

**Peer Review Report**  
**on the**  
**Draft Information Report:**  
**Basis and Impact Considerations of Critical Habitat Designations for**  
**Threatened Indo-Pacific Corals**

*Acropora globiceps*  
*Acropora jacquelineae\**  
*Acropora retusa*  
*Acropora speciosa*  
*Euphyllia paradivisa\**  
*Isopora crateriformis*  
*Seriatopora aculeata\**

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**Peer Reviewers:**

Phillip Michael Payne (overall review), ECO49, Bethesda, MD  
Michael Shelly (economics focus), ERM Inc., Lancaster, NY  
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\*The version of the Information Report that was peer reviewed included these 3 species, however they were eventually removed as explained in Section 2.3 of the report.

## General Comments<sup>1</sup>

### Reviewer 1

#### **General Comments:**

- There is still a considerable amount of uncertainty as to whether *A. retusa* really is in Guam, it probably isn't.
  - Response: We agree, and have revised the report accordingly.
- I suggest retooling the 3 step approach to separate the substrate and water quality components.
  - Response: No, the first step of the 3 step process for determining which specific areas should be considered for proposed critical habitat necessarily covers the presence of the essential feature, which includes both substrate and water quality.
- Water quality information doesn't seem to have been a factor at all, which begs the questions whether or not it should be the defining parameter.
  - Response: We have revised the report to look more closely at water quality information, especially for the heavily populated islands of Tutuila, Guam, and Saipan. Subsequently, numerous areas with suitable substrate but unsuitable water quality were removed, as explained in the island sections.
- Key themes like herbivory, acidification, thermal stress and resilience are hardly mentioned, yet they are even more important than water quality in many cases.
  - Response: Ecological interactions like herbivory and biological characteristics like resilience aren't habitat characteristics. Acidification and thermal stress are incorporated into the seawater temperature and aragonite saturation state components of water quality.

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<sup>1</sup> Reviewer numbers are not in the order of reviewers listed above

- Your final maps are essentially just the EFH maps with new maximum depth assignments, so why not just say that? EFH has essentially gone through this process already to designate areas and come back with a similar result (everything is Critical / EFH), so why not borrow and build from that?
  - Response: We have prepared new maps for that delineate the essential feature in much more detail than previous maps or the EFH maps.
- Move the appropriate 4(b)(2) stuff into step 3 of the process so it is clearer where all of the red regions of the maps came from and discuss it at the island level.
  - Response: The 4(b)(2) process is completely separate from the 3-step process of determining which specific areas have the essential feature, so it is not possible to combine them.
- Clarify the purpose of the cost to benefit sections and be sure to show just how much critical habitat designation overlaps with EFH.
  - Response: The economic impact analysis for critical habitat has nothing to do with EFH, so the fact that there is overlap is inconsequential.

### Specific Comments:

P.3: *Pavona diffluens* is currently identified within the Marianas by regional coral taxonomy experts (see [Guamreeflife.com](http://Guamreeflife.com)). This document may be an opportunity to clarify.

- Response: As noted in the 2014 final listing rule for the 15 Indo-Pacific listed corals including *P. diffluens*, and on <https://www.fisheries.noaa.gov/species/pavona-diffluens-coral>, colonies resembling *P. diffluens* in the Pacific Ocean are considered to be a different, currently undescribed species. Thus, the distribution of the listed species *P. diffluens* is limited to parts of the western Indian Ocean and Red Sea.

P.6: This would be a good place to introduce any information we have about the pelagic larval duration for each species. PLD differences have the potential to impact management decisions as EFH and ESA reviews have the potential to limit sedimentation producing activities during key periods, if we know where those are.

- Response: No pelagic larval duration info is available for the listed Indo-Pacific coral species.

P.12: I have seen the CNMI listed as having *A. retusa* and as not having it. Given the CNMI's proximity to Guam, and recent observations about the northward trend of larval transport it would seem realistic for it to also be found somewhere within the region.

- Response: Based on the Records Document (Appendix A to the Info Report) *A. retusa* does not occur anywhere in the Mariana Islands. The proposed rule and supporting documents have been revised accordingly.

P.13: Surveys of these island communities are often times limited to fairly specific depth ranges, such that corals that prefer very shallow or deep areas can easily be missed. It would be interesting to replace the X with a depth of observation and have a closer look at what ranges have historically been overlooked by survey design.

- Response: Duly noted.

P.15: It may be worth mentioning that Fenner, Veron and Randall all identify what we are calling *A. globiceps* for the CNMI in a different way. From photos Veron believed it to be *A. gemmifera* while Randall called it something similar to *A. humilis*. So the uncertainty of these identifications could/should be flushed out for all of the regions.

- Response: The identification challenges for the listed corals including *A. globiceps* are described in the Info Report and the Records Document (Appendix A to the Info Report).

P.15: There is a considerable amount of uncertainty as to whether *A. retusa* was truly found on Guam. Dave Burdick and I exchanged emails this week where elaborated that his ID for *A. retusa* was tentative from the photo of a single colony that he has not been able to relocate. It has only ever been 'possibly' seen a single time and couldn't be replicated.

- Response: See above re: same issue.

