Supplemental Information for the Pillar Coral

Biological Status Review Report

The following pages contain peer reviews received from selected peer reviewers, comments received during the public comment period, and the draft report that was reviewed before the final report was completed

March 31, 2011

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Peer review #1 Jennifer Ann Moore

From: Jennifer.Moore
To: Imperiled
Cc: Semon, Kate
Subject: Re: Pillar coral Draft BSR Report
Date: Thursday, February 03, 2011 11:23:02 AM
Attachments: Pillar Coral Final Draft BSR 12-10-10_JAM.doc
Moore Review of Biological Status Review for the Pillar Coral.doc

Please see attached. Thank you for the opportunity to comment.

Independent Review of Biological Status Review for the Pillar Coral (*Dendrogyra cylindrus*)

On December 10, 2010, I received a request for independent review of the Biological Status Review (BSR) for the Pillar Coral (*Dendrogyra cylindrus*), as prepared by the Florida Fish and Wildlife Conservation Commission (FWC). The request included the following charge:

> The role of the independent reviewers is to ensure the quality of the science used in the BSR, including (but not limited to) the appropriateness of the methodology, data, analysis, and interpretation. We request you comment on (1) the completeness and accuracy of the biological information and data analyses in the BSR, and (2) the reasonableness and justifiability of our assumptions, interpretations of the data, and conclusions.

I was provided copies of the BSR and supporting documents outlining the process under which FWC evaluates a species status with respect to Florida's threatened criteria.

Given the criteria under which a species is evaluated, I found the BSR to be complete and accurate. As described in the review, there are few data specific to pillar coral on declines or trends. The BSR included the best available data, including unpublished data, and identified where the data may have limitations. Where assumptions were necessary (i.e., population size of mature adults), the BSR provided reasonable scenarios and evaluated the species' status for that criteria under both scenarios. Please note one comment in the document on page 8 regarding the criteria evaluating habitat area, extent, and quality.

The BSR provides a sound evaluation of pillar coral under the FWC criteria for listing as a threatened species. The references are appropriate and complete for the species and threats. The species meets several of the criteria; therefore, the recommendation to list as threatened is appropriate.

Biological Status Review Information
Findings

Species/taxon: Pillar coral (*Dendrogyra cylindrus*)
Date: 11/30/10
Assessors: Kate Semon, David Gilliam, Margaret Miller

Generation length: 30+ years; 3 generations ~ 100 years (see notes)

Criterion/Listing Measure	Data/Information	Data Type*	Criterion Met?	References
*Data Types - observed (O), estimated (E), inferred (I), suspected (S), or projected (P). Criterion met - yes (Y) or no (N).				
(A) Population Size Reduction, ANY of				
(a)1. An observed, estimated, inferred or suspected population size reduction of at least 50% over the last 10 years or 3 generations, whichever is longer, where the causes of the reduction are clearly reversible and understood and ceased[1]	Curio trade has stopped; perhaps was influential in causing past declines. No information on magnitude of population decline	S	N	Colin 1978
(a)2. An observed, estimated, inferred or suspected population size reduction of at least 30% over the last 10 years or 3 generations, whichever is longer, where the reduction or its causes may not have ceased or may not be understood or may not be reversible[1]	No information, although assumed to always have been rare.	S	N	Jaap 1984
(a)3. A population size reduction of at least 30% projected or suspected to be met within the next 10 years or 3 generations, whichever is longer (up to a maximum of 100 years) [1]	Based on the low reproductive potential of the current population, and the high level of threats (e) that are anticipated to be accelerated, it is highly likely that the population will have at least a 30% decline over the next 100 years. This species has exceedingly low resilience.	I, S, P	Y	Szmant 1986, Hoegh-Guldberg et al. 2007, Webster et al. 2005, Chiappone unpub. data,
(a)4. An observed, estimated, inferred, projected or suspected population size reduction of at least 30% over any 10 year or 3 generation period, whichever is longer (up to a maximum of 100 years in the future), where the time period must include both the past and the future, and where the reduction or its causes may not have ceased or may not be understood or may not be reversible.[1]	No information, although assumed to always have been rare.	S	N	Jaap 1984
[1] based on (and specifying) any of the following: (a) direct observation; (b) an index of abundance appropriate to the taxon; (c) a decline in area of occupancy, extent of occurrence and/or quality of habitat; (d) actual or potential levels of exploitation; (e) the effects of introduced taxa, hybridization, pathogens, pollutants, competitors or parasites.				
(B) Geographic Range, EITHER				
(b)1. Extent of occurrence < 20,000 km^2 (7,722 mi^2) OR	Extent of applicable state waters (oceanside of Martin County through the Tortugas Bank) is less than 20,000 km2 (667 km X 7.8 km = 5203 km2).	O	Y	Jaap et al. in Riegl and Dodge (eds) 2008
(b)2. Area of occupancy < 2,000 km^2 (772 mi^2)	Based on IUCN Red List guidelines, area of occupancy probably much less than 2,000 km2	I	Y	Wagner et al. 2010, Chiappone unpub. data
AND at least 2 of the following:				

