

Independent peer review of bumphead parrotfish (*Bolbometopon muricatum*) status review

Dr Nicholas A J Graham

Executive summary

Summary of findings and recommendations

The bumphead parrotfish (*Bolbometopon muricatum*) status review was compiled by a biological review team (BRT) in response to a petition submitted by WildEarth Guardians to list the species as endangered or threatened under the U.S. Endangered Species Act (ESA). The biological review team assess whether the species can be listed as having “distinct population segments” (DPS), concluding that it can due to population segments being delimited by international governmental boundaries with differing levels of exploitation, habitat management, conservation status and regulatory mechanisms. The team assesses what a “significant portion of its range” (SPOIR) means for this species and defines what is meant by extinction risk.

The life history and ecology of the species is comprehensively reviewed by the team drawing on a wide range of literature. There are very important discussions of the habitat use of the species, detailing why the abundance of the species may vary naturally within its range. Critically, this is a species with an extremely large geographic range size and a pelagic larval phase in its life history which facilitates high connectivity among locations and re-seeding of locations from which the species may have been depleted. Abundance data from various sources are presented, which range from the species being absent to very large populations in locations such as Wake Atoll in the Pacific, Rowley Shoals in western Australia and the Seychelles in the Indian Ocean. Critical in this section on abundance, is that although the species is clearly very vulnerable to fisheries exploitation, there are numerous pockets of high abundance across its entire range, and many more examples of medium levels of abundance. The bumphead parrotfish grows very large and

can live until ages of 40 years. It is a mobile species, however aggregated sleeping sites make the species vulnerable to exploitation at night. The bumphead parrotfish is a very generalist feeder. Although live coral makes up some of its diet, it is only a facultative corallivore, and thus is not threatened by live coral loss. The BRT present a useful table of potential drivers of carrying capacity for this species, identifying adult sleeping habitat, juvenile habitat, settlement/ recruitment habitat and human harvest as the most likely factors influencing carrying capacity.

The BRT go on to assess current population abundance. Abundance estimates are highest at locations that are remote, uninhabited or protected from fishing. The highest abundance of adults was reported for Wake Atoll in the Pacific. Data on abundance of juveniles are sparser. The BRT use a bootstrap randomization framework to estimate a global population estimate with the data available. This analysis estimated a global population of at least 3.1 million adult bumphead parrotfish, or a worst case scenario of 750 thousand. Two examples of time series data show declining abundance in Palau from 1986 to 1990, and an increase in abundance at Wake island from 2005 to 2009.

Finally the BRT use a plausibility point system to assess the most likely level of extinction risk for this species for 2 windows into the future: 40 years (maximum longevity of the species) and 100 years. The greatest certainty was given to the species not being at risk of extinction now or to both time windows, although the strength of the certainty was stronger for the 40 year window.

Is science reviewed the best scientific info available?

The BRT have utilised an impressive body of scientific and gray literature to compile their review. They have conducted a very professional and thorough assessment of the species' life history, ecology and threats. Using the best data available, they demonstrate that abundances have declined dramatically where the species is heavily exploited, but remain high in many other locations, and that these patterns do not reflect a loss across a significant portion of the species range. The science reviewed and compiled is comprehensive and the best that is available.

Background

The bumphead parrotfish is a charismatic species, which is vulnerable to exploitation due to its large body size, and relatively late maturation. WildEarth Guardians filed a petition on 4th January 2010 to the U.S. Secretary of Commerce, to list the bumphead parrotfish as threatened or endangered under the U.S. Endangered Species Act (ESA). They cited information on life history traits, exploitation levels, documented declines in abundance, increasing human population sizes in coastal zones and reliance on coral for food as reasons to list the species. The National Marine Fisheries Service (NMFS) reviewed the petition and decided that listing the species may be warranted. A 30 day public comment period was therefore opened, after which a biological review team conducted a formal status review of the bumphead parrotfish. This status review is now being peer reviewed by three independent experts.