P.16: There is a skeletal specimen of *S. aculeata* in the CNMI BECQ corals collection.

- Response: Thank you, this is noted in the Records Document.

P.18: Herbivory plays a vital part in balancing the relationship between algae and coral on the reef and should be discussed within this section or as a stand along section, including the importance of both invertebrates and fish. After a quick search it looks like herbivory is not mentioned at all within the document so this appears to be more

than just an oversite for this section but potentially intentional. If so, this would be a good place to explain that rational.

- Response: As mentioned above, ecological interactions like herbivory aren't habitat characteristics, and aren't considered part of the essential feature of coral critical habitat.

P.19: pH should be introduced somewhere in here, especially since ocean acidification is only mentioned once in the document that I can tell. Similarly temperature should be explained here somewhere as these are the two greatest broad scale risks corals currently face but is only mentioned once in the entire document. Some locations will create micro-habitats that will increase the resilience and recovery potential for corals in that area. Managing for resilience has become the foundation for ecosystem management in many areas, but resilience is not mentioned either in this document.

- Response: Aragonite saturation state was added to the water quality section, which includes some discussion of ocean acidification.

P.20: Fish also play an important role in this balance.

- Response: As mentioned above, ecological interactions aren't considered part of the essential feature of coral critical habitat.

P.22: I understand the need to make this manageable and hence not include the 50+ parameters for reef health that have been examined within the literature to various degree, but you may want to spend a bit more time justifying why only nutrients and sedimentation are included. A lot of work is currently being done to better understand what truly makes a reef resilient and rugosity, herbivory, temperature, pH, existing diversity, etc are all part of the equation. The McClanahan paper comes up a lot when trying to prioritize parameters so that may be a good place to start the clarification for why only these two parameters were chosen.

- Response: Seawater temperature, aragonite saturation state, turbidity, and absence of contaminants were added to the water quality section.

P.22: In many cases the water quality at a site may be something that can be managed/improved to shift a reef area back into the optimal range. Will locations be declared critical habitat based on the most recent measurements, the best historical measurement, a theoretical best case value or something else?

- Response: As explained in the Info Report, in order to determine which specific areas contain the essential feature including the water quality components, we reviewed available water quality data for each unit.

P.23: This is a bit misleading because you won't always have the 'necessary environment' when these two things are together, but these two things are a key foundation.

- Response: As explained in the essential feature section, hard substrate and suitable water quality are needed to provide suitable habitat.

P.24: I am not sure what this means. How do we define which areas are considered 'necessary' and those that do not qualify?

- Response: Areas within the confirmed geographic and depth ranges of the listed coral species that have the essential feature qualify for coral critical habitat, and thus were considered – that's the whole point of the Section 3 of the Info Report.

P.25: I recommend we change the flow of this section and following island sections as follows –

Step 1 - Discuss substrate and depth

Step 2 - An analysis of the water quality at each location, including where the data came from and how it was overlayed on the substrate date (this needs to be flushed out more)

Step 3 - Exempt man-made structures

- Response: No, Step 1 is consideration of where the essential feature occurs, and the essential feature includes both substrate and water quality.

P.25: Managed areas may make many readers think about MPA's, Monuments, etc. Maybe use, commercially managed areas or something like that.

- Response: A definition of "managed area" was added to the intro to Section 3.1: "defined as areas where the substrate has been disturbed by management, and will continue to be periodically disturbed by such management".

P.27: We say "This extensive area consists of a patchwork of different substrates and water quality conditions that are highly variable both spatially and temporally" a lot, nearly for each island area, which suggests that this can either be streamlined or may not be the best approach. Is water quality or different substrates driving this variability? This statement seems to be a catchall used to justify calling everything from 0-50m critical habitat, but it seems like we should be able to do more here.

- Response: We have prepared new maps for that delineate the essential feature in much more detail than previous maps or the EFH maps.

P. 38: The northern half of Tinian, like FDM, is under DoD lease, including submerged lands. Does this have an effect on how these areas should be handled in step 3? I don't see it mentioned here, but it looks like the Tinian map does have a lot of red around the northern portion of the island, clarification needed.

- Response: No, DoD presence is not considered in Step 3 of the Specific Area analysis. Rather, it is considered in the 4(a)(3) and 4(b)(2) national security impacts sections.

P. 38: Was water quality a factor for any of the locations? Perhaps this is an issue of scale and not enough available data?

- Response: We have revised the report to look more closely at water quality information, especially for the heavily populated islands of Tutuila, Guam, and Saipan. Subsequently, numerous areas with suitable substrate but unsuitable water quality were removed, as explained in the island sections.

P.40: For all of the earlier islands the available substrate and water quality were 'patchy' which justified using 0-50. Now they are 'wide distributed, which also justifies using 0-50. To me this suggests that water quality information was a non-factor and soft bottom (sand) areas were also a non-factor. Hence, it isn't clear if any analysis was necessary or even occurred as part of step 1. This could essentially be streamlined by just using EFH area designations and then adjusting based on the depth profiles of each coral.

- Response: The introduction to Section 3.1 was expanded to better explain the process of how the available information on substrate and water quality was used to delineate the specific areas considered for coral critical habitat.

