Endangered Species Act – Section 7 Consultation

Action Agency:	National Marine Fisheries Service, Pacific Islands Region,
Activity:	Development of a Pilot Coral Nursery on Saipan, CNMI
Consulting Agency:	National Marine Fisheries Service, Pacific Islands Region, Protected Resources Division
NMFS File No. (PCTS):	PIR-2018-10501
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1 INTRODUCTION

Section 7(a)(2) of the Endangered Species Act of 1973, as amended (ESA; 16 U.S.C. 1536(a)(2)) requires each federal agency to ensure that any action they authorize, fund, or carry out 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. When a federal agency's action "may affect" a listed species or its designated critical habitat, that agency is required to consult formally with the National Marine Fisheries Service (NMFS) or the U.S. Fish and Wildlife Service (USFWS), depending upon the endangered species, threatened species, or designated critical habitat that may be affected by the action (50 CFR 402.14(a)). Federal agencies are exempt from this general requirement if they have concluded that an action "may affect, but is not likely to adversely affect" endangered species, threatened species or their designated critical habitat, and NMFS or the USFWS concur with that conclusion (50 CFR 402.14 (b)).

For the actions described in this document, the action agency is the National Oceanic and Atmospheric Administration -National Marine Fisheries Service, Habitat Conservation Division (HCD) which proposes to fund this project under Contract #1333MF18PNFFT0144. The consulting agency for this proposal is NMFS' Pacific Islands Regional Office, Protected Resources Division (PRD). This document represents NMFS' final biological opinion on the effects of the proposed action on endangered and threatened species and critical habitat that has been designated for those species.

This biological opinion has been prepared in accordance with the requirements of section 7 of the ESA, implementing regulations (50 CFR 402), agency policy, and guidance and is based on information contained in the biological evaluation and EFH Assessment (BE) submitted with the consultation request, published and unpublished scientific information on the biology and ecology of threatened and endangered marine species of concern in the action area, monitoring reports and research in the region, similar nursery activities and their effects on corals and other listed species in other regions of the world, and other relevant scientific and grey literature (see Literature Cited).

1.1 Consultation History

This is not a complete list of every consultation interaction, but identifies key dates and exchanges, requests for additional information, extensions, and can include earlier consultations.

Early coordination and pre-consultation with NMFS has been ongoing since June 2018 through a series of meetings, phone conversations, and email correspondence. On December 14, 2018, NMFS HCD submitted ESA/EFH BE to PRD and requested section 7 consultation. We worked with HCD on gathering details of the proposed nursery and information on potential effects, and on February 13, 2019, we had the information necessary and initiated section 7 consultation. The HCD determined that their action would affect, and is likely to adversely affect *Acropora globiceps*, and would affect, but is not likely to adversely affect two sea turtle species and two coral species, and would have no effect on five marine mammal species, three sea turtle species, and three elasmobranch species.

2 DESCRIPTION OF THE PROPOSED ACTION

The purpose of this proposed action is to develop an *in situ* coral nursery in the Commonwealth of the Northern Mariana Islands (CNMI) to address rapidly changing ocean conditions that are negatively affecting coral health throughout the region. Johnston Applied Marine Sciences (the contractor), in cooperation with NOAA and CNMI, is proposing to collect 30-300 fragments from living coral colonies from various sites in Saipan to build and maintain a coral nursery that will grow and reproduce coral colonies. The intent of the nursery is to research, produce, and eventually outplant colonies back into the wild.

Collection of fragments

The contractor will collect fragments from parent, or donor, colonies from several geographically disparate sites around Saipan to capture as much of the local genetic diversity as possible. The contractor expects to collect most fragments of the parent colonies by breaking them off using pliers[1], labeling them with tags, and transporting them in plastic tubs, containers or bags immediately to the nursery site. The contractor will use techniques that minimize long-term harm to parent colonies and survival of fragments. The contractor has experience with collecting fragments and will collect during conditions when they can make clean breaks which will ensure optimal survival of fragments and rapid healing for the parent colony. The contractor will transport fragments to the nursery site as quickly as possible to minimize stress and place them in shade to maintain temperature and reduce exposure to sunlight while transporting.

Development of Nursery Trees

The project will start with the deployment of 6 to 10 nursery trees, but the applicant hopes to eventually bolster this to twenty tree structures with additional funding. The trees are based on designs developed in the Caribbean that have shown the greatest level of storm tolerance. The trees will be deployed as densely as possible, while avoiding entanglement risks, so that turtles and other marine organisms can more easily navigate around them.

Each tree within the nursery will consist of a "spine" of five-foot-tall, 1" diameter PVC tube that supports five, four-foot-long "arms" made of 3/8" fiberglass. The trees will be anchored to the sandy bottom and stood upright using floats (Figure 1) with approximately 1 m buffer between each tree to allow them to sway in the current without entanglement. The trees may have parachord, wire or cable attached to various parts. The total footprint of the nursery will be approximately 400 m^2; however, the footprint of the substrate affected by the nursery will be limited to the anchor sites or a total of about 2.5 m^2.

The corals are attached to the PVC arms using wire line or monofilament. The trees will be secured to the substrate using duckbill anchors. The anchors work like a toggle bolt in the sand and are driven into the ground by hand (with no holes, no digging and no concrete), using a proprietary drive rod and mini-sledge. Once inserted, an upward pull on the anchor tendon rotates the anchor into a perpendicular "anchor lock" position in undisturbed sand creating superb holding capacity.

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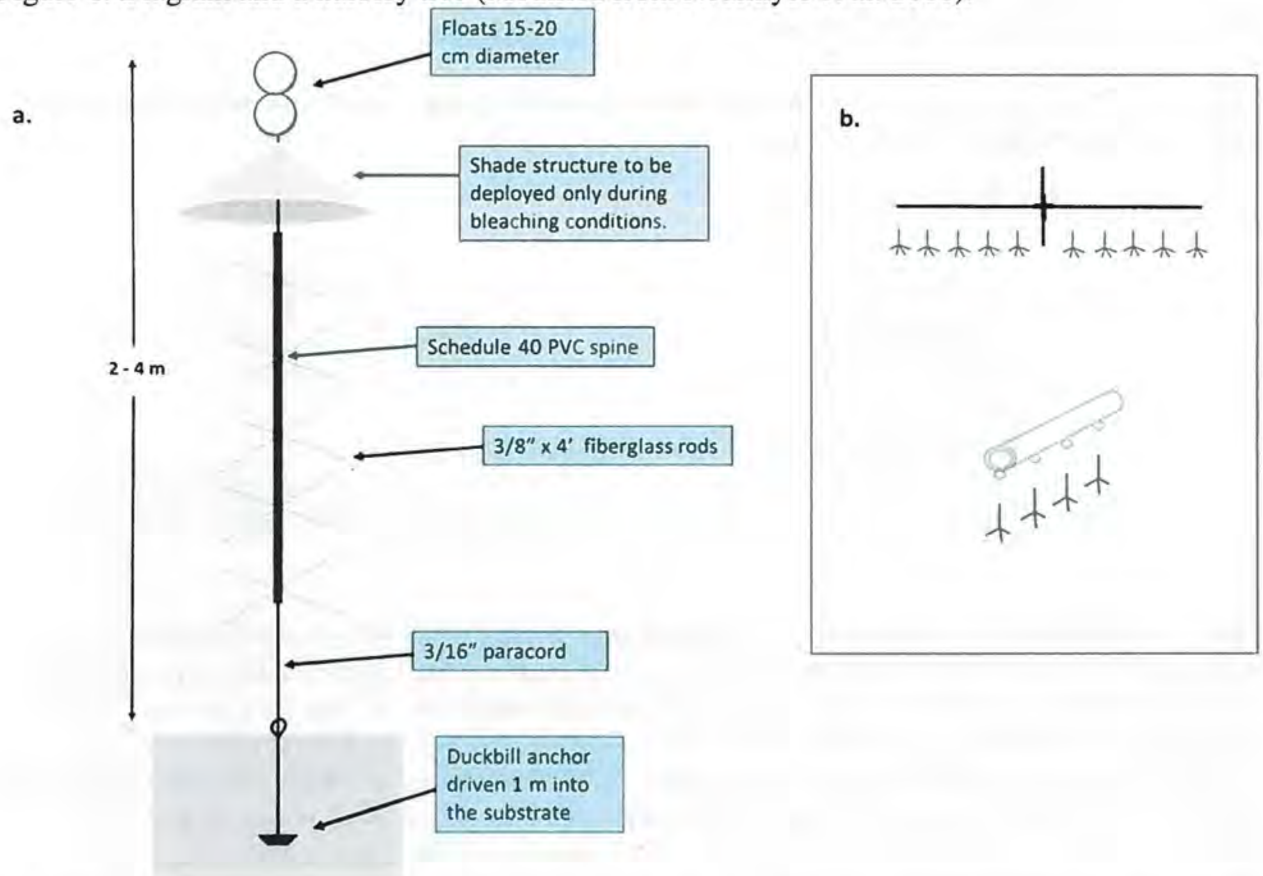
[1] The other options for collection could include stainless steel surgical bonecutters, diagonal electrical wire cutters, needlenose pliers, or polyvinyl chloride (PVC) cutters, if such would be safer than the above primary method.

After deployment parent colonies will be tagged and monitored through time to assess impacts of fragmentation on survival and growth. Once deployed, bi-monthly monitoring and maintenance will occur to collect data on growth rates, temperature and current data from loggers and, if necessary, deploy shade structures to protect the coral fragments from bleaching. The coral fragments will be secured to the constructed nursery trees.

Figure 1. Diagram and a nursery tree (Modified from Nedimyer et al. 2011).



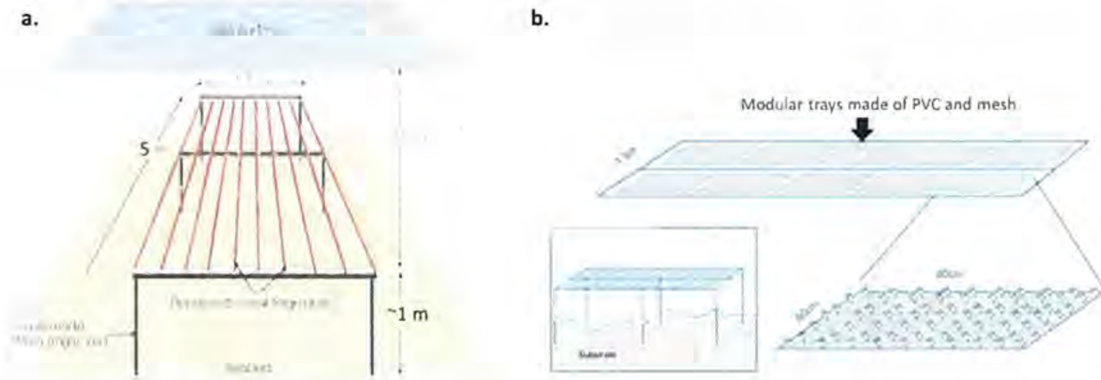
The HCD and the applicant are preparing protocol for storm events which occur often in Saipan. The applicant's response plan will be triggered by a Condition Level 3 (destructive winds are possible within 48hrs) when the storm is forecast to be a Category 1 or stronger typhoon (> 74 mph maximum sustained winds) when it passes over or near Saipan. When these conditions are met, divers will travel to the nursery and connect auxiliary lines from the trees to pre-installed helix style anchors which will be screwed deep into the sediment. There will be approximately one helix anchor installed per 3-4 trees. The extra lines will provide redundancy and absorb some of the stress on the tree lines and anchors during major storms. The helix anchors will be also be installed slightly deeper than the duckbills, providing some protection in the case of major sand movement.