Description of the Individual Reviewer's Role in the Review Activities

The individual reviewer's role, as detailed in appendix 2, was to deliver an independent peer review of the bumphead parrotfish status review. This was a desk review of the various documents listed in appendix 1, and an assessment of the scientific and grey literature available on this species, also listed in appendix 1. The peer review specifically addressed a list of terms of reference, as detailed below.

Summary of Findings for Each ToR:

Evaluate the adequacy, appropriateness and application of data used in the Status Review document. Describe weaknesses and strengths.

1. In general, does the Status Review include and cite the best scientific and commercial information available on the species, its biology, stock structure, habitats, threats, and risks of extinction?

Yes, the BRT have compiled an extremely comprehensive list of information from scientific sources, grey literature, raw datasets and anecdotal evidence. They comprehensively review the biology, habitat use, threats and risks of extinction using this information. Due to the low abundance and high mobility of the species, the quantitative data available are sparse, limiting the ability to conduct detailed stock assessments. However, the use of multiple sources of information, which all support the fact that the species is still very abundant in multiple locations spread across its range, lend robust support to the final plausibility points assessment.

2. Are methods used valid and appropriate?

Given the sparse nature of the available data, the methods used are commendable. The bootstrap randomization framework to provide an estimate of the global population size is carefully conducted, incorporating a worst case scenario to reflect the uncertainty with the data. The use of time series and harvest data also lend support to the overall picture. The BRT have done a good job of incorporating information from various sources.

3. Are the scientific conclusions factually supported, sound, and logical?

Yes, the scientific conclusions are grounded in solid scientific literature, and sound, logical analyses, given the data available. The plausibility points system is entirely appropriate given the information available.

4. Where available, are opposing scientific studies or theories acknowledged and discussed?

An important point in the status review, which differs from the initial petition from WildEarth Guardians, is that the bumphead parrotfish is not dependent on live coral for survival. Although live coral makes up some of its diet, it is a generalist feeder, showing no selectivity preference for any benthic food item. Therefore individuals can survive in coral reef habitats where the live coral is very sparse.

5. Are uncertainties assessed and clearly stated?

Yes, uncertainty is explicitly acknowledged and dealt with in the status review. For example the BRT did not attempt any population viability analysis due to inappropriate data, and selected methods that were more appropriate to the information available. This included the global population method, providing both the estimated abundance and the worst case scenario to incorporate uncertainty. Also the plausibility points system was appropriate given the broad range of information sources available and the inherent uncertainty.

Evaluate the findings made in the Status Review.

1. Are the results of the Extinction Risk Analysis supported by the information presented?

Yes, the results that there is most support for this species not being currently at risk of extinction or in risk within 40 and 100 years time is supported by the information presented. Although the species is highly vulnerable to exploitation, it is not highly specialised on an endangered habitat type from its diet or other aspects of its life history. Critically, the species has a very broad geographic range and is still very abundant in

many locations across its range. Many of these locations protect the species directly (e.g. bans on fishing in Palau, large networks of protected areas in Australia) or indirectly through bans on specific fishing gears used to target this species (such as bans on spearfishing in the Seychelles). This situation is unlikely to change in the foreseeable future, so the assessment of the BRT seems appropriate.

Conclusions and recommendations in accordance with the ToRs

- 1. In general, does the Status Review include and cite the best scientific and commercial information available on the species, its biology, stock structure, habitats, threats, and risks of extinction?**

The BRT have included and cited the best information available to conduct this status report.

- 2. Are methods used valid and appropriate?**

The methods are both valid and appropriate.

- 3. Are the scientific conclusions factually supported, sound, and logical?**

The scientific conclusions are factually supported, sound and logical.

- 4. Where available, are opposing scientific studies or theories acknowledged and discussed?**

Although, not explicitly stated, the review team highlight that the original petition was incorrect in identifying coral loss as a direct threat to this species, as it is a non-selective facultative coral feeder, and is not dependent on the presence of coral for survival.

5. Are uncertainties assessed and clearly stated?

Uncertainties are clearly acknowledged and dealt with in the most appropriate ways available.