P.42: The Pagan map has red all around the main island matching what DoD has planned as part of CJMT live fire training, but it is not mentioned at all here in the text. Also, DoD does not have a lease or submerged land rights to Pagan at this time, so it is unclear why it would already be declared a 'commercially managed area'.

- Response: The Pagan map has been redone to not show CJMT area, since it is not relevant to critical habitat.

P.70: Flush this out more. What exactly are we supposed to learn from the sections below and how are we supposed to apply it to thinking about critical habitat?

- Response: This section (3.4) was revised and shortened to more succinctly describe future actions within the specific areas that may require special management considerations or protection.

P.70: Consider reorganizing these sections so it is easier to tease out information specific to each jurisdiction.

- Response: The section (3.4) was revised, as noted above.

P.76: The start of this new section (post aquaculture) should have a unique heading.

- Response: The section (3.4) was revised, as noted above, and the heading is no longer necessary.

P.79: This should be moved up into your discussion about (step 3) for each island. This is a major component of the decision making process and is unique for each island (i.e. In some cases we are already attributing 4(b)(2) despite DoD not currently having any binding agreements for access to an area (i.e. Pagan).

- Response: No, 4(b)(2) analysis is a completely discrete part of proposing critical habitat than consideration of specific areas.

P.80: As this is not part of the 4 step designation process it can stay here.

- Response: Duly noted.

P.84: All consultations are not created equal, so this is a bit misleading. We have had dozens of meetings and reviewed many documents for CJMT for example, yet here it doesn't even appear to be listed among the formal consultations for the CNMI.

- Response: We are not saying that all consultations are created equal, but rather estimating the total number of annual formal and informal consultations, and the mean cost of completing each.

P.94: This is a bit misleading, are we talking about the benefits of coral themselves and reefs, or the benefits we are getting by designating critical habitat? Designating critical habitat is not likely to have much effect on the coral at all as we are already managing these species through projects that trigger EFH and Section 7 review. In fact, EFH

encompasses the currently proposed critical habitat boundaries and much more, making this somewhat redundant. In truth, designating critical habitat is creating little to no additional coral protection. If this section is supposed to show the benefits of defining critical habitat vs the cost of supporting it, the arithmetic shown here is very misleading.

- Response: The section (5.1.6) has been completely revised to accurately portray what we know about the economic benefits of critical habitat.

P.95: Or how it would differ from EFH recommendations that are already being made to protect benthic habitat.

- Response: Critical habitat and EFH have nothing to do with one another, so there is no need to explain EFH here.

## Reviewer 2

### **General Comments:**

- Overall, the document does provide a well-reasoned rationale in identifying the physical and biological features of a critical habitat designation for the listed coral species (confirmed) based on the best available data. Given the best available information, the document includes a complete suite of relevant scientific information. The comments included in the document are merely suggestions to improve clarity of the information provided.
  - Response: Duly noted.
- The ESA listed coral species in the Indo-Pacific provide a unique challenge in terms of recovery and with respect to critical habitat designation due to the limited 1) amount of species-specific survey data, 2) spatial coverage of species information, 3) difficulty of species identification and 4) distribution range within U.S Pacific waters. The document clearly identifies a sound approach to designate critical habitat within these limitations and uses the best available information. With the potential increase in both species level surveys and the spatial extent of survey effort in the near future, it is likely that both the distribution range of the confirmed listed species could be extended and additional listed species could be confirmed in US Pacific waters. The comprehensive approach used to establish the lower limit of critical habitat not only accounts for the overlapping or unknown distribution of confirmed species but also covers the distribution of potentially newly confirmed species (e.g.

Tutuila). Is it applicable or relevant to this document to include an outline or brief description of how new information about listed species will be incorporated to update critical habitat designation given the unique challenges in the Indo-Pacific? This would be relevant to islands/atolls where the recommended lower limit is 20m (e.g. Rota) or islands not currently included (e.g. Baker and Jarvis).

- Response: While we can update critical habitat based on new information, it is an extremely time-consuming process (e.g., economic and national security analyses), thus we cannot commit to any particular process for updating coral critical habitat as new info becomes available.

#### **Specific Comments:**

P.5: Suggested adding “Polyps are the building blocks of colonies, and colony growth occurs both by increasing the number of polyps, as well as extending the supporting skeleton under each polyp.”

- Response: Done.

P.5: I got a little lost when reading through section 2.2. Perhaps provide 1-2 introductory sentences to symbiosis, growth and reproduction to set up the more detailed paragraphs below.

- Response: Done.

P.6: Suggested adding “(maximum size not finite)”

- Response: Done.

P.7: Suggested adding “Once larvae are able to settle onto appropriate hard substrate, metabolic energy is diverted to colony growth and maintenance.”

- Response: Done.

P.7: Suggested deleting “Once larvae are able to settle onto appropriate hard substrate, metabolic energy is diverted to colony growth and maintenance. Polyps are the building blocks of colonies, and colony growth occurs both by increasing the number of polyps, as well as extending the supporting skeleton under each polyp.”

- Response: Done.

P.19: Needs clarification in the context of mortality under heavy sediment conditions.

