep | Forereef | 67 | 21.070024 | -157.026855 | Yes |
| MOL-2260 | Mid | Forereef | 50 | 21.082517 | -157.061151 | Yes |
| MOL-2254 | Deep | Forereef | 67 | 21.046582 | -156.939546 | Yes |
| MOL-2283 | Shallow | Forereef | 11 | 21.089713 | -157.113792 | Yes |
| MOL-2280 | Shallow | Forereef | 13 | 21.084641 | -157.051425 | Yes |
| MOL-2286 | Deep | Forereef | 64 | 21.084062 | -157.281082 | Yes |
| MOL-2300 | Mid | Forereef | 57 | 21.147213 | -157.294302 | Yes |
| MOL-2291 | Deep | Forereef | 83 | 21.19345 | -157.262953 | Yes |
| MOL-2306 | Shallow | Forereef | 18 | 21.084772 | -157.256248 | Yes |
| MOL-2240 | Shallow | Forereef | 20 | 21.170277 | -156.930981 | Yes |
| MOL-2194 | Deep | Forereef | 69 | 21.187111 | -157.011622 | Yes |
| MOL-2197 | Mid | Forereef | 54 | 21.202912 | -156.987432 | Yes |
| MOL-2242 | Shallow | Forereef | 19 | 21.164895 | -156.865881 | Yes |

| Site | Depth bin | Reef zone | Depth (feet) | Latitude | Longitude | Photos taken |
|---|---|---|---|---|---|---|
| MOL-2233 | Mid | Forereef | 59 | 21.176795 | -156.809894 | Yes |
| MOL-2221 | Deep | Forereef | 75 | 21.181599 | -156.769346 | Yes |
| MOL-2227 | Mid | Forereef | 38 | 21.176883 | -156.776444 | Yes |
| MAI-2544 | Deep | Forereef | 79 | 20.851549 | -156.123809 | Yes |
| MAI-2567 | Mid | Forereef | 45 | 20.86184 | -156.133755 | Yes |
| MAI-2546 | Mid | Forereef | 48 | 20.906648 | -156.212839 | Yes |
| MAI-2586 | Shallow | Forereef | 24 | 20.896253 | -156.198119 | Yes |
| LAN-1819 | Mid | Forereef | 44 | 20.746493 | -156.976904 | Yes |
| LAN-1795 | Deep | Forereef | 69 | 20.732397 | -156.950492 | Yes |
| KAH-659 | Mid | Forereef | 52 | 20.603972 | -156.582876 | Yes |
| KAH-635 | Shallow | Forereef | 14 | 20.55697783 | -156.6735557 | Yes |
| KAH-619 | Deep | Forereef | 67 | 20.591597 | -156.548868 | Yes |
| KAH-627 | Mid | Forereef | 40 | 20.582135 | -156.622557 | Yes |
| MAI-2483 | Mid | Forereef | 57 | 20.799957 | -156.601688 | Yes |
| MAI-2502 | Shallow | Forereef | 15 | 20.806692 | -156.623291 | Yes |
| MAI-2459 | Deep | Forereef | 70 | 20.791743 | -156.591316 | Yes |
| MAI-2481 | Mid | Forereef | 53 | 20.767123 | -156.480527 | Yes |
| MAI-2489 | Mid | Forereef | 39 | 20.703395 | -156.452145 | Yes |
| MAI-2505 | Shallow | Forereef | 14 | 20.631349 | -156.44844 | Yes |
| MAI-2466 | Deep | Forereef | 66 | 20.729225 | -156.464758 | Yes |
| MAI-2461 | Deep | Forereef | 75 | 20.766831 | -156.478652 | Yes |
| MAI-2520 | Deep | Forereef | 73 | 20.91426 | -156.70078 | Yes |
| MAI-2543 | Shallow | Forereef | 18 | 20.861183 | -156.674928 | Yes |
| MAI-2541 | Shallow | Forereef | 17 | 20.915718 | -156.698072 | Yes |
| MAI-2534 | Shallow | Forereef | 14 | 20.892013 | -156.686535 | Yes |
| MAI-2532 | Mid | Forereef | 48 | 20.879202 | -156.691049 | Yes |
| MAI-2529 | Mid | Forereef | 26 | 20.908677 | -156.690794 | Yes |
| MAI-2530 | Mid | Forereef | 38 | 20.841611 | -156.657179 | Yes |
| MAI-2537 | Shallow | Forereef | 19 | 20.877005 | -156.685317 | Yes |
| MAI-2527 | Mid | Forereef | 30 | 20.913024 | -156.69682 | Yes |
| MAI-2515 | Deep | Forereef | 89 | 20.977523 | -156.686272 | Yes |

**Table 6. Summary of sites where fish SPC surveys were conducted. Island abbreviations are defined as follows: Hawaii (HAW; Big Island), Kahoolawe (KAH), Lanai (LAN), Maui (MAI), Molokai (MOL), Oahu (OAH), Kauai (KAU), and Niihau (NII).**

| Site | Depth bin | Reef zone | Depth (meters) | Latitude | Longitude |
|---|---|---|---|---|---|
| HAW-3341 | Deep | Forereef | 22.7 | 20.075375 | -155.399111 |
| HAW-3346 | Deep | Forereef | 20.4 | 20.181251 | -155.677939 |
| HAW-3350 | Deep | Forereef | 18.8 | 20.22848 | -155.738199 |
| HAW-3354 | Deep | Forereef | 19.85 | 20.001223 | -155.250042 |
| HAW-3356 | Deep | Forereef | 22.65 | 19.982259 | -155.222333 |
| HAW-3357 | Mid | Forereef | 12.75 | 20.185372 | -155.693117 |
| HAW-3359 | Mid | Forereef | 12.1 | 20.165665 | -155.648421 |
| HAW-3362 | Mid | Forereef | 16.25 | 20.014558 | -155.269487 |
| HAW-3363 | Mid | Forereef | 7.45 | 20.246613 | -155.777357 |
| HAW-3364 | Deep | Forereef | 21.65 | 19.968566 | -155.20143 |
| HAW-3366 | Shallow | Forereef | 3.15 | 20.252542 | -155.800695 |
| HAW-3367 | Mid | Forereef | 14.65 | 20.034048 | -155.318917 |
| HAW-3368 | Mid | Forereef | 13.8 | 20.059754 | -155.372349 |
| HAW-3371 | Mid | Forereef | 13.6 | 20.217855 | -155.730055 |
| HAW-3374 | Mid | Forereef | 9.95 | 20.068805 | -155.393637 |
| HAW-3375 | Mid | Forereef | 7.9 | 20.260587 | -155.821472 |
| HAW-3385 | Shallow | Forereef | 4.75 | 20.047385 | -155.344223 |
| HAW-3387 | Shallow | Forereef | 4.7 | 20.24141 | -155.764613 |
| HAW-3391 | Shallow | Forereef | 3.95 | 20.022652 | -155.294332 |
| HAW-3396 | Deep | Forereef | 21.9 | 19.325011 | -155.890526 |
| HAW-3399 | Deep | Forereef | 25.15 | 19.977417 | -155.841771 |
| HAW-3401 | Deep | Forereef | 20.15 | 19.365212 | -155.894947 |
| HAW-3413 | Deep | Forereef | 20.1 | 19.608245 | -155.985084 |
| HAW-3417 | Deep | Forereef | 20.8 | 19.107665 | -155.916488 |
| HAW-3705 | Deep | Forereef | 18.4 | 19.838831 | -155.98546 |
| HAW-3708 | Mid | Forereef | 12 | 19.188793 | -155.908496 |
| HAW-3716 | Mid | Forereef | 14.85 | 19.242862 | -155.899904 |
| HAW-3717 | Mid | Forereef | 11.1 | 19.538487 | -155.959138 |
| HAW-3718 | Mid | Forereef | 13.05 | 19.387355 | -155.904909 |
| HAW-3720 | Mid | Forereef | 12.15 | 19.498528 | -155.950878 |
| HAW-3721 | Shallow | Forereef | 5.45 | 19.484837 | -155.949476 |
| HAW-3725 | Mid | Forereef | 6.8 | 19.565873 | -155.969343 |
| HAW-3727 | Mid | Forereef | 13.65 | 19.401905 | -155.910872 |
| HAW-3730 | Mid | Forereef | 8.95 | 19.422209 | -155.914273 |
| HAW-3732 | Mid | Forereef | 11.15 | 19.924188 | -155.893388 |
| HAW-3734 | Mid | Forereef | 7.75 | 19.788396 | -156.048212 |
| HAW-3735 | Mid | Forereef | 15.05 | 19.585911 | -155.973106 |
| HAW-3739 | Mid | Forereef | 5.95 | 19.351719 | -155.88944 |
| HAW-3743 | Mid | Forereef | 16.15 | 19.133328 | -155.919252 |
| HAW-3745 | Mid | Forereef | 15.35 | 19.63297 | -155.996419 |
| HAW-3746 | Mid | Forereef | 13.7 | 19.763842 | -156.051682 |

| Site | Depth bin | Reef zone | Depth (meters) | Latitude | Longitude |
|---|---|---|---|---|---|
| HAW-3748 | Mid | Forereef | 7.145 | 19.853493 | -155.959848 |
| HAW-3749 | Mid | Forereef | 17.35 | 19.806631 | -156.015699 |
| HAW-3750 | Mid | Forereef | 14.75 | 19.797235 | -156.029654 |
| HAW-3751 | Mid | Forereef | 14.2 | 19.677569 | -156.035911 |
| HAW-3753 | Mid | Forereef | 6.245 | 20.025732 | -155.831776 |
| HAW-3756 | Mid | Forereef | 12.75 | 19.777651 | -156.049673 |
| HAW-3757 | Mid | Forereef | 10.175 | 19.95025 | -155.870116 |
| HAW-3759 | Mid | Forereef | 8.5 | 19.209742 | -155.900209 |
| HAW-3767 | Shallow | Forereef | 3.8 | 19.262566 | -155.895701 |
| HAW-3768 | Shallow | Forereef | 5.2 | 19.741137 | -156.054655 |
| HAW-3771 | Shallow | Forereef | 4.25 | 19.828644 | -155.99838 |
| HAW-3774 | Shallow | Forereef | 5.64 | 19.893961 | -155.907238 |
| HAW-3777 | Shallow | Forereef | 3.9 | 19.542758 | -155.958843 |
| HAW-3778 | Shallow | Forereef | 3.65 | 19.030253 | -155.869178 |
| HAW-3783 | Shallow | Forereef | 2.55 | 19.511386 | -155.956579 |
| HAW-3796 | Deep | Forereef | 20.7 | 19.870785 | -155.100709 |
| HAW-3798 | Deep | Forereef | 24.85 | 19.803587 | -155.084186 |
| HAW-3799 | Deep | Forereef | 21.6 | 19.549881 | -154.865927 |
| HAW-3800 | Deep | Forereef | 21.5 | 19.533798 | -154.821628 |
| HAW-3802 | Deep | Forereef | 19.25 | 19.749405 | -155.072139 |
| HAW-3804 | Mid | Forereef | 17.2 | 19.506029 | -154.808004 |
| HAW-3814 | Deep | Forereef | 21.25 | 19.458164 | -154.834713 |
| HAW-3817 | Mid | Forereef | 12.4 | 19.853316 | -155.081361 |
| HAW-3818 | Mid | Forereef | 8.8 | 19.54249 | -154.843742 |
| HAW-3820 | Deep | Forereef | 21.15 | 19.567278 | -154.89433 |
| HAW-3822 | Mid | Forereef | 11.5 | 19.755143 | -155.088489 |
| HAW-3829 | Mid | Forereef | 7.75 | 19.744386 | -155.066344 |
| HAW-3835 | Mid | Forereef | 10.375 | 19.714348 | -154.988682 |
| HAW-3843 | Shallow | Forereef | 5.5 | 19.534812 | -154.83159 |
| HAW-3846 | Shallow | Forereef | 4.85 | 19.559103 | -154.885278 |
| HAW-3850 | Shallow | Forereef | 3.3 | 19.740152 | -155.059989 |
| HAW-3854 | Shallow | Forereef | 5.15 | 19.647725 | -154.98124 |
| KAH-420 | Mid | Forereef | 11.5 | 20.589301 | -156.548185 |
| KAH-424 | Deep | Forereef | 22.75 | 20.520011 | -156.710626 |
| KAH-425 | Mid | Forereef | 12.6 | 20.513914 | -156.689214 |
| KAH-434 | Shallow | Forereef | 3.8 | 20.515095 | -156.64689 |
| KAH-437 | Mid | Forereef | 7.25 | 20.509522 | -156.685133 |
| KAH-439 | Mid | Forereef | 9.2 | 20.514606 | -156.61668 |
| KAH-449 | Mid | Forereef | 7.65 | 20.59929 | -156.591954 |
| KAH-450 | Mid | Forereef | 16 | 20.504288 | -156.657697 |
| KAH-456 | Deep | Forereef | 20.1 | 20.606771 | -156.562538 |
| KAH-467 | Deep | Forereef | 20.95 | 20.510188 | -156.629161 |
| KAH-474 | Shallow | Forereef | 4.45 | 20.590042 | -156.609936 |