Evaluate the findings made in the Status Review.

1. Are the results of the Extinction Risk Analysis supported by the information presented?

Yes, the results of the extinction risk analysis are supported by the information presented.

Specific suggestions for changes to the status review.

The following are suggestions that may be incorporated into the status review.

Page iii-iv of the executive summary – It is not immediately clear what the results of the plausibility points assessment are stating. I would suggest earlier in the executive summary you make it clear that the purpose of the review is not to suggest the listing or not of the species under the ESA, but rather give guidance for this decision. Then in the statement of the results of the plausibility points analysis make the writing a little clearer as to what each option means and make the final statements that the final category (the species is neither currently in danger or likely to be in danger of extinction to the 40 and 100 year time windows) has most support much more clearly, perhaps in a final paragraph of its own.

The abundances at Wake Atoll, and to a lesser extent Palmyra and Pagan, seem extremely high, when compared to the GBR for example. Could this be a sampling artefact? It would be good to support these figures with a short statement about the appropriateness of the sampling at these locations.

Pages 32-34 on feeding and trophic role. It would be useful to make a stronger statement that the initial petition was incorrect in suggesting this species is vulnerable to coral cover declines due to its reliance on live coral. This was a major point raised in the initial petition, which was incorrect.

Page 48-49 on population abundance. This all focuses on exploitation as the driver of abundance. It would be useful to put this in the context of the other potential predictor

variables of carrying capacity you identified in the table on pages 35-36. These locations are likely to have differing carrying capacity due to juvenile habitat availability, adult sleeping habitat etc... also.

Page 52. Again it would be useful to comment on the suitability of the sampling protocol in the reef check surveys. These are very small fish transects (20*5m belt transects), however the extent and quantity of the surveys gives the data strength.

The risk assessment statements on pages 66-68, I find hard to follow (as in the executive summary). I think the writing in each paragraph could be simplified. I think the final statements in italics are a little lost and could be highlighted more clearly, perhaps in bold.

Related to the last comment, I found the table in Appendix B extremely helpful in understanding the methods and results of the plausibility points ranking. I would suggest moving that table to the risk assessment section in the main body of the document (pages 66-68).

Appendix 1: Bibliography of materials provided for review

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Appendix 2: A copy of the CIE Statement of Work

Statement of Work for Dr. Nicholas A. J. Graham (James Cook University)

External Independent Peer Review by the Center for Independent Experts

Status Review of Bumphead Parrotfish

Scope of Work and CIE Process: The National Marine Fisheries Service's (NMFS) Office of Science and Technology coordinates and manages a contract providing external expertise through the Center for Independent Experts (CIE) to conduct independent peer reviews of NMFS scientific projects. The Statement of Work (SoW) described herein was established by the NMFS Project Contact and Contracting Officer's Technical Representative (COTR), and reviewed by CIE for compliance with their policy for providing independent expertise that can provide impartial and independent peer review without conflicts of interest. CIE reviewers are selected by the CIE Steering Committee and CIE Coordination Team to conduct the independent peer review of NMFS science in compliance the predetermined Terms of Reference (ToRs) of the peer review. Each CIE reviewer is contracted to deliver an independent peer review report to be approved by the CIE Steering Committee and the report is to be formatted with content requirements as specified in **Annex 1**. This SoW describes the work tasks and deliverables of the CIE reviewer for conducting an independent peer review of the following NMFS project. Further information on the CIE process can be obtained from www.ciereviews.org.

Project Description: A Status Review of the bumphead parrotfish (*Bolbometopon muricatum*) is being conducted by a team at the Pacific Islands Fisheries Science Center pursuant to a petition for NMFS to list the species as threatened or endangered and designate critical habitat under the Endangered Species Act. The draft Report of the review team is the subject of the peer review. The draft report will include a comprehensive presentation and evaluation of information on distribution, biology, abundance trends, threats and risks, information on population structure and genetics, and danger of extinction throughout all or a significant portion of its range. The Terms of Reference (ToRs) of the peer review are attached in **Annex 2**.