- Response: A literature review of sediment effects on reef corals was conducted, which is now summarized in this section of the Info Report, including a discussion of mortality under heavy sediment conditions.

### Reviewer 3

#### **General Comments:**

- The economic analysis contained in the report and its Appendices B(1), B(2) and C, are of a high standard; the authors have made good use of the extensive data that they collected from agencies, and there is a wealth of detail contained in the analysis. The authors also provide a discussion of the sources of, and likely impacts of, the uncertainties in their estimates.
  - Response: None needed.
- The authors stress, a number of times, that the proposed designation of critical habitat for the 7 threatened corals would occur against a background in which the threatened corals already benefit from their designation as endangered species and in which other Federal, State and Commonwealth laws and regulations provide some protection for parts or all of the area to be designated as critical habitat.
  - Response: None needed.
- The vast majority of the text deals with the estimation of the incremental costs of the proposed critical habitat designation. This emphasis on the incremental costs reflects data availability and the present state of the science of economic benefit estimation.
  - Response: None needed.
- While Section 7.2 includes a mention of a study by Taylor and Suckling (2005) "*... found that listed species with designated critical habitat are more than twice as likely to move toward recovery than species without designated critical habitat*" (p. 87), I believe that they should provide a longer discussion on those incremental benefits that cannot be monetized since such evidence would provide a compelling addition to the discussion of the incremental benefits of critical habitat designation and help to support the proposed designation.

- Response: Additional information was added to this section of the economic impact report.

### **Specific Comments:**

Regarding *Appendix B, 4(b)(2) Economic Impact Analysis, Section 6.1, Incremental Administrative Section 7 Costs*: I believe it would be helpful to the readers to provide the details behind the calculation of the administrative costs. In particular, the incremental hours by agency and the cost per hour for each agency. [Table 15, p.66]

- Response: A footnote was added.

Regarding *Section 6.2, Incremental Project Modification Costs*: Unlike the report on the Caribbean corals (Draft Information Basis and Impact Considerations of Critical Habitat Designations for Threatened Caribbean Corals, Table 15, p. 85) there is no mention of sediment and turbidity control measures as potential project modifications. [Table 19, p. 72]

- Response: Sediment and turbidity control measures aren't called out as a category of actions, but would be part of some of the other categories, esp. "USACE-permitted Activities".

Regarding *Section 7.1, Overview of Economic Benefits of Coral Reef Ecosystems*: This section contains information on the total benefits of coral reefs. However, as pointed out in the Caribbean report (Draft Information Basis and Impact Considerations of Critical Habitat Designations for Threatened Caribbean Corals, p. 121), "... evaluation of the benefits of the designation appropriately focuses on the incremental economic benefits specifically generated by implementation of the critical habitat designation." (emphasis added). [pp 86-87]

- Response: The following section (7.2 Benefits of Critical Habitat Designation) does focus on incremental economic benefits.

Regarding *Appendix C, Initial Regulatory Flexibility Act Analysis*: In the first paragraph of the Appendix it is stated that "Information for this IRFA was gathered from the U.S. Small Business Administration (SBA) and the U.S. Census Bureau's 2012 Economic Census of Island Areas." It would be helpful to readers if the next sentence explained that data from the SBA was used to identify the "Major Relevant Activities and a Description of the Industry Sectors Engaged in Those Activities" in Table 3; and that the Census Bureau information was used to identify "The number of small entities and their average revenues..." in Table 2. Also, since the industry sectors were identified first, it would be logical to place what is now Table 3 before what is now Table 2. [pp. 1-2]

- Response: Sentence added in suggested location reading “Data from the SBA was used to provide the data in Tables 2 and 3.”

#### Reviewer 4

##### **General Comments:**

- The result of the available scientific research, and findings from available reports and reviews provided in the Source Document, and available to this independent review, were considerable. Specific information available on the life history, reproductive biology, and ecology for each of the seven species that occur in U.S. waters was provided in the Report. The scientific information used benefitted from over a decade of scientific review by several Biological Review Teams (BRTs) to summarize the best available scientific and commercial data available for these species in the status review reports required by the ESA.
  - Response: None needed.
- Therefore, the information in the Source Document for threatened corals is unequivocally the best science available to NMFS PIRO at this time to consider a proposed rule designating critical habitat for listed corals.
  - Response: None needed.
- The BRTs considered all data available at the time of their deliberations and NMFS used all data available at the time of the final listings of the threatened corals. For purposes of developing a source document addressing those physical and biological features relevant to designating critical habitat for listed corals in waters under U.S. jurisdiction, this document likely has no peer. In that regard if additional data do exist, they are not needed by NMFS for decisions that need to be considered at this time, or as part of this proposed rulemaking process to designated critical habitat consistent with the requirements of the ESA.
  - Response: None needed.
- It was recognized by NMFS in the 2014 final listing that some of the species-specific information was considered minimal, albeit thorough in that it represented what was currently known about the life history and status of the species at the time. Uncertainties are a given for most scientific efforts. Where scientific uncertainty remained in this report, it was at a scale, or was dealt with in the Document, in a manner such that it does not hinder an informed analysis

under the ESA to determine the required ‘essential’ features of critical habitat for the listed corals. Therefore it is the opinion of this reviewer that the Source Document contains the most accurate, and complete/up-to-date scientific information, with minimal relevant scientific uncertainty, to consider the development of a proposed rule to designate critical habitat pursuant to Section 3 of the ESA.

