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NATIONAL MARINE FISHERIES SERVICE
Southeast Regional Office
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St. Petersburg, Florida 33701-5505
https://www.fisheries.noaa.gov/region/southeast

10/20/2020

F/SER31:MDA
SERO-2019-03349

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U.S. Fish and Wildlife Service
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Atlanta, Georgia 30345

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Edwin Rodriguez, Project Leader
Marine Ecological Division
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P. 0. Box 366147
San Juan, Puerto Rico 00936

Ref.: PRDNER, USFWS Project PR-F-Fl9AF01151, Remove, Replace, Install, and Maintain, Existing (65) and New (204) Mooring Anchor Systems for Ecological Mooring Buoys around Culebra Island, Fajardo, and Guánica, Puerto Rico

Dear Sir or Madam:

The enclosed Biological Opinion ("Opinion") responds to your request for consultation with us, the National Marine Fisheries Service (NMFS), pursuant to Section 7 of the Endangered Species Act (ESA) for the following action.

Applicant	**SER Number**	**Project Type(s)**
Edwin Rodriguez, PRDNER	SERO-2019-03349	Remove, replace, install, and maintain mooring anchor systems for ecological mooring buoys

The Opinion considers the effects of the removal, replacement, installation, and maintenance of existing mooring anchor systems for ecological mooring buoys and the installation and maintenance of new mooring systems in the coastal waters of Puerto Rico by the U.S. Fish and Wildlife Service (USFWS) and its agent, PRDNER on the following listed species and/or critical habitat. NMFS concludes that the proposed action is not likely to adversely affect green, (North and South Atlantic Distinct Population Segment [DPS]), leatherback, loggerhead, (Northwest Atlantic Ocean [NWA] DPS), and hawksbill sea turtles; scalloped hammerhead (Central and

Southwest Atlantic DPS), Nassau grouper, oceanic whitetip shark, and giant manta ray; and elkhorn, staghorn, boulder star, mountainous star, lobed star, rough cactus, and pillar corals. NMFS also concludes that the proposed action is likely to adversely affect, but not likely to result in the destruction or adverse modification (DAM) of designated critical habitat for elkhorn and staghorn corals.

We look forward to further cooperation with you on other projects to ensure the conservation of our threatened and endangered marine species and designated critical habitat. The project has been assigned the tracking number SERO-2019-03349 in our NMFS Environmental Consultation Organizer (ECO). Please refer to the ECO number in all future inquiries regarding this consultation. If you have any questions on this consultation, please contact Melissa Alvarez, Consultation Biologist, at (954) 734-0716, or by email at Melissa.Alvarez@noaa.gov.

Sincerely,

CRABTREE.ROY.E.DR.1365849559 Digitally signed by CRABTREE.ROY.E.DR.1365849559 Date: 2020.10.20 09:39:16 -04'00'

Roy E. Crabtree, Ph.D.
Regional Administrator

File: 1514-22.i

Endangered Species Act - Section 7 Consultation
Biological Opinion

Action Agencies:	U. S. Fish and Wildlife Service (USFWS) U. S. Army Corps of Engineers (USACE)
Applicant:	Puerto Rico Department of Natural and Environmental Resources (PRDNER)
Activity:	Removal, replacement, installation, and maintenance of existing mooring anchor systems for ecological mooring buoys and the installation and maintenance of new mooring systems in coastal waters of Puerto Rico
Consulting Agency:	National Oceanic and Atmospheric Administration (NOAA), National Marine Fisheries Service (NMFS), Southeast Regional Office, Protected Resources Division St. Petersburg, Florida
	Consultation Number SERO-2019-03349
Approved by:	CRABTREE.ROY.E.DR.1365849559 Digitally signed by CRABTREE.ROY.E.DR.1365849559 Date: 2020.10.20 09:40:01 -04'00' Roy E. Crabtree, Ph.D., Regional Administrator NMFS, Southeast Regional Office St. Petersburg, Florida
Date Issued:	10/20/2020

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Acronyms and Abbreviations

ASN – Alcatel-Lucent Submarine Networks
CFMC – Caribbean Fishery Management Council
CFR – Code of Federal Regulations
DAM – Destruction or adverse modification
DPS – Distinct Population Segment
EPA – U.S. Environmental Protection Agency
ESA – Endangered Species Act
LAA – Likely to adversely affect
NE – No effect
NLAA – Not likely to adversely affect
NMFS – National Marine Fisheries Service
NOAA – National Oceanic and Atmospheric Administration
NOS – National Ocean Service
NP – Not present
NWA – Northwest Atlantic
PRDNER – Puerto Rico Department of Natural and Environmental Resources
USACE – U. S. Army Corps of Engineers
USFWS – U.S. Fish and Wildlife Service
USVI – U.S. Virgin Islands

Units of Measurement

Length and Area

ac	acre(s)
ft	foot/feet
ft^2	square feet
in	inches
km	kilometer(s)
km^2	square kilometer(s)
m	meter(s)
mi	miles
mi^2	square miles

Introduction

Section 7(a)(2) of the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. § 1531 et seq.), requires each federal agency to "insure that any action authorized, funded, or carried out by such agency is not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of critical habitat of such species." Section 7(a)(2) requires federal agencies to consult with the appropriate Secretary on any such action. National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service (USFWS) share responsibilities for administering the ESA.

Consultation is required when a federal action agency determines that a proposed action "may affect" listed species or designated critical habitat. Consultation is concluded after NMFS determines that the action is not likely to adversely affect listed species or critical habitat or issues a Biological Opinion ("Opinion") that identifies whether a proposed action is likely to jeopardize the continued existence of a listed species, or destroy or adversely modify critical habitat. The Opinion states the amount or extent of incidental take of the listed species that may occur, develops measures (i.e., reasonable and prudent measures - RPMs) to reduce the effect of take, and recommends conservation measures to further the recovery of the species. Notably, no incidental destruction or adverse modification of designated critical habitat can be authorized, and thus there are no RPMs—only reasonable and prudent alternatives that must avoid destruction or adverse modification.

This document represents NMFS's Opinion based on our review of impacts associated with the proposed action to issue a permit within the coastal waters of Puerto Rico. This Opinion analyzes the project's effects on threatened and endangered species and designated critical habitat, in accordance with Section 7 of the ESA. We based it on project information provided by USFWS and its agents and other sources of information, including the published literature cited herein.

1 CONSULTATION HISTORY

We received your letter requesting consultation on October 10, 2019. We submitted a request for additional information on December 18, 2019, and a reply was received on December 20, 2019. Subsequently, an additional request for information was sent January 10, 2020, in regards to this consultation becoming a programmatic consultation for the same work. A response was received to these questions on January 24, 2020, and the consultation was initiated that day.

2 DESCRIPTION OF THE PROPOSED ACTION AND ACTION AREA

The Puerto Rico Department of Natural and Environmental Resources (PRDNER), the non-federal representative designated by the USFWS, proposes to remove and replace 65 existing mooring anchor systems for ecological mooring buoys and to install 204 new mooring systems in the coastal waters around Puerto Rico. Ecological mooring buoys are installed with anchoring systems to protect marine resources from mechanical damage from boats by managing recreational anchoring and navigation in areas containing sensitive seagrasses and corals. Over time, the anchoring systems deteriorate and breakdown and need to be replaced. The proposed

project is fully funded by USFWS and will require a permit from the U.S. Army Corps of Engineers (USACE). The USFWS and USACE are dual federal action agencies and the USFWS is acting as the lead federal agency.

2.1 Project Location

Specific locations for the removal, replacement and maintenance of the existing mooring anchor systems, and the installation and maintenance of 4 new mooring systems include areas around Culebra Island, in La Cordillera Natural Reserve (Natural Reserve) east of Fajardo, and the coral reefs in the waters south of Guánica, Puerto Rico, which will be referred to as Phase 1. The locations of the existing mooring anchor systems can be found in Table 1 and Figure 1 below. As discussed in detail later in this section, the installation and maintenance of up to 200 new mooring systems will be referred to as Phase 2 and will occur in 3 areas off the coast of Puerto Rico where the mooring buoy program has jurisdiction.