| Site | Depth bin | Reef zone | Depth (meters) | Latitude | Longitude |
|---|---|---|---|---|---|
| KAH-479 | Shallow | Forereef | 5.2 | 20.51488 | -156.604139 |
| KAH-484 | Mid | Forereef | 11.7 | 20.52629 | -156.709942 |
| KAH-488 | Shallow | Forereef | 5.2 | 20.582429 | -156.619652 |
| KAH-495 | Deep | Forereef | 21.55 | 20.607648 | -156.577038 |
| KAH-496 | Mid | Forereef | 12.65 | 20.501113 | -156.666899 |
| KAH-498 | Deep | Forereef | 20 | 20.543843 | -156.693574 |
| KAH-513 | Shallow | Forereef | 5.1 | 20.563207 | -156.649569 |
| KAH-518 | Mid | Forereef | 8.35 | 20.558879 | -156.66655 |
| KAH-520 | Deep | Forereef | 20.1 | 20.515663 | -156.698814 |
| KAU-1876 | Deep | Forereef | 21.8 | 21.91372 | -159.65952 |
| KAU-1880 | Mid | Forereef | 12.4 | 21.889572 | -159.60907 |
| KAU-1881 | Deep | Forereef | 21.75 | 22.033897 | -159.328254 |
| KAU-1885 | Deep | Forereef | 25.55 | 21.935164 | -159.342633 |
| KAU-1889 | Mid | Forereef | 10.6 | 21.991416 | -159.328154 |
| KAU-1890 | Mid | Forereef | 13.7 | 21.88222 | -159.510228 |
| KAU-1896 | Mid | Forereef | 16.9 | 21.927202 | -159.359072 |
| KAU-1897 | Mid | Forereef | 12.05 | 21.963943 | -159.328262 |
| KAU-1902 | Mid | Forereef | 8.8 | 21.935684 | -159.351208 |
| KAU-1906 | Shallow | Forereef | 4.4 | 21.995903 | -159.334604 |
| KAU-1909 | Deep | Forereef | 18.1 | 21.95107 | -159.696963 |
| KAU-1910 | Deep | Forereef | 19.95 | 22.17106 | -159.708953 |
| KAU-1914 | Deep | Forereef | 19.35 | 22.09184 | -159.770919 |
| KAU-1916 | Deep | Forereef | 24.85 | 22.14739 | -159.745249 |
| KAU-1921 | Mid | Forereef | 16.35 | 22.138802 | -159.760201 |
| KAU-1923 | Mid | Forereef | 9.1 | 22.166362 | -159.701294 |
| KAU-1924 | Mid | Forereef | 12.65 | 22.071027 | -159.789404 |
| KAU-1928 | Mid | Forereef | 10.4 | 22.218748 | -159.593523 |
| KAU-1931 | Shallow | Forereef | 5.3 | 22.188494 | -159.63563 |
| KAU-1932 | Shallow | Forereef | 3.35 | 22.06682 | -159.783925 |
| KAU-1950 | Mid | Forereef | 8.05 | 22.015458 | -159.334195 |
| KAU-1956 | Shallow | Forereef | 3.5 | 21.908902 | -159.626882 |
| LAN-1736 | Deep | Forereef | 17.75 | 20.922317 | -156.900077 |
| LAN-1740 | Mid | Forereef | 12.2 | 20.909039 | -156.878743 |
| LAN-1744 | Mid | Forereef | 11.75 | 20.866629 | -156.830911 |
| LAN-1777 | Deep | Forereef | 21 | 20.733334 | -156.941385 |
| LAN-1778 | Deep | Forereef | 21.1 | 20.733298 | -156.930106 |
| LAN-1781 | Deep | Forereef | 21.7 | 20.733798 | -156.937373 |
| LAN-2008 | Deep | Forereef | 20.7 | 20.733438 | -156.946929 |
| LAN-2016 | Deep | Forereef | 22.45 | 20.79564 | -156.991901 |
| LAN-2018 | Deep | Forereef | 19.45 | 20.825832 | -156.801717 |
| LAN-2021 | Mid | Forereef | 13.85 | 20.78301 | -156.818085 |
| LAN-2023 | Mid | Forereef | 8.5 | 20.75811 | -156.83883 |
| LAN-2030 | Mid | Forereef | 7.6 | 20.742341 | -156.971825 |

| Site | Depth bin | Reef zone | Depth (meters) | Latitude | Longitude |
|---|---|---|---|---|---|
| LAN-2033 | Mid | Forereef | 13.55 | 20.75802 | -156.985884 |
| LAN-2034 | Mid | Forereef | 17.5 | 20.788189 | -156.991844 |
| LAN-2036 | Mid | Forereef | 9.7 | 20.81712 | -156.988236 |
| LAN-2040 | Shallow | Forereef | 4.15 | 20.788053 | -156.815799 |
| LAN-2042 | Shallow | Forereef | 2.9 | 20.829877 | -156.993631 |
| LAN-2053 | Shallow | Forereef | 5.45 | 20.757526 | -156.840838 |
| LAN-2054 | Shallow | Forereef | 5.65 | 20.737005 | -156.919045 |
| LAN-2060 | Shallow | Forereef | 4.1 | 20.846865 | -157.005594 |
| LAN-2061 | Shallow | Forereef | 3.8 | 20.732881 | -156.959309 |
| LAN-2062 | Shallow | Forereef | 4.1 | 20.865849 | -157.038415 |
| LAN-2065 | Mid | Forereef | 7.255 | 20.816224 | -156.802525 |
| LAN-2066 | Mid | Forereef | 8.2 | 20.742582 | -156.875757 |
| LAN-2068 | Mid | Forereef | 16.35 | 20.832792 | -156.806258 |
| LAN-2074 | Shallow | Forereef | 4.45 | 20.915868 | -156.893563 |
| LAN-2080 | Mid | Forereef | 14.55 | 20.881127 | -156.844643 |
| MAI-2332 | Deep | Forereef | 24.25 | 20.716509 | -156.459365 |
| MAI-2337 | Deep | Forereef | 19 | 20.77455 | -156.539046 |
| MAI-2341 | Mid | Forereef | 6.9 | 20.666778 | -156.445006 |
| MAI-2343 | Mid | Forereef | 9.85 | 20.814817 | -156.630565 |
| MAI-2344 | Mid | Forereef | 12.05 | 20.803854 | -156.622078 |
| MAI-2349 | Shallow | Forereef | 4.55 | 20.791072 | -156.579717 |
| MAI-2350 | Shallow | Forereef | 5.65 | 20.62254 | -156.44349 |
| MAI-2352 | Shallow | Forereef | 3.33 | 20.797618 | -156.591021 |
| MAI-2354 | Shallow | Forereef | 3.6 | 20.74858 | -156.462764 |
| MAI-2358 | Deep | Forereef | 20.05 | 21.008846 | -156.662327 |
| MAI-2362 | Mid | Forereef | 13.9 | 20.909517 | -156.695804 |
| MAI-2363 | Deep | Forereef | 18.8 | 20.877748 | -156.69075 |
| MAI-2365 | Deep | Forereef | 17.5 | 20.996077 | -156.676067 |
| MAI-2374 | Mid | Forereef | 14.9 | 20.858933 | -156.674478 |
| MAI-2377 | Mid | Forereef | 11.85 | 20.9599 | -156.689401 |
| MAI-2381 | Deep | Forereef | 18.55 | 20.971675 | -156.687438 |
| MAI-2382 | Shallow | Forereef | 3.05 | 20.888267 | -156.686048 |
| MAI-2383 | Shallow | Forereef | 5.65 | 20.832417 | -156.644228 |
| MAI-2384 | Deep | Forereef | 22.1 | 20.805168 | -156.023781 |
| MAI-2385 | Deep | Forereef | 19.5 | 20.952063 | -156.69434 |
| MAI-2386 | Shallow | Forereef | 3.85 | 20.839433 | -156.654409 |
| MAI-2387 | Shallow | Forereef | 2.9 | 20.971893 | -156.682558 |
| MAI-2388 | Deep | Forereef | 19.3 | 20.873701 | -156.689116 |
| MAI-2391 | Mid | Forereef | 9.75 | 20.826844 | -156.104891 |
| MAI-2392 | Mid | Forereef | 10.9 | 20.914341 | -156.224995 |
| MAI-2394 | Mid | Forereef | 15.9 | 20.853923 | -156.125412 |
| MAI-2395 | Shallow | Forereef | 5.25 | 20.897916 | -156.200616 |
| MAI-2396 | Deep | Forereef | 18.8 | 20.824815 | -156.074853 |

| Site | Depth bin | Reef zone | Depth (meters) | Latitude | Longitude |
|---|---|---|---|---|---|
| MAI-2398 | Deep | Forereef | 22.6 | 20.81808 | -156.062315 |
| MAI-2399 | Shallow | Forereef | 5.8 | 20.863802 | -156.14247 |
| MAI-2437 | Deep | Forereef | 19.95 | 20.786803 | -156.564417 |
| MAI-2439 | Mid | Forereef | 12.3 | 20.800761 | -156.600044 |
| MAI-2444 | Shallow | Forereef | 2.25 | 20.807247 | -156.613741 |
| MAI-2445 | Deep | Forereef | 20.55 | 20.641866 | -156.091141 |
| MAI-2450 | Mid | Forereef | 9.25 | 20.582226 | -156.311572 |
| MAI-2820 | Deep | Forereef | 21.35 | 20.627188 | -156.115998 |
| MAI-2821 | Mid | Forereef | 11.15 | 20.581797 | -156.325305 |
| MAI-2822 | Deep | Forereef | 20.4 | 20.596882 | -156.262218 |
| MAI-2828 | Mid | Forereef | 9.55 | 20.619229 | -156.162603 |
| MAI-2834 | Mid | Forereef | 10.2 | 20.624016 | -156.155274 |
| MAI-2840 | Shallow | Forereef | 5.2 | 20.590436 | -156.282806 |
| MAI-2843 | Mid | Forereef | 9.1 | 20.623966 | -156.178231 |
| MOL-2149 | Deep | Forereef | 20.3 | 21.170015 | -156.912978 |
| MOL-2152 | Deep | Forereef | 24.2 | 21.172713 | -156.871967 |
| MOL-2153 | Deep | Forereef | 19.95 | 21.176712 | -156.740678 |
| MOL-2156 | Mid | Forereef | 8.35 | 21.174859 | -156.787037 |
| MOL-2158 | Mid | Forereef | 8.05 | 21.170263 | -156.82448 |
| MOL-2164 | Shallow | Forereef | 5.05 | 21.176571 | -156.764425 |
| MOL-2173 | Mid | Forereef | 14.8 | 21.040509 | -156.840016 |
| MOL-2174 | Mid | Forereef | 6.55 | 21.061962 | -156.793576 |
| MOL-2175 | Mid | Forereef | 9.75 | 21.059528 | -156.965946 |
| MOL-2176 | Mid | Forereef | 7.6 | 21.097332 | -156.747076 |
| MOL-2183 | Shallow | Forereef | 2.35 | 21.087038 | -157.082317 |
| MOL-2200 | Deep | Forereef | 23.65 | 21.175254 | -157.273315 |
| MOL-2201 | Mid | Forereef | 11.15 | 21.11971 | -157.303971 |
| MOL-2202 | Deep | Forereef | 22.3 | 21.13353 | -157.304481 |
| MOL-2206 | Mid | Forereef | 11 | 21.106146 | -157.312285 |
| MOL-2209 | Deep | Forereef | 23.4 | 21.16693 | -157.28235 |
| MOL-2210 | Mid | Forereef | 14.55 | 21.080359 | -157.259525 |
| MOL-2212 | Mid | Forereef | 14.4 | 21.189509 | -157.257448 |
| MOL-2214 | Shallow | Forereef | 4.7 | 21.082637 | -157.234858 |
| MOL-2215 | Shallow | Forereef | 5.05 | 21.089952 | -157.285276 |
| MOL-2237 | Deep | Forereef | 23.7 | 21.165368 | -156.897251 |
| MOL-2238 | Deep | Forereef | 21.45 | 21.161695 | -156.723268 |
| MOL-2239 | Shallow | Forereef | 5.5 | 21.19239 | -156.95079 |
| MOL-2241 | Deep | Forereef | 21.6 | 21.161218 | -156.706346 |
| MOL-2245 | Mid | Forereef | 7.95 | 21.173522 | -156.93772 |
| MOL-2246 | Shallow | Forereef | 4.25 | 21.18084 | -156.947625 |
| MOL-2249 | Mid | Forereef | 16.65 | 21.161807 | -156.712009 |
| MOL-2250 | Shallow | Forereef | 3.7 | 21.17497 | -156.774609 |
| MOL-2251 | Shallow | Forereef | 4.95 | 21.173213 | -156.814173 |

| Site | Depth bin | Reef zone | Depth (meters) | Latitude | Longitude |
|---|---|---|---|---|---|
| MOL-2252 | Mid | Forereef | 10.7 | 21.211956 | -156.964149 |
| MOL-2253 | Mid | Forereef | 10.95 | 21.167498 | -156.893253 |
| MOL-2406 | Shallow | Forereef | 5.3 | 21.138929 | -156.716508 |
| MOL-2407 | Shallow | Forereef | 2.85 | 21.037199 | -156.859405 |
| MOL-2409 | Shallow | Forereef | 4.1 | 21.039227 | -156.871426 |
| MOL-2469 | Deep | Forereef | 22.7 | 21.045715 | -156.93992 |
| MOL-2471 | Mid | Forereef | 15.8 | 21.087035 | -157.11162 |
| MOL-2476 | Mid | Forereef | 13.4 | 21.070391 | -157.016379 |
| MOL-2477 | Mid | Forereef | 8.5 | 21.11935 | -156.729256 |
| MOL-2488 | Shallow | Forereef | 4.55 | 21.085928 | -156.761524 |
| MOL-2489 | Shallow | Forereef | 3.85 | 21.058004 | -156.805411 |
| MOL-2497 | Shallow | Forereef | 2.25 | 21.081839 | -157.0411 |
| NII-1885 | Deep | Forereef | 24.3 | 21.930146 | -160.06907 |
| NII-1897 | Deep | Forereef | 19.45 | 21.79861 | -160.193356 |
| NII-1908 | Mid | Forereef | 9.6 | 21.953267 | -160.071848 |
| NII-1933 | Deep | Forereef | 21.3 | 22.024663 | -160.091979 |
| NII-1936 | Mid | Forereef | 18.4 | 21.992777 | -160.049617 |
| NII-1939 | Deep | Forereef | 20.95 | 22.027732 | -160.09946 |
| NII-1944 | Mid | Forereef | 15.05 | 22.010291 | -160.093858 |
| NII-1945 | Mid | Forereef | 16.65 | 22.009173 | -160.080699 |
| NII-1947 | Mid | Forereef | 8.5 | 21.984566 | -160.048161 |
| NII-1950 | Deep | Forereef | 21.05 | 21.805188 | -160.250107 |
| NII-1955 | Shallow | Forereef | 5.8 | 21.98847 | -160.112336 |
| NII-1972 | Deep | Forereef | 20.85 | 21.950853 | -160.162351 |
| NII-1977 | Mid | Forereef | 16.8 | 21.858576 | -160.241301 |
| NII-1981 | Mid | Forereef | 15.2 | 21.958976 | -160.144184 |
| NII-1987 | Mid | Forereef | 15.07 | 21.781435 | -160.21526 |
| NII-1991 | Mid | Forereef | 12.85 | 21.89752 | -160.225977 |
| NII-1997 | Shallow | Forereef | 5.8 | 21.92818 | -160.183392 |
| OAH-2921 | Mid | Forereef | 17.7 | 21.260833 | -157.697477 |
| OAH-2953 | Deep | Forereef | 21.45 | 21.671915 | -157.91717 |
| OAH-2955 | Shallow | Forereef | 7.75 | 21.465791 | -158.220685 |
| OAH-2956 | Deep | Forereef | 21.3 | 21.599605 | -157.877262 |
| OAH-2960 | Mid | Forereef | 10.15 | 21.553817 | -157.832057 |
| OAH-2963 | Mid | Forereef | 8 | 21.53458 | -157.83458 |
| OAH-2964 | Mid | Forereef | 7.9 | 21.471604 | -157.780418 |
| OAH-2965 | Shallow | Forereef | 5.3 | 21.267782 | -157.765801 |
| OAH-2970 | Mid | Forereef | 16.15 | 21.570011 | -157.843044 |
| OAH-2971 | Deep | Forereef | 22.4 | 21.487401 | -157.782821 |
| OAH-2975 | Shallow | Forereef | 5.35 | 21.591988 | -157.88109 |
| OAH-2987 | Mid | Forereef | 8.3 | 21.488147 | -157.805314 |
| OAH-3004 | Deep | Forereef | 20.75 | 21.610894 | -158.112073 |
| OAH-3006 | Deep | Forereef | 22.1 | 21.704092 | -158.024082 |