- Response: None needed.
- NMFS provided a well-reasoned, rational process to identify the two physical features required by the listed corals, and the determination that they must co-occur, in order to be considered “essential” for the conservation of the listed species of coral. The physical features essential for the conservation of the species are: (1) A suitable hard bottom substrate (i.e., natural, consolidated hard substrate or dead coral skeleton) that is free from fleshy or turf macroalgae cover and sediment cover for larval settlement and recruitment; and (2) water quality with a combined nutrient and water clarity that support: (1) reproduction; (2) adult growth and survival; and (3) larval and juvenile survival, growth, development, and recruitment.
  - Response: None needed.
- NMFS regulations state that critical habitat will be defined by specific limits using reference points and lines on standard topographic maps of the area, and referencing each area by the State, county, or other local governmental unit in which it is located (50 CFR 424.12(c)). NMFS regulations also state that when several habitats, each satisfying requirements for designation as critical habitat, are located in proximity to one another, an inclusive area may be designated as critical habitat (50 CFR 424.12(d)).
  - Response: None needed.
- NMFS used this information in a process that systematically identified specific units within geographical areas of U.S. waters that were occupied by the listed species at the time of listing, and that contained the identified essential features. This process allowed NMFS PIRO to take an ecosystem-based approach to implementing the tools of the ESA where possible, while still meeting species-specific mandates of the ESA, to achieve conservation value for listed Indo-Pacific corals. Response: None needed.
  - Response: None needed.

- The approach taken by NMFS PIRO was comprehensive, based on scientific rigor, and consistent with the intent of the ESA. The rationale used also addressed the fourth concern considered by this peer review “Is a justification lacking for reaching conclusions?” This reviewer believes that the justification by NMFS to use this step-wise technique and rationale to identify geographic areas to be considered for critical habitat for the listed coral species was consistent with the intent and species-specific requirements of the ESA.
  - Response: None needed.
- After reviewing the scientific information provided in the “*Source Document for Biological, Geographic, 4(a)(3), and 4(b)(2) Information Pertaining to Proposed Indo-Pacific Coral Critical Habitat*” prepared by NOAA, NMFS, PIRO, Honolulu, Hawaii, it is my view that the determinations reached by NMFS reflect a thorough synthesis of an extraordinary body of scientific evidence, an appropriate use of the best scientific information available, and the application of a reasonable and thorough tiered process, to develop a highly plausible pathway to define those areas that contain both essential features required by the listed coral species, and that may require special management, as critical habitat.
  - Response: None needed.

### **Specific Comments:**

Regarding *Chapter 1, Introduction*: Chapter 1 of the Source Document provides the definitions necessary to understanding the requirements of designation of critical habitat including the justification for not designating critical habitat at the time of the listing. Section 424.12(a) (2)(i) and (ii) of the ESA state that “Critical habitat is not determinable when one or both of the following situations exist: (i) Information sufficient to perform required analyses of the impacts of the designation is lacking, or (ii) the biological needs of the species are not sufficiently well known to permit identification of an area as critical habitat. NMFS PIRO admitted uncertainties due to the lack of specific information on the extent of the range of the listed species at the time of listing, and their occurrence within the jurisdiction of NMFS PIRO. Further, the ESA provides an allowance for additional time to consider the critical habitat designation under conditions of ESA, Section 424.12(a) (2). Therefore, NMFS PIRO was both reasonable and prudent in not designating critical habitat for the listed species at the time of listing.

- Response: None needed

Regarding *Chapter 2, Background, Listing History*: There is very little time actually spent on reviewing the listing process or history in this Source Document. This section does not focus as much on the listing process as the title suggests, but rather spends most of the space justifying the decision made by NMFS as to whether, or not, a listed species should be considered further in this document because it cannot be considered in the process to designate critical habitat. Based on the charge(s) of this peer-review the “listing process” was not considered a focus of the need to ensure the accuracy, quality, completeness and relevance of the scientific information considered, as that process had been completed several years prior. However, in my opinion, it is unequivocal that the scientific information used by NMFS in the listing decisions resulted from nearly two decades of research and focus within the United States and should be considered the best available at the time of listing.

- Response: The first 2 chapters (Introduction, Critical Habitat Identification and Designation) were reorganized and renamed in response to this and similar comments. The listing process is summarized in the Introduction.

It should be emphasized that the information used by NMFS to list the species is the same scientific information used by NMFS to identify those physical and biological features “essential to the conservation of the species and that may require special management considerations or protection.” Therefore, the scientific information used by NMFS in this process of identifying those features and areas to be considered as critical habitat for listed corals should also be considered the best available at this time. Although scientific uncertainties still remain in the collective understanding of the species-specific distribution, life-histories and status of many corals including several of the listed species, it is at a scale, or is it dealt with in a manner by NMFS PIRO, such that it did not hinder an informed analysis under the ESA to determine the required features of critical habitat, or to determine those areas that should be considered, or excluded, from designation in a proposed rulemaking.

