

Standard Operating Procedure (SOP) #1

Before the Field Season

Version 1.03 (June 2, 2022)

Change History

New Version #	Revision Date	Author	Changes Made	Reasons for Change	Previous Version #
1.01	7/25/2012	Greg Kudray	Updated safety information	Safety	1.0
1.02	7/9//2021	Kim Weisenborn, Kelly Kozar, Sheila McKenna	Minor updates to content	To update outdated SOP references	1.01
1.03	6/2/2022	Kim Weisenborn	Updated content to refer to new PACN I&M SharePoint. Updated footnotes.	PACN data is no longer stored on a networked server (I:\ drive) and is now stored on the PACN I&M SharePoint site.	1.02

Only changes in this specific SOP will be logged here. Version numbers increase incrementally by hundredths (e.g., version 1.01, version 1.02) for minor changes. Major revisions should be designated with the next whole number (e.g., version 2.0, 3.0, 4.0). Record the previous version number, date of revision, author of the revision, changes made, and reason for the change along with the new version number.

Purpose

Prior to the field season each year, usually beginning in early spring, observers are required to review the entire Pacific Island Inventory and Monitoring Network (PACN I&M) Marine Fish Monitoring Protocol, including all SOPs listed in the protocol. This SOP outlines the annual steps to prepare for a field season ensuring the availability of proper equipment prior to the start of monitoring. More detailed descriptions of specific monitoring tasks are given SOP #2 Training Observers, SOP #3 Safety Protocol, SOP #4 Using Garmin® GPS Units, SOP #6 Pre-dive Equipment Preparation, SOP #7 Selecting and Marking Subtidal Transect Locations, and SOP #8 Conducting Marine Fish Surveys.

A master equipment list for the entire Marine Fish Protocol can be found in Appendix SOP 1.a of this SOP. The master equipment list should be updated simultaneously if any SOP associated with or containing gear lists is revised.

General Preparation and Review

Notebooks and Dive Logs

Notebooks and dive logs from previous surveys need to be reviewed to identify unique events that may be encountered in the current field season. A field notebook for the current survey year should be prepared with columns indicating sampling schedule, observer names, field hours, and unique occurrences. These fields may influence how the data are interpreted and reported. Survey reports are based on information recorded in field notebooks; therefore, it is imperative these are clearly organized for ease of field note entry. Field notebooks should be scanned at the end of each park's sampling event and uploaded to the [PACN I&M SharePoint site](#)¹ (see SOP #10 Workspace Setup and Project Records Management, and SOP #11 Field Form Handling Procedures for more information).

Compile Species Lists

A list of fish species from previous surveys in a park or local area should be compiled from the existing database and reference manuals to identify fish that have a probability of being recorded. Prior knowledge of fish species most likely to be encountered in a park will aid divers in species identification. Copies of this list should be updated and carried into the field as quick references in helping to identify fish species.

Load Waypoints

Waypoints for each Marine Fish transect (co-located with Benthic Marine Community transects) must be loaded onto the Global Positioning System (GPS) unit prior to the start of the field season. Waypoints are the X and Y coordinates for each transect start point and are used to navigate to sampling locations. SOP #7 Selecting and Marking Subtidal Transect Locations contains instructions for generating transect locations in latitude and longitude for each of the PACN parks with their associated Universal Transverse Mercator (UTM) grid coordinates and SOP #4 Using Garmin® GPS Units contains instructions on loading transect locations into the GPS unit.

Prepare Compass Headings

A complimentary list of compass headings and depths should be compiled or updated in advance of the field season for each fixed transect within a park (see SOP #7 Selecting and Marking Subtidal Transect Locations). Paper copies of these compass headings and depths, in addition to the GIS/GPS version, should be carried into the field to ensure that each fixed transect is located at the same point and surveyed as in previous years.