| Site | Depth bin | Reef zone | Depth (meters) | Latitude | Longitude |
|---|---|---|---|---|---|
| OAH-3404 | Mid | Forereef | 8.95 | 21.58505 | -158.158875 |
| OAH-3407 | Mid | Forereef | 17.35 | 21.637676 | -158.076754 |
| OAH-3408 | Mid | Forereef | 8.05 | 21.592828 | -158.139736 |
| OAH-3413 | Mid | Forereef | 7.3 | 21.665657 | -158.053948 |
| OAH-3414 | Mid | Forereef | 11.3 | 21.617529 | -158.103473 |
| OAH-3416 | Mid | Forereef | 10.25 | 21.697589 | -158.032571 |
| OAH-3429 | Shallow | Forereef | 5.05 | 21.675311 | -158.045836 |
| OAH-3430 | Shallow | Forereef | 2.55 | 21.625585 | -158.077834 |
| OAH-3432 | Shallow | Forereef | 4.3 | 21.604342 | -158.108277 |
| OAH-3437 | Deep | Forereef | 18.4 | 21.390098 | -158.168914 |
| OAH-3444 | Deep | Forereef | 21.3 | 21.254815 | -157.745744 |
| OAH-3447 | Deep | Forereef | 25.3 | 21.346123 | -158.140963 |
| OAH-3448 | Deep | Forereef | 26.5 | 21.309255 | -158.128098 |
| OAH-3463 | Mid | Forereef | 7.3 | 21.376963 | -158.149533 |
| OAH-3464 | Mid | Forereef | 6.55 | 21.423606 | -158.188188 |
| OAH-3471 | Mid | Forereef | 15 | 21.277308 | -157.847269 |
| OAH-3472 | Mid | Forereef | 7.6 | 21.330941 | -158.131487 |
| OAH-3473 | Mid | Forereef | 15.65 | 21.395772 | -158.188592 |
| OAH-3475 | Mid | Forereef | 9.35 | 21.292094 | -157.889321 |
| OAH-3490 | Shallow | Forereef | 4.9 | 21.274039 | -157.7347 |
| OAH-3497 | Shallow | Forereef | 4.9 | 21.369566 | -158.141284 |
| OAH-3499 | Shallow | Forereef | 2.55 | 21.537065 | -158.232438 |
| OAH-3502 | Shallow | Forereef | 5.25 | 21.287534 | -158.105944 |
| OAH-3504 | Shallow | Forereef | 5.45 | 21.298931 | -157.927904 |
| OAH-3507 | Shallow | Forereef | 3.8 | 21.297019 | -157.892229 |
| OAH-3518 | Shallow | Forereef | 4.9 | 21.418574 | -158.186313 |
| OAH-3522 | Deep | Forereef | 24.1 | 21.569702 | -158.285599 |
| OAH-3526 | Deep | Forereef | 24.7 | 21.564631 | -158.273955 |
| OAH-3529 | Deep | Forereef | 20.85 | 21.584675 | -158.260056 |
| OAH-3530 | Deep | Forereef | 20.7 | 21.590902 | -158.175852 |
| OAH-3533 | Mid | Forereef | 15.7 | 21.576772 | -158.285644 |
| OAH-3543 | Shallow | Forereef | 4.75 | 21.584749 | -158.209939 |
| OAH-3544 | Mid | Forereef | 8.2 | 21.583113 | -158.248468 |
| OAH-3550 | Shallow | Forereef | 5.25 | 21.572206 | -158.278362 |
| OAH-3552 | Shallow | Forereef | 3.85 | 21.563076 | -158.262344 |
| OAH-3553 | Shallow | Forereef | 4.9 | 21.579011 | -158.263301 |

**Table 7. Summary of sites where structure for motion photogrammetry surveys were conducted. Island abbreviations are defined as follows: Hawaii (HAW; Big Island), Kahoolawe (KAH), Lanai (LAN), Maui (MAI), Molokai (MOL), Oahu (OAH), Kauai (KAU), and Niihau (NII).**

| Site | Survey Size (m) | Latitude | Longitude | Survey Type | Depth (ft) |
|---|---|---|---|---|---|
| MAI-2362 | 3 x 20 | 20.909517 | -156.695804 | belt | 44 |
| MAI-2363 | 3 x 20 | 20.877748 | -156.69075 | belt | 61 |
| MAI-2387 | 3 x 20 | 20.971893 | -156.682558 | belt | 9.2 |
| MAI-2515 | 3 x 13 | 20.977523 | -156.686272 | belt | 80 |
| MAI-2527 | 3 x 20 | 20.913024 | -156.69682 | belt | 26 |
| MAI-2537 | 3 x 20 | 20.877005 | -156.685317 | belt | 14 |
| OCC-MAI-005 | 12 | 21.00738 | -156.668 | spiral | 53 |
| MAI-2374 | 3 x 20 | 20.858933 | -156.674478 | belt | 50 |
| MAI-2381 | 3 x 20 | 20.971675 | -156.687438 | belt | 62 |
| MAI-2383 | 3 x 20 | 20.832417 | -156.644228 | belt | 19 |
| MAI-2385 | 3 x 20 | 20.952063 | -156.69434 | belt | 64 |
| MAI-2520 | 3 x 13 | 20.91426 | -156.70078 | belt | 74 |
| MAI-2529 | 3 x 20 | 20.908677 | -156.690794 | belt | 27 |
| MAI-2530 | 3 x 20 | 20.841611 | -156.657179 | belt | 37 |
| MAI-2532 | 3 x 20 | 20.879202 | -156.691049 | belt | 48 |
| MAI-2534 | 3 x 20 | 20.892013 | -156.686535 | belt | 10 |
| MAI-2541 | 3 x 20 | 20.915718 | -156.698072 | belt | 17 |
| MAI-2543 | 3 x 20 | 20.861183 | -156.674928 | belt | 12 |
| MAI-SIO-K16 | 12 | 20.95244 | -156.693 | spiral | 36 |
| MAI-SIO-OL3 | 12 | 20.80465 | -156.60721 | spiral | 29 |
| MAI-2332 | 3 x 20 | 20.716509 | -156.459365 | belt | 82 |
| MAI-2341 | 3 x 20 | 20.666778 | -156.445006 | belt | 24 |
| MAI-2350 | 3 x 15 | 20.62254 | -156.44349 | belt | 20 |
| MAI-2354 | 3 x 20 | 20.74858 | -156.462764 | belt | 12 |
| MAI-2461 | 3 x 13 | 20.766831 | -156.478652 | belt | 73 |
| MAI-2466 | 3 x 13 | 20.729225 | -156.464758 | belt | 66 |
| MAI-2481 | 3 x 20 | 20.767123 | -156.480527 | belt | 53 |
| MAI-2489 | 3 x 20 | 20.703395 | -156.452145 | belt | 37 |
| MAI-2505 | 3 x 20 | 20.631349 | -156.44844 | belt | 14 |
| MAI-SIO-KEA | 12 | 20.70485 | -156.451 | spiral | 29 |
| MAI-SIO-LAP | 12 | 20.59386 | -156.417 | spiral | 33 |
| MAI-SIO-MAA | 12 | 20.79133 | -156.507 | spiral | 11 |
| MAI-2337 | 3 x 20 | 20.77455 | -156.539046 | belt | 61 |
| MAI-2343 | 3 x 20 | 20.814817 | -156.630565 | belt | 32 |
| MAI-2344 | 3 x 20 | 20.803854 | -156.622078 | belt | 39 |
| MAI-2349 | 3 x 20 | 20.791072 | -156.579717 | belt | 13 |
| MAI-2352 | 3 x 20 | 20.797618 | -156.591021 | belt | 9 |
| MAI-2437 | 3 x 20 | 20.786803 | -156.564417 | belt | 65 |
| MAI-2439 | 3 x 20 | 20.800761 | -156.600044 | belt | 43 |
| MAI-2444 | 3 x 20 | 20.807247 | -156.613741 | belt | 5 |

| Site | Survey Size (m) | Latitude | Longitude | Survey Type | Depth (ft) |
|---|---|---|---|---|---|
| MAI-2459 | 3 x 15 | 20.791743 | -156.591316 | belt | 70 |
| MAI-2483 | 3 x 20 | 20.799957 | -156.601688 | belt | 54 |
| MAI-2502 | 3 x 20 | 20.806692 | -156.623291 | belt | 15 |
| MAI-SIO-CG1 | 12 | 20.7863 | -156.558 | spiral | 30 |
| MAI-SIO-OL2 | 12 | 20.80439 | -156.622 | spiral | 26 |
| MAI-SIO-OL4 | 12 | 20.80342 | -156.603 | spiral | 31 |
| MAI-SIO-OL6 | 12 | 20.78993 | -156.577 | spiral | 32 |
| KAH-420 | 3 x 20 | 20.589301 | -156.548185 | belt | 43 |
| KAH-474 | 3 x 20 | 20.590042 | -156.609936 | belt | 19 |
| KAH-484 | 3 x 20 | 20.52629 | -156.709942 | belt | 35 |
| KAH-495 | 3 x 20 | 20.607648 | -156.577038 | belt | 71 |
| KAH-498 | 3 x 20 | 20.543843 | -156.693574 | belt | 71 |
| KAH-518 | 3 x 20 | 20.558879 | -156.66655 | belt | 25 |
| KAH-619 | 3 x 15 | 20.591597 | -156.548868 | belt | 66 |
| KAH-627 | 3 x 20 | 20.582135 | -156.622557 | belt | 40 |
| KAH-635 | 3 x 20 | 20.55697783 | -156.6735557 | belt | 16 |
| KAH-659 | 3 x 20 | 20.603972 | -156.582876 | belt | 52 |
| KAH-SIO-S01 | 12 | 20.60532 | -156.567 | spiral | 29 |
| KAH-SIO-S03 | 12 | 20.60048 | -156.56 | spiral | 38 |
| KAH-SIO-S05 | 12 | 20.60489 | -156.578 | spiral | 36 |
| KAH-SIO-S08 | 12 | 20.56139 | -156.661 | spiral | 29 |
| LAN-1777 | 3 x 20 | 20.733334 | -156.941385 | belt | 70 |
| LAN-1778 | 3 x 20 | 20.733298 | -156.930106 | belt | 68 |
| LAN-1795 | 3 X 13 | 20.732397 | -156.950492 | belt | 69 |
| LAN-1819 | 3 X 20 | 20.746493 | -156.976904 | belt | 42 |
| OCC-LAN-003 | 12 | 20.73582 | -156.916 | spiral | 50 |
| MAI-2384 | 3 x 20 | 20.805168 | -156.023781 | belt | 74 |
| MAI-2392 | 3 x 20 | 20.914341 | -156.224995 | belt | 36 |
| MAI-2394 | 3 x 20 | 20.853923 | -156.125412 | belt | 50 |
| MAI-2396 | 3 x 20 | 20.824815 | -156.074853 | belt | 62 |
| MAI-2544 | 3 x 13 | 20.851549 | -156.123809 | belt | |
| MAI-2546 | 3 x 20 | 20.906648 | -156.212839 | belt | 47 |
| MAI-2567 | 3 x 20 | 20.86184 | -156.133755 | belt | 47 |
| MAI-2586 | 3 x 20 | 20.896253 | -156.198119 | belt | 19 |
| OCC-MAI-002 | 12 | 20.86857 | -156.146 | spiral | 53 |
| MOL-2153 | 3 x 20 | 21.176712 | -156.740678 | belt | 67 |
| MOL-2158 | 3 x 20 | 21.170263 | -156.82448 | belt | 28 |
| MOL-2221 | 3 x 13 | 21.181599 | -156.769346 | belt | 74 |
| MOL-2227 | 3 x 20 | 21.176883 | -156.776444 | belt | 38 |
| MOL-2233 | 3 x 20 | 21.176795 | -156.809894 | belt | 59 |
| MOL-2241 | 3 x 20 | 21.161218 | -156.706346 | belt | 71 |
| MOL-2242 | 3 x 20 | 21.164895 | -156.865881 | belt | 18 |
| MOL-2250 | 3 x 20 | 21.17497 | -156.774609 | belt | 15 |