- Response: None needed

Regarding *Chapter 3, Critical Habitat Identification and Designation*: The most significant contribution of this chapter to the Document is that it makes the connection between [defining terms “conserve,” “conserving,” and “conservation” to mean: “to use, and the use of, all methods and procedures which are necessary to bring any endangered species or threatened species to the point at which the measures provided pursuant to this chapter are no longer necessary”] and the step-wise approach used by NMFS PIRO to identify areas that may be designated as critical habitat for listed corals. The process described in the following chapters directly addresses the question ‘Does the Source Document provide a well-reasoned rationale in identifying the physical and biological

features of a critical habitat designation for each coral species based on the best available data?’

- Response: None needed

Regarding *Chapter 4, Geographical Areas Occupied by the Species*: Chapter 4 has considerable species-specific information on each of the geographical areas within U.S. waters occupied by each of the seven Indo-Pacific listed coral species occurring in the U.S. The significant point of the narrative in Chapter 4, and the information in the Table, is that it reaffirms the scientific process used by NMFS PIRO to consider only those species of coral for which there were confirmed locations and distributional data to further consider critical habitat designation. The process significantly reduced the likelihood of identifying a geographical area as being ‘critical’ when, in fact it does not meet the criteria.

- Response: None needed

Regarding *Chapter 5, Physical or Biological Features Essential for Conservation*: Chapter 5 of the Document clearly outlines in considerable length and detail the macro-scale features regarding the requirements of the seven listed species. This level of detail demonstrated the completeness of the scientific information used in the document. The final listing rule is considered to have been developed using the best available information on each of the seven listed species’ depth distributions and ranges. It should be emphasized that this information is not just the ‘best available’ but is also considered extremely relevant to any proposed rulemaking to designate critical habitat.

- Response: None needed

Regarding *Chapter 7, Unoccupied Areas*: The Source Document generally characterizes the threats to the seven listed coral species as the same threats affecting coral reefs throughout the world (climate change, fishing, and land-based sources of pollution). NMFS issued guidance in December 2015 on the treatment of climate change uncertainty in ESA decisions, which addresses critical habitat specifically. The guidance states that “when designating critical habitat, NMFS will consider proactive designation of unoccupied habitat as critical habitat when there is adequate data to support a reasonable inference that the habitat is essential for the conservation of the species because of the function(s) it is likely to serve as climate changes.” The Source Document specifically addressed this consideration for listed corals in this section.

- Response: None needed

Regarding *Chapter 8, Special Management Considerations or Protections*: When designating critical habitat, NMFS is required to assess whether the specific areas within the geographical area occupied by the species at the time of listing contain the physical or biological features essential to the conservation of the species and “*may require special management considerations or protection.*” NMFS recognizes that activities in and adjacent to areas being considered for critical habitat may affect one or more of the essential features found in these areas. The Source Document provided a complete and thorough discussion of the types of activities that occur within the units under consideration that may require special management to reduce or mitigate impacts to the essential features (for greater detail, see the Source Document).

- Response: None needed

## Reviewer 5

### **General Comments:**

- My review did not involve detailed review of the original data used in this study. The authors employ the customary and typical types of data used in ESA economic impact studies. Based on my experience, however, consultation databases in general are plagued by two main data quality issues: 1) a portion of the records are not useable in the analysis due to missing information required for project consultations by type, activity and location; and 2) the databases are censored when informal consultations are not tracked because a project proponent is faced with the decision of whether to seek consultation and ultimately decides not to do so. Readers may benefit from a footnote on these issues specific to the consultation database used in this study.
  - Response: While the 2 issues the reviewer pointed out may affect many Section 7 consultation databases, the PIRO Section 7 database is not significantly affected by either. Furthermore, Section 6.5 of the economic report acknowledges uncertainties associated with the Section 7 consultation data.

### **Specific Comments:**

Regarding *Appendix B, 4(b)(2) Economic Impact Analysis, Section 4.0, Activities that May Trigger Section 7 Consultation*: Readers will benefit from adding totals rows to Tables 4,

6, 7, 8, 9, 10 and 11. If the reason for exclusion is inability to sum to the totals reported in Tables 2 and 3 due to rounding, a note should be added to those tables.

- Response: Done

Page 23 states, “[t]he consultation history included 16 formal and 172 informal consultations within the geographic boundaries of the proposed critical habitat for the 12 coral species.” This implies the historical consultations reviewed total 188, whereas Tables 2 and 3 report 205 total consultations--20 formal and 185 formal.

- Response: The cited sentence was incorrect and has been removed.

Regarding Section 5.0, *Projection of Future Section 7 Consultations*: Uncertainty about the frequency of future Section 7 consultations could be incorporated into the range in estimated incremental costs. Given the uncertainty about the future, a maintained assumption in the study is that annual trends in the frequency (and location) of Section 7 consultation rates during the next 10 years (2016-2025) are the same as during the preceding 11-year period (2005-2015) [p. 60]. While the authors recognize and characterize this uncertainty, the impact of their assumption and methodology on the estimated range in incremental costs could be quantified. For example, the authors could:

- Compute annual growth rates over shorter-periods within 2005-2015 and use the lowest and highest growth rates to form the lower- and upper-bound forecast annual consultations.
- Compute the standard deviation in the average annual growth rate and use it to generate a lower- and upper-bound forecast.
- Project 2013-15 Section 7 consultation rates based on the 2005-2012 average and compute the mean percentage difference between projected and actual consultations. The mean forecast is then scaled higher and lower by the mean percentage difference to generate a lower- and upper-bound forecast.

