



April 6, 2013

Assistant Regional Administrator  
Protected Resources, NMFS, Southeast Regional Office  
263 13th Avenue South,  
St. Petersburg, FL 33701  
Fax 727-824-5309;

Attn: Protected Resources Assistant Regional Administrator.

Re: Listing of 66 Reef-Building Coral Species; Reclassification of Elkhorn *Acropora palmata* and Staghorn *Acropora cervicornis*

I had been following the proposed listing for several years. It was not until the proposed rule was published that I had time to fully read the Biological Review Team's (BRT) Status Review Report (SRR). I must admit I made the assumption that NMFS would do a fine job reviewing the topic at hand. It became apparent in my review of the BRT's assessment that they had little to no knowledge of one of the key areas upon which the SRR is based, namely the trade in corals (including those for home aquariums, as well as dried curio items).

I am writing to; 1) provide additional background and information on the trade in corals, noting some dramatic changes particularly regarding live specimens, that has been omitted from this review, 2) to question and express my concern over listing of species as endangered with almost a complete lack of any data or information.

While it cannot be understated, this process is an enormous task for any agency to undertake. Reviewing the status of 82 species with ranges cover two vast regions of the World's oceans presents challenges the authors of the ESA likely never envisioned. Corals are often not discrete populations and thus some of the petitioned "species" are of questionable status. Our current understanding of the topic is lacking and this lack of understanding makes it nearly impossible for anyone to determine with a level of certainty what a population, species or hybrid is. Our knowledge of Pacific corals is so limited that the BRT resorted to what can only be called guessing in the absence of data to make assumptions as to what the Critical Risk Threshold (CRT) might be in the next 100 years.

There is no doubt that the impacts of anthropogenic activities on the oceans and global climate present challenges to the survival of many marine and terrestrial species. Indirect impacts are compounded by the effects of direct impacts. Is the mere threat from anthropogenic impacts sufficient for ESA listing? Will listing the species in question provide them protection and benefits? These are important questions that must be considered.

For the past 7 years I have been heavily invested in several projects with the aim to better understand the global trade in live aquatic animals (referred to as the “aquarium trade”). We have published several papers that outline the rapid changes that the aquarium trade has undergone in the past two decades. Most recently with funding in part from NOAA we have investigated the importation of marine aquarium fish and invertebrates into the United States. This undertaking is the largest effort of its kind. We raised numerous issues with the current level of understanding of the aquarium trade and mode of monitoring this trade at the federal level.

Beginning in 2011 at the request of the Ocean Foundation & NOAA, I attended two coral mariculture workshops in Bali Indonesia. During the workshops I gave an overview of the global trade in marine ornamental species with a focus on the coral trade. The outcome of this report has been published in the peer-reviewed literature and I would like to highlight a few key points with a focus on the current listing proposal.

Indonesia had developed an advanced coral mariculture industry, with rigorous standards of operation. These rigorous standards clearly define what a maricultured coral is, how corals are to be produced and the rules that govern an aquaculture operation. This includes labeling of colonies to provide an auditable paper trail. So in contrast to the BRT’s assessment that there is no documentation, there actually is a well-documented mariculture standard for corals published in 2008. Furthermore, after review of the BRT’s supporting documents, I am under the impression that the BRT is unaware of the standards that CITES requires for the export of listed species with codes C, F, or R, indicating a general unfamiliarity with the trade in live corals.