Scheduling Field Work

Sampling Dates

Sampling dates should be scheduled, and logistics organized well before the start of each field season. In the northern hemisphere, fish surveys can be conducted after the first full week of May until the end of September to coincide with diminished wave activity. In the southern hemisphere, surveys can be scheduled after the first full week of November until the end of April. It is preferable to sample at approximately the same time each year (± 1 month) and as early in time as possible at a

¹ PACN I&M SharePoint site, <https://doimspp.sharepoint.com/sites/nps-PWR-PACNIM> (accessed 2 June 2022).

given park. Inclement weather, rough sea conditions, or personnel workloads may preclude the scheduling of sampling events to specific annual dates. Ideally, the Marine Fish Monitoring needs to be scheduled at a time period that (± 1 month) coincides as close in time as possible with other marine protocols (e.g., Benthic Marine Community Monitoring) to examine any correlations with other data sets.

Crew

Monitoring efforts within each PACN park require a two to four person crew. Ideally, three people are needed to sample and one to serve as a boat operator/safety diver. Parks may possess site-specific safety requirements that must be followed. All personnel must read the Marine Fish Monitoring Protocol and SOPs, including SOP #3 Safety Protocol, prior to entering the field.

Timing and Co-location

Two to four fish transects should be scheduled for completion each field day (30 total transects annually). Thus, at least 8 – 15 field days per park will be needed to complete the field portion of this protocol. To maximize efficiency, this protocol can be completed simultaneously with the PACN Benthic Marine Community Protocol. Once transects are set-up, if fish and benthic monitoring are conducted on the same day, the field work for the PACN Marine Fish Protocol must be completed first to prevent disturbance to fish and bias in data.

Organizing Supplies and Equipment

Review Equipment Lists

The marine ecologist at each park ensures that all equipment and supplies listed in the tables of [Appendix SOP 1.a](#) of this SOP have been compiled, organized, and made ready for the field season at least two months in advance. Advance preparation allows time to make needed repairs and order equipment.

Field Data Forms

Copies of the field data forms (see specific SOPs for each anticipated task) must be made on waterproof paper with waterproof photocopies or printer ink (e.g., Xerox laser/copier; never-tear paper, not rite-in-rain).

Reference Manuals

Suggested reference manuals to facilitate identification of organisms encountered in fish surveys for each park should be available to pertinent staff (Table SOP 1.1).

Table SOP 1.1. Suggested reference materials by region and park.

Region and Park	Reference
American Samoa	
NPSA	Randall, J. 2005. Reef and shore fishes of the South Pacific. Univ. Hawaii Press, Honolulu, Hawaii.
	Allen, G. et al. 2003. Reef fish identification, tropical Pacific. New World Publ., Jacksonville, Florida.
	Myers, R. 1999. Micronesian reef fishes. Coral Graphics, Guam.

Region and Park	Reference
	Randall, J. et al. 1997. Fishes of the Great Barrier Reef and Coral Sea. Univ. Hawaii Press, Honolulu, Hawaii.
	Michael, S. 2001. Reef fishes, Vol. 1 - 5, T.F.H. Publications, New Jersey.
Guam/CNMI	
WAPA	Myers, R. 1999. Micronesian reef fishes. Coral Graphics, Guam.
	Allen, G. et al. 2003. Reef fish identification, tropical Pacific. New World Publ., Jacksonville, Florida.
	Randall, J. et al. 1997. Fishes of the Great Barrier Reef and Coral Sea. Univ. Hawaii Press, Honolulu, Hawaii.
	Randall, J. 2005. Reef and shore fishes of the South Pacific. Univ. Hawaii Press, Honolulu, Hawaii.
	Michael, S. 2001. Reef fishes, Vol. 1 - 5, T.F.H. Publications, New Jersey.
Hawaii Parks	
KALA & KAHŌ	Randall, J. 1996. Shore fishes of Hawaii. Natural World Press. Vida, Oregon.
	Hoover, J. 1993. Hawaii's fishes, a guide for snorkelers, divers and aquarists. Mutual Publishing. Honolulu, Hawaii.
	Michael, S. 2001. Reef fishes, Vol. 1-5, T.F.H. Publications, New Jersey.