| Site | Survey Size (m) | Latitude | Longitude | Survey Type | Depth (ft) |
|---|---|---|---|---|---|
| MOL-2251 | 3 x 20 | 21.173213 | -156.814173 | belt | 12 |
| OCC-MOL-003 | 12 | 21.17693 | -156.76 | spiral | 50 |
| MOL-2149 | 3 x 20 | 21.170015 | -156.912978 | belt | 65 |
| MOL-2194 | 3 x 13 | 21.187111 | -157.011622 | belt | 68 |
| MOL-2197 | 3 x 20 | 21.202912 | -156.987432 | belt | 51 |
| MOL-2239 | 3 x 20 | 21.19239 | -156.95079 | belt | 17 |
| MOL-2240 | 3 x 20 | 21.170277 | -156.930981 | belt | 16 |
| MOL-2245 | 3 x 20 | 21.173522 | -156.93772 | belt | 25 |
| MOL-2253 | 3 x 20 | 21.167498 | -156.893253 | belt | 38 |
| MOL-2201 | 3 x 20 | 21.11971 | -157.303971 | belt | 37 |
| MOL-2209 | 3 x 20 | 21.16693 | -157.28235 | belt | 76 |
| MOL-2212 | 3 x 20 | 21.189509 | -157.257448 | belt | 47 |
| MOL-2214 | 3 x 20 | 21.082637 | -157.234858 | belt | 17 |
| MOL-2215 | 3 x 20 | 21.089952 | -157.285276 | belt | 17 |
| MOL-2286 | 3 x 20 | 21.084062 | -157.281082 | belt | 68 |
| MOL-2291 | 3 x 13 | 21.19345 | -157.262953 | belt | 81 |
| MOL-2300 | 3 x 20 | 21.147213 | -157.294302 | belt | 56 |
| MOL-2306 | 3 x 20 | 21.084772 | -157.256248 | belt | 17 |
| OCC-MOL-008 | 12 | 21.13402 | -157.3 | spiral | 50 |
| MOL-2175 | 3 x 20 | 21.059528 | -156.965946 | belt | 32 |
| MOL-2183 | 3 x 20 | 21.087038 | -157.082317 | belt | 8 |
| MOL-2254 | 3 x 13 | 21.046582 | -156.939546 | belt | 66 |
| MOL-2260 | 3 x 20 | 21.082517 | -157.061151 | belt | 50 |
| MOL-2265 | 3 x 13 | 21.070024 | -157.026855 | belt | 66 |
| MOL-2266 | 3 x 20 | 21.06394 | -156.983005 | belt | 36 |
| MOL-2280 | 3 x 30 | 21.084641 | -157.051425 | belt | 11 |
| MOL-2283 | 3 x 20 | 21.089713 | -157.113792 | belt | 9 |
| MOL-2471 | 3 x 20 | 21.087035 | -157.11162 | belt | 49 |
| MOL-2476 | 3 x 20 | 21.070391 | -157.016379 | belt | 44 |
| MOL-2497 | 3 x 20 | 21.081839 | -157.0411 | belt | 8 |
| OCC-MOL-005 | 12 | 21.03566 | -156.89 | spiral | 44 |
| OCC-MOL-006 | 12 | 21.08299 | -157.064 | spiral | 51 |
| MOL-2173 | 3 x 20 | 21.040509 | -156.840016 | belt | 51 |
| MOL-2255 | 3 x 20 | 21.03949 | -156.842741 | belt | 37 |
| MOL-2263 | 3 x 20 | 21.079063 | -156.762611 | belt | 53 |
| MOL-2275 | 3 x 20 | 21.074587 | -156.775917 | belt | 12 |
| MOL-2276 | 3 x 20 | 21.05343 | -156.83035 | belt | 5 |
| MOL-2409 | 3 x 20 | 21.039227 | -156.871426 | belt | 12 |
| MOL-2477 | 3 x 20 | 21.11935 | -156.729256 | belt | 29 |
| MOL-2488 | 3 x 20 | 21.085928 | -156.761524 | belt | 17 |
| MOL-2489 | 3 x 20 | 21.058004 | -156.805411 | belt | 15 |
| MOL-SIO-908 | 12 | 21.03795 | -156.897 | spiral | 33 |
| OCC-MOL-010 | 12 | 21.13106 | 156.70622 | spiral | 49 |

| Site | Survey Size (m) | Latitude | Longitude | Survey Type | Depth (ft) |
|---|---|---|---|---|---|
| HAW-3341 | 3 x 20 | 20.075375 | -155.399111 | belt | 75 |
| HAW-3356 | 3 x 20 | 19.982259 | -155.222333 | belt | 75 |
| HAW-3362 | 3 x 20 | 20.014558 | -155.269487 | belt | 55 |
| HAW-3367 | 3 x 20 | 20.034048 | -155.318917 | belt | 49 |
| HAW-3368 | 3 x 13 | 20.059754 | -155.372349 | belt | 41 |
| HAW-3433 | 3 x 20 | 20.088132 | -155.429411 | belt | 31 |
| HAW-3434 | 3 x 13 | 20.069002 | -155.391537 | belt | 69 |
| HAW-3436 | 3 x 13 | 20.030422 | -155.308065 | belt | 70 |
| HAW-3441 | 3 x 20 | 20.065206 | -155.381868 | belt | 41 |
| HAW-3441 | 12 | 20.065206 | -155.381868 | spiral | 37 |
| HAW-3445 | 3 x 20 | 20.089567 | -155.436063 | belt | 14 |
| HAW-3451 | 3 x 20 | 20.07739 | -155.403639 | belt | 54 |
| HAW-3465 | 3 x 20 | 20.054534 | -155.363257 | belt | 18 |
| KAH_SIO_S04 | 12 | 20.52531 | -156.71 | spiral | 36 |
| KAH-424 | 3 x 20 | 20.520011 | -156.710626 | belt | 74 |
| KAH-425 | 3 x 20 | 20.513914 | -156.689214 | belt | 39 |
| KAH-450 | 3 x 20 | 20.504288 | -156.657697 | belt | 52 |
| KAH-467 | 3 x 20 | 20.510188 | -156.629161 | belt | 69 |
| KAH-479 | 3 x 20 | 20.51488 | -156.604139 | belt | 16 |
| KAH-608 | 3 x 13 | 20.514866 | -156.694125 | belt | 52 |
| KAH-632 | 3 x 20 | 20.513488 | -156.606224 | belt | 43 |
| KAH-646 | 3 x 13 | 20.50115 | -156.677237 | belt | 74 |
| KAH-662 | 3 x 20 | 20.513373 | -156.572995 | belt | 19 |
| KAH-663 | 3 x 20 | 20.517361 | -156.554569 | belt | 21 |
| KAH-672 | 3 x 13 | 20.50412 | -156.640723 | belt | 67 |
| OCC-OAH-010 | 12 | 21.28838 | -157.865 | spiral | 42 |
| LAN-1768 | 3 x 20 | 20.869365 | -156.833874 | belt | 40 |
| LAN-1788 | 3 x 18 | 20.866011 | -156.833808 | belt | 13 |
| LAN-1814 | 3 x 20 | 20.854233 | -156.820285 | belt | 35 |
| LAN-1816 | 3 x 20 | 20.829301 | -156.805223 | belt | 31 |
| LAN-1829 | 3 x 20 | 20.861626 | -156.830342 | belt | 12 |
| LAN-2021 | 3 x 20 | 20.78301 | -156.818085 | belt | 42 |
| LAN-2023 | 3 x 20 | 20.75811 | -156.83883 | belt | 25 |
| LAN-2053 | 3 x 20 | 20.757526 | -156.840838 | belt | 18 |
| LAN-2066 | 3 x 20 | 20.742582 | -156.875757 | belt | 28 |
| LAN-SIO-002 | 12 | 20.75613 | -156.8504 | spiral | 32 |
| LAN-SIO-005 | 12 | 20.84382 | -156.8136 | spiral | 35 |
| HAW-4245 | 3 x 20 | 19.041389 | -155.882028 | belt | 17 |
| HAW-4263 | 3 x 20 | 19.162636 | -155.914784 | belt | 41 |
| HAW-4277 | 3 x 20 | 19.076322 | -155.904967 | belt | 40 |
| HAW-4300 | 3 x 13 | 19.190762 | -155.908649 | belt | 69 |
| OCC-HAW-15 | 12 | 19.20995 | -155.9014 | spiral | 52 |
| HAW-3399 | 3 x 20 | 19.977417 | -155.841771 | belt | 83 |

| Site | Survey Size (m) | Latitude | Longitude | Survey Type | Depth (ft) |
|---|---|---|---|---|---|
| HAW-3732 | 3 x 20 | 19.924188 | -155.893388 | belt | 38 |
| HAW-3753 | 3 x 20 | 20.025732 | -155.831776 | belt | 27 |
| HAW-3757 | 3 x 20 | 19.95025 | -155.870116 | belt | 36 |
| HAW-3774 | 3 x 20 | 19.893961 | -155.907238 | belt | 20 |
| HAW-4252 | 3 x 13 | 19.891443 | -155.90992 | belt | 67 |
| HAW-4253 | 3 x 13 | 19.912586 | -155.901428 | belt | 61 |
| HAW-4257 | 3 x 20 | 19.920873 | -155.89325 | belt | 35 |
| HAW-4267 | 3 x 20 | 19.986201 | -155.835354 | belt | 47 |
| HAW-4272 | 3 x 20 | 19.904344 | -155.90619 | belt | 42 |
| HAW-4278 | 3 x 20 | 20.044184 | -155.837756 | belt | 31 |
| HAW-4283 | 3 x 20 | 20.056914 | -155.844993 | belt | 13 |
| HAW-4285 | 3 x 20 | 19.949277 | -155.866257 | belt | 5 |
| OCC-HAW-012 | 12 | 19.88447 | -155.9239 | spiral | 47 |
| OCC-HAW-013 | 12 | 19.9309 | -155.8921 | spiral | 47 |
| HAW-3796 | 3 x 20 | 19.870785 | -155.100709 | belt | |
| HAW-3798 | 3 x 20 | 19.803587 | -155.084186 | belt | 79 |
| HAW-3817 | 3 x 20 | 19.853316 | -155.081361 | belt | 37 |
| HAW-3835 | 3 x 20 | 19.714348 | -154.988682 | belt | 32 |
| HAW-3854 | 3 x 20 | 19.647725 | -154.98124 | belt | 15 |
| HAW-4221 | 3 x 20 | 19.745762 | -155.066556 | belt | 27 |
| HAW-4237 | 3 x 20 | 19.747905 | -155.08926 | belt | 27 |
| HAW-4239 | 3 x 13 | 19.841398 | -155.079881 | belt | 68 |
| HAW-4247 | 3 x 20 | 19.731735 | -155.068138 | belt | 7 |
| OCC-HAW-003 | 12 | 19.74693 | -155.058 | spiral | 45 |
| OCC-HAW-004 | 12 | 19.66469 | -154.9747 | spiral | 47 |
| HAW-3804 | 3 x 15 | 19.506029 | -154.808004 | belt | 53 |
| HAW-3814 | 3 x 20 | 19.458164 | -154.834713 | belt | 71 |
| HAW-3820 | 3 x 20 | 19.567278 | -154.89433 | belt | 73 |
| HAW-3843 | 3 x 20 | 19.534812 | -154.83159 | belt | 18 |
| HAW-4208 | 3 x 20 | 19.58264 | -154.92026 | belt | 14 |
| HAW-4220 | 3 x 13 | 19.532548 | -154.819135 | belt | 73 |
| HAW-4224 | 3 x 20 | 19.542266 | -154.84331 | belt | 34 |
| HAW-4227 | 3 x 20 | 19.549169 | -154.860281 | belt | 45 |
| HAW-4231 | 3 x 20 | 19.553661 | -154.8712 | belt | 32 |
| HAW-4232 | 3 x 13 | 19.51626 | -154.804172 | belt | 73 |
| HAW-4249 | 3 x 20 | 19.573559 | -154.907607 | belt | 17 |
| HAW-3350 | 3 x 15 | 20.22848 | -155.7382 | belt | 63 |
| HAW-3357 | 3 x 20 | 20.185372 | -155.693117 | belt | 40 |
| HAW-3359 | 3 x 20 | 20.165665 | -155.648421 | belt | 40.9 |
| HAW-3366 | 3 x 20 | 20.252542 | -155.800695 | belt | 11 |
| HAW-4203 | 3 x 20 | 20.246042 | -155.783357 | belt | 16 |
| HAW-4219 | 3 x 20 | 20.196579 | -155.713916 | belt | 35 |
| HAW-4234 | 3 x 20 | 20.201779 | -155.724604 | belt | 17 |

| Site | Survey Size (m) | Latitude | Longitude | Survey Type | Depth (ft) |
|---|---|---|---|---|---|
| OCC-HAW-002 | 12 | 20.26822 | -155.8604 | spiral | 46 |
| OCC-HAW-014 | 12 | 20.24909 | -155.8908 | spiral | 47 |
| HAW-4240 | 3 x 20 | 19.828205 | -156.001287 | belt | 22 |
| HAW-4241 | 3 x 20 | 19.798083 | -156.021233 | belt | 18 |
| HAW-4254 | 3 x 13 | 19.850164 | -155.972788 | belt | 73 |
| HAW-4260 | 3 x 20 | 19.78536 | -156.042101 | belt | 15 |
| HAW-SIO-997 | 12 | 19.97006 | -155.8485 | spiral | 30 |
| HAW-TNC-024 | 12 | 19.85525 | -155.9341 | spiral | 29 |
| HAW-3413 | 3 x 20 | 19.608245 | -155.985084 | belt | 69 |
| HAW-3725 | 3 x 20 | 19.565873 | -155.969343 | belt | 22 |
| HAW-3735 | 3 x 20 | 19.585911 | -155.973106 | belt | 56 |
| HAW-3745 | 3 x 20 | 19.63297 | -155.996419 | belt | 52 |
| HAW-3751 | 3 x 20 | 19.677569 | -156.035911 | belt | 51 |
| HAW-4243 | 3 x 20 | 19.607508 | -155.983174 | belt | 56 |
| HAW-4264 | 3 x 20 | 19.551252 | -155.965955 | belt | 19 |
| HAW-4268 | 3 x 20 | 19.566983 | -155.970355 | belt | 29 |
| HAW-4280 | 3 x 20 | 19.579364 | -155.969723 | belt | 8 |
| HAW-4287 | 3 x 20 | 19.59316 | -155.97189 | belt | 13 |
| HAW-4294 | 3 x 20 | 19.561026 | -155.967373 | belt | 44 |
| HAW-4296 | 3 x 13 | 19.641879 | -156.013599 | belt | 73 |
| HAW-4304 | 3 x 13 | 19.673376 | -156.034139 | belt | 82 |
| HAW-SIO-K09 | 12 | 19.46275 | -155.9268 | spiral | 38 |
| HAW-SIO-K10 | 12 | 19.64217 | -156.0122 | spiral | 37 |
| HAW-3401 | 3 x 20 | 19.365212 | -155.894947 | belt | 69 |
| HAW-3717 | 3 x 20 | 19.538487 | -155.959138 | belt | 36 |
| HAW-3718 | 3 x 20 | 19.387355 | -155.904909 | belt | 40 |
| HAW-3727 | 3 X 20 | 19.401905 | -155.910872 | belt | 46 |
| HAW-3759 | 3 x 20 | 19.209742 | -155.900209 | belt | 25 |
| HAW-4259 | 3 x 13 | 19.340351 | -155.887944 | belt | 73 |
| HAW-4292 | 3 x 20 | 19.391824 | -155.908866 | belt | 45 |
| HAW-4299 | 3 x 20 | 19.451268 | -155.921941 | belt | 13 |
| HAW-SIO-K08 | 12 | 19.42335 | -155.91307 | spiral | 31 |
| OCC-HAW-010 | 12 | 19.24431 | -155.9003 | spiral | 41 |
| LAN-1809 | 3 x 13 | 20.780128 | -156.992239 | belt | 62 |
| LAN-1810 | 3 x 20 | 20.860202 | -157.027821 | belt | 37 |
| LAN-1811 | 3 x 20 | 20.883442 | -157.057024 | belt | 8 |
| LAN-1813 | 3 x 20 | 20.820918 | -156.990676 | belt | 45 |
| LAN-1815 | 3 x 20 | 20.853104 | -157.013381 | belt | 15 |
| LAN-1817 | 3 x 20 | 20.846649 | -157.006896 | belt | 26 |
| LAN-1818 | 3 x 20 | 20.837106 | -156.998897 | belt | 21 |
| LAN-1823 | 3 x 20 | 20.865607 | -157.037924 | belt | 11 |
| LAN-2008 | 3 x 20 | 20.733438 | -156.946929 | belt | 69 |
| LAN-2034 | 3 x 20 | 20.788189 | -156.991844 | belt | 56 |