a. Severely fragmented or exist in ≤ 10 locations	Florida reef tract can be considered a single location, subject to threats (temperature extremes, bleaching), or fewer than 5 locations for other threats (disease, hurricane).	I, S, P	Y	Wagner et al. 2010, FRRP unpub. data, CREMP unpub. Data
b. Continuing decline, observed, inferred or projected in any of the following: (i) extent of occurrence; (ii) area of occupancy; (iii) area, extent, and/or quality of habitat; (iv) number of locations or subpopulations; (v) number of mature individuals	Projected continuing decline in area of occupancy (ii) and number of mature individuals (v)	P	Y	Szmant 1986, Hoegh-Guldberg et al. 2007, Webster et al. 2005, Chiappone unpub. Data
c. Extreme fluctuations in any of the following: (i) extent of occurrence; (ii) area of occupancy; (iii) number of locations or subpopulations; (iv) number of mature individuals	Extreme fluctuations unknown, but not expected.		N	
(C) Population Size and Trend				
Population size estimate to number fewer than 10,000 mature individuals AND EITHER	Unknown at this time. Scenario 1: Under the assumption that existing colonies are all mature (i.e., capable of successful sexual reproduction), reports of population size within the Florida Keys has been estimated at 129,000 colonies, and within the Florida reef tract at 0.6 colonies / m2. Scenario 2: Under the assumption that censused colonies are at such low density that fertilization potential approaches zero, the number of mature individuals would be zero, suggesting that Florida's is a relict population.	Scenario 1:E, Scenario 2:S	Scenario 1: N. Scenario 2: Y (population is a relict?)	Scenario 1: Chiappone unpub data, FRRP unpub data, Wagner et al. 2010; Scenario 2: Szmant 1986, Levitan et al. 2004
(c)1. An estimated continuing decline of at least 10% in 10 years or 3 generations, whichever is longer (up to a maximum of 100 years in the future) OR	If either scenario, at least 10% continuing decline is estimated over next 100 years	P	Y	Szmant 1986, Hoegh-Guldberg et al. 2007, Webster et al. 2005, Chiappone unpub. data,
(c)2. A continuing decline, observed, projected, or inferred in numbers of mature individuals AND at least one of the following:	If either scenario, at least 10% continuing decline is estimated over next 100 years	P	Y	Szmant 1986, Hoegh-Guldberg et al. 2007, Webster et al. 2005, Chiappone unpub. data,
a. Population structure in the form of EITHER				
(i) No subpopulation estimated to contain more than 1000 mature individuals; OR				
(ii) All mature individuals are in one subpopulation	Based on data for other broadcast-spawning coral, all Florida pillar coral constitute one subpopulation (if they are mature)	S	Y	Baums et al. 2005, Vollmer and Palumbi 2006.
b. Extreme fluctuations in number of mature individuals				
(D) Population Very Small or Restricted, EITHER				

Comment [jam1]: What about (iii), area, extent, quality of habitat? Given the numerous threats to the reef ecosystem from climate change and LBSP, one could project a reduction in quality of habitat, which may lead to reduction of area or extent.