Table 1. Phase 1 locations and attributes of currently selected mooring replacement/installation areas

Number	Location	Latitude	Longitude	Type of anchor systems	Depth (feet)	Sea Bottom
	Fajardo Area					
1	Cayo Icacos Cay	18.388417	-65.594750	Manta Ray	17	Seagrass/Sand
2	Lobos Cay	18.37782	-65.57312	Manta Ray	17	Seagrass/Sand
3	Lobos	18.377867	-65.57238	Manta Ray	15	Seagrass/Sand
4	Palominito	18.338817	-65.563650	Manta Ray	15	Seagrass/Sand
5	Palominito	18.33843	-65.563517	Manta Ray	15	Seagrass/Sand
6	Palominito	18.33529	-65.56643	Manta Ray	20	Seagrass/Sand
7	Palominito	18.33656	-65.56583	Manta Ray	22	Seagrass/Sand
8	Palomino Island	18.3485	-65.57217	Manta Ray	17	Seagrass/Sand
9	Palomino	18.34796	-65.57198	Manta Ray	20	Seagrass/Sand
10	Palomino	18.34391	-65.5702	Manta Ray	16	Seagrass/Sand
11	Palomino	18.34367	-65.56991	Manta Ray	17	Seagrass/Sand
12	Palomino	18.3443	-65.57003	Manta Ray	20	Seagrass/Sand
13	Palomino	18.34409	-65.56998	Manta Ray	22	Seagrass/Sand
14	Palomino	18.34835	-65.57193	Manta Ray	24	Seagrass/Sand
15	Palomino	18.3481	-65.57163	Manta Ray	17	Seagrass/Sand
	Culebra Area					
16	Luis Peña	18.30554	-65.33797	Manta Ray	25	Seagrass/Sand
17	Luis Peña	18.2986	-65.33232	Manta Ray	16	Seagrass/Sand
18	Carlos Rosario	18.32448	-65.33192	Manta Ray	35	Seagrass/Sand
19	Carlos Rosario	18.32381	-65.33204	Manta Ray	35	Seagrass/Sand
20	Tamarindo Grande	18.32228	-65.32942	Manta Ray	12	Seagrass/Sand
21	Tamarindo Grande	18.3227	-65.32877	Manta Ray	12	Seagrass/Sand
22	Tamarindo Grande	18.32317	-65.32836	Manta Ray	12	Seagrass/Sand
23	Tamarindo Grande	18.32315	-65.32745	Manta Ray	12	Seagrass/Sand
24	Tamarindo Grande	18.32277	-65.32922	Manta Ray	12	Seagrass/Sand
25	Tamarindo Grande	18.32283	-65.32811	Manta Ray	12	Seagrass/Sand

Number	Location	Latitude	Longitude	Type of anchor systems	Depth (feet)	Sea Bottom
26	Tamarindo Chico	18.31833	-65.31893	Manta Ray	11	Seagrass/Sand
27	Tamarindo Chico	18.31747	-65.31847	Manta Ray	10	Seagrass/Sand
28	Tamarindo Chico	18.31692	-65.31825	Manta Ray	10	Seagrass/Sand
29	Tamarindo Chico	18.31644	-65.31813	Manta Ray	12	Seagrass/Sand
30	Tamarindo Chico	18.31594	-65.31815	Manta Ray	12	Seagrass/Sand
31	Tarja	18.30770	-65.31432	Manta Ray	11	Seagrass/Sand
32	Tarja	18.30736	-65.31404	Manta Ray	11	Seagrass/Sand
33	Punta Melones	18.30366	-65.31168	Manta Ray	8	Seagrass/Sand
34	Punta Melones	18.303029	-65.31131	Manta Ray	9	Seagrass/Sand
35	Bahía Linda	18.29782	-65.30131	Manta Ray	7	Seagrass/Sand
36	Bahía Linda	18.29785	-65.30172	Manta Ray	8	Seagrass/Sand
37	Bahía Linda	18.29745	-65.30121	Manta Ray	5	Seagrass/Sand
38	Pta Soldado	18.28012	-65.2877	Manta Ray	20	Seagrass/Sand
39	Ensenada Dakity	18.29246	-65.28080	Manta Ray	8	Seagrass/Sand
40	Ensenada Dakity	18.28919	-65.27944	Manta Ray	9	Seagrass/Sand
41	Ensenada Dakity	18.29142	-65.28018	Manta Ray	16	Seagrass/Sand
42	Ensenada Dakity	18.29075	-65.28061	Manta Ray	16	Seagrass/Sand
43	Ensenada Dakity	18.29017	-65.28045	Manta Ray	15	Seagrass/Sand
44	Ensenada Dakity	18.29196	-65.28026	Manta Ray	16	Seagrass/Sand
45	Ensenada Dakity	18.289526	-65.27960	Manta Ray	12	Seagrass/Sand
46	Ensenada Dakity	18.289725	-65.280328	Manta Ray	12	Seagrass/Sand
47	Ensenada Dakity	18.29161	-65.280746	Manta Ray	10	Seagrass/Sand
48	Ensenada Dakity	18.291110	-65.280334	Manta Ray	8	Seagrass/Sand
49	Ensenada Dakity	18.290576	-65.279868	Manta Ray	12	Seagrass/Sand
50	Ensenada Dakity	18.289965	-65.279820	Manta Ray	10	Seagrass/Sand
51	Bahía Almodovar	18.29545	-65.2556	Manta Ray	8	Seagrass/Sand
52	Bahía Almodovar	18.29742	-65.25265	Manta Ray	10	Seagrass/Sand
53	Bahía Almodovar	18.29815	-65.25275	Manta Ray	11	Seagrass/Sand
54	Bahía Almodovar	18.296915	-65.253751	Manta Ray	8	Seagrass/Sand
55	Bahía Almodovar	18.297781	-65.25270	Manta Ray	10	Seagrass/Sand
56	Bahía Almodovar	18.296505	-65.254158	Manta Ray	10	Seagrass/Sand
57	Culebrita	18.31821	-65.22912	Manta Ray	12	Seagrass/Sand
58	Culebrita	18.319750	-65.2267	Manta Ray	15	Seagrass/Sand
59	Culebrita	18.31987	-65.2273	Manta Ray	11	Seagrass/Sand
60	Culebrita	18.31915	-65.22734	Manta Ray	8	Seagrass/Sand
61	Culebrita	18.31885	-65.2285	Manta Ray	8	Seagrass/Sand
62	Culebrita	18.31823	-65.22878	Manta Ray	16	Seagrass/Sand
63	Culebrita	18.318866	-65.227668	Manta Ray	12	Seagrass/Sand
64	Culebrita	18.319566	-65.227657	Manta Ray	10	Seagrass/Sand
65	Culebrita	18.319385	-65.226953	Manta Ray	10	Seagrass/Sand
	Guánica Area					
66	Ledge Reef	17.901583	-66.953767	Halas Pin	50	Hardbottom
67	Whitefish	17.90525	-66.905033	Halas Pin	50	Hardbottom
68	1990	17.890083	-66.994933	Halas Pin	60	Hardbottom
69	Dominican Rock	17.89945	-66.92015	Halas Pin	60	Hardbottom