Camera Gear

Camera gear will occasionally be used to aid identification of fishes observed. This method of identification is highly valuable especially for people with less identification experience; however, this method should only be utilized if it will not disrupt the further collection of data (i.e., not scaring other would-be surveyed fish).

Boat, Motor and Trailer

Boat, trailer, and motor servicing should be independently verified for each park for field operation. Ensure that this required preparation has been done in accordance with the Department of Interior (DOI) Motorboat Operator Manual and park specific SOPs (Table SOP 1.2). Park-specific SOPs can be obtained from the Park Dive Officer or the certified motorboat operator at each park. Marine Fish Monitoring Protocol SOP #20 After the Field Season also outlines the required post-field season maintenance for each.

Dive Gear

Prior to the start of the field season all dive gear should be checked, serviced, and tested as required by Reference Manual #4 – Diving Safety and Operations Manual (RM-4)². Verify that required inspections and maintenance were completed for the gear in Table SOP 1.3.

Transect Lines

New transect lines should be purchased or old transect lines reconditioned for conducting the fish survey as described in SOP #6 Pre-Dive Equipment Preparation.

² Reference Manual – 4: Diving Safety and Operations Manual, https://www.nps.gov/policy/DOrders/RM-4_6-2014.pdf (accessed 2 June 2022).

Appendix SOP 1.a. Equipment list for preparation of gear for the Marine Fish Monitoring Protocol

Table SOP 1.2. Equipment list for operating motorboats. Specific equipment required based on vessel length is listed in MOCC (2006)³. This equipment list refers to SOP #1 Before the Field Season.

Equipment (#/quantity)	Vendor Source	Preparation & Maintenance
MOCC (2006) ³	DOI course in Honolulu or at a park	Ensure that this equipment is available
DAN O2 kit	DAN 800-446-2671	Ensure that this equipment is available
Dive flag	Local dive store	Ensure that this equipment is available
Flares	West Marine ⁴	Ensure that this equipment is available
Survival kit (with contents list)	West Marine ⁴	Ensure that this equipment is available
Extra water	Local hardware store	Ensure that this equipment is available
PFDs for each person	West Marine ⁴	Ensure that this equipment is available
Spare parts kit	West Marine ⁴	Ensure that this equipment is available
EPIRB	West Marine ⁴	Ensure that this equipment is available
First aid kit	Local drug store	Ensure that this equipment is available
VHF and park radio or cell phone	West Marine ⁴	Ensure that this equipment is available
Water intake "rabbit ears"	West Marine ⁴	Ensure that this equipment is available
Water hose	Local hardware store	Ensure that this equipment is available
Battery	Local auto parts store	Ensure that this equipment is available
Battery charger	Local auto parts store	Ensure that this equipment is available
Fuel tanks	West Marine ⁴	Ensure that this equipment is available
Fuel filter	West Marine ⁴	Ensure that this equipment is available
Outboard motor leg oil	West Marine ⁴	Ensure that this equipment is available
Impeller	West Marine ⁴	Ensure that this equipment is available
Mooring lines	West Marine ⁴	Ensure that this equipment is available
Anchor, chain, and line	West Marine ⁴	Ensure that this equipment is available
Bilge pump	West Marine ⁴	Ensure that this equipment is available

Table SOP 1.3. SCUBA gear requiring periodic inspection and maintenance. This equipment list refers to SOP #1 Before the Field Season.

Equipment	Certification or Required Service
Air cylinders	VIP certification (annually), check o-rings, hydrostatic testing for expired cylinders (once every 5 years)
Regulators	Annual Service
Buoyancy compensator devices (BCDs)	Annual Service

³ Department of Interior (2006). Motorboat operator certification course, student manual. [https://training.fws.gov/courses/programs/watercraft-safety/MOCC-Student-Manual\(v2017-10-30\).pdf](https://training.fws.gov/courses/programs/watercraft-safety/MOCC-Student-Manual(v2017-10-30).pdf) (access 2 June 2022)

⁴ West Marine contact: 808-526-4420 or <https://www.westmarine.com/> (accessed 2 June 2022).