| Site | Survey Size (m) | Latitude | Longitude | Survey Type | Depth (ft) |
|---|---|---|---|---|---|
| LAN-2036 | 3 x 20 | 20.81712 | -156.988236 | belt | 31 |
| LAN-2060 | 3 x 20 | 20.846865 | -157.005594 | belt | 18 |
| LAN-2062 | 3 x 20 | 20.865849 | -157.038415 | belt | 14 |
| KAU-1876 | 3 x 20 | 21.91372 | -159.65952 | belt | 69 |
| KAU-1880 | 3 x 20 | 21.889572 | -159.60907 | belt | 42 |
| KAU-1890 | 3 x 20 | 21.88222 | -159.510228 | belt | 46 |
| KAU-1909 | 3 x 20 | 21.95107 | -159.696963 | belt | 68 |
| KAU-1956 | 3 x 20 | 21.908902 | -159.626882 | belt | 13 |
| KAU-2101 | 3 x 13 | 21.875405 | -159.523047 | belt | 68 |
| KAU-2105 | 3 x 13 | 21.913054 | -159.659167 | belt | 75 |
| KAU-2115 | 3 x 20 | 21.927625 | -159.652355 | belt | 31 |
| KAU-2119 | 3 x 20 | 21.888873 | -159.572176 | belt | 52 |
| KAU-2127 | 3 x 13 | 21.934153 | -159.662431 | belt | 27 |
| KAU-2128 | 3 x 20 | 21.953135 | -159.705824 | belt | 24 |
| OCC-KAU-004 | 12 | 21.87667 | 159.5255 | spiral | 48 |
| NII-2504 | 3 x 13 | 21.930355 | -160.069049 | belt | 76 |
| NII-2547 | 3 x 20 | 22.013878 | -160.099541 | belt | 47 |
| NII-2552 | 3 x 20 | 22.003468 | -160.065279 | belt | 32 |
| NII-2559 | 3 x 20 | 21.995524 | -160.114841 | belt | 15 |
| NII-2594 | 3 x 20 | 21.970101 | -160.1269 | belt | 43 |
| OCC-NII-001 | 12 | 21.9414 | 160.07005 | spiral | 48 |
| NII-1897 | 3 x 20 | 21.79861 | -160.193356 | belt | 67 |
| NII-1950 | 3 x 20 | 21.805188 | -160.250107 | belt | 70 |
| NII-1977 | 3 x 20 | 21.858576 | -160.241301 | belt | 53 |
| NII-1987 | 3 x 20 | 21.781435 | -160.21526 | belt | 48 |
| NII-2572 | 3 x 13 | 21.842666 | -160.251839 | belt | 78 |
| NII-2580 | 3 x 20 | 21.951717 | -160.137183 | belt | 36 |
| NII-2583 | 3 x 20 | 21.915757 | -160.205899 | belt | 34 |
| NII-2584 | 3 x 20 | 21.884451 | -160.236959 | belt | 31 |
| OCC-NII-003 | 12 | 21.89757 | 160.2339 | spiral | 51 |
| KAU-2145 | 3 x 13 | 22.203572 | -159.634819 | belt | 87 |
| KAU-2146 | 3 x 20 | 22.171172 | -159.692323 | belt | 68 |
| KAU-2160 | 3 x 20 | 22.146988 | -159.750268 | belt | 52 |
| KAU-2164 | 3 x 20 | 22.163459 | -159.72309 | belt | 47 |
| KAU-2166 | 3 x 20 | 22.11205 | -159.73892 | belt | 9 |
| OCC-KAU-007 | 12 | 22.16845 | 159.68573 | spiral | 51 |
| KAU-2100 | 3 x 13 | 22.076976 | -159.297917 | belt | 84 |
| KAU-2113 | 3 x 20 | 21.956434 | -159.337983 | belt | 14 |
| KAU-2118 | 3 x 20 | 22.002109 | -159.32247 | belt | 71 |
| KAU-2133 | 3 x 20 | 22.040952 | -159.311087 | belt | 57 |
| LAN-1736 | 3 x 20 | 20.922317 | -156.900077 | belt | 60 |
| LAN-1740 | 3 x 20 | 20.909039 | -156.878743 | belt | 41 |
| LAN-1744 | 3 x 20 | 20.866629 | -156.830911 | belt | 42 |

| Site | Survey Size (m) | Latitude | Longitude | Survey Type | Depth (ft) |
|---|---|---|---|---|---|
| LAN-1767 | 3 x 13 | 20.922491 | -156.896249 | belt | 64 |
| LAN-1783 | 3 x 20 | 20.923624 | -156.923681 | belt | 30 |
| LAN-1785 | 3 x 20 | 20.897379 | -156.868382 | belt | 20 |
| LAN-1789 | 3 x 20 | 20.932909 | -156.961339 | belt | 27 |
| LAN-2065 | 3 x 20 | 20.816224 | -156.802525 | belt | 25 |
| LAN-2068 | 3 x 20 | 20.832792 | -156.806258 | belt | 53 |
| OCC-LAN-001 | 12 | 20.92648 | 156.93854 | spiral | |
| OCC-LAN-002 | 12 | 20.91538 | 156.88637 | spiral | |
| OAH-3000 | 3 x 20 | 21.380155 | -158.152649 | belt | 31 |
| OAH-3262 | 3 x 13 | 21.287911 | -158.114198 | belt | 67 |
| OAH-3267 | 3 x 20 | 21.36308 | -158.13631 | belt | 29 |
| OAH-3272 | 3 x 20 | 21.32858 | -158.1273 | belt | 24 |
| OAH-3282 | 3 x 20 | 21.3991 | -158.180481 | belt | 34 |
| OAH-3286 | 3 x 20 | 21.350555 | -158.130857 | belt | 10 |
| OAH-3296 | 3 x 20 | 21.427689 | -158.183038 | belt | 20 |
| OAH-3437 | 3 x 20 | 21.390098 | -158.168914 | belt | 61 |
| OAH-3447 | 3 x 20 | 21.346123 | -158.140963 | belt | 84 |
| OAH-3464 | 3 x 20 | 21.423606 | -158.188188 | belt | 23 |
| OAH-3473 | 3 x 20 | 21.395772 | -158.188592 | belt | 50 |
| OAH-3503 | 3 x 15 | 21.28753 | 158.10594 | belt | 18 |
| OAH-3051 | 3 x 20 | 21.58246 | -158.218192 | belt | 18 |
| OAH-3057 | 3 x 20 | 21.591253 | -158.184679 | belt | 46 |
| OAH-3122 | 3 x 13 | 21.592143 | -158.146568 | belt | 64 |
| OAH-3235 | 3 x 20 | 21.60814 | -158.108096 | belt | 26 |
| OAH-2955 | 3 x 20 | 21.465791 | -158.220685 | belt | 25 |
| OAH-3052 | 3 x 20 | 21.570787 | -158.277027 | belt | 30 |
| OAH-3065 | 3 x 20 | 21.561565 | -158.260918 | belt | 20 |
| OAH-3279 | 3 x 20 | 21.523808 | -158.23403 | belt | 46 |
| OAH-3499 | 3 x 20 | 21.537065 | -158.232438 | belt | 8 |
| OAH-3526 | 3 x 15 | 21.564631 | -158.273955 | belt | 82 |
| OAH-3550 | 3 x 20 | 21.572206 | -158.278362 | belt | 18 |
| OAH-4000 | 3 x 13 | 21.559305 | -158.264141 | belt | 62 |
| OAH-4001 | 3 x 20 | 21.570429 | -158.272413 | belt | 8 |
| OAH-4002 | 3 x 20 | 21.502444 | -158.232263 | belt | 18 |
| OCC-OAH-012 | 12 | 21.53408 | 158.23439 | spiral | 53 |
| OAH-3004 | 3 x 20 | 21.610894 | -158.112073 | belt | 70 |
| OAH-3006 | 3 x 20 | 21.704092 | -158.024082 | belt | 75 |
| OAH-3110 | 3 x 20 | 21.67636 | -158.059481 | belt | 74 |
| OAH-3112 | 3 x 20 | 21.695809 | -158.038111 | belt | 76 |
| OAH-3232 | 3 x 20 | 21.633314 | -158.079568 | belt | 26 |
| OAH-3233 | 3 x 20 | 21.656095 | -158.063551 | belt | 24 |
| OAH-3234 | 3 x 20 | 21.684098 | -158.042318 | belt | 28 |
| OAH-3242 | 3 x 20 | 21.617556 | -158.091785 | belt | 12 |

| Site | Survey Size (m) | Latitude | Longitude | Survey Type | Depth (ft) |
|---|---|---|---|---|---|
| OAH-3243 | 3 x 20 | 21.62903 | -158.077318 | belt | 16 |
| OAH-3407 | 3 x 20 | 21.637676 | -158.076754 | belt | 52 |
| OAH-3413 | 3 x 20 | 21.665657 | -158.053948 | belt | 24 |
| OAH-3432 | 3 x 20 | 21.604342 | -158.108277 | belt | |
| OAH-3078 | 3 x 13 | 21.50332 | -157.796254 | belt | 74 |
| OAH-3084 | 3 x 20 | 21.538795 | -157.823184 | belt | 34 |
| OAH-3087 | 3 x 20 | 21.585349 | -157.865782 | belt | 35 |
| OCC-OAH-005 | 12 | 21.47969 | -157.78299 | spiral | 40 |
| OAH-2921 | 3 x 20 | 21.260833 | -157.697477 | belt | 62 |
| OAH-2965 | 3 x 20 | 21.267782 | -157.765801 | belt | 18 |
| OAH-3259 | 3 x 13 | 21.252589 | -157.750743 | belt | 76 |
| OAH-3265 | 3 x 20 | 21.256857 | -157.762622 | belt | 57 |
| OAH-3284 | 3 x 20 | 21.267457 | -157.829619 | belt | 21 |
| OAH-3288 | 3 x 20 | 21.249555 | -157.808296 | belt | 20 |
| OAH-3292 | 3 x 20 | 21.27008 | -157.8273 | belt | 13 |
| OAH-3301 | 3 x 20 | 21.269619 | -157.757898 | belt | 16 |
| OAH-3444 | 3 x 20 | 21.254815 | -157.745744 | belt | 70 |
| OAH-3490 | 3 x 20 | 21.274039 | -157.7347 | belt | 16 |
| OCC-OAH-008 | 12 | 21.26181 | -157.765 | spiral | 42 |
| MAI-2445 | 3 x 20 | 20.641866 | -156.091141 | belt | 69 |
| MAI-2664 | 3 x 13 | 20.629946 | -156.111358 | belt | 64 |
| MAI-2666 | 3 x 13 | 20.593871 | -156.272201 | belt | 64 |
| MAI-2685 | 3 x 20 | 20.606902 | -156.241445 | belt | 53 |
| MAI-2686 | 3 x 20 | 20.582409 | -156.305525 | belt | 21 |
| MAI-2706 | 3 x 20 | 20.626842 | -156.117587 | belt | 52 |
| MAI-2709 | 3 x 20 | 20.593114 | -156.279849 | belt | 15 |
| MAI-2822 | 3 x 20 | 20.596882 | -156.262218 | belt | 69 |
| MAI-2843 | 3 x 20 | 20.623966 | -156.178231 | belt | 31 |

**Table 8. Summary of sites where CTD casts and water samples were conducted. Island abbreviations are defined as follows: Hawaii (HAW, Big Island); Kahoolawe (KAH); Lanai (LAN); Maui (MAI); Molokai (MOL); Oahu (OAH); Kauai (KAU); and Niihau (NII).**