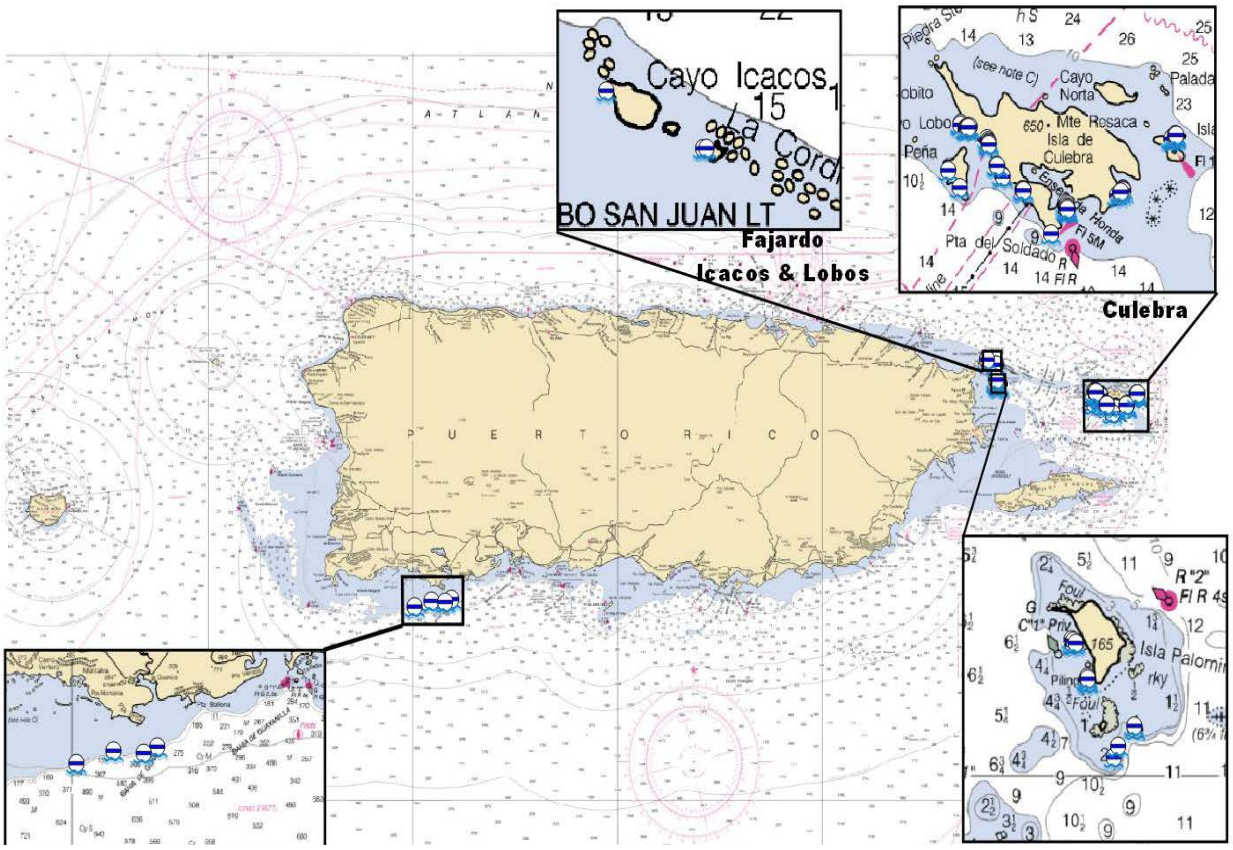

Figure 1. Phase 1 Specific Locations of Mooring Buoys to be Replaced or Added

2.2 Existing Site Conditions

The existing mooring anchor systems to be replaced and the 4 new mooring systems to be installed as part of Phase 1 are located in areas that contain seagrass and hardbottom habitats. All of these locations were chosen by PRDNER (in collaboration with users such as diving schools) because they are highly visited by recreational boaters and divers. This is confirmed by means of continued and programmed aerial photographs censuses and site visits. The 200 new mooring systems to be installed during Phase 2 will be chosen in a similar manner.

Phase 1:
Of the 69 existing mooring anchor systems included in Phase 1, 65 mooring anchors would be used to repair or replace the mooring buoy anchor systems previously installed by the PRDNER in seagrass sea bottom in Icacos and Lobos Cay and Palominito and Palomino Island in the Natural Reserve, and in the waters around Culebra Island. An additional 4 new mooring systems will be installed as part of Phase 1 on marine hardbottom in the Guánica Coral Reef Insular Shell Platform. Two biological assessments were performed in the months of March and May 2019 in these areas to determine the benthic components present at each location. Quadrats were placed on the selected areas in the Natural Reserve in Fajardo and Culebra Island with seagrass benthic

habitat with the intention to quantify the percent cover of benthic ecosystems. Many of these areas are near sea turtle nesting beaches and areas containing benthic resources including seagrass beds, coral reefs, and colonized hardbottom.

At the sampling locations in the Natural Reserve, the benthic communities were shown to have 31.5% seagrass coverage and 63.5% sand. At the sampling locations around Culebra Island, the benthic communities were shown to have 32% seagrass coverage, 7.3% macro algae, and 60% sand. For the areas proposed in Guánica, the benthic communities were found to have 57% hard bottom (rock), 14% macro algae, and 6% sand, 5% sponges, and 11% corals.

Phase 2:
There will be up to 200 new mooring systems installed in Phase 2. The proposed buoy locations are in the areas of Lajas (La Parguera), Guánica, and Mayagüez. The new mooring systems will be installed in hardbottom. The benthic surveys conducted for the project found ESA-listed elkhorn, staghorn, boulder star, mountainous star, and lobed star coral colonies, near a few of the sites where buoys are proposed.

2.3 Proposed Action

Currently, there are approximately 315 ecological mooring buoys installed in Puerto Rico territorial waters. As part of the maintenance and routine inspections of these mooring buoys, there is an ongoing need to repair, replace anchoring systems or abandon some systems with another new one adjacent to the existing one. This is due to the high demand and frequency of use of buoys by recreational vessels in certain areas (Culebra, Fajardo and La Parguera in Lajas), the misuse of mooring buoys by boaters, and by recent oceanic/atmospheric events (Hurricanes Irma and Maria). These factors are responsible for the deterioration and breakdown of anchor systems, which eventually need to be replaced. The buoys are meant to protect marine and ESA resources, including sea turtles and corals and their habitat, from mechanical damage from boats by managing recreational anchoring and navigation in areas containing seagrass and corals.

PRDNER has a routine inspection and maintenance program that includes monitoring the ecological mooring buoys to ensure no buoys or associated tackle affect areas containing corals. As part of the routine inspection and maintenance program, PRDNER also monitors whether coral recruitment or colonization has occurred since the buoys were installed and, in areas where corals recruit and grow near existing mooring buoys, the tackle and buoy are relocated to a different location to prevent vessels from mooring in coral areas.

In order to select the exact location for the installation of mooring and special-use buoys, PRDNER has established a selection methodology for areas containing corals and for areas containing seagrass to avoid impacting these resources when a buoy is installed and maintained. In all areas, the selected buoy anchor locations will be located at least 1 meter (m) away from: 1) attached living resources (including corals and seagrasses); and 2) habitats with rugosity (habitats with vertical relief). This is to ensure that no part of the anchor system can contact living resources or damage habitat.

In areas around Guánica, where hardbottom cannot be avoided, a Halas® anchor system will be installed in areas with flat, low relief areas with no attached marine resources (including corals and sponges), and sufficient depth to enable the drilling of a 2-feet (ft)-deep by 2-inch (in)-wide hole. The pin of the anchor is secured in the borehole with hydraulic cement (see Figure 2).

In areas around Jardo, Culebra, and the Natural Reserve, where sand habitats are known to occur more frequently, sandy bottom areas will be selected for the installation of the buoy anchors. Flat areas are selected to avoid any interactions with coral or other vertical relief areas by the buoy tackle as well. In areas containing seagrass, Manta Ray® anchors are installed for mooring buoys as these cause very minor disturbance to seagrass. These anchors are installed using a small hydraulic hammer to drive an 8-ft-long anchor rod with a utility anchor at the bottom into soft sediment. These anchors create a hole that has a diameter of approximately 1in in the sediment. Helical screw anchors may also be used in seagrass areas for anchoring special-use buoys. These anchors have at least one 10-in diameter disk and a 6-ft-long shaft bar. The disk enables the anchor to be screwed into the bottom sediments manually. All of the anchor systems include floats on the lines between the buoys and the anchor to ensure the buoy tackle does not drag on the sea floor or get entangled with marine resources. Figure 2 depicts the Manta Ray® and Halas® anchor systems.