(d)1. Population estimated to number fewer than 1,000 mature individuals; OR	Unknown at this time. Scenario 1: Under the assumption that existing colonies are all mature (i.e., capable of successful sexual reproduction), reports of population size within the Florida Keys has been estimated at 129,000 colonies, and within the Florida reef tract at 0.6 colonies / m2. Scenario 2: Under the assumption that censused colonies are at such low density that fertilization potential approaches zero, the number of mature individuals would be zero, suggesting that Florida's is a relict population.	Scenario 1:E, Scenario 2:S	Scenario 1: N; Scenario 2: Y	Scenario 1: Chiappone unpub data, FRRP unpub data, Wagner et al. 2010; Scenario 2: Szmant 1986, Levitan et al. 2004
(d)2. Population with a very restricted area of occupancy (typically less than 20 km^2 [8 mi^2]) or number of locations (typically 5 or fewer) such that it is prone to the effects of human activities or stochastic events within a short time period in an uncertain future	Florida reef tract can be considered a single location, subject to threats (temperature extremes, bleaching), or fewer than 5 locations for other threats (disease, hurricane).	I, S, P	Y	Wagner et al. 2010, FRRP unpub. data, CREMP unpub. data
(E) Quantitative Analyses				
e1. Showing the probability of extinction in the wild is at least 10% within 100 years	Not available.		N	

Initial Finding (Meets at least one of the criteria OR Does not meet any of the criteria)	Reason (which criteria are met)
Meets at least one of the criteria	Scenario 1: A3e;B1+2ab(ii,v);D2 Scenario 2: A3e;B1+2ab(ii,v),C1+2a(ii); D1+2
Is species/taxon endemic to Florida? (Y/N)	N
If Yes, your initial finding is your final finding. Copy the initial finding and reason to the final finding space below. If No, complete the regional assessment sheet and copy the final finding from that sheet to the space below.	
Final Finding (Meets at least one of the criteria OR Does not meet any of the criteria)	Reason (which criteria are met)
Meets at least one of the criteria	Scenario 1: A3e;B1+2ab(ii,v);D2 Scenario 2: A3e;B1+2ab(ii,v),C1+2a(ii); D1+2

Peer review #2 from Walter Jaap

From: Walt Jaap
To: Imperiled
Subject: Dendrogyra cylindrus review
Date: Friday, January 14, 2011 2:45:44 PM
Attachments: Draft Review WCJ.docx

Please find my review *for Dendrogyra cylyndrus*

Walter C. Jaap
Lithophyte Research- Team W
273 Catalan Blvd. NE
Saint Petersburg, FL 33704-3845

12 January 2011
TO: Elsa M. Haubold, Section Leader, Species Conservation Group, Florida Fish & Wildlife Conservation Commission, FWRI
FROM: Walter C. Jaap, Lithophyte Research LLC
SUBJECT: Comments and thoughts on Biological Status review for Pillar coral, *Dendrogyra cylindrus* for threatened species consideration (addendum, minor changes).

Mostly, we have very little information to understand the decline of this rare and iconic coral species. The review covered the aspects as defined in FWC and Florida statutes. The majority of the area inhabited by *Dendrogyra cylindrus* is in federal waters; however, being that FKNMS is a joint venture, management and conservation of *D. cylindrus* is most important to Florida citizens so this effort is relevant and should be given a high priority. I believe that the biological review team provided a reasonable review of salient facts, and the recommendation is logical given that this species is probably the rarest of zooxanthellate scleractinian coral species in Florida. I offer up a few ideas and thoughts as things that might be worthy to include in the final document; please see below.

The information on taxonomy-Systematics is lacking:

PHYLUM CNIDARIA (COELENTERATA)
CLASS ANTHOZOA EHRENBURG, 1834
SUBCLASS ZOANTHARIA (HEXACORALLIA)
Order Scleractinia, Bourne 1900
Family Meandrinidae Gray, 1847

The Family includes *Meandrina* (Linnaeus, 1758), *Ctenella* (Matthai, 1928), *Dichocoenia* (Milne Edwards and Haime, 1848), *Dendrogyra* (Ehrenberg, 1834), *Gyrosmilla* (Milne Edwards and Haime, 1851), and *Montigyra* (Matthai, 1928).

Extant (living) genera in this family form massive, phaceloid (closely aligned columns), columnar, and encrusting colonies. Skeletal structures are solid and robust; septa are exsert and evenly spaced. *Meandrina, Dichocoenia*, and *Dendrogyra* are known from the western Atlantic; *Centella, Gyrosmilla*, and *Montigyra* are Indo-Pacific species. *Goreaugyra* known from one Bahamian specimen is an unusual colony of *Meandrina* that grew in columnar form. The family has a fossil record from the Cretaceous to Recent.

Genus *Dendrogyra* Ehrenburg, 1834

Etymology: A branch having rounded and convoluted surface

There is only one species in this genus, *Dendrogyra cylindrus*, with fossils known from as far back as the Tethys Miocene.