I would like to take a few moments to clarify these requirements. Exporting countries such as Indonesia must develop guidelines for listing export source codes for species with the source codes C, F or R. This is not something exporters can simply do themselves. In the absence of such guidelines, and in contrast to Indonesia, coral aquaculture operations in the Solomon Islands have been exporting maricultured corals under their wild quota (Source Code W) for several decades even though it is maricultured product. It is simply easier to export cultured products under wild quotas than deal with additional layers of paper and governmental support that is not available. Interestingly, cultured corals from the Solomon Islands represent about half of the total volume of corals exported from this country, yet the CITES database lists all trade as wild. It was only after visiting several coral farms and examining the CITES trade database that we were able to accurately document in our paper published in Conservation Letters, a striking and rapid change in the coral trade. For most corals, the trade is rapidly shifting from a wild fishery to aquaculture. This process is neither ambiguous nor modest. It is nothing short of industrial in nature. Numerous exporters have closed distant collection stations throughout Indonesia in favor of near shore farming operations. This change is important on several fronts. While there are examples of well managed wild coral fisheries (ex. Fiji and Australia), there was little argument that the wild coral harvest within Indonesia had caused localized impacts to coral populations and associated habitats. Indonesia has importantly recognized this, in part due to the efforts of Dr. Andrew Bruckner (at the time with NOAA) and made a fundamental shift in policy. It is now national policy to support an aquacultured coral trade. They have begun phasing out the wild quota for many taxa. In essence Indonesia has made it national policy to support a more responsible trade. As part of this effort Indonesia requires 10% of the coral production from these aquaculture operations to be out-planted in restoration efforts. Most impressively nearly every exporter at the two NOAA funded workshops, even those that did not have coral farms, recognize the need for a more responsible coral trade. Most are eager to be part of the solution and put behind them several decades of destructive fishing. The changes in the coral trade could spark a more positive movement within the broader fish trade as exporters are more connected to their habitats through their coral farms. Likewise the Philippines and several other countries have begun aquaculture-based operations. These operations could easily become the largest coral enhancement projects ever undertaken.

At present, Indonesia exports over 400,000 cultured corals per year, over 75% of all *Acropora* sp. are now cultured. This level of production requires that over 40,000 fragments will be available for restocking to the wild on an annual basis. This number will increase and I would forecast that annual production in the next 5 years to likely exceed a million corals. Out planting requirement provides enormous opportunities for the stock enhancement of corals designated as species of concern, threatened and/or endangered. Coral farmers could be engaged to produce 10,000s of fragments annually for a given species solely for the purpose of out-planting on near by reefs. If properly coordinated these efforts could mitigate decades of destructive fishing practices. This opportunity is of course contingent on a thriving coral trade.

It is very clear that the BRT omitted the use of experts in the trade of corals from their SRR and other documents. The BRT makes several unfounded comments in their SRR and omits important areas of wild collection. Comments from Queensland, Australia provided some details about the scope of Australia's trade during the SRR's comment period. This omission in the SRR again calls into question's the BRT's ability to properly review the coral trade. Furthermore there are misleading statements included in the SRR. The BRT should cite supportive documentation for the following statement (page 73, quoted below, underlined and in bold). If unable to support this statement, NMFS should remove or retract the following statement from their documents.

From the reefs of Kāne`ohe Bay, Hawai`i, the average number of feather-duster worms (*Sabellastarte sanctijosephi*) collected per year for the aquarium trade was reported to be 43,143 (Friedlander et al., 2008). **As each feather duster worm is obtained by breaking away the coral, the total coral and habitat damage can be significant.**

I looked into this allegation and could find no evidence for such a statement. I do not know of any literature or communication that can support such outlandish urban legends. This again serves as examples of the SRT's unfamiliarity with the aquarium trade.

It is abundantly clear that the BRT failed to use current science and/or commercial information available about the coral trade in the SRR. The BRT suggests they cited commercial data by presenting information from the CITES database. However, this should be not construed as an evaluation or 'use' of commercial data. The BRT merely cut and pasted numbers from a data query and failed to interpret such information. Therefore, it is in my opinion that the BRT arbitrarily used the CITES database to form an opinion of the trade and its impact on the corals in the petition. In large part due to their failure to consider both scientific and commercial data the BRT made serious errors in their CRT values. An example of this is found for *Euphyllia paradivisa*, where "trade" appears to be the sole factor in evaluating this species to the endangered status when compared to the BRT's CRT values for other members of the genus. From the BRT's SRR page 436:

Factors that increase the potential extinction risk (higher likelihood of falling below the Critical Risk Threshold) for *Euphyllia paradivisa* include its **heavy involvement in international trade** combined with its rare existence but conspicuous colonies, suggesting it is vulnerable to overexploitation. The species appears bleaching-susceptible. Its geographic distribution is also somewhat restricted, centered in the threat-prone Coral Triangle Region. Narrow geographic distribution increases the likelihood that changing conditions or a local impact in a particular location can push the species below the Critical Risk Threshold. No known factors were noted by the BRT to reduce the extinction risk of this species.

The risk from the international trade is only near term due to exploitation by the trade in wild harvested corals. Indonesia's change in coral sourcing from wild to mariculture will eliminate this threat in the near future. I have personally visited a coral farm with 1000s of colonies of this species in production and they are expanding their production yearly. Because of the changes in sourcing, there is no reason to consider the coral trade a long-term threat to this species survival. It is likely the species could benefit from the coral trade in the near future. If the BRT had consulted with trade experts, their conclusion may have differed.

With respect to the 'science-based' determination of this proposed listed, I am not the first nor will I be the last scientist to raise a red flag that the 'science' based determination is highly flawed. The review team itself notes these flaws. The external reviewer Dr. Terry Hughes questions the validity of the method and use of the literature. Examples include but are not limited to:

The methodology is weak, as illustrated by the disparity in scoring by different members of the BRT. A major weakness of any analysis of coral vulnerability to extinction is the paucity of species-level abundance data at regional scales.

**1. Are the results of the Extinction Risk Analysis supported by the information presented?** Generally, no. Page 3, third paragraph, line 4 states: *The petition asserted that all of the petitioned species have suffered population reductions of at least 30% over a 30-year period, relying on information from the IUCN.* Here, "asserted" is indeed the appropriate verb, since there is very little species-specific data on abundance. It would be worth explaining here how the various IUCN categories relate to different levels of population decline, and how Carpenter et al. 2008 came to their conclusions.

The BRT's responses to this reviewer are not at the level that would be expected of a peer-review of this detail. The BRT often dodges the reviewer's comments.

To this scientist, the simple act of voting probability of extinction risk based on the literature does not give credence to a process, regardless of the reasons for undertaking such endeavors. This is not to say the species in question do not need some level of protection, it merely states the obvious, the method employed is useless for the determination of endangerment for most species due to a lack of data. To highlight this I would like to focus your attention on two species presented in the report. The Caribbean pillar coral *Dendogyra cylindrus* is reasonably well studied, with detailed accounts of abundance and distribution throughout its range. The assessment is clear with its classification as "rare" but conspicuous, citing population lost, accounts of bleaching and other environmental trauma. The species is well delineated and defined. There is a lot of information supporting the conclusion that its population is at least threatened. The BRT had access to these studies and rated this species probability of extinction as (CRT value) 74%. In sharp contrast a poorly studied, little known coral, the deep water Pacific *Acropora* species *A. jacquelineae*, a species with questionable taxonomic status, lacking any density estimates, limited distribution information, and is only noted as uncommon or rare by at most a handful of reports received a higher rating. The BRT assessment of this species is marked with statements such as "not much species-specific information..." and "are poorly known". Yet the BRT gives a CRT ranking of 76%, citing the "susceptibility of the genus *Acropora* to common threats" such as bleaching. This fast growing species is rated 2% more susceptible than a very slow growing shallow water Caribbean species that has demonstrated to be highly susceptible to bleaching and is clearly a rare species. How the BRT could make a determination as to the status of a species with no creditable data is beyond my understanding. Based on this logic, it would seem the BRT should make a general level determination that all members of the *Acropora* are threatened or endangered; and yet some were not listed at all.