Table SOP 1.4. Equipment list for installing permanent transect marking pins. This equipment list refers to SOP #7 Selecting and Marking Subtidal Transect Locations.

Equipment (#/quantity)	Vendor Source	Preparation and Maintenance
1 cm (3/8") X 40 cm (16") threaded stainless steel rod (2+)/transect	Local hardware store	More pins may be necessary if conditions warrant
Z-spar® or Powerfast® epoxy (1 ea.)	West Marine ⁴	Ensure that 1 gallon of A&B (Z-Spar®) or 1 tube (Powerfast®) is available
Mesh bag (1)	Local dive store	Ensure that this equipment is available
Tupperware® containers for Z-spar® (2)	Local supermarket	One for each part of (A&B) of Z-spar® compound; Ensure that this equipment is available
2 or 5 lb. sledgehammer (2)	Local hardware store	One for back up; Ensure this equipment is available
30 m transect line (2)	Forestry Suppliers ⁵	Labeled at 50 cm intervals; see SOP #1 Before the Field Season
Coordinates, depths, compass headings, and/or maps of transect locations	Generated within each park	See SOP #7 Selecting and Marking Subtidal Transect Locations
GPS (1)	West Marine ⁴	See SOP #4 Using Garmin® GPS Units
Transparent waterproof container for GPS (1)	West Marine ⁴	Ensure that this equipment is available
U/W compass (1)	Local dive store	Ensure that this equipment is available
Surface float marker (2)	Local dive store	One for back-up; Ensure that this equipment is available
U/W slate with pencil (2)	Local dive store	Ensure that this equipment is available
U/W lights (2)	Local dive store	Ensure that this equipment is available
U/W light rechargeable batteries (2 sets)	Local dive store	Ensure that this equipment is available
Scuba gear	Local dive store	See SOP #6 Pre-Dive Equipment Preparation

⁵ Forestry Suppliers contact: 800-647-5368 or <https://www.forestry-suppliers.com/> (accessed 2 June 2022)

Table SOP 1.5. Equipment list for conducting marine fish surveys. This equipment list refers to SOP #6 Pre-Dive Equipment Preparation and SOP #8 Conducting Marine Fish Surveys.

Equipment (#/quantity)	Vendor Source	Preparation & Maintenance
30 m transect line	Forestry Suppliers ⁵	Labeled at 50 cm intervals, see SOP #1 Before the Field Season
Coordinates, depths, compass headings, and/or maps of transect locations	Generated within each park	Ensure that this equipment is available; See SOP #7 Selecting and Marking Subtidal Transect Locations
GPS (1)	West Marine ⁴	Ensure in working order; See SOP #4 Using Garmin® GPS Units
Transparent waterproof container for GPS (1)	West Marine ⁴	Ensure that this equipment is available
U/W compass (1)	Local dive store	Ensure that this equipment is available
Surface float marker (2)	Local dive store	One for back-up; Ensure that this equipment is available
U/W slate with pencil (2)	Local dive store	Ensure that this equipment is available
U/W field data forms	Local dive store	See SOP #8 Conducting Marine Fish Surveys
U/W lights (2)	Local dive store	Ensure equipment is in working order
U/W light rechargeable batteries (2 sets)	Local dive store	Ensure equipment has sufficient power
Pelican® case to store equipment (e.g. GPS) on boat.	West Marine ⁴	Ensure that this equipment is available
SCUBA gear	Local dive store	See SOP #6 Pre-Dive Equipment Preparation, and SOP #20 After the Field Season
Boat, motor, and trailer	GSA vendor	See SOP #6 Pre-Dive Equipment Preparation, and SOP #20 After the Field Season

Table SOP 1.6. Equipment list for conducting diving activities. This equipment list refers to SOP #6 Pre-Dive Equipment Preparation. All of this equipment can be obtained from a local dive shop.