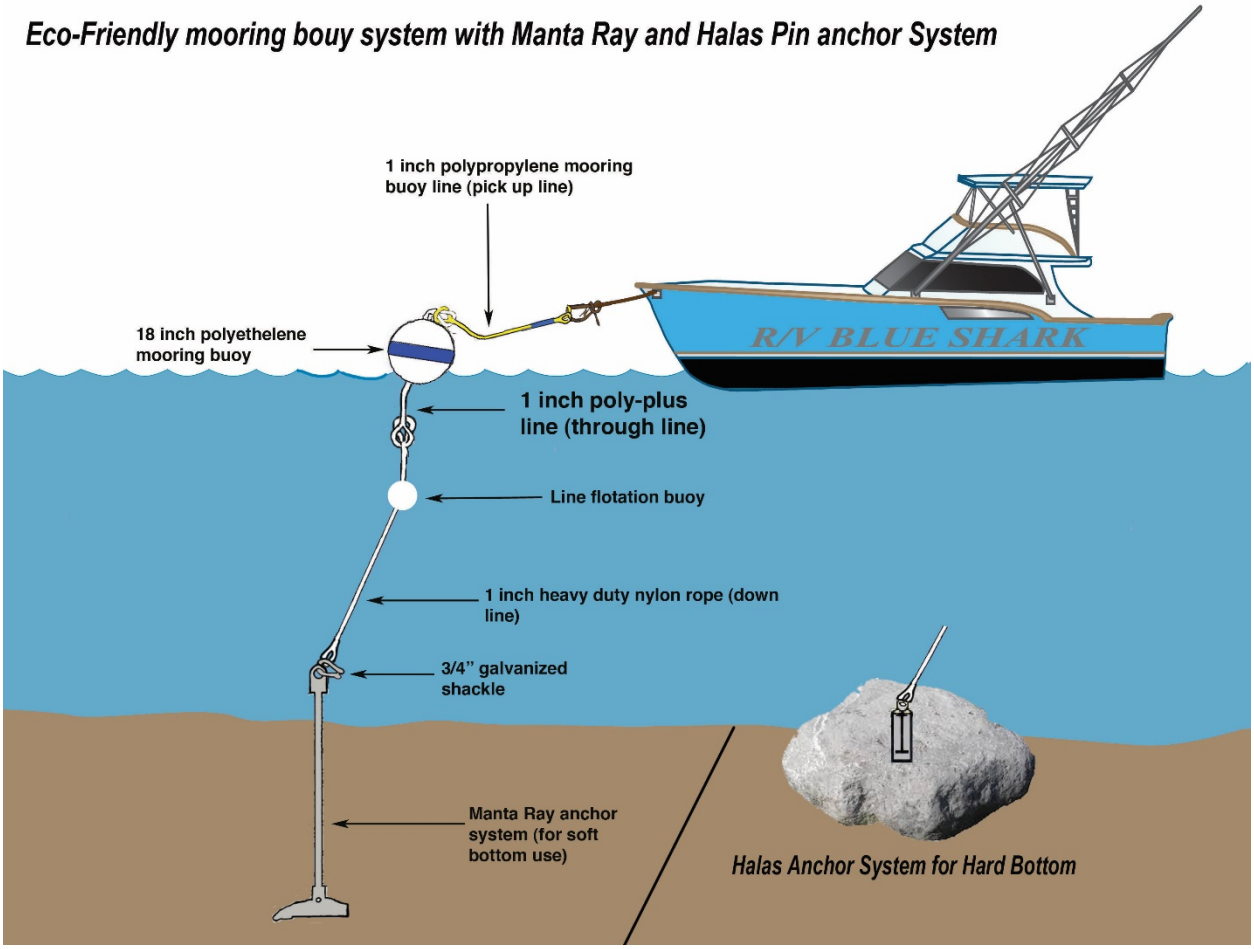

Figure 2. Showing the buoy and tackle system with the Manta Ray® and Halas® anchor systems. Provided by PRDNER

All buoys are installed by divers and supported by a 33-ft-long PRDNER vessel. A diving team consisting of 2 divers performs the installation while a support team of 2 PRDNER employees remain in the vessel in order to manage vessel operation and equipment and material handling. Installation of buoy anchors takes between 35 to 45 minutes depending on the depths, type of substrate, and anchor system to be used. Lift bags are used to lower equipment to the sea floor in order to control the descent and ascent of tools and equipment and prevent them from dragging on the sea floor. The dive team also assists in anchoring the work vessel in areas where there are no impacts to benthic resources caused by anchoring.

Phase 1

The applicant is proposing to replace 65 Manta Ray® mooring buoy anchor systems previously installed in the waters east of Fajardo and around Culebra Island in Puerto Rico, which are currently damaged beyond repair or lost (see locations 1-65 in Table 1). The replacement anchorage systems will be installed exactly in the previous location or in adjacent areas (within a radius of 1 m or less) in sand. These 65 anchor locations all occur in sand or, if necessary, areas containing seagrasses. The applicant also proposes the installation of 4 new Halas® mooring buoys in marine hardbottom in Guánica coral reef (see locations 66-69 in Table 1).

Phase 2 Future Installation, Maintenance and Removal

All future installation, maintenance and removals will use the criteria above when deemed necessary by the program. Future work will be limited to 200 new mooring buoys and unlimited maintenance and removal of the existing 315 ecological mooring buoys.

3 CONSTRUCTION CONDITIONS

The applicant has also agreed to adhere to the following Construction Conditions:

1. NMFS's *Sea Turtle and Smalltooth Sawfish Construction Conditions*.[1]
2. No buoy will be installed in areas where any corals, soft corals, seagrasses, and other marine species are within 1-m from the buoy anchor site. Buoy anchor systems will be installed in locations with a little to no vertical relief. This has been confirmed through benthic surveys completed as part of the project, but will be verified in the field prior to any installation activities taking place at each site containing coral resources.
3. Halas® anchors will be used in areas containing hard substrate and Manta Ray® anchors will be used in seagrass beds for securing mooring buoys. All the anchor and buoy systems are selected to minimize impacts to bottom substrate associated with buoy installation.

[1] NMFS. 2006. Sea Turtle and Smalltooth Sawfish Construction Conditions revised March 23, 2006. National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southeast Regional Office, Protected Resources Division, Saint Petersburg, Florida. Sea Turtle and Smalltooth Sawfish Construction Conditions.

4. All buoys mooring systems have floats on the down lines to prevent any tackle from dragging on the bottom and to ensure there is no potential for species or habitat entanglement (Figure 2). All in-water lines must be thick and taut and cannot have excess line in the water.
5. When the work vessels have to anchor, the placement and removal of the anchor is diver-assisted in order to minimize any anchor damage to bottom substrate. Sand bottom areas used for anchoring the work vessel to the extent that these are available where buoy installation take s place.
6. A 2-person dive team is used for buoy installation while a 2-person support team remains on the work vessel to watch for sea turtles and stop work if animals come within 50 ft of the work area.
7. If ESA-listed corals colonize an area after mooring buoys have been installed and are in use, anchors and buoys in need maintenance or repair will be relocated away from listed coral colonies to prevent damage to these colonies from vessel use of the mooring buoys.
8. In locations where surveys have identified abundant sand habitats (>25%, the areas around Fajardo, Culebra, and the Natural Reserve as discussed in Section 2.2), mooring buoys will be installed in sandy substrate devoid of hardbottom, coral reefs, and seagrass.
9. The PRDNER will install boater education signage to inform boaters that they are required to use the mooring buoys and to educate them about ESA resources and proper boating, snorkeling, and diving techniques to avoid damaging benthic resources. (Note: NMFS may be consulted for content of signs).

3.1 Action Area

The proposed project is located in the Caribbean Sea in the coastal waters east and south of Puerto Rico (Figure 1). The action area is 69 specific locations presented in Table 1, as well as an additional 200 new locations (to be determined) (not specified in Table 1). All existing and proposed locations as part of the proposed project are presumed[2] to be within the Puerto Rico unit of elkhorn and staghorn coral critical habitat. Based on our analysis of the project effects below, we consider the action area to be at the immediately surrounding area of each location occupied by each existing and proposed mooring system.

The action area is defined by regulation as "all areas to be affected directly or indirectly by the federal action and not merely the immediate area involved in the action" (50 CFR 402.02). For the purposes of this federal action, the action area includes the flat, uncolonized, sandy marine substrates east of Puerto Rico, and the flat, uncolonized, hardbottom marine substrates south of Puerto Rico.

4 STATUS OF LISTED SPECIES AND CRITICAL HABITAT

This section identifies ESA-listed species and designated critical habitat under NMFS's jurisdiction that may occur in or near the action area and evaluates which of those may be affected by the proposed action. Effects determinations are also summarized in Table 2. The section also describes the status of listed species and/or critical habitat that may be adversely affected by the proposed action.

[2] Presumption is a conservation estimation without actual field verification of locations and the edge of the critical habitat unit.

Table 2. Effects Determination(s) for Species the Action Agency and/or NMFS Believe May Be Affected by the Proposed Action[3]

Species	ESA Listing Status	Action Agency Effect Determination	NMFS Effect Determination
Sea Turtles			
Green (North Atlantic [NA] distinct population segment [DPS])	T	NLAA	NLAA
Green (South Atlantic [SA] DPS)	T	NLAA	NLAA
Leatherback	E	NLAA	NLAA
Loggerhead (Northwest Atlantic [NWA] DPS)	T	NLAA	NLAA
Hawksbill	E	NLAA	NLAA
Fish			
Scalloped hammerhead shark (Central and Southwest Atlantic DPS)	T	NE	NLAA
Nassau grouper	T	NLAA	NLAA
Oceanic whitetip shark	T	NE	NLAA
Giant manta ray	T	NE	NLAA
Invertebrates			
Elkhorn coral	T	NLAA	NLAA
Staghorn coral	T	NLAA	NLAA
Boulder star coral	T	NLAA	NLAA
Mountainous star coral	T	NLAA	NLAA
Lobed star coral	T	NLAA	NLAA
Rough cactus coral	T	NLAA	NLAA
Pillar coral	T	NLAA	NLAA

Critical Habitat

Table 3 provides the effects determinations for designated critical habitat occurring within the action area that the USFWS, PRDNER and/or NMFS believe may be affected by the proposed action.

Table 3 Effects Determinations for Designated Critical Habitat the Action Agency and/or NMFS Believe May Be Affected by the Proposed Action[4]

Critical Habitat	Unit	Action Agency Effect Determination	NMFS Effect Determination
Green sea turtle	Culebra Island	NLAA	NE
Elkhorn and staghorn coral	Florida; Caribbean	NLAA	LAA

[3] E = endangered; T = threatened; NLAA = may affect, not likely to adversely affect; NE = no effect

[4] E = endangered; T = threatened; NLAA = may affect, not likely to adversely affect; NE = no effect

Critical habitat for the green sea turtle is designated in the waters surrounding the island of Culebra, Puerto Rico, from the mean high water line seaward to 3 nautical miles. These waters include Culebra's outlying Keys, including Cayo Norte, Cayo Ballena, Cayos Geniquı´, Isla Culebrita, Arrecife Culebrita, Cayo de Luis Pena, Las Hermanas, El Mono, Cayo Lobo, Cayo Lobito, Cayo Botijuela, Alcarraza, Los Gemelos, and Piedra Steven. At that time, essential features to critical habitat were not precisely defined; however, the critical habitat was designated to provide protection mainly for important developmental and resting habitats. Juvenile and adult green sea turtles depend on seagrasses as the principal dietary component of for foraging. In addition, coral reefs and other topographic features within the waters around Culebra Island and surrounding islands and cays provide green turtles with shelter during inter-foraging periods that serve as refuge from predators. New mooring systems and work vessel anchors around Culebra will only be placed in sand patches; seagrasses and coral reef structure will be located at least 1 m away from mooring systems. Therefore, we do not believe green sea turtle critical habitat will be affected by the proposed action.