The BRT used invalid studies in their assessment. An example of the use of highly questionable literature is provided below. While reviewing the literature cited in the BRT for the proposed endangered species *Euphyllia paradivisa*, I had an opportunity to review an unpublished Masters Thesis (SRR citation Tibbits, 2009). This Thesis, the only citation that provides data on this species beyond CITES import values or an ID book reference. A brief review of this thesis suggest it is highly flawed:

While aquarium studies are necessary for understanding the impact of ocean acidification on species in a controlled manner, results are invalid if the methods used for control result in confounding variables. Current and expected acidification of ocean waters is a CO<sub>2</sub> species controlled process. Controlling pH of carbonate buffered saline waters with organic weak acids does not model this process, nor does it effectively isolate the one variable that was actually monitored in this study: pH. This weak acid does not fully dissociate in aqueous environments, setting up an additional buffer system and thus confounding what is known about the buffering capacity and constituencies of the water.

Aside from the complexities of organic acid influence on biomineralization processes, adding acids to the water will inherently change the carbonate-bicarbonate balance of the water column. This balance is directly related to the mineralization of carbonate structures and is modeled by the saturation state ( $\Omega_{\text{calcite-aragonite}}$ ). The climate change literature documents the interaction of this term on other species quite well. Ignoring this fundamental concept effectively invalidates this study. No water quality data is presented, including parameters that would allow one to reconstruct  $\Omega$ . No pH timeseries data is presented. No calibration procedures for the instrumentation is discussed.

In short, almost every one of the reporting guidelines in the National Research Council's "Ocean Acidification: A National Strategy to Meet the Challenges of a Changing Ocean" have not been met. The challenges that exist regarding pH manipulation and data reporting for appropriate analysis of results are many. ***This study, while valiant, contains too many oversights to be considered for policy decisions and should be approached with caution.***

In light of the current state of science any thoughtful review or reading of this Thesis would result in a similar conclusion, yet it is include by the BRT in the SRR numerous times.

My comments in this letter are not to say that data poor species do not deserve attention or further study. However I must suggest that the entire process could be easily questioned with such examples scattered throughout the entire report. It would appear that any species under NOAA's purview that is under some recognized global threat (climate change / OA) and has little to no formal data on distribution could be listed on the ESA and if it considered "rare" it could be immediately listed as endangered. This is regardless of the taxon's status as a valid species (i.e. rare species are likely hybrids, Richards et al. 2008). It would seem logical that the first step for data deficient species would be to study the species. NOAA's listing of the Caribbean *Acropora* species is exemplary of this more measured approach. Considering the apparent reliance on the IUCN database for determination of status, I queried the IUCN database for species with similar threats and you quickly recognize that the BRT methods are a road map for the listing of hundreds if not thousands of species under the ESA. The question is whether the current proposed listing or future listings prevent extinction or facilitate recovery. This remains highly questionable.

The ESA is a static law, the authors of the Act likely never envisioned the present actions, and therefore is likely inadequate in its protection of most of the proposed species. The Act provides nothing more than a feel good listing for these foreign species. Especially when the nature of the current trade is taken into account. The ability of the Act to prevent extinction is likely undermined by its impact on the reasonable coral trade. If the trade is lost, the economic incentive to restore damage habitats through industry out-planting would be lost. If as a result of these listings, the US closes its borders to the coral trade, we will lose the influence of being the largest importer of corals. This influence is the most likely reason for the impressive changes we (members of the NOAA funded coral mariculture workshop) witnessed in Indonesia over the past two summers. While NOAA has some discretion with respect to trade for threatened species, as presently interpreted, the Act prohibits 'take' for species listed as endangered. It is my conclusion that the precautionary approach to protection of these species is to afford the protections to species that are truly threatened while giving the agency flexibility in its handling of trade. In closing I urge NMFS to reconsider the proposed rule to ensure they do not damage current and future conservation actions.

Thank you for your time and attention.

Sincerely,

A handwritten signature in black ink, appearing to read 'Andrew L. Rhyne', with a stylized flourish at the end.

Andrew L. Rhyne, Ph.D.