Equipment (#/quantity)	Preparation & Maintenance
Air cylinders	Verify hydro and VIP; fill with compressed air or NITROX. See SOP #20 After the Field Season
Fins	Ensure that this equipment is available
Booties	Ensure that this equipment is available
Wetsuit	Ensure that this equipment is available
Hooded vest (optional)	Ensure that this equipment is available
Weights	Ensure that this equipment is available
Belt/integrated weight container	Ensure that this equipment is available
BC	Verify annual service. See SOP #20 After the Field Season
Regulator	Verify annual service. See SOP #20 After the Field Season
Mask & Snorkel	Ensure that this equipment is available
Dive computer	Ensure that this equipment is available
Thermometer	Ensure that this equipment is available
Compass	Ensure that this equipment is available
Knife, dive tool, or shears	Ensure that this equipment is available
Rescue “sausage” (international orange)	Ensure that this equipment is available
Whistle or surface noise maker	Ensure that this equipment is available
Underwater noise maker (e.g., subduck, knife)	Ensure that this equipment is available
Save a dive kit	Ensure that this equipment is available
Spare gear (mask, fin, snorkel, straps, other as needed)	Ensure that this equipment is available
Brass clips--attached to BCD, gear bags, or equipment (e.g., camera housing, hammers)	Ensure that this equipment is available
Dive bag for boat work	Ensure that this equipment is available
Bucket for shore work	Ensure that this equipment is available

Table SOP 1.7. Equipment list for permanent pin maintenance, as needed.

Equipment (#/quantity)	Vendor Source	Preparation & Maintenance
Pins (threaded stainless steel rod)	Local hardware store	Ensure that this equipment is available
Z-spar® (or other 2-part marine epoxy)	West Marine ⁴	Ensure that this equipment is available
Mesh bag	Local dive store	Ensure that this equipment is available
Tupperware® containers	Local supermarket	Ensure that this equipment is available
Sledge hammer	Local hardware store	Ensure that this equipment is available
Slate	Local dive store	Ensure that this equipment is available

Table SOP 1.8. Equipment list for tools and repair, as needed.

Equipment (#/quantity)	Vendor Source	Preparation & Maintenance
Fin and mask straps	Local dive store	Ensure that this equipment is available
O-rings	Local dive store	Ensure that this equipment is available
Electrical tape	Local hardware store	Ensure that this equipment is available
Duct tape	Local hardware store	Ensure that this equipment is available
Pliers	Local hardware store	Ensure that this equipment is available
Wire cutters	Local hardware store	Ensure that this equipment is available
Cable ties	Local hardware store	Ensure that this equipment is available
Snorkel keepers	Local dive store	Ensure that this equipment is available
Multimeter	Local hardware store	Ensure that this equipment is available
Allen & crescent wrenches for regulator repair	Local hardware store	Ensure that this equipment is available
O-ring pick	Local hardware store	Ensure that this equipment is available
Multi-purpose tool (e.g., Leatherman®)	Local hardware store	Ensure that this equipment is available

Table SOP 1.9. Equipment list for paperwork needed to complete any of the surveys in this protocol.

Equipment (#/quantity)	Source	Preparation & Maintenance
Permits	NPS and Local Gov.	Ensure that this equipment is available
Log book for documenting dives and accomplishments.	Local dive store	Ensure that this equipment is available
Charts and grid layouts	NOAA	Ensure that this equipment is available
Call local marine enforcement agency as appropriate	DOCARE ⁶	Ensure that this equipment is available
Pencils	Local supermarket	Ensure that this equipment is available
Pens	Local supermarket	Ensure that this equipment is available
Eraser	Local supermarket	Ensure that this equipment is available
Permanent marker	Local supermarket	Ensure that this equipment is available

⁶ State of Hawaii Division of Conservation and Resources Enforcement /643-DLNR/, <https://dlnr.hawaii.gov/docare/> (accessed 2 June 2022).