4.1 Potential Routes of Effect Not Likely to Adversely Affect Listed Species

ESA-listed sea turtles and fish may be at risk of becoming entangled by accidently encountering in-water lines such as buoy lines. However, we believe this effect is insignificant because these buoy mooring systems have thick lines like rope, rather than fishing line. In addition, these buoying mooring systems do not have excess lines in the water and have floats on the down lines to keep the lines taut to ensure there is no potential for species entanglement. The applicant has been performing managing ecological mooring buoys for 20 years and has not encountered any issues with species entanglement.

ESA-listed sea turtles, fish and corals may experience increased environmental stress in the immediate vicinity of the mooring buoys due to the concentrated recreational daily usage of the buoys by vessels and humans. These recreational usages may include diving and fishing. We believe an increased stress on the species will be insignificant due to the current usage of the buoys and the long history of the ecological mooring buoy program. This program includes quarterly monitoring, which documents whether there are potential fishing line entanglement issues, abrasion damage to corals, or other negative resource damage associated with the program. Over the past 20 years, the monitoring program has not encountered these situations and actually documented corals and seagrass colonizing the anchor areas at some locations.

ESA-listed sea turtles and fish may be injured if struck by the support vessel transporting the divers to each mooring buoy location to be replaced or installed, or while the vessel set anchor, or while on location. However, we believe this route of effect is highly unlikely to occur because these species are highly mobile and expected to exhibit avoidance behavior by moving away from any vessels. In addition, the vessel will be operating at slow speeds because it will be laden with buoys and equipment, and the vessel will be anchored with the motor off during each of the buoy installations. The applicant's implementation of NMFS's *Sea Turtle and Smalltooth Sawfish Construction Conditions* will further reduce the risk by requiring all construction workers watch for sea turtles. Operation of any construction equipment will cease immediately if a sea turtle is seen within a 50-ft radius of the equipment. Activities will not resume until the

protected species has departed the project area of its own volition. The applicant is also utilizing a diver-assisted anchorage so that the anchoring of the vessel will have minimal impact on resources.

ESA-listed corals, sea turtles and fish may be affected by the degradation of water quality. Water quality may be temporarily affected by turbidity caused by the maintenance, removal and installation activities of the mooring systems. However, we believe this effect will be insignificant. With only 2 divers in the water, the work area where turbidity would be generated is expected to be very small and discrete. Also, the installation time per mooring is 45 minutes or less, so therefore the potential for turbidity to affect species is extremely limited.

ESA-listed sea turtles and fish may be affected by being temporarily excluded from seagrass and hardbottom habitat during maintenance and installations activities. We believe this affect will be insignificant because of the abundance of similar habitat in the area available to the species for continued foraging and refuge.

Loggerhead, green and hawksbill sea turtle, and Nassau grouper may be impacted by the loss of hardbottom habitat that they use for refuge and foraging. At locations south of Puerto Rico, mooring buoys will be installed into hardbottom. We believe the effect of temporary loss of use of potential foraging or refuge habitat on sea turtles is insignificant. The total impacts from the installation of the Halas® anchors will be 34.07[5] ft^2 (assuming 4 locations in Phase 1 and that all 200 new buoys in Phase 2 are within hardbottom areas). The loss of 34.07 ft^2 of hardbottom habitat is insignificant compared to the abundance of similar habitat available to the species in the area.

ESA-listed sea turtles and fish species may be affected by being struck by the additional vessels using the proposed ecological mooring buoys, as it may increase the risk of collisions with these species. An increase in vessel traffic in the area may result from the construction of 4 new buoys in Phase 1, and up to 200 new buoys in the future phase. We believe, based on a recent NMFS analysis,[6] the potential effects on ESA-listed sea turtles and fish resulting from increased vessel traffic associated with the proposed action are extremely unlikely to occur. First, little information exists on vessel interactions with species with primarily demersal (i.e., bottom-dwelling) habits, such as Nassau grouper and scalloped hammerhead shark, because these species are rarely at risk from vessels at the surface. Next, in general, vessel strikes of elasmobranch species, which includes giant manta rays and oceanic whitetip sharks, are extremely rare. The giant manta ray is frequently observed in nearshore coastal waters and feeding at inlets along the coastline. As vessel traffic is concentrated in and around inlets and nearshore waters, this overlap exposes the giant manta ray in these locations to an increased likelihood of potential vessel strike injury, especially from faster moving recreational vessels. Vessel traffic associated with the proposed action will not occur in inlets and passes

[5] 34.07 ft^2 (Phase 1 is 0.67 ft^2 and Phase 2 is 33.4 ft^2).

[6] Barnette, M. 2018. Threats and Effects Analysis for Protected Resources on Vessel Traffic Associated with Dock and Marina Construction. NMFS Southeast Regional Office Protected Resources Division Memorandum. October 31, 2018.

where giant manta rays are likely to be found in higher concentrations. While oceanic whitetip sharks do occur at the water's surface, they tend to prefer the deeper ocean waters where vessel strikes are less likely.

Furthermore, ESA-listed sea turtles and fish species are highly mobile species and will typically utilize avoidance behavior to move out of the way of moving vessels within the action area. According to NMFS' recent analysis,[7] it would take an introduction of at least 200 new vessels to an area to result in a take of 1 sea turtle in any single year. While the proposed project includes installing and maintaining up to 204 new buoy systems, it is highly unlikely that all 204 new buoys systems will be installed in the same season or in close proximity to one another. As discussed above, the precise location of the new buoy systems to be installed as part of Phase 2 will be determined based on the program's criteria and it is highly unlikely that all 200 new locations will be clustered in close proximity to one another. Thus, assuming each new buoy system represented one new vessel in the water, the proposed action would introduce far less than 200 vessels in a particular area to result in a potential vessel strike with a sea turtle. Moreover, these ecological buoy systems provide temporary moorage, as opposed to a marina or a dock. As a result, the vessels that would use these buoys would not represent new vessels in the project area. Finally, as noted above, over the past 20 years, there is no known collision to have occurred between a vessel using an ecological mooring buoy and an ESA-listed sea turtle or fish species. Therefore, based on our review of the best available scientific information, we believe that the potential for a vessel strike with an ESA-listed sea turtle or fish species is extremely unlikely to occur.

4.2 Status of Elkhorn and Staghorn Critical Habitat Likely to be Adversely Affected

On November 26, 2008, a Final Rule designating critical habitat for elkhorn (*Acropora palmata*) and staghorn (*A. cervincornis*) corals was published in the Federal Register (73 Fed. Reg. 72236). Within the geographical area occupied by a listed species, critical habitat consists of specific areas on which are found those physical or biological features essential to the conservation of the species. The feature essential to the conservation of *Acropora* species (also known as the essential feature) is substrate of suitable quality and availability in water depths from the mean high water line to 30 m in order to support successful larval settlement, recruitment, and reattachment and recruitment of asexual fragments. "Substrate of suitable quality and availability" means consolidated hardbottom or dead coral skeletons free from fleshy macroalgae or turf algae and sediment cover (50 C.F.R 226.16(a)). Areas containing this feature have been identified in 4 locations within the jurisdiction of the United States: the Florida area, which comprises approximately 1,329 square miles (mi^2) (3,442 square kilometers (km^2) of marine habitat; the Puerto Rico area, which comprises approximately 1,383 mi^2 (3,582 km^2) of marine habitat; the St. John/St. Thomas area, which comprises approximately 121 mi^2 (313 km^2) of marine habitat; and the St. Croix area, which comprises approximately 126 mi^2 (326 km^2) of marine habitat. The total area covered by the designation is thus approximately 2,959 mi^2 (7,664 km^2).

[7] Barnette, M. 2018. Threats and Effects Analysis for Protected Resources on Vessel Traffic Associated with Dock and Marina Construction. NMFS Southeast Regional Office Protected Resources Division Memorandum. October 31, 2018.