Dendrogyra cylindrus Ehrenburg, 1834.

Photos are important so that the less informed know about the nature of the species. I would include several photos that would document gross morphology, skeletal structure, and polyps. The shot below is an example of gross morphology.

Ehrenburg's coral collections are housed in Berlin; we are uncertain if the Holotype specimen remains in the Humboldt Museum.

Species Diagnosis

Most colonies are fused solidly to the underlying substratum; cylindrical columns develop from the base and extend upward in an undulating fashion. Large colonies may include multiple columns that attain several meters in upward growth. Colonies that do not settle and grow on solid substratum are prone to fall over and form new upward growth from the older horizontal columns. This cycle of upward growth followed by toppling over limits these colonies to small size; however, the process may generate large numbers of small colonies. The skeleton is brain coral-like, with a series of meandering ridges and valleys. Tentacles are often exposed during daylight and give a colorful fur-like appearance, light-brown in color.

Although *Dendrogyra cylindrus* is often found in spur and groove-fore reef habitats or zones, it is not limited to these habitats. It also occurs in patch reefs and hard bottom. It has a wide niche range in Florida.

Because of curio harvest, in the 1970s we initiated an effort to protect *Acropora* spp. and *Dendrogyra cylindus* in state waters. At the time we heard from several sources (FMP officers) that curio harvesters were targeting *D. cylindrus* from Coffins Patch, off Marathon. It was one of the patch reefs that had a moderately abundant population of pillar coral. After intense harvesting, the population did not recover.

The population estimate is too large. I perceived it was derived from density sampling and suspect that the 0.6 colonies m^2 includes a variance or standard deviation that is multiple times greater than the mean; the predictability of population size is very poor. Additionally, in a reasonably robust sample size, it is questionable that *D. cylindrus* would have a density of 0.6 colonies m^2. To evaluate the population estimate, I did a simulation of ten samples, each sample

was 100, one m^2 quadrates, five samples had zero colonies of *Dendrogyra*, the others ranged from 1 to 4 colonies. Sample results shown in table below:

Statistic	Mean
N	100
Mean	0.009
Std. Dev.	0.068
Variance	0.011
X-S	-0.059
X+S	0.077

Using these data one might extrapolate for 5,200,000,000.00 m^2 and see a population that ranges from -308,663,501 to 402,263,501 colonies. You can see from this exercise the problem of extrapolation of rare species density information; you can generate information, but it is not useful.

I would be surprised if there are several hundred colonies of *Dendrogyra* in Florida waters. Consider some discussion on what remediation options could or should be employed to try and improve the *D. cylindrus* situation. Was any effort put into planning or developing a strategy in principal of what should we do? The nearest neighbors to our populations are in the Bahamas and Cuba. Some thoughts to ponder include the status in the neighboring countries. Can colleagues provide information about these locations? Does aquaculture or the public aquaria offer any hope of culturing this species? The genetic heritage is poorly understood. Are Florida colonies from multiple or a single genetic heritage? What specific regulations would enhance survival?

The fossil record (very poor) for *D. cylindrus* is not going to offer us much information about the historical abundance and distribution.

Taxonomic distinctness should be considered because *Dendrogyra*; is a genus with a single species. A genus with one species has a high conservation value relative to a genus with multiple species (loss of a species in the genus with multiple species has less impact on the gene pool relative to the genus with one species). I suggest that you include the following publications in your bank of references supporting designating *D. cylindrus* as being threatened.

Clarke RM, Warwick RM (1998). A taxonomic distinctness index and its statistical properties. J Applied Ecology 35: 523-531.

Warwick RM, Clarke KR (1998) Taxonomic distinctness and environmental assessment. J Applied Ecology 35: 532-543.

Warwick RM, Clarke KR (2001) Practical measures of marine biodiversity based on relatedness of species. Oceanography and Marine Biology: Ann Rev 39: 207-231

Give me a shout if you have questions or you would like to discuss the challenges
Good luck and thanks for the opportunity to be of service.