Deployment of Nursery Tables

Pending additional funding, up to five, fixed frame structures will be deployed at the nursery site. These structures will be simple "U-frames" made of rebar or angle iron that can be adapted to support ropes for branching corals or PVC trays for massive corals and corals of opportunity (Figure 2).

Corals of opportunity (broken coral fragments that are no longer attached to the substrate) will be identified ad hoc by snorkelers and divers during surveys of potential parent colonies for the nursery trees as discussed above. These fragments may be tagged to identify species and location of collection and will be placed into plastic bins separate from those corals being harvested for use as part of the nursery tree project.

Figure 2. Drawing of a nursery table with ropes (a) and modular trays (b) modified from Shaish et al. (2008) and Sharfir et al. (2010).



For the fixed-frame rope assembly, the branching coral fragments will be attached directly to a natural fiber rope by untwisting part of the rope and inserting the fragment. This type of nursery is particularly useful when the goal is to restore staghorn thickets. In this case, the entire rope with attached corals can be transported to the restoration site and quickly attached to the substrate by securing the rope at several points, rather than having to attach each individual coral colony. For the table assembly, trays will be made of a PVC frame with plastic coated mesh stretched across to form a platform. Small coral fragments will be mounted on "plugs" using epoxy and secured to the tray with cable ties. Larger fragments or dislodged colonies could be placed directly on the mesh of the tray.

Table frames will be deployed at the same location as the nursery trees, but outside of their footprint and shadow in sand at a depth of at least 15 ft. The frames will be made of rebar A-frames or domes (Figure 2) not to exceed a total of $25m^2$ of total coverage area across all tables. The frames will be secured to the bottom using duckbill anchors (discussed above) and cinderblocks. Coral fragments will be attached to the frames using a combination of zip ties, wire and/or monofilament line.

Collection of Genetic Tissue

All parent colonies selected for the Saipan coral nursery will be genotyped and subsequent fragments will be tracked so that the genetic identity of all nursery colonies will be known. Genetic tissue will be collected from fragments that have already been harvested from parent colonies, adding no additional impact risk to the parent colonies or the ecosystems to which they are a part.

Nursery Maintenance

Divers will visit the nursery periodically, roughly every two months, depending on the level of natural herbivory, to check on the nursery and repair damage, and remove algae and any other nuisance species. Hand held tools and brushes will be used to remove fouling organisms (algae, tunicates, sponges, hydroids, etc.). The divers will also inspect the fragments for diseases and parasites, and treat or remove them from the fragments, or remove the affected fragments to keep them from spreading to other fragments.

Outplant Corals

Outplanting is not part of the currently funded Saipan pilot nursery project as the existing contract currently ends after a single year, but the entire intent of the nursery, and the true benchmark for success, is to eventually transplant corals from the nursery back onto local reefs.

In an ideal scenario, each year coral outplants will be transplanted from the nurseries to reefs impacted by physical disturbances or those prioritized with the greatest resilience potential to aid in the restoration of damaged reefs and long-term reef viability. Outplants may also be transplanted to reefs where populations were once prevalent but have drastically declined recently due to bleaching and other stressors in order to assist in the recovery of the coral populations once the stressors have been removed.

Corals selected for outplaning will be either fully untied or fragmented from the nursery trees (or tables), labeled and placed in plastic bins and transported via small boats to the targeted outplanting site. In most cases corals will be attached, by hand, directly to hard substrate that has been scrubbed free of turf algae using a low toxicity epoxy such as Splash Zone. Should a large amount of coral reattachment be needed cement may be substituted for epoxy. Cement has a tendency to cause pluming when used, but this can and will be minimized to the extent possible using silicate additives, such as SikaCrete® 950P, when applicable.

Long-term monitoring of coral health and environmental conditions will be performed at the outplanting sites to document survivorship and parameters of resilience in order to maximize the efficacy of future outplanting efforts.

Deployment of instruments

Instruments may be deployed at the nursery site, at parent collection sites and at outplanting sites depending on the amount of available equipment, timing, weather and many other factors. A best case scenario would have both a temperature logger and current meter deployed at each location at some point during the project, though this level of coverage is unlikely. When deployed, the sensors will be mounted to a cinderblock and placed at the site by divers onto sand or similar substrate at least 3 meters from any living coral.

Best management practices

The following Best Management Practices (BMPs) will be followed where possible and practicable during the execution of the Saipan Coral Nursery Pilot Project:

1. No anchors, tools or equipment should be placed on any organism, especially live coral. Divers should also avoid contact with organisms wherever possible. Preference should be

to place anchors and spuds in soft-sediment only. Transect tapes and rugosity chains will be placed to minimize contact, wherever possible to avoid all live corals.

2. All vessels should operate at 'no wake/idle' speeds at all times while in water depths where the draft of the vessel provides less than a 2 m (6 ft) clearance. All vessels should follow deep-water routes (e.g. marked channels) whenever possible. If operating in shallow water, all vessels should use a dedicated lookout to assist the pilot with avoiding large coral colonies.
3. Scientific instruments, such as acoustic receivers, may only be attached to sandy bottoms or non-living hard substrates. Attachments and tethers must be as short as possible to avoid potential entanglement hazards. They should be checked regularly and removed after data collection is completed.

Constant vigilance shall be kept for the presence of ESA- or MMPA-listed marine species during all aspects of the project, particularly in-water activities such as boat operations, diving, and deployment of anchors and mooring lines.

4. The project manager shall designate an appropriate number of competent observers to survey the areas adjacent to the proposed action for listed species.
5. Workers will not approach sea turtles or enter the work area if they are present and shall only begin/resume after the animals have voluntarily departed the area.
6. Before entering the water, all divers shall be made aware of ESA-listed corals, and the requirement to avoid contact with those organisms while performing their duties. This shall include taking measures to avoid kicking the reef with fins, and to secure dive and survey equipment in a manner that will prevent that material from being drug across the substrate.
7. Special attention will be given to verify that no listed animals are in the area where equipment or material is expected to contact the substrate before that equipment/material may enter the water. This includes the requirement to limit anchoring to sandy areas well away from coral.
8. All objects will be lowered to the bottom (or installed) in a controlled manner. This can include the use of buoyancy controls such as lift bags, or the use of cranes, winches or other equipment that affect positive control over the rate of descent.
9. In-water tethers, as well as mooring lines for vessels and marker buoys shall be kept to the minimum lengths necessary, and shall remain deployed only as long as needed to properly accomplish the required task.
10. When piloting vessels, vessel operators shall alter course to remain at least 100 m from whales and at least 50 m from other marine mammals and sea turtles. Reduce vessel speed to 10 knots or less when piloting vessels at or within the ranges described above from marine mammals and sea turtles. Operators shall be particularly vigilant to watch for turtles at or near the surface in areas of known or suspected turtle activity, and if practicable, reduce vessel speed to 5 knots or less.
11. If, despite efforts to maintain the distances and speeds described above, a marine mammal or turtle approaches the vessel, put the engine in neutral until the animal is at least 50 feet away and then slowly move away to the prescribed distance.
12. Marine mammals and sea turtles shall not be encircled or trapped between multiple vessels or between vessels and the shore.

13. Do not attempt to feed, touch, ride, or otherwise intentionally interact with any ESA-listed marine species.

Avoid and minimize contamination of the marine environment from project-related activities:

14. A contingency plan to control toxic materials is required.
15. Appropriate materials to contain and clean potential spills shall be stored at the work site and be readily available.
16. All project-related materials and equipment placed in the water shall be free of pollutants.
17. Fueling of land-based vehicles and equipment shall take place at least 50 feet away from the water, preferably over an impervious surface. Fueling of vessels shall be done at approved fueling facilities.

Avoid and minimize introduction or transportation of parasites, diseases, nuisance or invasive species from the nursery to the reefs, or from reef to reef:

18. All dive equipment, materials and instruments will be examined and rinsed with fresh water prior to use or deployment to ensure no organisms are being introduced or transported between the collection areas or outplanting areas.
19. Before corals are moved for outplanting, each colony will be inspected for epiphytic invasive species as well as small coral predators (such as *Drupella* sp. snails), parasites or diseases. Corals with observed invasive species or parasites attached to them will be moved to another section of the nursery, all vectors will be removed and the colony will be observed in quarantine before outplanting.
20. To manage disease, the applicant will not collect form parent colonies that appear to have disease. If disease appears on fragments growing in the nursery, they will immediately be removed from the nursery structures and discarded. If disease appears on corals that have been recently outplanted at a rate exceeding what is happening in the local wild coral population, the diseased nursery corals will be removed from the outplanting site and discarded.

3 APPROACH TO THE ASSESSMENT

3.1 Overview of NMFS Assessment Framework

NMFS approaches its section 7 analyses through a series of sequential steps. The first step of this sequence identifies those physical, chemical, or biotic aspects of proposed actions that are known or are likely to have individual, interactive, or cumulative direct and indirect effects on the environment (we use the term "potential stressors" for these aspects of an action). As part of this step, we identify the spatial extent of any potential stressors and recognize that the spatial extent of those stressors may change with time. The area that results from this step is the *Action Area* for consultation.

The second step of our analyses identifies the listed species (collectively, listed resources) that are likely to co-occur with these potential stressors in space and time. If we conclude that such co-occurrence is likely, we then try to estimate the nature of that co-occurrence (these represent our *exposure analyses*); that is, the intensity of the stressors we expect listed species to be exposed to and the duration and frequency of any exposure. In this step of our analyses, we try to identify the number, age (or life stage), and gender of the individuals that are likely to be exposed to an Action's effects and the populations or subpopulations those individuals represent.

If applicable, our exposure analyses also identify the physical or biological features of critical habitat, including any physical or biological features ("essential features") of critical habitat or areas that require special management consideration or protection such as sites for breeding and rearing, food, water, space for growth and normal behavior, and cover and shelter; and we identify the number, age or life stage, and gender of the individuals that are likely to be exposed to an action's effects and the populations or subpopulations those individuals represent. This information is represented in the *Status of Listed Resources*. In this section we review the species' legal status, trends, and the threats that led to this status as well as those that may be impeding the species' chances of recovery. We also assess the effects of past and ongoing human and natural factors leading to the current status of the species, its habitat, and ecosystem. We present this information in the *Environmental Baseline*. The environmental baseline is designed to assess the condition of the habitat and the species within the action area. The information in the *Environmental Baseline* with the *Status of Listed Resources* forms the foundation of our analyses and determining the risk a proposed action poses a particular species or their designated critical habitat.