The substrate of suitable quality and availability essential feature can be found unevenly dispersed throughout the critical habitat units, interspersed with natural areas of loose sediment, fleshy or turf macroalgae covered hard substrate. Existing federally authorized or permitted man-made structures such as artificial reefs, boat ramps, docks, pilings, channels or marinas do not provide the essential feature. The proximity of this habitat to coastal areas subjects this feature to impacts from multiple activities including dredging and disposal activities, stormwater run-off, coastal and maritime construction, land development, wastewater and sewage outflow discharges, point and non-point source pollutant discharges, fishing, placement of large vessel anchorages, and installation of submerged pipelines or cables. The impacts from these activities, combined with those from natural factors (i.e., major storm events), significantly affect the quality and quantity of available substrate for these threatened species to successfully sexually and asexually reproduce.

A shift in benthic community structure from coral-dominated to algae-dominated that has been documented since the 1980s means that the settlement of larvae or attachment of fragments is often unsuccessful (Hughes and Connell 1999). Sediment accumulation on suitable substrate also impedes sexual and asexual reproductive success by preempting available substrate and smothering coral recruits.

While algae, including crustose coralline algae and fleshy macroalgae, are natural components of healthy reef ecosystems, increases in the dominance of algae since the 1980s impedes coral recruitment. The overexploitation of grazers through fishing has also contributed fleshy macroalgae to persist in reef and hardbottom areas formerly dominated by corals. Impacts to water quality associated with coastal development, in particular nutrient inputs, are also thought to enhance the growth of fleshy macroalgae by providing them with nutrient sources. Fleshy macroalgae are able to colonize dead coral skeleton and other hard substrate and some are able to overgrow living corals and crustose coralline algae. Because crustose coralline algae is thought to provide chemical cues to coral larvae indicating an area is appropriate for settlement, overgrowth by macroalgae may affect coral recruitment (Steneck 1986). Several studies show that coral recruitment tends to be greater when algal biomass is low (Birrell et al. 2005; Connell et al. 1997; Edmunds et al. 2004; Hughes 1985; Rogers et al. 1984; Vermeij 2006). In addition to preempting space for coral larval settlement, many fleshy macroalgae produce secondary metabolites with generalized toxicity, which also may inhibit settlement of coral larvae (Kuffner and Paul 2004). The rate of sediment input from natural and anthropogenic sources can affect reef distribution, structure, growth, and recruitment. Sediments can accumulate on dead and living corals and exposed hardbottom, thus reducing the available substrate for larval settlement and fragment attachment.

In addition to the amount of sedimentation, the source of sediments can affect coral growth. In a study of 3 sites in Puerto Rico, Torres (2001) found that low-density coral skeleton growth was correlated with increased re-suspended sediment rates and greater percentage composition of terrigenous sediment. In sites with higher carbonate percentages and corresponding low percentages of terrigenous sediments, growth rates were higher. This suggests that re-suspension of sediments and sediment production within the reef environment does not necessarily have a

negative impact on coral growth while sediments from terrestrial sources increase the probability that coral growth will decrease, possibly because terrigenous sediments do not contain minerals that corals need to grow (Torres 2001).

Long-term monitoring of sites in the U.S. Virgin Islands (USVI) indicate that coral cover has declined dramatically; coral diseases have become more numerous and prevalent; macroalgal cover has increased; fish of some species are smaller, less numerous, or rare; long-spined black sea urchins are not abundant; and sedimentation rates in nearshore waters have increased from one to 2 orders of magnitude over the past 15 to 25 years (Rogers et al. 2008). Thus, changes that have affected elkhorn and staghorn coral and led to significant decreases in the numbers and cover of these species have also affected the suitability and availability of habitat.

Elkhorn and staghorn corals require hard, consolidated substrate, including attached, dead coral skeleton, devoid of turf or fleshy macroalgae for their larvae to settle. Atlantic and Gulf of Mexico Rapid Reef Assessment Program data from 1997-2004 indicate that although the historic range of both species remains intact, the number and size of colonies and percent cover by both species has declined dramatically in comparison to historic levels (Ginsburg and Lang 2003). Monitoring data from the US Virgin Islands Territorial Coral Reef Monitoring Program indicate that the 2005 coral bleaching event caused the largest documented loss of coral in USVI since coral monitoring data have been available with a decline of at least 50% of coral cover in waters less than 25 m deep (Smith et al. 2011). Many of the shallow water coral monitoring stations showed at most a 12% recovery of coral cover by 2011, 6 years after the loss of coral cover due to the bleaching event (Smith et al. 2011). The lack of coral cover has led to increases in algal cover on area hardbottom, including the critical habitat essential feature.

5 ENVIRONMENTAL BASELINE

This section is an analysis of the effects of past and ongoing human and natural factors leading to the current status of the designated critical habitat for *Acropora* species (elkhorn and staghorn corals) within the action area.

By regulation, the environmental baseline for an Opinion refers to the condition of the listed species or its designated critical habitat in the action area, without the consequences to the listed species or designated critical habitat caused by the proposed action. The environmental baseline includes the past and present impacts of all state, federal, or private actions and other human activities in the action area, the anticipated impacts of all proposed federal projects in the action area that have already undergone formal or early Section 7 consultations, as well as the impact of state or private actions that are contemporaneous with the consultation in process. The consequences to the listed species or designated critical habitat from ongoing agency activities or existing agency facilities that are not within the agency's discretion to modify are part of the environmental baseline (50 CFR 402.02).

Focusing on the impacts of the activities in the action area specifically allows us to assess the prior experience and state (or condition) of the designated critical habitat that occurs in an action area, and that will be exposed to effects from the actions under consultation. This is important because, under some ecological conditions, the features essential to the designated critical habitat

will commonly exhibit, or be more susceptible to, adverse responses to stressors than they would be in other areas. These localized stress responses or stressed baseline conditions may increase the severity of the adverse effects expected from the proposed action.

5.1 Status of Coral Critical Habitat within the Action Area

In Section 4.2, we described the status of elkhorn and staghorn coral critical habitat, including the Puerto Rico elkhorn and staghorn coral critical habitat unit. Within the Puerto Rico elkhorn and staghorn coral critical habitat unit, approximately 292 mi^2 (756 km^2) are likely to contain the essential feature of ESA-designated elkhorn and staghorn coral critical habitat, based on the amount of coral, rock reef, colonized hardbottom, and other coralline communities mapped by NOAA's National Ocean Service (NOS) Biogeography Program in 2000 (Kendall et al. 2001b). Within the action area, the essential feature of elkhorn and staghorn coral critical habitat is known to be present at the 4 proposed locations in Guánica in Phase 1, and is assumed to be present at the 200 proposed locations in Phase 2. Impacts to critical habitat described in Section 4.2 include land-based sources of pollutants, fishing activities, boating, and commercial activities. Phases 1 and 2 of the proposed action will impact a total of 34.07 ft^2 (Phase 1 is 0.67 ft^2 and Phase 2 is 33.4 ft^2) of hardbottom that contains the elkhorn and staghorn coral critical habitat essential features. Given that the action area may include vessel transit routes, commercial operations, and areas with coastal development, we believe the status of critical habitat described in Section 4.2 accurately reflects the status of critical habitat within the action area.

5.2 Factors Affecting Critical Habitat within the Action Area

The environmental baseline for this Opinion includes the effects of several activities that affect the condition of elkhorn and staghorn coral critical habitat. We describe these activities' effects in the sections below.

5.2.1 Federal Actions

Numerous activities funded, authorized, or carried out by federal agencies have been identified as threats and may affect elkhorn and staghorn coral critical habitat in the action area. Although many regulations exist to protect ESA-listed species and designated critical habitat within the action area, many of the activities identified as threats still adversely affect the species and critical habitat. Poor boating and anchoring practices and destructive fishing practices cause abrasion and breakage to elkhorn and staghorn critical habitat. Nutrients, contaminants, and sediment from point and non-point sources create substrate that is unsuitable for larval settlement, recruitment, and reattachment and recruitment of asexual fragments in coral critical habitat. Below are a few of the Federal actions that may occur in the action area.

- The Caribbean Fishery Management Council (CFMC) develops fishery management plans (FMP), implemented by NMFS-approved fishery regulations, that govern fishing activities that may affect critical habitat. For all fisheries for which there is a FMP or for which any federal action is taken to manage that fishery, impacts are evaluated under Section 7 of the ESA. NMFS reinitiated Section 7 consultations for the Coral, Queen

Conch, Reef Fish, and Spiny Lobster FMPs under the jurisdiction of the CFMC when critical habitat was designated for elkhorn and staghorn corals. NMFS concluded that the implementation of the Coral FMP would have no effect on elkhorn and staghorn coral critical habitat. NMFS determined that the Queen Conch FMP is not likely to adversely affect elkhorn and staghorn coral critical habitat. NMFS has also completed Biological Opinions for the Reef Fish and Spiny Lobster FMPs as part of Section 7 consultations to consider the potential impacts of the fisheries to elkhorn and staghorn coral critical habitat.