Copy of the Pillar coral BSR draft report that was sent out for peer review

Biological Status Review for the Pillar Coral (*Dendrogyra cylindrus*)

EXECUTIVE SUMMARY

The Florida Fish and Wildlife Conservation Commission (FWC) directed staff to evaluate all species listed as Threatened or Species of Special Concern as of September 1, 2010. Public information on the status of the peregrine was sought from September 17 to November 1, 2010. The members of the biological review group (BRG) met on November 30, 2010. Group members were Kate Semon (FWC lead), Dave Gilliam, and Margaret Miller. In accordance with rule 68A-27.0012 Florida Administrative Code (F.A.C.), the BRG was charged with evaluating the biological status of the pillar coral (*Dendrogyra cylindrus*) using criteria included in definitions in 68A-27.001(3) and following the protocols in the *Guidelines for Application of the IUCN Red List Criteria at Regional Levels (Version 3.0)* and *Guidelines for Using the IUCN Red List Categories and Criteria (Version 8.1)*. Please visit http://www.myfwc.com/WILDLIFEHABITATS/imperiledSpp_listingprocess.htm to view the listing process rule and the criteria found in the definitions.

The Pillar Coral Biological Review Group concluded from the biological assessment that pillar coral met at least one of the five listing criteria. Staff recommends that the pillar coral be listed as a threatened species.

This work was supported by a Conserve Wildlife Tag grant from the Wildlife Foundation of Florida.

BIOLOGICAL INFORMATION

Life History References – Vaughan (1915), Wallace (1999), Hudson et al. (1997), Szmant (1986), Wittenburg and Hunte (1992), Lewis and Price (1975), Bak and Elgershuizen (1976)

Taxonomic Classification -- This biological status report is for pillar coral (*Dendrogyra cylindrus*) in Florida.

Population Status and Trend –Although conspicuous, the species has been described as rare on many Caribbean reefs, and small colonies are unusual (Szmant 1986). No specific population trends are available, but low colony density and infrequent encounter rates are reported from monitoring programs (Chiappone, Ruzicka, unpublished data). Additionally, no

juvenile pillar coral have been identified from Florida Keys reef surveys during 1999-2009 (M. Chiappone, pers. comm.).

Geographic Range and Distribution- Pillar coral is widely distributed throughout coral reefs of the Caribbean Sea and the subtropical and tropical West Atlantic, ranging from the northern coast of South America (Colombia) to southern Florida (Smith 1971, Veron 2000). Reported distributions on wider Caribbean reefs include (Goreau 1959): rear zone, reef flat, buttress zone and *A. cervicornis* zone; Goreau and Wells (1967): 2 to 20 m, but typically occurs from 3-8 m depth; Pressick (1970): rear zone from 2-3 m depth; Cairns (1982): spur-and-groove reefs (14 m) and back reef (1 m); Tomascik and Sander (1987): spur-and-groove reefs; and Wheaton and Jaap (1988): spur-and-groove reefs.

Within Florida, the species is most frequently encountered at high-relief spur and groove reefs of the Florida Keys, and very rarely on mid-channel patch reefs and deep fore-reef (M. Chiappone, unpublished data, see http://people.uncw.edu/millers). Reports of geographic distribution range from Palm Beach county to the Dry Tortugas.

Quantitative Analyses – No population viability analyses exist for Florida pillar coral to date.

BIOLOGICAL STATUS ASSESSMENT

Threats – This species is highly susceptible to white plague disease (Bruckner and Bruckner 1997, Porter et al. 2001, Santavy et al. 2001, Miller et al. 2003, Weil 2004), protozoan parasites (E.C. Peters, pers. comm.. to M. Chiappone), and sedimentation (Bak and Elgershuizen 1976). Localized impacts have been associated with hurricane damage (Rogers et al. 1991), damselfish predation, physical colony damage induced by anchors and boats, and bioerosion by sponges. Prior to its ban, collection for curios was once widespread off Florida (Colin 1978). Additional threats to population persistence may be attributed to projected global climate change (i.e., prolonged periods of high sea surface temperatures, which can induce region-wide bleaching events; increases in the frequency and intensity of storm events and ocean acidification, which can cause physical and skeletal damage, impair sexual reproduction, and prevent larval settlement and metamorphosis), and habitat loss or a reduction in habitat quality attributed to poor water quality and coastal development (Hoegh-Guldberg et al. 2007, Webster et al. 2005).

This species' biology also threatens its own local extirpation. As a gonochoric broadcast spawner that currently exists in extremely low densities in Florida, an Allee effect exists such that there is a low probability of resident colonies' gametes successfully fertilizing in the water column and recruiting (Szmant 1986, M. Chiappone, unpublished data). This Allee effect is supported by the absence of juveniles in Florida.

Statewide Population Assessment – Findings from the Biological Review Group are included in Biological Status Review Information tables.