| Location | CTD_ID | Date | Latitude | Longitude | Water Sample |
|---|---|---|---|---|---|
| HAW | SE1902_MHI_LEG1_HAW_SN4282_035 | 5/4/2019 | 20.029952 | -155.307763 | YES |
| HAW | SE1902_MHI_LEG1_HAW_SN4282_036 | 5/4/2019 | 20.065388 | -155.381452 | YES |
| HAW | SE1902_MHI_LEG1_HAW_SN4282_037 | 5/4/2019 | 20.054978 | -155.36305 | YES |
| HAW | SE1902_MHI_LEG1_HAW_SN4818_042 | 5/4/2019 | 19.982251 | -155.222291 | YES |
| HAW | SE1902_MHI_LEG1_HAW_SN4818_043 | 5/4/2019 | 20.014509 | -155.269528 | YES |
| HAW | SE1902_MHI_LEG1_HAW_SN4818_044 | 5/4/2019 | 20.034215 | -155.318773 | YES |
| KAH | SE1902_MHI_LEG1_KAH_SN3029_001 | 4/25/2019 | 20.252844 | -156.674902 | YES |
| KAH | SE1902_MHI_LEG1_KAH_SN4282_013 | 4/25/2019 | 20.600827 | -156.560206 | YES |
| KAH | SE1902_MHI_LEG1_KAH_SN4282_014 | 4/25/2019 | 20.604829 | -156.566835 | YES |
| KAH | SE1902_MHI_LEG1_KAH_SN4282_015 | 4/25/2019 | 20.604958 | -156.578603 | YES |
| KAH | SE1902_MHI_LEG1_KAH_SN4282_016 | 4/25/2019 | 20.560816 | -156.660494 | YES |
| KAH | SE1902_MHI_LEG1_KAH_SN4282_038 | 5/6/2019 | 20.524725 | -156.710195 | YES |
| KAH | SE1902_MHI_LEG1_KAH_SN4282_039 | 5/6/2019 | 20.514489 | -156.693031 | YES |
| KAH | SE1902_MHI_LEG1_KAH_SN4282_040 | 5/6/2019 | 20.517766 | -156.600408 | YES |
| KAH | SE1902_MHI_LEG1_KAH_SN4818_018 | 4/25/2019 | 20.589411 | -156.548228 | YES |
| KAH | SE1902_MHI_LEG1_KAH_SN4818_019 | 4/25/2019 | 20.607623 | -156.576989 | YES |
| KAH | SE1902_MHI_LEG1_KAH_SN4818_020 | 4/25/2019 | 20.590111 | -156.609991 | YES |
| KAH | SE1902_MHI_LEG1_KAH_SN4818_021 | 4/25/2019 | 20.558777 | -156.666449 | YES |
| KAH | SE1902_MHI_LEG1_KAH_SN4818_045 | 5/6/2019 | 20.520563 | -156.710971 | YES |
| KAH | SE1902_MHI_LEG1_KAH_SN4818_046 | 5/6/2019 | 20.504093 | -156.657721 | YES |
| KAH | SE1902_MHI_LEG1_KAH_SN4818_047 | 5/6/2019 | 20.51001 | -156.628808 | YES |
| LAN | SE1902_MHI_LEG1_LAN_SN4282_017 | 4/26/2019 | 20.735819 | -156.915538 | YES |
| LAN | SE1902_MHI_LEG1_LAN_SN4818_022 | 4/26/2019 | 20.733537 | -156.930211 | YES |
| LAN | SE1902_MHI_LEG1_LAN_SN4818_023 | 4/26/2019 | 20.733631 | -156.941615 | YES |
| MAI | SE1902_MHI_LEG1_MAI_SN4282_001 | 4/21/2019 | 21.007379 | -156.667761 | YES |
| MAI | SE1902_MHI_LEG1_MAI_SN4282_002 | 4/21/2019 | 20.907656 | -156.689764 | YES |
| MAI | SE1902_MHI_LEG1_MAI_SN4282_003 | 4/22/2019 | 20.950477 | -156.694036 | YES |
| MAI | SE1902_MHI_LEG1_MAI_SN4282_004 | 4/22/2019 | 20.913177 | -156.69909 | YES |
| MAI | SE1902_MHI_LEG1_MAI_SN4282_005 | 4/22/2019 | 20.845903 | -156.658306 | YES |
| MAI | SE1902_MHI_LEG1_MAI_SN4282_006 | 4/23/2019 | 20.788213 | -156.505768 | YES |
| MAI | SE1902_MHI_LEG1_MAI_SN4282_007 | 4/23/2019 | 20.701976 | -156.449556 | YES |
| MAI | SE1902_MHI_LEG1_MAI_SN4282_008 | 4/23/2019 | 20.591338 | -156.417151 | YES |
| MAI | SE1902_MHI_LEG1_MAI_SN4282_009 | 4/24/2019 | 20.787283 | -156.558158 | YES |
| MAI | SE1902_MHI_LEG1_MAI_SN4282_010 | 4/24/2019 | 20.790073 | -156.575633 | YES |
| MAI | SE1902_MHI_LEG1_MAI_SN4282_011 | 4/24/2019 | 20.801929 | -156.617174 | YES |
| MAI | SE1902_MHI_LEG1_MAI_SN4282_012 | 4/24/2019 | 20.804239 | -156.605138 | YES |
| MAI | SE1902_MHI_LEG1_MAI_SN4282_018 | 4/27/2019 | 20.762224 | -155.979892 | YES |
| MAI | SE1902_MHI_LEG1_MAI_SN4282_019 | 4/27/2019 | 20.868567 | -156.146285 | YES |
| MAI | SE1902_MHI_LEG1_MAI_SN4282_020 | 4/27/2019 | 20.863448 | -156.15138 | YES |

| Location | CTD_ID | Date | Latitude | Longitude | Water Sample |
|---|---|---|---|---|---|
| MAI | SE1902_MHI_LEG1_MAI_SN4818_001 | 4/21/2019 | 20.97821 | -156.686978 | YES |
| MAI | SE1902_MHI_LEG1_MAI_SN4818_002 | 4/21/2019 | 20.913075 | -156.696699 | YES |
| MAI | SE1902_MHI_LEG1_MAI_SN4818_003 | 4/21/2019 | 20.876917 | -156.685199 | YES |
| MAI | SE1902_MHI_LEG1_MAI_SN4818_004 | 4/21/2019 | 20.881026 | -156.690877 | YES |
| MAI | SE1902_MHI_LEG1_MAI_SN4818_006 | 4/22/2019 | 20.971841 | -156.687863 | YES |
| MAI | SE1902_MHI_LEG1_MAI_SN4818_007 | 4/22/2019 | 20.951315 | -156.694601 | YES |
| MAI | SE1902_MHI_LEG1_MAI_SN4818_008 | 4/22/2019 | 20.873874 | -156.689073 | YES |
| MAI | SE1902_MHI_LEG1_MAI_SN4818_009 | 4/22/2019 | 20.858984 | -156.674622 | YES |
| MAI | SE1902_MHI_LEG1_MAI_SN4818_010 | 4/23/2019 | 20.748456 | -156.462635 | YES |
| MAI | SE1902_MHI_LEG1_MAI_SN4818_011 | 4/23/2019 | 20.716315 | -156.459542 | YES |
| MAI | SE1902_MHI_LEG1_MAI_SN4818_012 | 4/23/2019 | 20.66679 | -156.445055 | YES |
| MAI | SE1902_MHI_LEG1_MAI_SN4818_013 | 4/23/2019 | 20.623267 | -156.444132 | YES |
| MAI | SE1902_MHI_LEG1_MAI_SN4818_014 | 4/24/2019 | 20.774513 | -156.539357 | YES |
| MAI | SE1902_MHI_LEG1_MAI_SN4818_015 | 4/24/2019 | 20.791069 | -156.579731 | YES |
| MAI | SE1902_MHI_LEG1_MAI_SN4818_016 | 4/24/2019 | 20.800857 | -156.600034 | YES |
| MAI | SE1902_MHI_LEG1_MAI_SN4818_017 | 4/24/2019 | 20.814839 | -156.630658 | YES |
| MAI | SE1902_MHI_LEG1_MAI_SN4818_024 | 4/27/2019 | 20.851605 | -156.123636 | YES |
| MAI | SE1902_MHI_LEG1_MAI_SN4818_025 | 4/27/2019 | 20.861897 | -156.133891 | YES |
| MAI | SE1902_MHI_LEG1_MAI_SN4818_026 | 4/27/2019 | 20.896702 | -156.197846 | YES |
| MOL | SE1902_MHI_LEG1_MOL_SN4282_021 | 4/28/2019 | 21.176929 | -156.760487 | YES |
| MOL | SE1902_MHI_LEG1_MOL_SN4282_022 | 4/28/2019 | 21.174539 | -156.815819 | YES |
| MOL | SE1902_MHI_LEG1_MOL_SN4282_023 | 4/28/2019 | 21.167516 | -156.855314 | YES |
| MOL | SE1902_MHI_LEG1_MOL_SN4282_024 | 4/29/2019 | 21.175095 | -156.929991 | YES |
| MOL | SE1902_MHI_LEG1_MOL_SN4282_025 | 4/29/2019 | 21.207042 | -156.984749 | YES |
| MOL | SE1902_MHI_LEG1_MOL_SN4282_026 | 4/29/2019 | 21.186673 | -157.004797 | YES |
| MOL | SE1902_MHI_LEG1_MOL_SN4282_027 | 5/1/2019 | 21.15639 | -157.285171 | YES |
| MOL | SE1902_MHI_LEG1_MOL_SN4282_028 | 5/1/2019 | 21.134024 | -157.300253 | YES |
| MOL | SE1902_MHI_LEG1_MOL_SN4282_029 | 5/2/2019 | 21.035657 | -156.890356 | YES |
| MOL | SE1902_MHI_LEG1_MOL_SN4282_030 | 5/2/2019 | 21.062346 | -156.980457 | YES |
| MOL | SE1902_MHI_LEG1_MOL_SN4282_031 | 5/2/2019 | 21.082994 | -157.06427 | YES |
| MOL | SE1902_MHI_LEG1_MOL_SN4282_032 | 5/3/2019 | 21.131445 | -156.706948 | YES |
| MOL | SE1902_MHI_LEG1_MOL_SN4282_033 | 5/3/2019 | 21.065858 | -156.782813 | YES |
| MOL | SE1902_MHI_LEG1_MOL_SN4282_034 | 5/3/2019 | 21.037938 | -156.897985 | YES |
| MOL | SE1902_MHI_LEG1_MOL_SN4818_027 | 4/28/2019 | 21.181705 | -156.769334 | YES |
| MOL | SE1902_MHI_LEG1_MOL_SN4818_028 | 4/28/2019 | 21.177038 | -156.776601 | YES |
| MOL | SE1902_MHI_LEG1_MOL_SN4818_029 | 4/28/2019 | 21.176929 | -156.809845 | YES |
| MOL | SE1902_MHI_LEG1_MOL_SN4818_030 | 4/29/2019 | 21.187124 | -157.011616 | YES |
| MOL | SE1902_MHI_LEG1_MOL_SN4818_031 | 4/29/2019 | 21.202842 | -156.987503 | YES |
| MOL | SE1902_MHI_LEG1_MOL_SN4818_033 | 5/1/2019 | 21.193681 | -157.263525 | YES |
| MOL | SE1902_MHI_LEG1_MOL_SN4818_034 | 5/1/2019 | 21.147179 | -157.294332 | YES |
| MOL | SE1902_MHI_LEG1_MOL_SN4818_035 | 5/1/2019 | 21.083958 | -157.281091 | YES |
| MOL | SE1902_MHI_LEG1_MOL_SN4818_036 | 5/2/2019 | 21.045591 | -156.939884 | YES |

| Location | CTD_ID | Date | Latitude | Longitude | Water Sample |
|---|---|---|---|---|---|
| MOL | SE1902_MHI_LEG1_MOL_SN4818_037 | 5/2/2019 | 21.059523 | -156.965984 | YES |
| MOL | SE1902_MHI_LEG1_MOL_SN4818_038 | 5/2/2019 | 21.070411 | -157.016334 | YES |
| MOL | SE1902_MHI_LEG1_MOL_SN4818_039 | 5/3/2019 | 21.078979 | -156.762769 | YES |
| MOL | SE1902_MHI_LEG1_MOL_SN4818_040 | 5/3/2019 | 21.074624 | -156.775922 | YES |
| MOL | SE1902_MHI_LEG1_MOL_SN4818_041 | 5/3/2019 | 21.039568 | -156.842847 | YES |
| OAH | SE1902_MHI_LEG1_OAH_SN4282_041 | 5/7/2019 | 21.288417 | -157.86533 | YES |
| HAW | SE1902_MHI_LEG2_HAW_SN1280_001 | 7/11/2019 | 19.190669 | -155.90859 | YES |
| HAW | SE1902_MHI_LEG2_HAW_SN1280_002 | 7/11/2019 | 19.162698 | -155.914907 | YES |
| HAW | SE1902_MHI_LEG2_HAW_SN1280_003 | 7/11/2019 | 19.076348 | -155.904957 | YES |
| HAW | SE1902_MHI_LEG2_HAW_SN1280_011 | 7/14/2019 | 19.53378 | -154.821573 | YES |
| HAW | SE1902_MHI_LEG2_HAW_SN1280_012 | 7/14/2019 | 19.542416 | -154.843766 | YES |
| HAW | SE1902_MHI_LEG2_HAW_SN1280_013 | 7/14/2019 | 19.549928 | -154.865856 | YES |
| HAW | SE1902_MHI_LEG2_HAW_SN1280_014 | 7/15/2019 | 20.166103 | -155.647796 | YES |
| HAW | SE1902_MHI_LEG2_HAW_SN1280_015 | 7/15/2019 | 20.185437 | -155.693151 | YES |
| HAW | SE1902_MHI_LEG2_HAW_SN1280_016 | 7/15/2019 | 20.228329 | -155.737844 | YES |
| HAW | SE1902_MHI_LEG2_HAW_SN1280_020 | 7/17/2019 | 19.677495 | -156.035961 | YES |
| HAW | SE1902_MHI_LEG2_HAW_SN1280_021 | 7/17/2019 | 19.632944 | -155.996367 | YES |
| HAW | SE1902_MHI_LEG2_HAW_SN1280_022 | 7/17/2019 | 19.608151 | -155.984772 | YES |
| HAW | SE1902_MHI_LEG2_HAW_SN1280_023 | 7/19/2019 | 19.21012 | -155.899984 | YES |
| HAW | SE1902_MHI_LEG2_HAW_SN1280_024 | 7/19/2019 | 19.36543 | -155.894682 | YES |
| HAW | SE1902_MHI_LEG2_HAW_SN1280_025 | 7/19/2019 | 19.387358 | -155.904898 | YES |
| HAW | SE1902_MHI_LEG2_HAW_SN1281_003 | 7/11/2019 | 19.209855 | -155.901266 | YES |
| HAW | SE1902_MHI_LEG2_HAW_SN1281_004 | 7/11/2019 | 19.244309 | -155.900306 | YES |
| HAW | SE1902_MHI_LEG2_HAW_SN1281_005 | 7/11/2019 | 19.209781 | -155.901363 | YES |
| HAW | SE1902_MHI_LEG2_HAW_SN1281_011 | 7/14/2019 | 19.457961 | -154.834217 | YES |
| HAW | SE1902_MHI_LEG2_HAW_SN1281_012 | 7/14/2019 | 19.5056 | -154.807487 | YES |
| HAW | SE1902_MHI_LEG2_HAW_SN1281_013 | 7/14/2019 | 19.534627 | -154.831689 | YES |
| HAW | SE1902_MHI_LEG2_HAW_SN1281_014 | 7/14/2019 | 19.567467 | -154.894639 | YES |
| HAW | SE1902_MHI_LEG2_HAW_SN1281_015 | 7/15/2019 | 20.268271 | -155.860393 | YES |
| HAW | SE1902_MHI_LEG2_HAW_SN1281_016 | 7/16/2019 | 19.970252 | -155.848808 | YES |
| HAW | SE1902_MHI_LEG2_HAW_SN1281_017 | 7/16/2019 | 19.922924 | -155.893565 | YES |
| HAW | SE1902_MHI_LEG2_HAW_SN1281_018 | 7/16/2019 | 19.85504 | -155.934001 | YES |
| HAW | SE1902_MHI_LEG2_HAW_SN1281_019 | 7/16/2019 | 19.833611 | -155.987759 | YES |
| HAW | SE1902_MHI_LEG2_HAW_SN1281_020 | 7/16/2019 | 19.794511 | -156.028839 | YES |
| HAW | SE1902_MHI_LEG2_HAW_SN1281_021 | 7/16/2019 | 19.737125 | -156.05425 | YES |
| HAW | SE1902_MHI_LEG2_HAW_SN1281_022 | 7/17/2019 | 19.642144 | -156.011985 | YES |
| HAW | SE1902_MHI_LEG2_HAW_SN1281_023 | 7/17/2019 | 19.597113 | -155.977388 | YES |
| HAW | SE1902_MHI_LEG2_HAW_SN1281_024 | 7/17/2019 | 19.561015 | -155.965557 | YES |
| HAW | SE1902_MHI_LEG2_HAW_SN1281_025 | 7/17/2019 | 19.55497 | -155.98285 | YES |
| HAW | SE1902_MHI_LEG2_HAW_SN1281_026 | 7/17/2019 | 19.550788 | -155.999951 | YES |
| HAW | SE1902_MHI_LEG2_HAW_SN1281_027 | 7/17/2019 | 19.546413 | -156.017275 | YES |
| HAW | SE1902_MHI_LEG2_HAW_SN1281_028 | 7/17/2019 | 19.54286 | -156.034842 | YES |