Once we identify the listed resources that are likely to be exposed to an action's effects and the nature of that exposure, we examine the scientific and commercial data available to determine whether and how those listed resources are likely to respond given their exposure (these represent our *response analyses*).

3.2 Risk Analyses for Endangered and Threatened Species

Our jeopardy analyses ask whether an action agency has *insured* that its action – the action considered in this consultation is the continued authorization of the HI SSLL fishery – *is not likel*y to jeopardize the continued existence of endangered or threatened species. To assess whether an action agency has complied with this standard, our jeopardy analyses ask if the evidence available allows us to conclude that the agency has *insured* that any reductions in *numbers*, *reproduction*, or the *distribution* of endangered or threatened species that are likely to result from its proposed action are likely to be inconsequential for these species (50 CFR §402.02). This standard specifically focuses on endangered or threatened species as those "species" have been listed, which can include a biological species, a subspecies, or distinct population segments of vertebrate species.

Few federal actions affect every member of endangered and threatened species that occur in marine or coastal ecosystems. Instead, the overwhelming majority of federal actions affect some members of some populations of these listed species. To determine whether an action that affects individuals is likely to affect the listed species those individuals belong to, we rely on the relationship between species, populations, and individuals. The viability of listed species (their probability of extinction or probability of persistence) depends on the viability of the populations that comprise the species while the viability of populations are determined by the fate of the individuals that comprise them: populations grow or decline as the individuals that comprise the population live, die, grow, mature, migrate, and reproduce (or fail to do so).

Our risk analyses reflect these relationships between listed species and the populations that comprise them, and the individuals that comprise those populations. Our risk analyses begin by identifying the probable risks actions pose to listed individuals that are likely to be exposed to an action's effects. Our analyses then integrate those individuals' risks to identify consequences to the populations they represent and next we determine the consequences of population-level effects on the species as listed.

Our risk analyses reflect these relationships between listed species and the populations that comprise them, and the individuals that comprise those populations. Our risk analyses begin by identifying the probable risks actions pose to listed individuals that are likely to be exposed to an action's effects. Our analyses then integrate those individuals' risks to identify consequences to the populations they represent and next we determine the consequences of population-level effects on the species as listed.

We measure risks to listed individuals using the individual's "fitness," which are changes in an individual's growth, survival, annual reproductive success, or lifetime reproductive success as a result of their exposure to a stressor. In particular, we examine the scientific and commercial data available to determine if an individual's probable responses to an action's effect on the environment (which we identify during our response analyses) are likely to have consequences for the individual's fitness. When individual listed plants or animals are expected to experience reductions in fitness, we would expect those reductions to also reduce the abundance, reproduction rates, or growth rates (or increase variance in one or more of these rates) of the populations those individuals represent (see Stearns 1992). A reduction in one or more of these variables (or one of the variables we derive from them) is a *necessary* condition for reductions in a population's viability, which itself is a *necessary* condition for reductions in a species' viability. On the other hand, when listed plants or animals exposed to an action's effects are not expected to experience reductions in fitness, we would not expect the action to have adverse consequences on the viability of the populations those individuals represent or the species those populations comprise (for example, see Anderson 2000; Mills and Beatty 1979; Stearns 1992). If we conclude that listed plants or animals are not likely to experience reductions in their fitness we would conclude our assessment.

If, however, we conclude that listed plants or animals are likely to experience reductions in their fitness, our assessment tries to determine if those reductions are likely to be sufficient to reduce the viability of the populations those individuals represent (measured using changes in the population' abundance, reproduction, spatial structure and connectivity, growth rates, genetic health, or variance in these measures to make inferences about the population's extinction risks). In this step of our analyses, we use the population's base condition (established in the *Environmental Baseline* and *Status of Listed Resources* sections of this biological opinion) as our point of reference.

Finally, our assessment tries to determine if changes in population viability are likely to be sufficient to reduce the viability of the species those populations comprise. That is, our assessment tries to determine if the action agency can insure that changes in the populations are not likely to reduce the viability of the species those populations comprise. In this step of our analyses, we use the species' status (established in the *Status of Listed Resources* and informed by the *Environmental Baseline* sections of this opinion) as our point of reference. The primary advantage of this approach is that it considers the consequences of the response of endangered and threatened species in terms of fitness costs. Individual-level effects can then be translated into changes in demographic parameters of populations, thus allowing for an assessment of the biological significance of particular human disturbances.

Biological opinions, then, distinguish among different kinds of "significance". First, we focus on potential physical, chemical, or biotic stressors that are "significant" or most important (also, salient), and distinct from ambient or background. We then ask if (a) exposing individuals to those potential stressors is likely to represent a "significant" adverse experience in the life of individuals that have been exposed; (b) exposing individuals to those potential stressors is likely to cause the individuals to experience "significant" physical, chemical, or biotic responses; and (c) any "significant" physical, chemical, or biotic responses are likely to have "significant" consequence for the fitness of the individual animal. In the latter two cases, (items (b) and (c)), the term "significant" means "clinically or biotically significant" rather than statistically significant.

For populations (or sub-populations, demes, etc.), we are concerned about whether the number of individuals that experience "significant" reductions in fitness and the nature of any fitness reductions are likely to have a "significant" consequence for the viability (i.e. probability of demographic, ecological, or genetic extinction) of the populations(s) those individuals represent. Here "significant" also means "clinically or biotically significant" rather than statistically significant.

For "species" (the entity listed as threatened or endangered, which may not be the biological species), we are concerned about whether the number of populations that experience "significant" reductions in viability (that is, increases their extinction probabilities) and the nature of any reductions in viability are likely to have "significant" consequences for the viability (the probability of demographic, ecological, or genetic extinction) of the listed species those populations comprise. Here again, "significant" also means "clinically or biotically significant" rather than statistically significant.

In this step, we also ask whether or to what degree the agency has insured that probable reductions in a species' viability are not likely to have significant consequences for the viability of the listed species those populations comprise. The answer to this question informs our conclusion about whether an agency has insured that any reductions in numbers, reproduction, or the distribution of threatened or endangered species that are likely to result from its proposed action are likely to be inconsequential for these species (50 CFR §402.02).

3.3 Evidence Available for this Consultation

To conduct our analyses, we considered lines of evidence available through published and unpublished sources that represent evidence of adverse consequence or the absence of such consequences. In particular, we considered information contained in NMFS's final ruling to list 20 coral species as threatened under the ESA (79 FR 53851), status of corals reports, manuals, and taxonomic listings (Veron 2014, Veron 2000, Wallace 1999), coral resilience studies in Saipan (Maynard et al. 2012, Maynard et al 2015), and coral nursery restoration guides and documents (Johnson et al. 2011, Nedimyer 2011).

We supplemented this information by conducting electronic searches of literature published in English or with English abstracts using research platforms in the Science Direct, PubMed, Google Scholar, Google, Bing Academia, and Bing. These platforms allowed us to cross search multiple databases for journals, open access resources, books, proceedings, web sites, for literature on the biological, ecological, and fisheries sciences.

For our literature searches, we used paired combinations of the keywords such as *Acropora*, wound healing, parent colony healing, coral breakage, coral breakage survival, coral regeneration, regeneration rates, Saipan and coral, coral disease, climate change, and many others to search these electronic databases. Electronic searches have important limitations, however. First, often they only contain articles from a limited time span. Second, electronic databases commonly do not include articles published in small or obscure journals or magazines. Third, electronic databases do not include unpublished reports from government agencies, consulting firms, and non-governmental organizations. To overcome these limitations, we identified additional papers that had not been captured in our electronic searches and searched their literature cited sections and bibliographies. We acquired references that, based on a reading of their titles and abstracts, appeared to comply with our keywords. If a references' title did not allow us to eliminate it as irrelevant to this inquiry, we acquired the reference.

3.4 Application of this Approach in this Consultation

We begin by deconstructing the proposed action into its constituent parts. This step allows us to distinguish the effects of related activities on listed resources. NMFS identified the following potential stressors (or subsidies) associated with the proposed action. These stressors are:

1. Direct physical impact
2. Hazardous chemicals and materials
3. Disease, parasites, and nuisance and invasive species
4. Turbidity
5. Benthic Disturbance

In this step of our analysis, we evaluate available evidence to determine the likelihood of listed species or critical habitat being exposed to these potential stressors. Our analysis assumed that these stressors pose no risk to listed species or critical habitat if these stressors do not co-occur, in space or time, with the: (a) individuals of endangered or threatened species, or areas designated as critical habitat for threatened or endangered species; (b) species that are food for endangered or threatened species; or (c) species that prey on or compete with endangered or threatened species.

3.4.1 Exposure Analyses

Our challenge in this step is to identify: what populations, life history forms or stages of listed species are exposed to the proposed action; the number of individuals that are exposed; the pathways of their exposure; the timing and duration of their exposure; the frequency and severity of the exposure; and how exposure might vary depending upon the characteristic of the environment and individual behavior. Typically, in this step of our analysis we would identify how many individuals are likely to be exposed, which populations the individuals represent, where and when the exposure would occur, how long the exposure would occur, the frequency of the exposure, and any other particular details that help characterize the exposure. To do this we require knowledge of a species' population structure and distribution, migratory behaviors, life history strategy, and abundance.

For our exposure analyses, we use data on species occurrence in the action area and the extent, duration, frequency, and severity of each stressor. For data gaps, we may use information on surrogate species, and information on similar actions in other locations which may be impacting individuals of other populations. We may also query experts to formulate opinions or estimates of exposure. We also meet with the action agency to obtain information on their actions and to understand the effects of these actions.

Managing and analyzing coral within the context of the ESA is unusual since the term "individual" that we use for coral is not necessarily one individual animal like we consider individual sea turtles or whales. Coral colonies are made up of hundreds to thousands of coral polyps, which all could be considered individuals in the truest sense of the word. However, NMFS has defined the physiological colony as the "individual" rather than the coral polyp (79 FR 53876). For the purposes of this consultation, we consider effects to each colony as individuals within a local population, within a regional, and global population.

3.4.2 Response Analyses

As discussed in the introduction to this section of this biological opinion, we use the best scientific and commercial data available to identify the intended and unintended consequences that are likely to result from the different activities that comprise the proposed action. These analyses identify the probable direct and indirect consequences of exposing listed resources to those activities for listed individuals, populations, and species, and designated critical habitat; these analyses represent the "response analyses" and "risk analyses" of our consultations. Our "response analyses" review the scientific and commercial data available to determine whether, how, and to what degree listed resources are likely to respond given their exposure to the intended and unintended consequences of classes of activities. Because the response of animals to a potential stressor are influenced by the animal's pre-existing physical, physiological, or behavioral state, our response analyses consider the *Status of Listed Resources* and the impacts of the *Environmental Baseline*.

3.4.3 Risk Analyses

Our "risk analyses" begin by identifying the probable consequences of those responses for the "performance" of listed individuals, and then they identify the consequences of changes in individual performance on the viability of the populations those individual represent. Our "risk analyses" conclude by determining the consequences of changing the viability of the populations, and the species those populations comprise. We ask: (1) what is likely to happen to different individuals; and (2) what is likely to happen to the populations or species those individuals comprise?