- The Department of the Interior, including National Park Service, along with NOAA and the U.S. Environmental Protection Agency (EPA), also conduct research activities using federal research vessels as part of coral reef monitoring activities within the territorial waters of Puerto Rico.
- The U.S. Army Corps of Engineers (USACE) issues permits to authorize construction activities and the EPA issues permits, which establish concentration limits to discharges to surface waters through shoreline and riparian disturbances. These disturbances (whether in the riverine, estuarine, marine, or floodplain environment) result in discharges to surface waters that may retard or prevent the reproduction, settlement, reattachment, and development of listed corals (e.g., land development and run-off, and dredging and disposal activities, can result in direct deposition of sediment on corals, shading, and lost substrate for fragment reattachment or larval settlement or recruitment). These discharges can also smother, bury and ultimately cause die-off in seagrass beds within green sea turtle critical habitat.
    - The USACE authorizes and carries out construction and dredge-and-fill activities that may result in direct mortality or injury of elkhorn or staghorn coral and seagrasses through direct deposition of sediment resulting in habitat destruction/modification.
    - EPA, through the PRDNER regulates the discharge of pollutants, such as oil, toxic chemicals, radioactivity, carcinogens, mutagens, teratogens, or organic nutrient-laden water, including sewage water, from point sources into the waters of the United States. Elevated discharge levels may cause habitat destruction/modification.
    - The EPA, through the PRDNER, authorizes the discharge of stormwater to surface waters as part of construction projects. This discharge may result in the release of pollutants carried in runoff that can lead to habitat destruction/modification.

5.2.2 Non-Federal Actions

A number of nonfederal activities that may adversely affect designated critical habitat for elkhorn and staghorn corals include impacts from upland development that do not require federal permits or otherwise have a federal nexus (i.e., residential, agriculture), depending on the size of the development. Development can affect water quality and lead to habitat destruction, in particular through the transport of land-based sources of pollution in sediments and stormwater runoff, but this development often does not require federal authorization. NMFS does not have any knowledge of state or private actions occurring in or near the action area that may affect these resources that would not also require a federal permit; the likelihood of a shoreline-adjacent project occurring in or near the action area that does not require a federal permit for in-water construction work, for instance, is very small.

Hurricanes and large coastal storms can also harm coral critical habitat through sediment deposition and substrate damage. Major hurricanes have caused changes in the physical structure of many reefs in Puerto Rico. Based on data from the NOAA Office for Coastal Management, there have been a total of 21 hurricanes and tropical storms that have affected Puerto Rico between 1975 and 2017, including most recently Hurricanes Irma and Maria.

5.2.3 Conservation and Recovery Actions Shaping the Environmental Baseline

CFMC has established fishery management plans, which NMFS has implemented by regulations, that prohibit the use of bottom-tending fishing gear in seasonally and permanently closed fishing areas containing coral reefs in federal waters of the U.S. Exclusive Economic Zone. The Coral Reef Conservation Act and the FMPs established by the CFMC, and implemented by NMFS under the Magnuson-Stevens Fishery Conservation and Management Act (the Reef Fish Fishery of Puerto Rico and the U.S. Virgin Islands and the Corals and Reef Associated Plants and Invertebrates of Puerto Rico and the U.S. Virgin Islands), require the protection of corals and prohibit the collection of hard corals. These plans also provide protection of coral critical habitat.

The Commonwealth of Puerto Rico regulates activities that occur in terrestrial and marine habitats of Puerto Rico. Puerto Rico Regulation 6766 (Law 241 of 1999, the New Wildlife Law) establishes protections for listed species. Permits can be issued by the Secretary of PRDNER for the collection and transport of species listed by the Commonwealth as vulnerable, threatened, endangered, or critically endangered species for rehabilitation, scientific use, or survival and species' benefit purposes. (Note that federally-listed species are also protected through this Commonwealth regulation, as are ESA-designated critical habitat). In addition, the regulation prohibits the modification of listed species' habitat without a mitigation plan approved by the Secretary of PRDNER, although the regulation also restricts the type of habitat that can be modified at all. Regulation 6768 under the same law also regulates the collection of all organisms, not just listed species. The PRDNER Secretary can issue a collection permit for the purposes of scientific investigation, or educational activities or exhibits. Puerto Rico Law 147 of 1999 for the protection, conservation, and management of coral reefs in Puerto Rico, prohibits the removal, extraction, mutilation, or destruction of coral reefs and associated systems. The Secretary of PRDNER can issue permits for scientific investigations that require extraction of corals, or those that will otherwise affect corals. Additionally, Puerto Rico has a state regulatory program that regulates most land, including upland and wetland, and surface water alterations, including in partnership with NOAA under the Coastal Zone Management Act, and EPA under the Clean Water Act. EPA has maintained regulatory authority for some activities regulated under the Clean Water Act, such as the non-point source discharge elimination system permits.

Section 6 of the ESA allows NMFS to enter into cooperative agreements with states to assist in recovery actions of ESA-listed species, including scientific research related to documenting species condition and trends in presence and abundance. PRDNER renewed its Section 6 agreement with NMFS on August 7, 2018. Recovery actions may also include the collection of fragments from coral colonies, their grow-out in nursery areas, and the outplanting of fragments. The PRDNER has issued memoranda of understanding to several coral nursery operators with coral nurseries in various areas around Puerto Rico. The PRDNER is also the entity responsible for permitting the use of coral species, including ESA-listed corals, in coral nurseries. NMFS

completed ESA Section 7 consultation with the USACE for the issuance of a Regional General Permit, SAJ-112, that authorizes the installation and maintenance of coral nursery operations up to 1 acre (ac) in size that do not require the placement of fill, such as the installation of polyvinyl chloride "trees." NOAA's Restoration Center also maintains coral nurseries in various locations around Puerto Rico and uses farmed corals in efforts to repair damage from vessel groundings on reefs.

NMFS convened a recovery team comprised of fishers, scientists, managers, and agency personnel from Florida, Puerto Rico, and USVI, as well as federal representatives to create a recovery plan for elkhorn and staghorn corals and their habitat. NMFS has also created a recovery outline for the development of a recovery plan for the 5 additional coral species that were listed in September 2014 (https://www.fisheries.noaa.gov/resource/document/5-caribbean-coral-species-recovery-outline).

The NOAA Coral Reef Conservation Program, through its internal grants, external grants, and grants in seven U.S. states and territories. , has provided funding for several activities with an education and outreach component for informing the public about the importance of the coral reef ecosystem of the USVI and Puerto Rico. The NMFS Southeast Regional Office has also developed outreach materials regarding the listing of elkhorn and staghorn corals, the listing of 5 other coral species on September 10, 2014, the ESA Section 4(d) rule for elkhorn and staghorn corals, and the designation of elkhorn and staghorn coral critical habitat. These materials have been circulated to constituents during education and outreach activities and public meetings, and as part of other Section 7 consultations, and are readily available on the web: https://www.fisheries.noaa.gov/corals.

6 EFFECTS OF THE ACTION ON CRITICAL HABITAT

Effects of the action are all consequences to listed species or critical habitat that are caused by the proposed action, including the consequences of other activities that are caused by the proposed action. A consequence is caused by the proposed action if it would not occur but for the proposed action and it is reasonably certain to occur. Effects of the action may occur later in time and may include consequences occurring outside the immediate area involved in the action (50 CFR 402.02).

As described below, NMFS believes that the proposed action is likely to adversely affect elkhorn and staghorn coral designated critical habitat within the Puerto Rico area. As part of this Opinion and because the action will result in adverse effects to elkhorn and staghorn coral critical habitat, NMFS must evaluate whether the action is likely to result in destruction or adverse modification of critical habitat. If so, NMFS must develop RPAs to avoid the destruction or adverse modification.

6.1 Effects of the Action on Elkhorn and Staghorn Coral Critical Habitat

The substrate of suitable quality and availability essential feature of elkhorn and staghorn coral critical habitat will be affected by the installation, maintenance and removal of ecological mooring buoys. The estimated total area of substrate of suitable quality and availability for elkhorn and staghorn coral critical habitat that will be adversely affected by the removal,

replacement, installation, and maintenance of the ecological mooring buoys is 34.07 ft^2 (Phase 1 is 0.67 ft^2 and Phase 2 is 33.4 ft^2). Thus, we believe the proposed action will adversely affect 34.07 ft^2 of elkhorn and staghorn coral critical habitat.

7 CUMULATIVE EFFECTS

Cumulative effects include the effects of future state, tribal, local or private actions that are reasonably certain to occur in the action area considered in this Biological Opinion. Future federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to Section 7 of the ESA (50 CFR 402.14).

Most activities affecting elkhorn and staghorn coral are regulated federally; therefore, any future activities within the action area, which is in waters of the U.S., will likely require ESA Section 7 consultation. However, upland development, whether for housing or agriculture, often has no federal nexus if the project is located on uplands and is small in size. Depending on the number and location of these developments, sediment and nutrient loading to nearshore waters could become a chronic stressor, which would affect elkhorn and staghorn coral critical habitat.