| Location | CTD_ID | Date | Latitude | Longitude | Water Sample |
|---|---|---|---|---|---|
| HAW | SE1902_MHI_LEG2_HAW_SN1281_029 | 7/17/2019 | 19.542784 | -156.052576 | YES |
| HAW | SE1902_MHI_LEG2_HAW_SN1281_030 | 7/17/2019 | 19.509912 | -155.956883 | YES |
| HAW | SE1902_MHI_LEG2_HAW_SN1281_031 | 7/17/2019 | 19.462817 | -155.926738 | YES |
| HAW | SE1902_MHI_LEG2_HAW_SN1281_032 | 7/19/2019 | 19.244404 | -155.900528 | YES |
| HAW | SE1902_MHI_LEG2_HAW_SN1281_033 | 7/19/2019 | 19.209948 | -155.901378 | YES |
| HAW | SE1902_MHI_LEG2_HAW_SN1281_034 | 7/19/2019 | 19.298979 | -155.889949 | YES |
| HAW | SE1902_MHI_LEG2_HAW_SN1281_035 | 7/19/2019 | 19.359359 | -155.891722 | YES |
| LAN | SE1902_MHI_LEG2_LAN_SN1280_026 | 7/20/2019 | 20.733303 | -156.94666 | YES |
| LAN | SE1902_MHI_LEG2_LAN_SN1280_027 | 7/20/2019 | 20.787903 | -156.992559 | YES |
| LAN | SE1902_MHI_LEG2_LAN_SN1280_028 | 7/20/2019 | 20.81702 | -156.98841 | YES |
| LAN | SE1902_MHI_LEG2_LAN_SN1280_029 | 7/20/2019 | 20.846637 | -157.00564 | YES |
| LAN | SE1902_MHI_LEG2_LAN_SN1280_030 | 7/20/2019 | 20.865803 | -157.038344 | YES |
| LAN | SE1902_MHI_LEG2_LAN_SN1281_001 | 7/10/2019 | 20.843918 | -156.813398 | YES |
| LAN | SE1902_MHI_LEG2_LAN_SN1281_002 | 7/10/2019 | 20.756211 | -156.8502 | YES |
| LAN | SE1902_MHI_LEG2_LAN_SN1281_036 | 7/20/2019 | 20.732482 | -156.959149 | YES |
| LAN | SE1902_MHI_LEG2_LAN_SN1281_037 | 7/20/2019 | 20.742419 | -156.971549 | YES |
| LAN | SE1902_MHI_LEG2_LAN_SN1281_038 | 7/20/2019 | 20.757876 | -156.985936 | YES |
| LAN | SE1902_MHI_LEG2_LAN_SN1281_039 | 7/20/2019 | 20.795482 | -156.992404 | YES |
| LAN | SE1902_MHI_LEG2_LAN_SN1281_040 | 7/20/2019 | 20.829942 | -156.993786 | YES |
| KAU | SE1902_MHI_LEG3_KAU_SN1280_005 | 7/27/2019 | 22.203483 | -159.634594 | YES |
| KAU | SE1902_MHI_LEG3_KAU_SN1280_006 | 7/27/2019 | 22.113295 | -159.738913 | YES |
| KAU | SE1902_MHI_LEG3_KAU_SN1280_007 | 7/28/2019 | 22.076973 | -159.300003 | YES |
| KAU | SE1902_MHI_LEG3_KAU_SN1280_008 | 7/28/2019 | 21.956199 | -159.338073 | YES |
| KAU | SE1902_MHI_LEG3_KAU_SN1281_001 | 7/24/2019 | 21.875821 | -159.525592 | YES |
| KAU | SE1902_MHI_LEG3_KAU_SN1281_002 | 7/24/2019 | 21.891997 | -159.580292 | YES |
| KAU | SE1902_MHI_LEG3_KAU_SN1281_011 | 7/27/2019 | 22.204219 | -159.606751 | YES |
| KAU | SE1902_MHI_LEG3_KAU_SN1281_012 | 7/27/2019 | 22.18031 | -159.652592 | YES |
| KAU | SE1902_MHI_LEG3_KAU_SN1281_013 | 7/27/2019 | 22.168322 | -159.685645 | YES |
| KAU | SE1902_MHI_LEG3_KAU_SN1281_014 | 7/28/2019 | 22.060909 | -159.31116 | YES |
| KAU | SE1902_MHI_LEG3_KAU_SN1281_015 | 7/28/2019 | 22.030453 | -159.329643 | YES |
| KAU | SE1902_MHI_LEG3_KAU_SN1281_016 | 7/28/2019 | 21.995494 | -159.330453 | YES |
| LAN | SE1902_MHI_LEG3_LAN_SN1280_010 | 7/30/2019 | 20.908947 | -156.878748 | YES |
| LAN | SE1902_MHI_LEG3_LAN_SN1280_011 | 7/30/2019 | 20.866647 | -156.830469 | YES |
| LAN | SE1902_MHI_LEG3_LAN_SN1281_017 | 7/29/2019 | 20.926801 | -156.937616 | YES |
| LAN | SE1902_MHI_LEG3_LAN_SN1281_018 | 7/29/2019 | 20.915346 | -156.886806 | YES |
| LAN | SE1902_MHI_LEG3_LAN_SN1281_019 | 7/29/2019 | 20.844003 | -156.813531 | YES |
| MAI | SE1902_MHI_LEG3_MAI_SN1280_030 | 8/6/2019 | 20.641721 | -156.09135 | YES |
| MAI | SE1902_MHI_LEG3_MAI_SN1280_031 | 8/6/2019 | 20.623816 | -156.178402 | YES |
| MAI | SE1902_MHI_LEG3_MAI_SN1280_032 | 8/6/2019 | 20.59726 | -156.262131 | YES |
| MAI | SE1902_MHI_LEG3_MAI_SN1281_038 | 8/6/2019 | 20.62983 | -156.111276 | YES |
| MAI | SE1902_MHI_LEG3_MAI_SN1281_039 | 8/6/2019 | 20.607197 | -156.242342 | YES |
| NII | SE1902_MHI_LEG3_NII_SN1280_001 | 7/25/2019 | 22.003485 | -160.065263 | YES |

| Location | CTD_ID | Date | Latitude | Longitude | Water Sample |
|---|---|---|---|---|---|
| NII | SE1902_MHI_LEG3_NII_SN1280_002 | 7/25/2019 | 22.014113 | -160.099468 | YES |
| NII | SE1902_MHI_LEG3_NII_SN1280_003 | 7/26/2019 | 21.80423 | -160.249751 | YES |
| NII | SE1902_MHI_LEG3_NII_SN1281_003 | 7/25/2019 | 21.941402 | -160.070059 | YES |
| NII | SE1902_MHI_LEG3_NII_SN1281_004 | 7/25/2019 | 21.968401 | -160.055522 | YES |
| NII | SE1902_MHI_LEG3_NII_SN1281_005 | 7/25/2019 | 21.998963 | -160.0545 | YES |
| NII | SE1902_MHI_LEG3_NII_SN1281_006 | 7/25/2019 | 22.025795 | -160.099304 | YES |
| NII | SE1902_MHI_LEG3_NII_SN1281_007 | 7/26/2019 | 21.780286 | -160.205599 | YES |
| NII | SE1902_MHI_LEG3_NII_SN1281_008 | 7/26/2019 | 21.816878 | -160.250116 | YES |
| NII | SE1902_MHI_LEG3_NII_SN1281_009 | 7/26/2019 | 21.857173 | -160.241592 | YES |
| NII | SE1902_MHI_LEG3_NII_SN1281_010 | 7/26/2019 | 21.897851 | -160.233949 | YES |
| OAH | SE1902_MHI_LEG3_OAH_SN1280_012 | 7/30/2019 | 21.28681 | -158.10532 | YES |
| OAH | SE1902_MHI_LEG3_OAH_SN1280_013 | 7/30/2019 | 21.346067 | -158.141055 | YES |
| OAH | SE1902_MHI_LEG3_OAH_SN1280_014 | 7/30/2019 | 21.389957 | -158.169229 | YES |
| OAH | SE1902_MHI_LEG3_OAH_SN1280_015 | 7/31/2019 | 21.608058 | -158.108147 | YES |
| OAH | SE1902_MHI_LEG3_OAH_SN1280_018 | 8/2/2019 | 21.571724 | -158.278773 | YES |
| OAH | SE1902_MHI_LEG3_OAH_SN1280_019 | 8/2/2019 | 21.564715 | -158.274302 | YES |
| OAH | SE1902_MHI_LEG3_OAH_SN1280_020 | 8/2/2019 | 21.537185 | -158.232528 | YES |
| OAH | SE1902_MHI_LEG3_OAH_SN1280_021 | 8/3/2019 | 21.704857 | -158.022102 | YES |
| OAH | SE1902_MHI_LEG3_OAH_SN1280_022 | 8/3/2019 | 21.665995 | -158.053797 | YES |
| OAH | SE1902_MHI_LEG3_OAH_SN1280_023 | 8/3/2019 | 21.63781 | -158.075347 | YES |
| OAH | SE1902_MHI_LEG3_OAH_SN1280_024 | 8/4/2019 | 21.503404 | -157.796233 | YES |
| OAH | SE1902_MHI_LEG3_OAH_SN1280_025 | 8/4/2019 | 21.539013 | -157.823403 | YES |
| OAH | SE1902_MHI_LEG3_OAH_SN1280_026 | 8/4/2019 | 21.585634 | -157.865762 | YES |
| OAH | SE1902_MHI_LEG3_OAH_SN1280_027 | 8/5/2019 | 21.260311 | -157.697178 | YES |
| OAH | SE1902_MHI_LEG3_OAH_SN1280_028 | 8/5/2019 | 21.254629 | -157.745686 | YES |
| OAH | SE1902_MHI_LEG3_OAH_SN1280_029 | 8/5/2019 | 21.273411 | -157.734253 | YES |
| OAH | SE1902_MHI_LEG3_OAH_SN1281_020 | 7/30/2019 | 21.307023 | -158.125842 | YES |
| OAH | SE1902_MHI_LEG3_OAH_SN1281_021 | 7/30/2019 | 21.380051 | -158.152593 | YES |
| OAH | SE1902_MHI_LEG3_OAH_SN1281_022 | 7/30/2019 | 21.399106 | -158.180392 | YES |
| OAH | SE1902_MHI_LEG3_OAH_SN1281_023 | 7/31/2019 | 21.590864 | -158.17652 | YES |
| OAH | SE1902_MHI_LEG3_OAH_SN1281_024 | 7/31/2019 | 21.58853 | -158.222405 | YES |
| OAH | SE1902_MHI_LEG3_OAH_SN1281_025 | 7/31/2019 | 21.580313 | -158.274711 | YES |
| OAH | SE1902_MHI_LEG3_OAH_SN1281_026 | 8/2/2019 | 21.534475 | -158.2346 | YES |
| OAH | SE1902_MHI_LEG3_OAH_SN1281_027 | 8/2/2019 | 21.503444 | -158.236493 | YES |
| OAH | SE1902_MHI_LEG3_OAH_SN1281_028 | 8/2/2019 | 21.477809 | -158.230368 | YES |
| OAH | SE1902_MHI_LEG3_OAH_SN1281_029 | 8/2/2019 | 21.457762 | -158.218028 | YES |
| OAH | SE1902_MHI_LEG3_OAH_SN1281_030 | 8/3/2019 | 21.695948 | -158.038399 | YES |
| OAH | SE1902_MHI_LEG3_OAH_SN1281_031 | 8/3/2019 | 21.684293 | -158.042438 | YES |
| OAH | SE1902_MHI_LEG3_OAH_SN1281_032 | 8/3/2019 | 21.630287 | -158.078005 | YES |
| OAH | SE1902_MHI_LEG3_OAH_SN1281_033 | 8/4/2019 | 21.480041 | -157.783501 | YES |
| OAH | SE1902_MHI_LEG3_OAH_SN1281_034 | 8/4/2019 | 21.458424 | -157.798428 | YES |
| OAH | SE1902_MHI_LEG3_OAH_SN1281_035 | 8/5/2019 | 21.261808 | -157.765426 | YES |

| Location | CTD_ID | Date | Latitude | Longitude | Water Sample |
|---|---|---|---|---|---|
| OAH | SE1902_MHI_LEG3_OAH_SN1281_036 | 8/5/2019 | 21.249945 | -157.789748 | YES |
| OAH | SE1902_MHI_LEG3_OAH_SN1281_037 | 8/5/2019 | 21.25073 | -157.820028 | YES |