When individual, listed plants or animals are expected to experience reductions in fitness, we would expect those reductions to also reduce the abundance, reproduction rates, or growth rates (or increase variance in one or more of these rates) of the populations those individuals represent (see Stearns 1992). If we conclude that listed plants or animals are not likely to experience reductions in their fitness then we would conclude our assessment.

Our risk analyses reflect these relationships between listed species and the populations that comprise them, and the individuals that comprise those populations. Our risk analyses begin by identifying the probable risks actions posted to listed individuals that are likely to be exposed to an action's effects. Our analyses then integrate those individual risks to determine if the number of individuals that experience reduced fitness (or the magnitude of any reductions) is likely to be sufficient to reduce the viability of the populations those individuals represent (measured using changes in the populations' abundance, reproduction, spatial structure and connectivity, growth rates, or variance in these measures to make inferences about the population's probability of becoming demographically, ecologically, or genetically extinct in 25, 50, or 100 years). In this step of our analyses, we use the population's base condition (established in the *Environmental Baseline* and *Status of Listed Resources* sections of this opinion) as our point of reference.

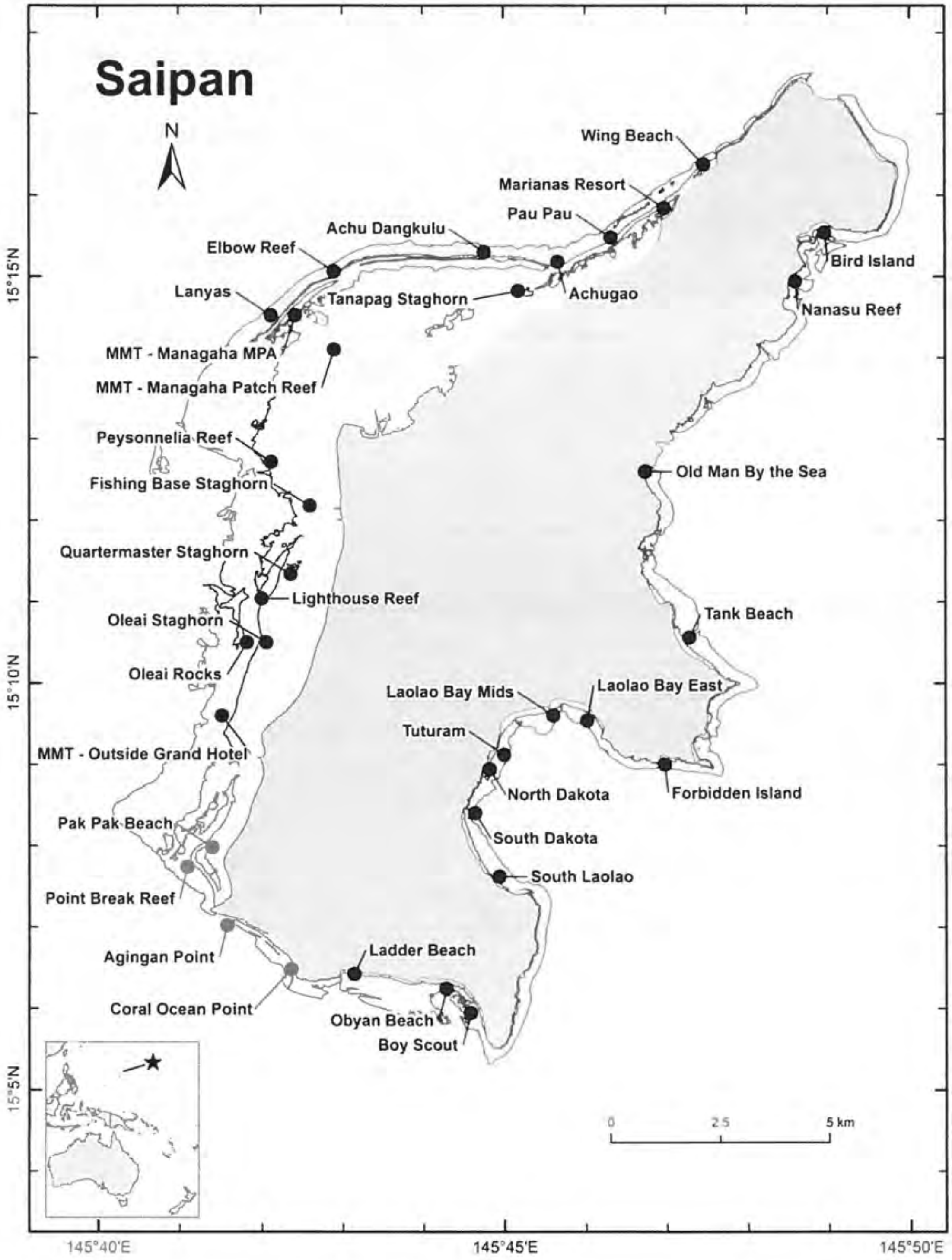
Our risk analyses conclude by determining whether changes in the viability of one or more population is or is not likely to be sufficient to reduce the viability of the species (measured using probability of demographic, ecological, or genetic extinction in 25, 50, or 100 years) those populations comprise. For these analyses, we combine our knowledge of the patterns that accompanied the decline, collapse, or extinction of populations and species that are known to have declined, collapsed, or become extinct in the past.

When we conduct these analyses, our assessment is designed to establish that a decline, collapse, or extinction of an endangered or threatened species is not likely; we do not conduct these analyses to establish that such an outcome is likely. In this step of our analyses, we use the species' status (established in the *Status of the Listed Resources* section of this opinion) as our point of reference.

3.5 Action Area

The "Action Area" means all areas to be affected directly or indirectly by the Proposed Action, in which the effects of the action can be meaningfully detected measured, and evaluated (50 CFR 402.02). The action area for this project includes all areas affected by deployment of instruments, harvesting of parent colonies, and deployment and operation of nursery trees and tables, maintenance, vessel transit, and outplanting of fragments. The majority of the action will be at the nursery site which will be located in Saipan Lagoon, specifically in or near the northeast corner of the Mañagaha Marine Conservation Area. The contractor has identified over 30 potential collection sites throughout Saipan, pictured in Figure 3. Since the contractor has not yet determined which collection sites they will use, all reef flats and fore reef slopes surrounding Saipan are considered part of the action area. The reef flats and slopes are also where fragments or nursery-produced colonies are outplanted. The action area also includes vessel routes that may extend no more than ½ mile seaward of the reef slope.

Figure 3. Locations of the 35 sites surveyed in Saipan during coral reef resiliency studies described in Maynard et al., (2012) and Maynard et al., (2015).



4 STATUS OF LISTED RESOURCES

This section identifies the ESA-listed species and any designated critical habitat that potentially occur within the action area that may be affected by the proposed action. It then identifies those species not likely to be adversely affected by the proposed action because the effects of the proposed action are deemed insignificant, discountable, or fully beneficial. Finally, this section summarizes the biology and ecology of those species that may be adversely affected by the proposed action and details information on their life histories in the action area, if known. The ESA-listed species potentially occurring within the action area that may be affected by the proposed action are given in Table 1.

Table 1. List of species considered in this consultation

ESA Species	Listing Status	Listing Date and Federal Register Notice	Critical Habitat Date and Federal Register Notice (if applicable)	HCD Effect Determination
Coral (*Acropora globiceps*)	Threatened	09/10/2014 79 FR 53852	N/A	Likely to Adversely Affect
Central West Pacific DPS Green sea turtle (*Chelonia mydas*)	Endangered	04/06/2016 81 FR 20057	N/A	Not Likely to Adversely Affect (NLAA)
Hawksbill sea turtle (*Eretmochelys imbricata*)	Endangered	06/02/1970 35 FR 8491	09/02/1998 63 FR 46693 Not in action area	NLAA
Coral *Acropora retusa*	Threatened	09/10/2014 79 FR 53851	N/A	NLAA
Coral *Seriatopora aculeata*	Threatened	09/10/2014 79 FR 53851	N/A	NLAA
Leatherback sea turtle (*Dermochelys coriacea*)	Endangered	06/02/1970 35 FR 8491	01/26/2012 77 FR 4170 Not in action area	No Effect (NE)
North Pacific loggerhead sea turtle (*Caretta caretta*)	Endangered	09/22/2011 76 FR 58868	N/A	NE
Olive Ridley sea turtle (*Lepidochelys olivacea*)	Threatened	07/28/1978 43 FR 32800	N/A	NE
Blue whale (*Balaenoptera musculus*)	Endangered	12/02/1970 35 FR 18319	N/A	NE
Fin whale (*Balaenoptera physalus*)	Endangered	12/02/1970 35 FR 18319	N/A	NE

ESA Species	Listing Status	Listing Date and Federal Register Notice	Critical Habitat Date and Federal Register Notice (if applicable)	HCD Effect Determination
Sei whale (*Balaenoptera borealis*)	Endangered	12/02/1970 35 FR 18319	N/A	NE
Western North Pacific Humpback whale (*Megaptera novaeangliae*)	Endangered	12/02/1970 35 FR 18319	N/A	NE
Sperm whale (*Physeter macrocephalus*)	Endangered	12/02/1970 35 FR 18319	N/A	NE
Oceanic whitetip shark (*Carcharinus lonigmanus*)	Threatened	01/30/2018 83 FR 4153	N/A	NE
Giant manta ray (*Manta birostris*)	Threatened	1/22/2018 83 FR 2916	N/A	NE
Indo West Pacific Scalloped hammerhead shark (*Sphyrna lewini*)	Threatened	09/02/2014 79 FR 38213	N/A	NLAA

4.1 Species Not Considered Further

The NMFS HCD determined that their action was not likely to adversely affect the Central West Pacific DPS green sea turtle, hawksbill sea turtle, scalloped hammerhead shark, *Acropora retusa* and *Seriatopora aculeata*. The NMFS HCD considered all ESA-listed species that occur in the Mariana Islands listed in Table 1. They concluded that primarily pelagic species, species that have previously occurred or suspected to occur in the action area, and concluded that they are not likely to be in the action area and will not be effected by this action. We concur with NMFS HCD on this determination.

For sea turtles, scalloped hammerhead shark, *Acropora retusa* and *Seriatopora aculeata*, we also concur with NMFS HCD that the proposed activities are not likely to adversely affect these species. The reasons for this determination are detailed below.

4.1.1 Sea Turtles

The nursery will be located where Central West Pacific DPS green sea turtles and hawksbill sea turtles feed or rest. Green and hawksbill sea turtles also use the reef slopes where fragments will be collected.

4.1.1.1 Vessel collisions

The applicant will use primarily small vessels (< 40-feet) during their action. There is a potential for vessels to collide with sea turtles. The applicant will implement BMPs that minimize exposure to vessel collisions, including observers who will look for sea turtles during transit, reduced vessel speeds in known sea turtle locations, and avoidance of areas where sea turtles are sighted. The speed restrictions are intended to reduce the probability of collisions, and the severity of injuries if one occurs.