LISTING RECOMMENDATION

As a relict population at the northernmost edge of its range that meets at least one of the listing criteria, staff recommends that the pillar coral be listed as a threatened species because the species met listint criteria as described in 68-27.001(3), F.A.C.

SUMMARY OF THE INDEPENDENT REVIEW

To be added later.

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Biological Status Review Information
Findings

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Date: 11/30/10
Assessors: Kate Semon, David Gilliam, Margaret Miller

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(a)2. An observed, estimated, inferred or suspected population size reduction of at least 30% over the last 10 years or 3 generations, whichever is longer, where the reduction or its causes may not have ceased or may not be understood or may not be reversible[1]	No information, although assumed to always have been rare.	S	N	Jaap 1984
(a)3. A population size reduction of at least 30% projected or suspected to be met within the next 10 years or 3 generations, whichever is longer (up to a maximum of 100 years) [1]	Based on the low reproductive potential of the current population, and the high level of threats (e) that are anticipated to be accelerated, it is highly likely that the population will have at least a 30% decline over the next 100 years. This species has exceedingly low resilience.	I, S, P	Y	Szmant 1986, Hoegh-Guldberg et al. 2007, Webster et al. 2005, Chiappone unpub. data,
(a)4. An observed, estimated, inferred, projected or suspected population size reduction of at least 30% over any 10 year or 3 generation period, whichever is longer (up to a maximum of 100 years in the future), where the time period must include both the past and the future, and where the reduction or its causes may not have ceased or may not be understood or may not be reversible.[1]	No information, although assumed to always have been rare.	S	N	Jaap 1984
[1] based on (and specifying) any of the following: (a) direct observation; (b) an index of abundance appropriate to the taxon; (c) a decline in area of occupancy, extent of occurrence and/or quality of habitat; (d) actual or potential levels of exploitation; (e) the effects of introduced taxa, hybridization, pathogens, pollutants, competitors or parasites.				
(B) Geographic Range, EITHER				

(b)1. Extent of occurrence < 20,000 km^2 (7,722 mi^2) OR	Extent of applicable state waters (oceanside of Martin County through the Tortugas Bank) is less than 20,000 km2 (667 km X 7.8 km = 5203 km2).	O	Y	Jaap et al. in Riegl and Dodge (eds) 2008
(b)2. Area of occupancy < 2,000 km^2 (772 mi^2)	Based on IUCN Red List guidelines, area of occupancy probably much less than 2,000 km2	I	Y	Wagner et al. 2010, Chiappone unpub. data
AND at least 2 of the following:				
a. Severely fragmented or exist in ≤ 10 locations	Florida reef tract can be considered a single location, subject to threats (temperature extremes, bleaching), or fewer than 5 locations for other threats (disease, hurricane).	I, S, P	Y	Wagner et al. 2010, FRRP unpub. data, CREMP unpub. Data
b. Continuing decline, observed, inferred or projected in any of the following: (i) extent of occurrence; (ii) area of occupancy; (iii) area, extent, and/or quality of habitat; (iv) number of locations or subpopulations; (v) number of mature individuals	Projected continuing decline in area of occupancy (ii) and number of mature individuals (v)	P	Y	Szmant 1986, Hoegh-Guldberg et al. 2007, Webster et al. 2005, Chiappone unpub. Data
c. Extreme fluctuations in any of the following: (i) extent of occurrence; (ii) area of occupancy; (iii) number of locations or subpopulations; (iv) number of mature individuals	Extreme fluctuations unknown, but not expected.		N	
(C) Population Size and Trend				
Population size estimate to number fewer than 10,000 mature individuals AND EITHER	Unknown at this time. Scenario 1: Under the assumption that existing colonies are all mature (i.e., capable of successful sexual reproduction), reports of population size within the Florida Keys has been estimated at 129,000 colonies, and within the Florida reef tract at 0.6 colonies / m2. Scenario 2: Under the assumption that censused colonies are at such low density that fertilization potential approaches zero, the number of mature individuals would be zero, suggesting that Florida's is a relict population.	Scenario 1:E, Scenario 2:S	Scenario 1: N. Scenario 2: Y (population is a relict?)	Scenario 1: Chiappone unpub data, FRRP unpub data, Wagner et al. 2010; Scenario 2: Szmant 1986, Levitan et al. 2004
(c)1. An estimated continuing decline of at least 10% in 10 years or 3 generations, whichever is longer (up to a maximum of 100 years in the future) OR	If either scenario, at least 10% continuing decline is estimated over next 100 years	P	Y	Szmant 1986, Hoegh-Guldberg et al. 2007, Webster et al. 2005, Chiappone unpub. data,
(c)2. A continuing decline, observed, projected, or inferred in numbers of mature individuals AND at least one of the following:	If either scenario, at least 10% continuing decline is estimated over next 100 years	P	Y	Szmant 1986, Hoegh-Guldberg et al. 2007, Webster et al. 2005, Chiappone unpub. data,
a. Population structure in the form of EITHER				