**Table 9. Summary of mooring sites. Island abbreviations are: Hawaii (HAW; Big Island), Kahoolawe (KAH), Lanai (LAN), Maui (MAI), Molokai (MOL), Oahu (OAH), Kauai (KAU), and Niihau (NII).**

| Location | Site | Action | Instrument Type | Latitude | Longitude | Depth (feet) |
|---|---|---|---|---|---|---|
| MOL | MOL_OCEAN_002 | DEPLOYMENT | STR | 21.177175 | -156.760074 | 18 |
| MOL | MOL_OCEAN_003 | DEPLOYMENT | STR | 21.134024 | -157.300253 | 52 |
| MOL | MOL_OCEAN_003 | DEPLOYMENT | STR | 21.134024 | -157.300253 | 52 |
| MOL | MOL_OCEAN_004 | DEPLOYMENT | STR | 21.134682 | -157.305887 | 83 |
| MOL | MOL_OCEAN_006 | DEPLOYMENT | STR | 21.176929 | -156.760487 | 48 |
| MOL | MOL_OCEAN_006 | DEPLOYMENT | STR | 21.176929 | -156.760487 | 48 |
| LAN | LAN_OCEAN_006 | DEPLOYMENT | STR | 20.735819 | -156.915538 | 48 |
| LAN | LAN_OCEAN_006 | DEPLOYMENT | STR | 20.735819 | -156.915538 | 48 |
| LAN | LAN_OCEAN_007 | DEPLOYMENT | STR | 20.737256 | -156.91578 | 18 |
| MAI | MAI_OCEAN_008 | DEPLOYMENT | STR | 20.868567 | -156.146285 | 50 |
| MAI | MAI_OCEAN_008 | DEPLOYMENT | STR | 20.868567 | -156.146285 | 50 |
| MAI | MAI_OCEAN_009 | DEPLOYMENT | STR | 20.870003 | -156.145262 | 83 |
| MAI | MAI_OCEAN_010 | DEPLOYMENT | STR | 20.95183 | -156.69184 | 19 |
| MOL | MOL_OCEAN_008 | DEPLOYMENT | STR | 21.178671 | -156.76055 | 81 |
| OAH | OAH_OCEAN_023 | DEPLOYMENT | STR | 21.288417 | -157.86533 | 40 |
| OAH | OAH_OCEAN_023 | DEPLOYMENT | STR | 21.288417 | -157.86533 | 40 |
| OAH | OAH_OCEAN_027 | DEPLOYMENT | STR | 21.289944 | -157.863761 | 16 |
| OAH | OAH_OCEAN_028 | DEPLOYMENT | STR | 21.284853 | -157.867868 | 87 |
| LAN | LAN_OCEAN_006 | RETRIEVAL | STR | 20.735819 | -156.915538 | 48 |
| LAN | LAN_OCEAN_007 | RETRIEVAL | STR | 20.737256 | -156.91578 | 18 |
| MAI | MAI_OCEAN_010 | RETRIEVAL | STR | 20.95183 | -156.69184 | 19 |
| MAI | MAI_OCEAN_011 | RETRIEVAL | STR | 20.960174 | -156.687776 | 20 |
| MAI | MAI_OCEAN_012 | RETRIEVAL | STR | 20.909578 | -156.691943 | 20 |
| MAI | MAI_OCEAN_008 | RETRIEVAL | STR | 20.868567 | -156.146285 | 50 |
| MAI | MAI_OCEAN_009 | RETRIEVAL | STR | 20.870003 | -156.145262 | 83 |
| MOL | MOL_OCEAN_003 | RETRIEVAL | STR | 21.134024 | -157.300253 | 52 |
| MOL | MOL_OCEAN_004 | RETRIEVAL | STR | 21.134682 | -157.305887 | 83 |
| MOL | MOL_OCEAN_006 | RETRIEVAL | STR | 21.176929 | -156.760487 | 48 |
| MOL | MOL_OCEAN_007 | RETRIEVAL | STR | 21.177175 | -156.760074 | 18 |
| MOL | MOL_OCEAN_008 | RETRIEVAL | STR | 21.178671 | -156.76055 | 81 |
| OAH | OAH_OCEAN_023 | RETRIEVAL | STR | 21.288417 | -157.86533 | 40 |
| OAH | OAH_OCEAN_027 | RETRIEVAL | STR | 21.289944 | -157.863761 | 16 |
| OAH | OAH_OCEAN_028 | RETRIEVAL | STR | 21.284853 | -157.867868 | 87 |
| HAW | Diel | DEPLOYMENT | ADP | 19.209911 | -155.901367 | 50 |
| HAW | Diel | DEPLOYMENT | PH | 19.209911 | -155.901367 | 50 |

| Location | Site | Action | Instrument Type | Latitude | Longitude | Depth (feet) |
|---|---|---|---|---|---|---|
| HAW | Diel | DEPLOYMENT | CTD | 19.209911 | -155.901367 | 50 |
| HAW | Diel | DEPLOYMENT | PAR | 19.209911 | -155.901367 | 50 |
| HAW | HAW_OCEAN_007 | DEPLOYMENT | STR | 20.268215 | -155.860413 | 46 |
| HAW | HAW_OCEAN_007 | DEPLOYMENT | STR | 20.268215 | -155.860413 | 46 |
| HAW | HAW_OCEAN_008 | DEPLOYMENT | STR | 20.270261 | -155.860994 | 81 |
| HAW | HAW_OCEAN_009 | DEPLOYMENT | STR | 19.244301 | -155.900277 | 47 |
| HAW | HAW_OCEAN_009 | DEPLOYMENT | STR | 19.244301 | -155.900277 | 47 |
| HAW | HAW_OCEAN_010 | DEPLOYMENT | STR | 19.244175 | -155.900429 | 79 |
| HAW | HAW_OCEAN_011 | DEPLOYMENT | STR | 19.244456 | -155.899736 | 17.1 |
| LAN | Diel | DEPLOYMENT | PAR | 20.843899 | -156.813413 | 47 |
| LAN | Diel | DEPLOYMENT | ADP | 20.843899 | -156.813413 | 47 |
| LAN | Diel | DEPLOYMENT | DO SENSOR | 20.843899 | -156.813413 | 47 |
| LAN | Diel | DEPLOYMENT | CTD | 20.843899 | -156.813413 | 47 |
| HAW | Diel | RETRIEVAL | ADP | 19.209916 | -155.901312 | 50 |
| HAW | Diel | RETRIEVAL | PH | 19.209916 | -155.901312 | 50 |
| HAW | Diel | RETRIEVAL | CTD | 19.209916 | -155.901312 | 50 |
| HAW | Diel | RETRIEVAL | PAR | 19.209916 | -155.901312 | 50 |
| HAW | HAW_OCEAN_007 | RETRIEVAL | STR | 20.268215 | -155.860413 | 46 |
| HAW | HAW_OCEAN_008 | RETRIEVAL | STR | 20.270261 | -155.860994 | 81 |
| HAW | HAW_OCEAN_009 | RETRIEVAL | STR | 19.244301 | -155.900277 | 47 |
| HAW | HAW_OCEAN_010 | RETRIEVAL | STR | 19.244175 | -155.900429 | 79 |
| HAW | HAW_OCEAN_011 | RETRIEVAL | STR | 19.244456 | -155.899736 | 17 |
| KAU | KAU_OCEAN_008 | DEPLOYMENT | STR | 21.998207 | -159.327901 | 75 |
| KAU | KAU_OCEAN_010 | DEPLOYMENT | STR | 22.168448 | -159.685726 | 48 |
| KAU | KAU_OCEAN_010 | DEPLOYMENT | STR | 22.168448 | -159.685726 | 48 |
| KAU | KAU_OCEAN_011 | DEPLOYMENT | STR | 22.171442 | -159.687149 | 86 |
| KAU | KAU_OCEAN_013 | DEPLOYMENT | STR | 21.876668 | -159.525503 | 52 |
| KAU | KAU_OCEAN_013 | DEPLOYMENT | STR | 21.876668 | -159.525503 | 52 |
| KAU | KAU_OCEAN_014 | DEPLOYMENT | STR | 21.875749 | -159.525324 | 83 |
| KAU | KAU_OCEAN_015 | DEPLOYMENT | STR | 21.882228 | -159.525489 | 18 |
| KAU | KAU_OCEAN_016 | DEPLOYMENT | STR | 21.998459 | -159.328539 | 49 |
| KAU | KAU_OCEAN_016 | DEPLOYMENT | STR | 21.998459 | -159.328539 | 49 |
| NII | NII_OCEAN_004 | DEPLOYMENT | STR | 21.901751 | -160.237635 | 86 |
| OAH | OAH_OCEAN_016 | DEPLOYMENT | STR | 21.458624 | -157.798648 | 7 |
| OAH | OAH_OCEAN_017 | DEPLOYMENT | STR | 21.590948 | -158.174669 | 46 |
| OAH | OAH_OCEAN_017 | DEPLOYMENT | STR | 21.590948 | -158.174669 | 46 |

| Location | Site | Action | Instrument Type | Latitude | Longitude | Depth (feet) |
|---|---|---|---|---|---|---|
| OAH | OAH_OCEAN_018 | DEPLOYMENT | STR | 21.592426 | -158.174718 | 81 |
| OAH | OAH_OCEAN_022 | DEPLOYMENT | STR | 21.480041 | -157.783501 | 42 |
| OAH | OAH_OCEAN_022 | DEPLOYMENT | STR | 21.480041 | -157.783501 | 42 |
| OAH | OAH_OCEAN_025 | DEPLOYMENT | STR | 21.483062 | -157.78075 | 79 |
| OAH | OAH_OCEAN_026 | DEPLOYMENT | STR | 21.473581 | -157.788019 | 18 |
| OAH | OAH_OCEAN_029 | DEPLOYMENT | STR | 21.534078 | -158.234391 | 48 |
| OAH | OAH_OCEAN_029 | DEPLOYMENT | STR | 21.534078 | -158.234391 | 48 |
| KAU | KAU_OCEAN_014 | RETRIEVAL | STR | 21.875749 | -159.525324 | 83 |
| KAU | KAU_OCEAN_015 | RETRIEVAL | STR | 21.882228 | -159.525489 | 18 |
| KAU | KAU_OCEAN_008 | RETRIEVAL | STR | 21.998207 | -159.327901 | 75 |
| KAU | KAU_OCEAN_016 | RETRIEVAL | STR | 21.998459 | -159.328539 | 49 |
| KAU | KAU_OCEAN_011 | RETRIEVAL | STR | 22.171442 | -159.687149 | 86 |
| KAU | KAU_OCEAN_013 | RETRIEVAL | STR | 21.876668 | -159.525503 | 52 |
| LAN | Diel | RETRIEVAL | PH | 20.843953 | -156.813482 | 47 |
| LAN | Diel | RETRIEVAL | PAR | 20.843953 | -156.813482 | 47 |
| LAN | Diel | RETRIEVAL | ADP | 20.843953 | -156.813482 | 47 |
| LAN | Diel | RETRIEVAL | DO SENSOR | 20.843953 | -156.813482 | 47 |
| LAN | Diel | RETRIEVAL | CTD | 20.843953 | -156.813482 | 47 |
| NII | NII_OCEAN_004 | RETRIEVAL | STR | 21.901751 | -160.237635 | 86 |
| OAH | Diel | RETRIEVAL | STR | 21.458624 | -157.798648 | 7 |
| OAH | OAH_OCEAN_017 | RETRIEVAL | STR | 21.590948 | -158.174669 | 46 |
| OAH | OAH_OCEAN_018 | RETRIEVAL | STR | 21.592426 | -158.174718 | 81 |
| OAH | OAH_OCEAN_022 | RETRIEVAL | STR | 21.480041 | -157.783501 | 42 |
| OAH | OAH_OCEAN_025 | RETRIEVAL | STR | 21.483062 | -157.78075 | 79 |
| OAH | OAH_OCEAN_026 | RETRIEVAL | STR | 21.473581 | -157.788019 | 18 |
| OAH | OAH_OCEAN_029 | RETRIEVAL | STR | 21.534078 | -158.234391 | 48 |

**Table 10. Geographic coordinates where BMUs were deployed and recovered. Island abbreviations are defined as follows: Hawaii (HAW, Big Island); Kahoolawe (KAH); Lanai (LAN); Maui (MAI); Molokai (MOL); Oahu (OAH); Kauai (KAU); and Niihau (NII).**

| Site | Latitude | Longitude | BMUs deployed | BMUs recovered |
|---|---|---|---|---|
| HAW-41 | 20.268215 | -155.860413 | 5 | 5 |
| HAW-42 | 20.249092 | -155.890808 | 0 | 3 |
| HAW-43 | 19.244301 | -155.900277 | 5 | 5 |
| OAH-19 | 21.458624 | -157.798648 | 5 | 0 |
| OAH-20 | 21.590948 | -158.174669 | 0 | 1 |
| OAH-22 | 21.479687 | -157.782982 | 5 | 5 |
| OAH-25 | 21.534078 | -158.234391 | 5 | 3 |

**Table 11. Geographic coordinates where CAUs were deployed and recovered. Island abbreviations are defined as follows: Hawaii (HAW, Big Island); Kahoolawe (KAH); Lanai (LAN); Maui (MAI); Molokai (MOL); Oahu (OAH); Kauai (KAU); and Niihau (NII).**

| Site | Latitude | Longitude | CAUs deployed | CAUs recovered |
|---|---|---|---|---|
| HAW-49 | 19.930896 | -155.892087 | 0 | 4 |
| HAW-73 | 19.88447 | -155.913932 | 0 | 5 |
| KAU-21 | 22.168448 | -159.6857236 | 5 | 3 |
| KAU-22 | 21.876668 | -159.525503 | 5 | 5 |
| LAN-10 | 20.915378 | -156.886374 | 0 | 4 |
| LAN-11 | 20.926482 | -156.93854 | 0 | 5 |
| LAN-12 | 20.73582 | -156.91554 | 5 | 5 |
| MAI-01 | 20.76222 | -155.97989 | 0 | 1 |
| MAI-02 | 20.86345 | -156.15138 | 0 | 4 |
| MAI-07 | 21.00738 | -156.66776 | 5 | 3 |
| MAI-30 | 20.86857 | -156.14629 | 5 | 5 |
| MOL-20 | 21.03566 | -156.89035 | 5 | 5 |
| MOL-21 | 21.08299 | -157.06427 | 5 | 5 |
| MOL-22 | 21.13402 | -157.30025 | 5 | 4 |
| MOL-23 | 21.17693 | -156.76048 | 5 | 3 |
| MOL-24 | 21.20704 | -156.98476 | 5 | 2 |
| NII-10 | 21.941402 | -160.070059 | 5 | 5 |
| NII-11 | 21.897569 | -160.233901 | 5 | 4 |
| OAH-19 | 21.458624 | -157.798648 | 5 | 0 |
| OAH-20 | 21.590948 | -158.174669 | 0 | 1 |
| OAH-22 | 21.479687 | -157.782982 | 5 | 4 |
| OAH-24 | 21.261808 | -157.765426 | 0 | 5 |
| OAH-25 | 21.534078 | -158.234391 | 5 | 3 |