Hazel et al. (2007) demonstrated greater vessel speed increased the probability that sea turtles would fail to flee from the approaching vessel. Additionally, operating at higher speeds makes it more difficult for operators to detect sea turtles, especially during choppy or low-visibility conditions. Vanderlaan and Taggart (2007) report that the severity of injury to large whales is directly related to speed. They found that the probability of lethal injury increased from 21% for vessels traveling at 8.6 knots, to over 79% for vessels moving at 15 knots or more.

The U.S. Navy and NMFS estimated that 250 sea turtles are struck by vessels in Hawaii (NMFS 2018). To estimate the rate of vessel strikes, the Navy used ship hours (number of hours that vessels were at sea) but it only included vessels 65-feet long and larger. Since the vessels used in this action are much smaller and generally travel closer to shore than large vessels (where turtles are more concentrated), the use of ship hours of 65-feet and larger vessels would be inappropriate. NMFS (2008) estimated 37.5 vessel strikes of sea turtles per year from an estimated 577,872 trips from vessels of all sizes in Hawaii. It is reasonable that the number of vessel trips have also increased but we have no information to support this claim. Using the 2008 estimate, this calculates to a 0.04% probability of a vessel strike for all vessels and trips, many of who are not reducing speeds or employing lookouts for listed species. We have less vessel data from Saipan but the mechanisms of vessel collision are likely similar to those in Hawaii. The probabilities are likely to be lower since there are fewer sea turtles in Saipan, fewer vessels, and sea turtles appear to display a stronger flight response in Saipan than in Hawaii. Considering the BMPs included with this project, including the use of lookouts, slower speeds and avoidance of areas when sea turtles are observed, the probabilities of vessel collision are likely even lower. Thus, we expect effects on sea turtles from vessel collisions to be discountable.

4.1.1.2 Entanglement

The applicant will be installing nursery trees and tables to the action area. These man-made structures, pictured in Figures 1 and 2, will have plastic and fiberglass poles, metal frames, anchors, anchor lines, subsurface buoys, and parachord, wire, natural fiber rope, or monofilament. These structures could create entanglement hazards to sea turtles that use the area. We searched for information regarding coral nurseries and entanglements, and found no journal articles, or reports of entangled sea turtles or any marine life. We found that other designs like suspending stacked ropes or lines were more dangerous (Nedimyer et al. 2011) because its shape acts like a net. Although coral fragments are attached to line or strings in the nursery tree design, they are too short to be serious entanglement risks to sea turtles. The "branches" or "arms" of the nursery trees are short (no more than 0.5m) and spaced close enough together to create an obvious visual barrier that sea turtles would not want to swim through and get caught between the arms or any part of the tree. Tethers to buoys and anchor lines are generally short and pulled tight, which reduces its likelihood of entangling sea turtles. All materials are marine grade quality and strength, and are unlikely to break off if rubbed on or contacted by a sea turtle.

Of the several nursery table designs described, the fixed-frame rope assembly appears to be the most likely to entangle a sea turtle if contacted. To avoid entanglement of sea turtles, all rope, strings or ties will be tied tightly to the structures, and arranged to create a visual barrier that sea turtles would avoid and not try to swim through. Like the materials used for nursery trees, all materials for the tables will be marine grade quality and strength, and are unlikely to break off if rubbed on or contacted by a sea turtle, and tables will be anchored deeply to minimize the risk of breaking free during a storm.

The applicant has redesigned the anchoring and arrangement of nursery trees to "storm proof" them. While all structures are not safe from typhoons, storms, and high surf, structures can be designed and built to minimize the damage and the probability of breaking off and being swept away from the site where it can become potential entanglements or simply marine debris. We expect the probability of entanglement of sea turtles to be discountable.

4.1.1.3 Direct contact and human disturbance

The nursery and the action will occur in areas where green and hawksbill sea turtles forage and rest. The action is not likely to adversely affect Central West Pacific DPS Green sea turtles and hawksbill sea turtles because the applicant is committed to best management practices to avoid contact and disturbance to sea turtles during their operations. A potential stressor from these activities is the interaction of divers with listed species. The applicant will not approach or purposely touch sea turtles. Sea turtles in the Mariana Islands generally leave the area when they see people, but resident sea turtles in the Mañagaha Marine Conservation Area appear to be more tolerant of people. Sea turtles would likely leave the work area on its own with minimal and insignificant expenditure of energy.

4.1.1.4 Turbidity

The applicant may expose sea turtles to elevated turbidity or sedimentation during any part of the action. Since there is no excavation planned for the proposed action, turbidity is not expected to be a major stressor during this action. The sediments at Saipan Lagoon is mostly sand to silt and the water in the lagoon is generally more turbid than seaward of the reef crest. Because it is subject to daily human recreational activity, the lagoon experiences daily disturbance of sediments and turbidity as a result. Turbidity is expected to occur during installation of the nursery trees and tables. Turbidity may also occur during collection of fragments, and occasionally during operation or maintenance at the nursery, but is less likely to occur and will be less severe because divers will avoid or minimize contact with the sediments to keep turbidity from affecting their coral fragments. At high levels, suspended sediments could irritate skin or eyes, or cloud their vision which reduces their ability to detect predators. Some species use turbid areas to hide from predators or to catch prey. Sea turtles are highly mobile and capable of avoiding turbid areas, thus unlikely to be exposed to highly turbid water. While the risk of increased turbidity is expected to be low, any response of the sea turtles to turbidity would be within the range of normal behaviors that will not alter their ability to grow and reproduce. The applicant will not install the anchors of the nursery trees or any other potential turbidity-creating activities when sea turtles are in the area.

4.1.1.5 Noise

The activities of this action will generate low levels of noise during operations, mostly in the form of bubbles from scuba divers and vessels, but also during installation of the nursery trees. The applicant will use hand-held hammers to pound the anchors and posts in. Neither are loud enough or long enough in duration to cause non-auditory injury or trauma, or temporary or permanent hearing loss. Noises can disturb sea turtles and illicit a behavior response. Vessel activity and scuba diving is a common and popular tourist activity throughout Saipan, especially within Saipan Lagoon. The noises generated by vessels and scuba occur almost daily in Saipan and are not likely to illicit an abnormal response from sea turtles who hear them. The striking of hammers onto anchors and poles would create noises that would barely reach a 160 dB (re: 1 μPa) threshold for behavioral responses, but it will not occur for a long enough duration to significantly affect their behavior in terms of life history functions. Sea turtles are generally more visually oriented and seeing humans and activities are more likely to illicit a response. We expect exposure to noise generated during this action to have an insignificant effect on sea turtles.

4.1.1.6 Benthic disturbance and change in habitat

The applicant will change the habitat at the nursery site by placing man-made structures hosting coral fragments where bare sand presently exists. Green and hawksbill sea turtles may currently use the nursery site but it is unlikely favored habitat because it provides little forage value as no macroalgae or seagrass is present, and little value as resting or refuge habitat since there is no cover. The location of the proposed nursery is not unique nor does it provide any type or quantity or quality of forage that cannot be found nearby within the lagoon where acres of bare sand in shallow water exist. Adding nursery trees and tables to the action area will not degrade the existing habitat and or decrease the quality or quantity of habitat for sea turtles because it will not decrease forage or increase predation. The total area of the nursery is at most 400 square meters, with actual disturbance to the bottom much smaller than that. We expect alteration of habitat will have an insignificant effect on sea turtles.

4.1.2 Scalloped hammerhead shark

Scalloped hammerhead shark pups were observed three times in the last six months in Saipan Lagoon near the shoreline (Trey Dunn, CNMI Fish and Wildlife, March 14, 2019). Scalloped hammerhead sharks could occur in the action area in all phases of the project.

4.1.2.1 Vessel collision

The manner of injury of hull or propeller impacts on scalloped hammerhead sharks would be similar to injuries to sea turtles described above. Sharks are not air breathers and are not often observed hovering near the surface like sea turtles. They are also observed much more seldom in Saipan than sea turtles. Vessel collisions with sharks are rarely observed anywhere, and will be much less likely during the action than sea turtles and is discountable to scalloped hammerhead sharks.

4.1.2.2 Entanglement

Sharks are vulnerable to entanglement and have been observed entangled in fishery-related nets and derelict gear. The manner of injury of entanglement would be similar to sea turtles. Although sea turtles are not air breathers, scalloped hammerhead sharks are obligate ram ventilators and will suffocate if they are restricted from swimming. We did not find information on entanglements of sharks in coral nurseries. We discussed the potential of entanglement of sea turtles in the above section, and its discountable probability. Scalloped hammerhead sharks are considered rarer in the action area than sea turtles, and will not have features that would attract scalloped hammerhead sharks. We expect entanglements to be discountable to scalloped hammerhead sharks.

4.1.2.3 Direct contact and human disturbance

The applicant has incorporated BMPs that would avoid direct contact and minimize human disturbance to scalloped hammerhead sharks. The divers are being instructed to avoid purposely touching large animals during the action, and not entering areas when listed species such as scalloped hammerhead sharks are in the area. We expect the effects of direct contact and human disturbance to be insignificant to scalloped hammerhead sharks.

4.1.2.4 Turbidity

Turbidity can affect scalloped hammerhead sharks with eye or skin irritation, and respiratory stress if it is severe enough. Scalloped hammerhead sharks may actually favor turbid habitat as they often bear their pups in estuaries that are often turbid. Yates et al. (2015) revealed that turbidity was strongly correlated with scalloped hammerhead sharks during their sampling, and their presence decreased as turbidity decreased. Sharks may use turbidity as cover to ambush prey, and as juveniles to use as cover to reduce predation. Other authors have described scalloped hammerhead preference for turbid areas (Clarke 1971, Duncan and Holland 2006). As described above, the project may slightly increase turbidity during installation of nursery trees or tables at the nursery, but it will likely be turbid enough to affect scalloped hammerhead sharks. Furthermore, the applicant will avoid installing the nursery or conduct turbidity-generating activities when scalloped hammerhead sharks are in the work area where they can be exposed. We expect the effects of turbidity generated in this action to be insignificant to scalloped hammerhead sharks.

4.1.2.5 Noise

The hearing range of scalloped hammerhead sharks and their sensitivity to noise is believed to be similar to sea turtles. Likewise, noises generated by the action will not reach levels that could injure them, and not long enough to illicit negative behavioral responses. The applicant will also adhere to BMPs, which will restrict in-water activities if scalloped hammerhead sharks are observed in the action area. We expect the effects of noise to scalloped hammerhead sharks to be insignificant.

4.1.2.6 Benthic disturbance and change in habitat

The applicant will add man-made structures to an area that is presently bare sand. The area's relative value to scalloped hammerhead sharks as a nursery or foraging area is low. Sandy areas are common throughout Saipan Lagoon. Scalloped hammerhead sharks had not been observed or reported for decades before they were observed near shore in Saipan Lagoon. These observations were generally far from the nursery site. The nursery is a fraction of the entire lagoon area and nothing will prevent access to the site. As more structure and coral fragments are added to the site, there may be an increase in fish in the area, but would probably have little effect to bottom-dwelling prey that scalloped hammerhead sharks would target. The changes in habitat are likely to have an insignificant effect on scalloped hammerhead shark.