(i) No subpopulation estimated to contain more than 1000 mature individuals; OR				
(ii) All mature individuals are in one subpopulation	Based on data for other broadcast-spawning coral, all Florida pillar coral constitute one subpopulation (if they are mature)	S	Y	Baums et al. 2005, Vollmer and Palumbi 2006.
b. Extreme fluctuations in number of mature individuals				
(D) Population Very Small or Restricted, EITHER				
(d)1. Population estimated to number fewer than 1,000 mature individuals; OR	Unknown at this time. Scenario 1: Under the assumption that existing colonies are all mature (i.e., capable of successful sexual reproduction), reports of population size within the Florida Keys has been estimated at 129,000 colonies, and within the Florida reef tract at 0.6 colonies / m2. Scenario 2: Under the assumption that censused colonies are at such low density that fertilization potential approaches zero, the number of mature individuals would be zero, suggesting that Florida's is a relict population.	Scenario 1:E, Scenario 2:S	Scenario 1: N; Scenario 2: Y	Scenario 1: Chiappone unpub data, FRRP unpub data, Wagner et al. 2010; Scenario 2: Szmant 1986, Levitan et al. 2004
(d)2. Population with a very restricted area of occupancy (typically less than 20 km^2 [8 mi^2]) or number of locations (typically 5 or fewer) such that it is prone to the effects of human activities or stochastic events within a short time period in an uncertain future	Florida reef tract can be considered a single location, subject to threats (temperature extremes, bleaching), or fewer than 5 locations for other threats (disease, hurricane).	I, S, P	Y	Wagner et al. 2010, FRRP unpub. data, CREMP unpub. data
(E) Quantitative Analyses				
e1. Showing the probability of extinction in the wild is at least 10% within 100 years	Not available.		N	

Initial Finding (Meets at least one of the criteria OR Does not meet any of the criteria)	Reason (which criteria are met)
Meets at least one of the criteria	Scenario 1: A3e;B1+2ab(ii,v);D2 Scenario 2: A3e;B1+2ab(ii,v),C1+2a(ii); D1+2
Is species/taxon endemic to Florida? (Y/N)	N
If Yes, your initial finding is your final finding. Copy the initial finding and reason to the final finding space below. If No, complete the regional assessment sheet and copy the final finding from that sheet to the space below.	
Final Finding (Meets at least one of the criteria OR Does not meet any of the criteria)	Reason (which criteria are met)
Meets at least one of the criteria	Scenario 1: A3e;B1+2ab(ii,v);D2 Scenario 2: A3e;B1+2ab(ii,v),C1+2a(ii); D1+2

1	Species/taxon:	Pillar coral (Dendrogyra cylindrus)
2	Biological Status Review Information Regional Assessment Date:	11/30/10
3	Assessors:	Kate Semon, David Gilliam, Margaret Miller
4		
5		
6		
7		
8	Initial finding	Supporting Information
9		
10	2a. Is the species/taxon a non-breeding visitor? (Y/N/DK). If 2a is YES, go to line 18. If 2a is NO or DO NOT KNOW, go to line 11.	DK
11	2b. Does the Florida population experience any significant immigration of propagules capable of reproducing in Florida? (Y/N/DK). If 2b is YES, go to line 12. If 2b is NO or DO NOT KNOW, go to line 17.	N
12	2c. Is the immigration expected to decrease? (Y/N/DK). If 2c is YES or DO NOT KNOW, go to line 13. If 2c is NO go to line 16.	
13	2d. Is the Florida population a sink? (Y/N/DK). If 2d is YES, go to line 14. If 2d is NO or DO NOT KNOW, go to line 15.	
14	If 2d is YES - Upgrade from initial finding (more imperiled)	
15	If 2d is NO or DO NOT KNOW - No change from initial finding	
16	If 2c is NO or DO NOT KNOW- Downgrade from initial finding (less imperiled)	
17	If 2b is NO or DO NOT KNOW - No change from initial finding	No change from initial finding
18	2e. Are the conditions outside Florida deteriorating? (Y/N/DK). If 2e is YES or DO NOT KNOW, go to line 24. If 2e is NO go to line 19.	
19	2f. Are the conditions within Florida deteriorating? (Y/N/DK). If 2f is YES or DO NOT KNOW, go to line 23. If 2f is NO, go to line 20.	
20	2g. Can the breeding population rescue the Florida population should it decline? (Y/N/DK). If 2g is YES, go to line 21. If 2g is NO or DO NOT KNOW, go to line 22.	
21	If 2g is YES - Downgrade from initial finding (less imperiled)	
22	If 2g is NO or DO NOT KNOW - No change from initial finding	
23	If 2f is YES or DO NOT KNOW - No change from initial finding	
24	If 2e is YES or DO NOT KNOW - No change from initial finding	
25		
26	Final finding	No change