NMFS is not aware of any proposed or anticipated changes in human-related actions (e.g., recreational use, fisheries, habitat degradation including from vessel use) or natural conditions that would substantially change the impacts that each threat has on elkhorn and staghorn coral critical habitat, or any additional future state, tribal, or local private actions that are reasonably certain to occur in the action area in the future beyond the potential development described above. Therefore, NMFS expects that the levels of interactions with elkhorn and staghorn critical habitat described for each of the fisheries and non-fisheries activities in Section 5.2 (Factors Affecting Species and Critical Habitat within the Action Area) will continue at similar levels into the foreseeable future.

8 ANALYSIS OF DESTRUCTION OR ADVERSE MODIFICATION OF DESIGNATED CRITICAL HABITAT FOR ELKHORN AND STAGHORN CORALS

NMFS's regulations define *destruction or adverse modification* to mean "a direct or indirect alteration that appreciably diminishes the value of critical habitat as a whole for the conservation of a listed species" (50 CFR § 402.02). NMFS will generally conclude that a Federal action is likely to "destroy or adversely modify" designated critical habitat if the action results in an alteration of the quantity or quality of the essential physical or biological features of designated critical habitat, or that precludes or significantly delays the capacity of that habitat to develop those features over time, and if the effect of the alteration is to appreciably diminish the value of critical habitat for the conservation of the species.

This analysis takes into account the geographic and temporal scope of the proposed action, recognizing that "functionality" of critical habitat necessarily means that it must now and must continue in the future to support the conservation of the species and progress toward recovery. Thus the analysis must take into account any changes in amount, distribution, or characteristics of the critical habitat that will be required over time to support a successfully recovering species.

Destruction or adverse modification does not depend strictly on the size or proportion of the area adversely affected, but rather on the role the action area and the affected critical habitat serves with regard to the function of the overall critical habitat designation, and how that role is affected by the action.

Elkhorn and Staghorn Coral Critical Habitat

Critical habitat was designated for elkhorn and staghorn corals, in part, because further declines in the low population sizes of the species could lead to threshold levels that make the chances for recovery low. More specifically, low population sizes for these species could lead to an Allee effect[8] and lower effective density (of genetically distinct adults required for sexual reproduction), and a reduced source of fragments for asexual reproduction and recruitment. Therefore, the key conservation objective of designated critical habitat is to facilitate increased incidence of successful sexual and asexual reproduction, which in turn facilitates increases in the species' abundances, distributions, and genetic diversity. To this end, our analysis of whether the proposed action is likely to destroy or adversely modify designated critical habitat seeks to determine if the adverse effects of the proposed action on the essential feature of designated *Acropora* critical habitat will appreciably reduce the capability of the critical habitat to facilitate an increased incidence of successful sexual and asexual reproduction. This analysis takes into account the status of the species during the removal, replacement, installation, and maintenance of the ecological mooring buoys with Manta Rays® and Halas® anchors. The level of increased incidence of successful reproduction needs to be facilitated by availability of the essential feature and may differ depending on the recovery status of elkhorn and staghorn corals in the action area for each project. This analysis also takes into account the geographic and temporal scope of the actions.

An area of 0.67 ft^2 containing the elkhorn and staghorn critical habitat essential feature will be permanently altered where the four anchors will be installed into the hardbottom in Phase 1 and potentially up to 33.4 ft^2 in Phase 2, for a total of 34.07 ft^2. Benthic surveys and previous monitoring reports from this program indicate that hard and soft corals are observed to colonize the area where the anchors are installed.

As noted in the critical habitat rule (73 FR 72210, November 26, 2008), the loss of suitable habitat is one of the greatest threats to the recovery of listed coral populations. The loss of suitable habitat affects the reproductive success of listed corals because substrate for sexual recruits to settle is lost. Thus, the value of critical habitat for the conservation of the species is to facilitate an increased incidence of successful sexual and asexual reproduction. Nevertheless, NMFS does not believe the removal, replacement, installation, and maintenance of the ecological mooring buoys will permanently alter the suitability or habitat quality of elkhorn and staghorn coral critical habitat in the action area or throughout the critical habitat units, or prevent the critical habitat from facilitating successful sexual and asexual reproduction. Approximately 292 mi^2 are likely to contain the essential element of ESA-designated elkhorn and staghorn coral critical habitat within the Puerto Rico unit, based on the amount of coral, rock reef, colonized hardbottom, and other coralline communities mapped by NOAA's NOS Biogeography Program in 2000 (Kendall et al. 2001a).

[8] The Allee effect is the effect of population density on population growth by which reproductive rates fall at very low population densities and reproduction and survival of individuals increase as population density increases.

There is a total of 1,383 mi^2 of elkhorn and staghorn coral designated critical habitat in Puerto Rico. Of this, approximately 292 mi^2 are likely to contain the essential feature, based on the amount of coral, rock reef, colonized hardbottom, and other coralline communities mapped by NOAA's National Ocean Service in 2001. Impacting approximately 34.07 ft^2 of elkhorn and staghorn coral critical habitat represents approximately 0.000000049% (292 mi^2 = 8,140,000,000 sq ft; 34.07ft^2/8,140,000,000 ft^2* 100 = 0.000000049%) of the area likely to contain the essential feature within the Puerto Rico critical habitat unit that would be permanently lost from the proposed action. Given the very small size (34.07 ft^2) of the impact to hardbottom compared to the area containing elkhorn and staghorn coral critical habitat within the Puerto Rico Unit, NMFS anticipates that the remaining area around each anchor location containing the essential feature will continue to function as adequate substrate for settlement of listed coral larvae, reattachment of listed coral fragments, and growth of listed coral colonies. Therefore, NMFS does not believe the removal, replacement, installation, and maintenance of the ecological mooring buoys will have an appreciable impact on the ability of elkhorn and staghorn coral critical habitat in the Puerto Rico unit to provide for the conservation of these acroporid corals and that the use of ecological mooring buoys may likely provide a beneficial effect by prevent and protecting adjacent elkhorn and staghorn coral critical habitat from ill placed anchors and boat groundings.

Based on the above analysis, we conclude that the adverse effects on elkhorn and staghorn coral critical habitat due to the proposed action will not impede the capability of the critical habitat to facilitate an increased incidence of successful sexual and asexual reproduction and, therefore will not appreciably diminish the value of critical habitat for the conservation of the species

9 CONCLUSION

After reviewing the current status of critical habitat for elkhorn and staghorn corals, the environmental baseline, the effects of the proposed action, and cumulative effects, it is NMFS's Biological Opinion that the proposed action is not likely to result in the destruction or adverse modification (DAM) of designated critical habitat for elkhorn and staghorn corals.

10 INCIDENTAL TAKE STATEMENT

NMFS does not anticipate that the proposed action will incidentally take any species and no take is authorized. Nonetheless, any take of any ESA-listed species shall be immediately reported to takereport.nmfsser@noaa.gov. Refer to the present Biological Opinion by title, issuance date, NMFS ECO identifier number SERO-2019-03349. At that time, consultation must be reinitiated.

11 CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the ESA directs federal agencies to use their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid

adverse effects of a proposed action on ESA-listed species or critical habitat, to help implement recovery plans, or to develop information.

We believe the following conservation recommendations further the conservation of ESA-listed sea turtles, fish, corals, and staghorn and elkhorn coral designated critical habitat. We strongly recommend consideration and adoption of these measures. In order for NMFS to be kept informed of actions minimizing or avoiding adverse effects or benefiting listed species or their habitats, we request notification of the implementation of any conservation recommendations.

1. USFWS and USACE shall require PRDNER to submit a yearly monitoring report to NMFS at the letterhead address. The USFWS and USACE must require PRDNER to provide NMFS with all data collected during monitoring events conducted, as well as any monitoring reports generated during the quarterly monitoring of the mooring buoy program. The monitoring programs shall include reporting requirements to ensure NMFS, USFWS, USACE, and other relevant agencies are aware of any changes in protocol, as well as ensure NMFS receives data related to the condition of listed corals in the area due to the importance of these listed species.

12 REINITIATION OF CONSULTATION

As provided in 50 CFR 402.16, reinitiation of formal consultation is required where discretionary federal agency involvement or control over the action has been retained (or is authorized by law) and if (1) the amount or extent of taking specified in the proposed actions is exceeded, (2) new information reveals effects of the actions that may affect listed species or critical habitat in a manner or to an extent not previously considered, (3) the identified actions are subsequently modified in a manner that causes an effect to listed species or critical habitat that was not considered in the Biological Opinion, or (4) a new species is listed or critical habitat designated that may be affected by the identified actions.

13 LITERATURE CITED

Literature Cited

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