4.1.3 *Acropora retusa* and *Seriatopora aculeata*

Although very rare and not observed in decades, *Acropora retusa* and *Seriatopora aculeata* could occur at the reef slopes in the action agency.

4.1.3.1 Direct physical impacts

The applicant will avoid *Acropora retusa* or *Seriatopora aculeata* if they are discovered at their collection sites, and will not collect fragments from those colonies. The applicant may mark the colonies for monitoring but will avoid touching or injuring the colony by creating turbidity or changing the habitat around it. We expect the action will have insignificant effects on *A. retusa* and *S. aculeata*.

4.2 Species Likely to be Adversely Affected

The NMFS HCD determined that the proposed action may affect and is likely to adversely affect *Acropora globiceps*.

4.2.1 *Acropora globiceps*

4.2.1.1 Distribution

A. globiceps has been reported from the central Indo-Pacific, the oceanic west Pacific, and the central Pacific (IUCN, 2010). It is common and relatively widespread in the north-south direction, but somewhat restricted in the east-west direction and has a narrow depth range (Richards 2009). Veron (2014) reports that *A. globiceps* is confirmed in 22 of his 133 Indo-Pacific ecoregions, and strongly predicted to be found in an additional 16. Wallace (1999b) reports its occurrence in seven of her 29 Indo-Pacific areas, many of which are significantly larger than Veron's ecoregions. Richards (2009) estimates the range of the species at 5 million km^2, and within its range are found on upper reef slopes, reef flats, and adjacent habitats in depth ranging from 0 to 8 m.

4.2.1.2 Population

Overall abundance was described as ''sometimes common.'' Veron did not infer trends in abundance from these data. Based on results from Richards et al. (2008) and Veron (2014), the absolute abundance of this species is likely at least tens of millions of colonies.

Carpenter et al. (2008) extrapolated species abundance trend estimates from total live coral cover trends and habitat types. For *A. globiceps*, the overall decline in abundance (''Percent Population Reduction'') was estimated at 35 percent, and the decline in abundance before the 1998 bleaching event (''Back-cast Percent Population Reduction'') was estimated at 14 percent (Carpenter et al., 2008). However, as summarized in the Inter-basin Comparison sub-section of the status review, live coral cover trends are highly variable both spatially and temporally, producing patterns on small scales that can be easily taken out of context, thus quantitative inferences to species-specific trends should be interpreted with caution. At the same time, an extensive body of literature documents broad declines in live coral cover and shifts to reef communities dominated by hardier coral species or algae over the past 50 to 100 years (Birkeland, 2004; Fenner, 2012; Pandolfi et al., 2003; Sale and Szmant, 2012). These changes have likely occurred, and are occurring, from a combination of global and local threats. Given that *A. globiceps* occurs in many areas affected by these broad changes, and that it has some susceptibility to both global and local threats, we conclude that it is likely to have declined in abundance over the past 50 to 100 years, but a precise quantification is not possible due to the limited species-specific information.

A. globiceps is located on Saipan, Guam, Rota, Tinian, Pagan, Maug, and suspected on four other islands within the Mariana Islands. Saipan had the highest abundance of *A. globiceps* of all of the islands surveyed in NOAA's Coral Reef Ecosystem Program's (CREP) 2017 survey. In 2017, CREP estimated 2,966,168 colonies on Saipan. About half of them were juvenile colonies (< 5 cm diameter). That population along with most other branching *Acropora* species were reduced by an estimated 90% by a mass bleaching event that killed most of the colonies (Doug Fenner, coral taxonomist and biologist, pers com May 2018, BECQ unpub. data, CREP unpub. data). The *A. globiceps* population is now estimated at around 300,000 based on a 90% reduction.

4.2.1.3 Threats to the Species

A. globiceps is vulnerable to land-based stressors and human activities such as trophic effects of fishing, nutrients, sedimentation, sea-level rise, and collection and trade. However, the biggest threat to this coral species is global climate change due to the increase of CO_2 emissions from the burning of fossil fuels. The impact of increased atmospheric CO_2 on the world's oceans is to increase water temperatures and lower pH. Increasing ocean temperatures is directly responsible for bleaching events around the world that have led to significant coral mortalities; while increasing temperatures may work in tandem with coral diseases to reduce coral health and survivorship (Bruno et al., 2007). As the oceans warm it is likely that there will also be a greater stratification of ocean water, which will decrease vertical mixing of nutrient-rich waters resulting in nutrient-poor surface waters (Behrenfeld et al., 2006).

Acidification of the world's ocean (lower pH) will potentially impact corals by reducing calcification rates, increasing erosion, and affecting reproduction. Reduced calcification rates may force corals to respond in one of three ways: (a) corals may grow slower; (b) corals may grow at the same rate, but with a reduction in skeletal density; or (c) corals may divert energy from other processes (such as reproduction) to maintain the same growth rate (Hoegh-Guldberg et al., 2007). An increasingly acidic ocean may cause corals to calcify more slowly and become more fragile, this would impede reef growth and decrease the ability of corals to recover from habitat damage resulting from disturbances such as hurricanes, vessel groundings, and anchoring (Brainard et al., 2011). Although research has been inconclusive, acidification may impact development and physiology, fertilization and settlement success of coral larvae (Portner et al., 2004, Albright et al., 2008, Albright et al., 2010).

There is very little information on threats to the species specific to *A. globiceps,* so the information for the genus *Acropora* is provided. *Acropora* are among the most susceptible corals to bleaching (Carpenter et al. 2008; Marshall and Baird, 2000; McClanahan et. al. 2007; McClanahan et. al., 2005). Experiments have shown that acidification has had negative effects on calcification, productivity, and has impaired the fertilization and settlement of *Acropora* species (Anthony et al., 2008; Marubini et al., 2003; Reneger and Riegel, 2005; Schneider and Erez, 2006; Anthony et al., 2008; Crawley et al., 2010; Albright et al., 2010). Available information indicates that species of the genus are moderately to highly susceptible to disease (Aronson and Precht, 2001; Bruckner and Hill, 2009).

4.2.1.4 Conservation of the Species

Records confirm that *A. globiceps* occurs in 22 Indo-Pacific ecoregions that encompass the following countries' EEZs: Australia, Federated States of Micronesia, Fiji, French Pacific Island Territories, Indonesia, Japan, New Zealand, Niue, Palau, Papua New Guinea, Philippines, Samoa, Solomon Islands, Timor-Leste, Tonga, Tuvalu, Pitcarin Islands, the Commonwealth of the Northern Mariana Islands, Guam, American Samoa, and Vietnam (79 FR 53851 (Sept. 10, 2014)).

The scope of regulatory mechanisms in the countries where the species is found varies in terms of those that utilize them and the extent to which those regulatory mechanisms are applied (see Appendix C), but the most common regulations in place for this species are those regarding reef fishing, area management for protection and conservation, and collection laws (79 FR 53851 (Sept. 10, 2014)).

5 ENVIRONMENTAL BASELINE

The environmental baseline includes the past and present impacts of all Federal, State, 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 consultation, and the impact of State or private actions which are contemporaneous with the consultation in process (50 CFR 402.02). The Consultation Handbook further clarifies that the environmental baseline is "an analysis of the effects of past and ongoing human and natural factors leading to the current status of the species, its habitat (including designated critical habitat), and ecosystem, within the action area (USFWS and NMFS, 1998). The purpose of describing the environmental baseline in this manner in a biological opinion is to provide context for effects of the proposed action on listed species.

The Mariana Islands Archipelago comprises of 15 major islands in a crescent shape on the 145° East meridian dividing the Philippine Sea to the west and the Pacific Ocean to the east between latitudes 12° North and 21° North. From the oldest in the south to north, the islands are between 5 and 30 million years old. The first human inhabitants are believed to have settled on Guam and the other Mariana Islands around 2000 B.C. The Mariana Islands are culturally connected to the Micronesia, which comprises of three other island chains; the Caroline Islands, Marshall Islands, and Gilbert Islands. The Mariana Islands are divided into two U.S. jurisdictions; Guam and the Commonwealth of the Northern Mariana Islands (CNMI) to the north. The proposed action will take place in Saipan, the second largest island in the Mariana Islands. Saipan is the largest (44.55 square miles) and most populous (55,000) island in CNMI.

Saipan is surrounded by coral reefs, with fringing reefs along the north, east, and south and a barrier reef stretching nearly 25 km along the west coast, forming a 32 km^2 semi-enclosed, shallow (1 m -10 m) lagoonal system. The action area will include up to 25 collection sites on reef and fore reef slope areas less than 20 m around Saipan. The conditions, physical properties, and health of the reefs vary among those 25 sites from the dynamic conditions of the east side where prevailing winds and storms batter the coast and reef, to the calm lagoon flat on the west side.

The applicant is proposing to place a nursery within Saipan Lagoon, in or near the northeast portion of the Mañagaha Marine Conservation Area. A large portion of this lagoon has been dredged and altered for a shipping lane and for mooring. The lagoon provides a sheltered water course that is relatively shallower, safer, and more predictable than beyond the reef flat where surf and currents are stronger and more variable. The lagoon is also on the leeward side, protected from the prevailing wind, which creates riskier water conditions. As such, the lagoon, especially near Mañagaha Island is heavily used by tourists, tour operators, boaters and other recreationalists.

The conditions at the reef slopes around the island vary with rougher seas on the east coasts, varying degrees of coastal development, pollution, and use, and other factors that influence coral health. Maynard et al. (2012) surveyed and scored the conditions of 35 sites throughout Saipan, noting coral diversity, recruitment, bleaching resistance, herbivore biomass, macroalgae cover, coral disease, and anthropogenic physical impacts (e.g., anchor or human-caused damage). The authors also noted variables such as temperature variability, nutrient input, sedimentation, the level of fishing pressure, and wave exposure at each site. Each site was ranked with a score of high, medium, or low resilience potential, or indicators that the reef can withstand or recover from bleaching or catastrophic events. Shortly after this initial survey, the original rankings were challenged by mass bleaching events that affected coral reefs throughout Saipan and the Mariana Islands in almost each of the years since its publication in 2012. In 2012, Maynard et al. ranked 23 of the 35 sites in Saipan as having high resilience. In 2015 after repeating the survey, Maynard et al. (2015) ranked only four as high, downgrading many of the sites previously ranked in 2012. After the most recent coral resilience survey in 2018, Doug Fenner (pers com.) estimated that branching *Acropora* and *Pocillopora* species populations were reduced by 90% and 70% respectively by a mass bleaching event that killed most of the colonies.

Coral bleaching events are attributed largely to rising ocean temperatures and climate change. Global mean temperature has risen 0.76°C over the last 150 years, and the linear trend over the last 50 years is nearly twice that for the last 100 years (Solomon *et al.*, 2007).