- Response: While the suggested methods of expressing uncertainty are valid, they are unnecessary because the actual consultations carried out in 2005-2015 provide the best available information on the likely consultations over 2016-2025. Furthermore, our comparison of the number of annual projected consultations in 2005-2015 vs. the number of actual consultations in 2016-2019 (Appendix 3 to the economic report) demonstrate that the projections were quite accurate.

In the final analysis, the low-end (high-end) incremental cost estimates are applied to the lower-bound (upper-bound) number of forecast annual consultations. Quantifying this impact to some degree seems warranted by the fact that the authors find “*no discernable trend*” in historical consultation rates [p. 64]. In other words, there is nothing deterministic about annual Section 7 consultations, suggesting that using the average alone may be quite misleading. A footnote presenting summary statistics from the trend analysis may be useful to the reader in judging the degree of certainty embodied in the forecast.

- Response: The referenced wording in the economic report on p.64 has been changed to “Based on review of historical consultation history, we have not seen an overall trend in the frequency of consultations for any particular activity.” The use of the average number of consultations appears to be useful, as shown by our comparison of the number of annual projected consultations in 2005-2015 vs. the number of actual consultations in 2016-2019 (Appendix 3 to the economic report) demonstrate that the projections were quite accurate.

The frequency of beach nourishment and protected areas management Section 7 consultations could be projected:

Future consultations associated with beach nourishment projects are not estimated due to an absence of (historical) consultations during the period 2005-2015 [p. 59]. However, the authors state that 2 beach nourishment projects in CNMI prior to 2005 triggered Section 7 consultations. Given that stakeholder outreach and existing literature specifically identified beach nourishment as an activity with the potential for adverse impact to corals critical habitat, the authors should make every effort to include some measure of beach nourishment activity in projected consultations [p. 24]. Assuming the consultations occurred in 2004, lower-bound estimate could be 0.18 associated annual consultations. This is likely to be a lower-bound, as beach nourishment is increasingly offered as an effective means of climate change adaptation, and enhancing human use of beaches. As an alternative, the authors could base the estimated number of beach nourishment consultations on the ratio between beach nourishment and in-water/coastal construction- or dredging and disposal- related consultations during 2016-2025 that IEc estimated in the areas overlapping critical habitat for Caribbean corals (IEc, 2015). Similarly, the authors could transfer consultations associated with protected areas from the same study based on a similar method.

- Response: The reviewer provides a plausible method for estimating future beach nourishment consultations. However, it would be inappropriate to use this method (i.e., consideration of historical beach nourishment

consultations outside of the analysis period) unless all other types of consultations are also considered outside the analysis period. I.e., the suggested method would require an extension of the analysis period beyond 2005-2015 for all consultation types.

Absence of discussion and/or uncertainty about the potential for programmatic consultations should be recognized and characterized:

None of the projected Section 7 consultations are programmatic in nature; they are either formal or informal. It is unclear why (to this reader) why the authors do not address programmatic consultations. If the reason for exclusion is their absence from the historical NFMS PIRO Section 7 consultation database, that assumption should be stated directly in the study. The same is true if programmatic consultations are a subset of formal consultations, and thus do not differ in terms of increase administrative burden or the cost of project modifications.

- Response: Many of the consultations in the 2005-2015 database were programmatic (PacSLOPES) although they weren't identified as such in the economic report. The term "programmatic consultation" is broadly used and applies to many different approaches to streamline Section 7 consultation, such as PIRO's PacSLOPES programmatic consultation with the US Corps of Engineers. Splitting consultations into programmatic and not programmatic would serve no purpose for the analysis in the economic report, because it is not possible to project the proportions of one vs. the other in the future.

It is unclear whether consultation rates are projected for each activity, or whether the total number of informal and formal consultations is projected, and then distributed across activities in proportion to the historic distribution. Readers would benefit from more specifics on the estimation methodology in the text on pp. 60-61.

- Response: As explained in Section 5.2 and shown in Tables 13 and 14, projected consultations are broken down both by informal vs. formal (Table 13) and by activity type (Table 14).

Regarding *Section 6.1, Incremental Administrative Section 7 Costs*: Based on my review, the reader would benefit from increased clarity and explicit explanation of the methodology for estimating incremental administrative costs presented in Section 6.1.

- Response: Some details were added to Section 6.1 of the economic report to better explain the methodology.

The description of the low-end estimate reads “[t]he low-end cost estimate assumes that inclusion of an analysis of adverse effects to the 12 corals' critical habitat in future consultations, in addition to analysis of adverse effects to listed species, will always result in at least some additional administrative cost and effort.” It is unclear what “some additional administrative cost” is referring to, specifically how the authors' measured that, or what was assumed, in quantifying the low-end. This is a stark contrast to the description of the high-end estimate, which states explicitly that all future consultations will require formal consultation, and that each will require additional administrative cost and effort. [p. 65]

- Response: The following description of “some additional administrative cost” was added: “including time spent attending meetings, making phone calls, preparing letters, and, in some cases, developing a biological assessment.”