Additional notes – Generation Time: Based on the published growth rates (18 to 24 mm / year) and the average size of colonies observed (> 1 m height), it seems likely that the generation time is long, presumed longer than 30 years. Therefore, we adopt 100 years to accommodate 3 generations and as the window of time to consider declines, etc. Population estimate determined by Chiappone (unpublished data) is based on extrapolation from a survey within one habitat type in the Keys, and Wagner et al.'s estimate may be suspect as well. This species' biology, as well as its Florida population structure, implies a very low reproductive potential (gonochoric, broadcast spawner, low fecundity, implying severe Allee effect) (Szmant 1986). This inference is supported by the observed lack of juveniles in Florida populations (Chiappone unpublished data). According to IUCN Red List guidelines for clonal species, we define individuals to be colonies, and area of occupancy to be the total area occupied by those colonies.

Appendix 1. Biological Review Group Members Biographies

David S. Gilliam received his B.S. at the University of Miami in Marine Science/Biology, his M.S. from Nova Southeastern University Oceanographic Center in Marine Biology and his Ph.D. from Nova Southeastern University Oceanographic Center in Marine Biology. He is currently Assistant Professor at Nova Southeastern University Oceanographic Center and a Research Scientist with the National Coral Reef Institute. He is a coral reef and fish ecologist who focuses on fisheries, restoration, assessment, and monitoring, and collaborates with local, state, and federal agencies on projects that have strong resource management goals. He is currently the Vice Chairman of the Coral Advisory Panel for the South Atlantic Fisheries Management Council. Dr. Gilliam has held many grants and contracts, including several which investigate the distribution, population status, and restoration of the federally threatened stony coral, *Acropora cervicornis*.

Margaret Miller received her B.A. in Biology and Mathematics from Indiana University and her Ph.D. in Marine Ecology from the University of North Carolina (Chapel Hill). Her dissertation involved ecological studies of non-reef building coral, *Oculina* spp, off North Carolina and factors that determined their growth and distribution. She began work as an Ecologist with the NOAA Fisheries' Southeast Science Center in 1997 and has served as a foundation for the Miami Lab's growing coral reef program. Dr. Miller is an active field researcher and diver, and has been a primary participant in the federal ESA listing and recovery planning process for *Acropora palmata* and *A.cervicornis*. She is currently engaged as a Biological Review Team member for the federal status review of an additional 82 coral species.

Kathleen Semon received her B.S. in Ecology from University of Georgia and her Ph.D. in Biology from University of Miami. Dr. Semon gained a strong background in coral population and community ecology while conducting coral and benthic macro-invertebrate surveys and assessments across geographical gradients along coastlines of The Bahamas. She was awarded the Smithsonian Institution's Marine Science Network Postdoctoral Fellowship, faciliting her research on cyanobacterial bloom dynamics in coastal and coral reef systems. She is currently the Associate Research Scientist for the Fish and Wildlife Research Institute Corals Program, a member of the Coral Reef Evaluation and Monitoring Program (CREMP), and the Principal Investigator/Project Manager for the ESA Section 6-funded "Monitoring and Mapping of Threatened Acroporid Corals" project.

Appendix 2. **Summary of letters and emails received during the solicitation of information from the public period of September 17, 2010 through November 1, 2010.**

No public comments were received on the pillar coral during the public solicitation for information period.

Appendix 3. Information and comments received from independent reviewers