6 EFFECTS OF THE ACTION

6.1 Potential Stressors

The potential stressors associated with this action include:

- Direct physical impacts
- Hazardous chemicals and materials
- Disease and parasites
- Turbidity
- Benthic Disturbance

6.2 Exposure Analyses

Direct physical impacts

A. globiceps will potentially be affected by the stressors listed above. The most likely and severe effect is direct physical harvest when divers cut fragments off of a parent colony. The applicant proposes to cut or break pieces off or dislodge coral colonies on reef slopes throughout Saipan. Hard corals occasionally break naturally. Depending on the severity of the break, the age and condition of the colony, the injuries could heal completely, cause the colonies to become stressed for a period of time, or die.

The contractor estimates to collect up to 300 fragments from 300 colonies at different locations throughout Saipan. To maximize parent colony survival, the contractor will only take fragments from healthy colonies and fragments will be no larger than 10% of the colony.

Hazardous chemicals and materials

Any foreign material added to the aquatic environment could affect corals in the action area. These include oil or other chemicals associated with vessels, and chemicals or materials used in the nursery or from outplantings. The applicant is committed to using vessels with engines that are in proper working order which will reduce the likelihood of catastrophic spill. Most oil and hydrocarbons associated with fuel floats on water, evaporates, and does not sink to the bottom where coral live. We expect the probability of exposure of oil or other hazardous chemicals associated with vessels to be extremely low.

Depending on the success of the nursery, the applicant might outplant fragments back into the wild on reef slopes or reef flats near living coral, including *A. globiceps*. The applicant may use a low toxicity epoxy to secure fragments onto hard substrate. Epoxy such as Splash Zone is water resistant and does not leach or dissolve in water, which could degrade the water column and harm organisms around them. The applicant will avoid placing coral fragments onto or near ESA-listed corals.

Disease, parasites, and nuisance and invasive species

Wild coral colonies are affected by diseases, parasites, and nuisance and invasive species[2]. Nursery operations could introduce parasites, diseases, and nuisance and invasive species into areas that do not presently have them. Furthermore, concentrating fragments from multiple collection areas can cross contaminate fragments and spread them quickly. This could potentially affect aquatic communities near the nursery sites and outplanting sites. The applicant will use BMPs which include inspecting parent and fragment colonies during collection, management within the nursery, and prior to outplanting, to eliminate the spread of vectors that may harm nearby colonies. The applicant will either rid the potential vectors, or remove the coral fragments completely to avoid cross contamination.

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[2] Nuisance and invasive species are species that either prey on or compete with coral colonies. They also are noted to have "infestations" that can overwhelm other species and disrupt the ecological stability of the habitat. Nuisance species are native or indigenous to the area while non-native species are labeled as invasive species.

Turbidity

The activities during collection, and at the nursery could cause temporary plumes of turbidity where suspended sediments could smother colonies or settle onto their skeletons which could stress colonies at various levels, which could range from benign nuisance to reduced survival or death. The activities at the nursery are more likely to create turbidity than collection where ground disturbance is not expected. No *A. globiceps* colony exists near the proposed nursery site and turbidity plumes at the site would only potentially harm fragments that have already been removed from the wild population. The applicant will use scuba divers to collect coral fragments from parent colonies while minimally disturbing the bottom or surrounding substrate.

Benthic Disturbance

Nursery trees will be placed in the lagoon in sand. The applicant will minimally disturb the sediments during placement. Benthic disturbance is not expected at collection sites. The applicant proposes six to ten nursery trees occupying up to 400 m^2. Because the trees are planted into the sediment and extends horizontally from the stem, the actual disturbed area is much less than 400 m^2. The nursery could eventually expand to 20 and double the size of area affected by the project. The nursery would occupy sand or unconsolidated sediments, which provides little biodiversity compared to hard substrates or coral reefs. The nursery trees are relatively thin and minimal compared to structures such as pilings or shipwrecks, but will provide some vertical structure that does not presently exist on site. The nursery trees are built to maximize sunlight penetration through the structures. The changes in the habitat will not affect to *A. globiceps* because it does not exist at the nursery site, and no hard substrate exists where it could naturally settle.

6.3 Response Analyses

Direct physical impacts

As fragments are snipped or broken off from parent colonies, both fragment and parent have wounds exposed to the surrounding aquatic environment. Wounds often heal naturally but can be subject to reduced fitness in three ways. First, regeneration requires energy so that resources may be diverted from growth and reproduction (e.g., Kobayashi, 1984; Rinkevich and Loya, 1989; Meesters et al., 1994; Van Veghel and Bak, 1994). Secondly, colony survival may be hindered because injuries provide sites for the entry of pathogens and bioeroders and space for the settlement of other organisms such as algae, sponges, and other corals (Bak et al., 1977). These organisms may later compete with the coral for food and space, or cause structural damage to the coral skeleton (Wahle, 1983; Hughes and Jackson, 1985; Babcock, 1991). Third, injuries reduce the surface area available for feeding, photosynthesis and reproduction (e.g. Jackson and Palumbi, 1979; Wahle, 1983; Hughes and Jackson, 1985). A reduction in surface area may also alter colony survivorship and reproduction since both are size-specific in scleractinian corals (e.g. Hughes and Jackson, 1985; Babcock, 1991; Hall and Hughes, 1996). Severe injuries to colonies can lead to death, especially if the colony is already stressed by warm sea temperatures, bleaching or other factors. The applicant will monitor parent colonies and note temperatures and other water quality parameters, which may help determine the level of stress unrelated to fragment breakage during this action.

Coral species vary in their ability to heal, depending on their growth form, their surrounding environment, their competition within the reef, and severity of the wound. *A. globiceps* is a branching, digitate coral that lives in the high reef slope that is often exposed to surf. A coral with these characteristics likely experiences occasional breakage. To survive in such conditions, *A. globiceps* like many of the Acroporid species that are digitate, branching, or table- or plate-like, have adapted to breakage and are likely to heal readily. Hall (1997) described: "Regeneration in *Acropora* species was characterized by the production of a smooth band of tissue and skeleton which enveloped the injury and grew over the colonizing algae. Polyps were then produced along the margin of the band that was closest to the uninjured tissue.", and "thirdly, vertical extension of the branch occurred with the growth of the axial polyp. The initial extension of the axial polyp produced a narrow branch (0.3 cm diameter) which gradually thickened at the base." Hall (1997) also noted that all wounds in 18 branching *Acropora* colonies in her study were sealed within 74 days, while some began vertical branch extension from the wound.

Understanding the processes associated with injury and regeneration in corals has also become very important from a management perspective because of the escalating degradation of coral reefs by human activities (e.g. Brown, 1988; Craik et al., 1990; Hughes, 1994). To minimize stress to parent corals and maximize wound healing and survival, the applicant is proposing to limit collection of fragments to colonies that are large enough to withstand an injury. The applicant will break off no more than 10% of a colony, and will limit collection periods to cooler months to reduce stress on colonies that may be exposed to higher water temperatures. These procedures should reduce the likelihood of killing parent colonies during fragmentation.

Responses to hazardous chemicals and materials, diseases, parasites, nuisance and invasive species, turbidity, and benthic disturbance are not expected to adversely affect *A. globiceps.* The epoxy materials proposed for use in these activities are water resistant and do not leach or dissolve in water, which could degrade the water column and harm organisms around them. The applicant will avoid placing coral fragments onto or near ESA-listed corals, and the probability of exposing existing coral colonies to epoxy is extremely low.

Hazardous chemicals and materials

We expect the probability of exposure of oil or other hazardous chemicals associated with vessels to be extremely low. In addition, any adhesives, such as Splash Zone, are water resistant and do not leach or dissolve in water. The applicant will also avoid placing coral fragments onto or near ESA-listed corals, and the probability of exposing existing coral colonies to chemicals or other hazardous materials is extremely low. The effects of these potential stressors are therefore discountable.

Disease, parasites, and nuisance and invasive species

The applicant will be vigilant in inspecting parent and fragment colonies during collection, and prior to outplanting, which will help eliminate the spread of harmful vectors. We therefore expect the probability of effects to *A. globiceps* from increased exposure of diseases, parasites, nuisance and invasive species from the proposed activities to be extremely unlikely to occur, and therefore discountable.

Turbidity

With the proposed BMPs, and avoiding or minimally disturbing the sediments, the applicant is not likely to create plumes that are severe enough to significantly change the likelihood of survival of any *A. globiceps* colonies in the action area in any meaningful way. The effects from these proposed activities are therefore insignificant.

Benthic Disturbance

Benthic disturbance is not expected at collection sites where *A. globiceps* may occur, and the placement of nursery trees will not affect to *A. globiceps* because it does not exist at the nursery site, and no hard substrate exists where it could naturally settle. We therefore consider any effects from benthic disturbance to be discountable.

6.4 Effects Resulting from the Interactions of Potential Stressors

In the last part of our analysis, we consider the stressors the species are likely to be exposed to, their likely response, and finally the risk of the project's effects to the species. We do not expect *A. globiceps* to be affected by the hazardous chemicals and materials, diseases and parasites, turbidity, or benthic disturbance. The only stressor we expect *A. globiceps* to be exposed to is direct contact or breakage of fragments from parent colonies. With the implementation of conservation measures described in the BE and this opinion, we expect the majority of the wounds from the parent colonies to heal, and most colonies to survive fragment breakage. Some may experience reduced survival or reproductive success, and some may die. Coral colonies in the action area experience natural and human-caused stressors which can also weaken or kill coral, especially abnormally warm water temperatures that can cause mass bleaching. Parent colonies could die despite the action.

A. globiceps colonies often grow and live high on reef slopes and are subject to waves, moving objects in waves, fish and other organisms. Parrotfish often graze on algae on living coral colonies, with some of the larger parrotfish species like bumphead parrotfish that break pieces of coral off and ingest them. Bellwood and Choat (1990) reported in their study at the Great Barrier Reef that over 50% of bumphead parrotfish grazed on live coral and it was primarily on *Acropora* species. A species like *A. globiceps* would be evolved to withstand occasional injury and fragmentation, to a similar or greater degree to what would be expected from the proposed activities.

6.5 Cumulative Effects

Cumulative effects are limited to the effects of future State, tribal, local, or private actions that are reasonably certain to occur in the action area considered in this opinion (50 CFR 402.02). 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. Cumulative effects on *A. globiceps* may occur as a result of climate change, continued activities at reef slopes, vessels, non-federal fishing, and other actions described in the Environmental Baseline that are reasonably certain to continue in the action area. Such effects could include worsening of the climate change effects described in Sections 5 and 6, and also could result in fishing gear or damage associated with vessel activity (e.g., anchor damage), marine debris, runoff, and severe storms.

The human population in Saipan peaked at 62,392 in 2000 (U.S. Census, 2003), but after new immigration and labor laws, the population decreased and is now estimated at about 55,000 (Saipan Chamber of Commerce, 2019). Tourism is a major source of income to CNMI and Saipan. Recently, the island has added several large resorts near the coast. Human population and coastal development can increase anthropogenic stress in nearshore aquatic habitat and coral reefs.