This statement, “[b]ased on the forecast of informal consultations presented in Table 13, this analysis estimates the number of additional formal consultations to total approximately 17 over the next ten years” [p.67]. Data reported in Table 13 states that 17 informal, rather than formal, consultations are projected over the next 10 years. Further, the use of the word “additional” may be confusing, because it implies the projected consultations are in addition to the baseline, or the “without” scenario. Because the projected consultations are not new incremental consultations, as stated in this study, the word “additional” should be deleted or replaced with “continued”.

- Response: Error corrected (i.e., “17 formal” changed to “17 informal”). The word “additional” replaced with “projected” (“continued” is confusing).

I am unable to replicate the \$349,000 present value low-end incremental administrative costs [p. 67]. Assuming 18.6 informal consultations annually, at \$2,400 per consultation listed in Table 15, and a 7 percent discount rate, my calculation results in a present value of \$314,000.

- Response: The 18.6 consultations do not refer to informal consultations only. Rather, it refers to informal (16.8) and formal (1.8) annual consultations combined (Table 13), and the formal consultations cost more than the formal.

This statement on p. 65, “[a]s discussed in Section 5.0, designation of critical habitat for the 12 coral species is in itself unlikely to result in any new section 7 consultations,” appears to be inconsistent with the findings of stakeholder outreach and literature review, which revealed that while aquaculture, beach nourishment and protected areas management did not result in consultations during 2005-2015, these projects would result in future consultations.

- Response: The results of the analysis are based on historical consultations in 2005-2016. If we use historical consultations for some actions outside of this time period, then we would have to look at all consultations for all activities outside this time period.

Regarding *Section 6.2, Incremental Project Modification Costs*: Readers would benefit from clarifying this sentence :“Nevertheless, with the listing of the 12 coral species and designation of critical habitat even in areas where the species are absent, more project location can be expected.” [p. 71]

- Response: The sentence has been removed.

Regarding *Section 6.3, Total Incremental Costs and Section 6.5 Caveats and Uncertainties*: Uncertainty with baseline protections against adverse modification is only partially incorporated into the range in estimated incremental project modification costs:

Recognizing the uncertainty surrounding the sufficiency of baseline protections for avoiding adverse modification of critical habitat, the authors generate low- and high-end estimates of incremental costs associated with project modifications. For the low-end, it is assumed that baseline protections are of sufficient strength and applied to all projects, while the high-end assumes that none of projected in-water/coastal construction or dredging and disposal project has any degree of baseline protection. As a result, Table 27 reports that the “[r]ange of results captures this uncertainty”. This is an accurate statement assuming the authors’ maintained assumption in the high-end scenario – that baseline protections are always sufficient for all activities other than in-water/coastal construction and dredging and disposal – is itself certain. As such, this caveat should be added to Caveats and Uncertainties [p. 80 and Table 27].

- Response: The statement in the table “At the high end, assuming baseline protections are not sufficient and additional project modifications are required for certain categories of activities may overstate impacts.” adequately addresses this concern.

*Regarding Section 6.5, Caveats and Uncertainties and Section 7.0 Economic Benefits:*  
Uncertainty about the existence and magnitude of indirect regulatory costs to industry could benefit from a summary of existing economic impact studies:

While the authors recognize the potential for the CHD to hinder the competitiveness of the area in attracting and retaining coastal and related tourism, resulting in an indirect cost, they state that quantifying the cost of regulatory uncertainty associated with the CHD is too speculative [p. 83]. However, uncertainty about the existence and magnitude of the cost remains, yet it appears altogether absent from the summary of uncertainties reflected in Table 27. Given the authors' recognition of the region's dependence on tourism, the authors' assessment of indirect costs of the CHD would benefit from a summary of existing studies on the regional economic impacts of coastal tourism, similar to the summary of ecosystem service benefits in Section 7 (Table 28). While existing studies may not focus on CHD or the region in question, studies examining the effect of environmental regulation on coastal tourism would put the potential impact in context, with the caveat that, as is the case with ecosystem service benefits, separating the portion of the impact attributed to the CHD is a seriously demanding study.

- Response: Duly noted.

Uncertainty with methods and data for estimating ecosystem service benefits should be recognized and characterized:

While region- and species-specific estimates of ecosystem services benefits are available for this study (as presented in Table 28) the authors do not recognize the uncertainty associated with methodologies for estimating ecosystem service benefits, particularly the biases associated with contingent valuation and other methods used to measure non-use values. For example, IEc 2015 points out that an appropriate study of non-use values associated with critical habitat provides insight on the relevant population holding such values, yet this study does not summarize the characteristics of the study producing the estimates of non-use values in America Samoa. As a result of this omission, the reader is left putting more certainty in the estimates presented than may be warranted by the inherent limitations.

- Response: While the results shown in Table 28 are based on methodologies with uncertainties, these estimates are the best available information, and the uncertainties are explained in the cited documents.