Global anthropogenic climate change is expected to continue and to therefore continue to impact coral. The effects of global climate change (the most significant of which for corals are the combined direct and indirect effects of rising sea surface temperatures and ocean acidification) are currently affecting corals on a global scale and has been observed in the Mariana Islands in the last several years. Thermal stress can induce bleaching (where the coral expels its symbiotic zooxanthellae), which often causes mortality of the affected colony. Increased ocean acidity is thought to adversely affect fertilization, larval settlement, and zooxanthellae acquisition rates for many corals, and for some species it can induce bleaching more so than thermal stress. It also tends to decrease growth and calcification rates. The return frequency of bleaching events at some sites has exceeded the ability of the reefs and coral species to recover there. Brainard et al. (2011) report that those effects likely represent the greatest risk of extinction to ESA corals over the next century.

As mentioned in the "*Environmental Baseline*" section of this biological opinion, the condition of the coral reefs throughout Saipan are well documented in Maynard et al. (2012) and Maynard et al. (2015). Among other observations and conclusions drawn about reef health throughout Saipan, the authors rank anthropogenic stress that is occurring at the time of the study. In 2012, Maynard et al. ranked 23 of the 35 sites in Saipan as having high resilience. In 2015 after repeating the survey, Maynard et al. (2015) ranked only four as high, downgrading many of the sites previously ranked in 2012. The authors conducted the same surveys in 2018 but the information is not entirely available yet. The CNMI does not currently have a master plan (for development), and we have not read about any major changes occurring at Saipan that will drastically degrade or improve reef conditions. We expect cumulative effects to be similar to human-caused effects currently occurring in the action area at a similar intensity, frequency, and pattern in the near future.

NMFS expects that recovery following the end of sampling activities would be relatively fast, and the possible synergistic impacts of climate change, combined with the effects of the proposed action, are not expected to be significant for the corals considered in this opinion.

7 INTEGRATION AND SYNTHESIS OF EFFECTS

The purpose of this opinion is to determine if the proposed action is likely to have direct or indirect effects on threatened and endangered species that appreciably reduce their likelihood of surviving and recovering in the wild by reducing their reproduction, numbers, or distribution (50 CFR 402.02), otherwise known as the jeopardy determination. This is done by considering the effects of the action within the context of the "*Status of Listed Resources*" together with the

"*Environmental Baseline*" and the "*Cumulative Effects*", as described in the "Approach to the Assessment section."

We determine if mortality of individuals of listed species resulting from the proposed action is sufficient to reduce the viability of the populations those individuals represent (measured using changes in the populations' abundance, reproduction, spatial structure and connectivity, growth rates, or variance in these measures to make inferences about the population's extinction risks).

In order to make that determination, we use a population's base condition (established in the *Status of Listed Resources* and *Environmental Baseline* sections of this opinion) as context for the overall effects of the action on affected populations. Finally, our opinion determines if changes in population viability, based on the *Effects of the Action* and the *Cumulative Effects* sections, are likely to be sufficient to reduce viability of the species those populations comprise. The following discussion summarizes the probability of risk the proposed action poses to the listed species identified in the "*Status of Listed Resources*" section.

As discussed in the "*Approach to the Assessment*," we defined the physiological colony as the "individual" rather than the coral polyp. We consider effects to each colony as individuals within a local population, within a regional, and global population.

The applicant proposes to extract up to no more than 300 fragments from 300 colonies from up to 35 locations throughout Saipan. Since the applicant will be taking fragments from several species, not just *A. globiceps*, the number of fragments taken will likely be much lower than 300, maybe as little as 30 (S. McKagan NMFS HCD, pers com). These parent colonies are naturally occurring individuals within Saipan's wild population of *A. globiceps*. When a fragment is removed from a parent colony, there will now be two individuals. Since the fragment colonies in the nursery are not contributing to the wild population, they are barely contributing to the species as a whole. All fragments and colonies within the nursery and in care of human intervention have little or no value to the wild population. Counting the fragments in the nursery confuses our analysis (e.g., you could keep splitting the fragments and the population grows each time you do), and every touch within the nursery would be considered take. Such reasoning would regress to absurdity.

We therefore focus our analysis on the effects of the action to the wild population, in this case the parent colonies that have fragments broken off or snipped from them. *A. globiceps* is a branching coral, and like most species in the *Acropora* genus, is characterized by fast growth in good conditions to outcompete other coral species within the reef. Branching species are generally naturally prone to breakage. Digits or fragments of *Acropora* species are often eaten by some species of parrotfishes (Bellwood and Choat, 2000). Corals with these natural stressors are likely to be resilient from occasional fragment breakage. Similar species within the *Acropora* genus show remarkable survival, recovery, and regrowth after breakage (Hall, 1997), and sometimes mass breakage due to hurricanes (Lirman 2000).

We expect most parent colonies to heal and survive from harvesting fragments. For our determination, we considered the effect of 100% mortality of all parent colonies as a worst case scenario, and the highest potential number of fragments to be taken, as a worst case scenario.

Since there are an estimated 300,000 *A. globiceps* colonies in Saipan, and over 10 million colonies worldwide, if all 300 parent colonies died after the removal of fragments, it would reduce the population by 0.1% on Saipan. This is a much smaller portion of the global population of *A. globiceps*.

The action is not likely to extirpate the local population because according to Kendall and Poti (2014) and (2015), currents throughout the Mariana Archipelago travel throughout all of the islands. Although prevailing current appears to be westward and northward, currents generated from the northern islands are variable in current directions and eddies, which may promote larval retention for the Mariana Archipelago. Saipan appears to be both source and sink for larval recruitment, and should contribute as a source to replenish other areas, and be replenished distant colonies as local colonies die. The authors, however, also caution that current patterns may change with climate change (Kendall et al. 2016).

NMFS believes that the magnitude and intensity of the impact from the directed take of voucher specimens from *A. globiceps* would be mitigated by the following factors: 1) The small number of colonies from which specimen material would be collected compared to the estimated abundance of the species; and 2) The strict adherence to BMPs for sampling coral species which includes: collecting from several sites to prevent local extirpation in any site, and not sampling if it is judged that collection may inhibit the capacity of the colony to replenish itself.

No recovery plan currently exists for this species against which we can assess the effects of the proposed action on recovery. However, given that impacts from the proposed action are expected to result in minimal injury to parent colonies which are most likely will survive, the proposed action is not expected to significantly impact reproduction or to impede the recovery of the species. We do not expect the proposed action to affect the ability of the overall population to grow and to successfully reproduce. The proposed action is expected to have no effect on the overall size of the population. We do not expect the proposed action to negatively affect the species ability to meet their lifecycle requirements, or its recovery.

Because of these factors, the proposed action is expected to have a negligible effect on any colony sampled, with no significant injury, and therefore represents negligible risk to any sampled individuals or the populations they comprise. We therefore conclude that the proposed project-related effects from sampling the coral colonies would not appreciably reduce the likelihood of the survival and recovery of the species in the action area, and across their global range.

The ultimate goal of this action is to develop knowledge of growing coral fragments into larger fragments, using larger colonies in the nursery as parents to smaller fragments, and ultimately outplanting of corals developed in nurseries back into the wild. This outplanting would supplement the existing local population, replace clusters of *A. globiceps* that may have been killed by mass bleaching, storm, or other catastrophic event, or reintroduce areas that have been extirpated. These future actions including outplanting have not been fully developed yet, and depending on the success of the nursery and other factors like funding may not occur. If, however, outplanting occurs in the future, it will likely benefit the species.

8 CONCLUSION

The purpose of this biological opinion is to determine if the proposed action is likely to jeopardize the continued existence of listed species (i.e., jeopardy determination) or result in destruction or adverse modification of designated critical habitat. "Jeopardize the continued existence of" means "to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species" (50 CFR 402.02).

After reviewing the current status of the coral species *Acropora globiceps*, the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects, it is NMFS' opinion that proposed action is not likely to jeopardize the continued existence of this species.

9 INCIDENTAL TAKE STATEMENT

Section 9 of the ESA and protective regulations pursuant to section 4(d) of the ESA generally prohibit the take of endangered and threatened species without a special exemption. "Incidental take" is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity (50 CFR 402.02). Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the ESA provided that such taking is in compliance with the reasonable and prudent measures and terms and conditions of the Incidental Take Statement (ITS).

The proposed action results in the directed take of *A. globiceps*. Currently there is no take prohibition for *A. globiceps*. Thus, an ITS is not required to provide an exemption to the prohibition of take under section 9(o). However, consistent with the decision in *Center for Biological Diversity v. Salazar*, 695 F.3d 893 (9th Cir. 2012), this ITS is included to serve as a check on the no-jeopardy conclusion by providing a reinitiation trigger so the action does not jeopardize the species if the level of take analyzed in the biological opinion is exceeded.

We anticipate at least 30, and up to 300 parent colonies on reef slopes throughout Saipan to be wounded during the action, while fragments are broken off of them to supply the nursery.

9.1 Reasonable and Prudent Measures and Terms and Conditions

The measures described below are nondiscretionary, and must be undertaken by the action. Section 7(b)(4) of the ESA requires that when a proposed agency action is found to be consistent with section 7(a)(2) of the ESA and the proposed action may take individuals of ESA-listed species, NMFS will issue a statement that specifies the impact of any taking of endangered or threatened species. To minimize such impacts, reasonable and prudent measures, and terms and conditions to implement the measures, must be provided.

"Reasonable and prudent measures" are nondiscretionary measures to minimize the amount or extent of take (50 C.F.R. §402.02). We believe the conservation measures included as part of the proposed action will minimize the amount and extent of take that may result from the proposed action. As such, the following reasonable and prudent measures are necessary and appropriate to minimize the impacts of take on threatened and endangered species:

NMFS HCD shall not deviate from the best management practices described in the BE and analyzed in this opinion. We are confident the best management practices described in the BE will adequately minimize the amount and severity of effects to individuals and populations of *A. globiceps*. We are confident that NMFS HCD will ensure adherence to best management practices and the number of colonies affected by this action will not exceed what is described in this ITS. We have no additional reasonable and prudent measures at this time.

9.1.1 Terms and Conditions

NMFS HCD must comply with the following terms and conditions, which implement the reasonable and prudent measures described above. These include the take minimization, monitoring, and reporting measures required by the section 7 regulations (50 C.F.R. §402.14(i)). These terms and conditions are non-discretionary.

To implement the Reasonable and Prudent Measures, NMFS HCD must provide a report of the amount and extent of any take of *A. globiceps* to the Pacific Island Regional Office PRD as soon as practicable, but on no less than an annual basis if take has occurred.

9.2 Reinitiation Notice

This concludes formal consultation on the Development of a Pilot Coral Nursery on Saipan project. As provided in 50 CFR 402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement over the action has been retained or is authorized by law, and if:

1. The amount or extent of anticipated take for any species is exceeded;
2. New information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion;
3. The agency action is subsequently modified in a manner that may affect listed species or critical habitat to an extent in a way not considered in this opinion; or
4. A new species is listed or critical habitat designated that may be affected by the action.

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