Requirements for CIE Reviewers: Three CIE reviewers shall conduct an impartial and independent peer review in accordance with the SoW and ToRs herein. The combination of required expertise of the CIE reviewers shall include working knowledge and recent experience in coral reef fish biology and ecology, fish population dynamics, and quantitative risk assessment of endangered species. Each CIE reviewer's duties shall not exceed a maximum of 10 days to complete all work tasks of the peer review described herein.

Location of Peer Review: Each CIE reviewer shall conduct an independent peer review as a desk review, therefore no travel is required.

Statement of Tasks: Each CIE reviewer shall complete the following tasks in accordance with the SoW and Schedule of Milestones and Deliverables herein.

Prior to the Peer Review: Upon completion of the CIE reviewer selection by the CIE Steering Committee, the CIE shall provide the CIE reviewer information (full name, title, affiliation, country, address, email) to the COTR, who forwards this information to the NMFS Project Contact no later the date specified in the Schedule of Milestones and Deliverables. The CIE is responsible for providing the SoW and ToRs to the CIE reviewers. The NMFS Project Contact is responsible for providing the CIE reviewers with the background documents, reports, and other pertinent information. Any changes to the SoW or ToRs must be made through the COTR prior to the commencement of the peer review.

Pre-review Background Documents: Two weeks before the peer review, the NMFS Project Contact will send (by electronic mail or make available at an FTP site) to the CIE reviewers the necessary background information and reports for the peer review. In the case where the documents need to be mailed, the NMFS Project Contact will consult with the CIE Lead Coordinator on where to send documents. CIE reviewers are responsible only for the pre-review documents that are delivered to the reviewer in accordance to the SoW scheduled deadlines specified herein. The CIE reviewers shall read all documents in preparation for the peer review.

Desk Review: Each CIE reviewer shall conduct the independent peer review in accordance with the SoW and ToRs, and shall not serve in any other role unless specified herein. **Modifications to the SoW and ToRs can not be made during the peer review, and any SoW or ToRs modifications prior to the peer review shall be approved by the COTR and CIE Lead Coordinator.** The CIE Lead Coordinator can contact the Project Contact to confirm any peer review arrangements.

Contract Deliverables - Independent CIE Peer Review Reports: Each CIE reviewer shall complete an independent peer review report in accordance with the SoW. Each CIE reviewer shall complete the independent peer review according to required format and content as described in Annex 1. Each CIE reviewer shall complete the independent peer review addressing each ToR as described in Annex 2.

Specific Tasks for CIE Reviewers: The following chronological list of tasks shall be completed by each CIE reviewer in a timely manner as specified in the **Schedule of Milestones and Deliverables**.

- 1) Conduct necessary pre-review preparations, including the review of background material and reports provided by the NMFS Project Contact in advance of the peer review.
- 2) Conduct an independent peer review in accordance with the ToRs (**Annex 2**).
- 3) No later than 15 September 2010, each CIE reviewer shall submit an independent peer review report addressed to the “Center for Independent Experts,” and sent to

Mr. Manoj Shivilani, CIE Lead Coordinator, via email to shivlanim@bellsouth.net, and Dr. David Die, CIE Regional Coordinator, via email to ddie@rsmas.miami.edu. Each CIE report shall be written using the format and content requirements specified in Annex 1, and address each ToR in **Annex 2**.

Schedule of Milestones and Deliverables: CIE shall complete the tasks and deliverables described in this SoW in accordance with the following schedule.

19 August 2010	CIE sends reviewer contact information to the COTR, who then sends this to the NMFS Project Contact
20 August 2010	NMFS Project Contact sends the CIE Reviewers background documents
30 August 2010	NMFS Project Contact sends the Status Report to the peer reviewers
1-14 September 2010	Each reviewer conducts an independent peer review as a desk review
15 September 2010	CIE reviewers submit draft CIE independent peer review reports to the CIE Lead Coordinator and CIE Regional Coordinator
29 September 2010	CIE submits the CIE independent peer review reports to the COTR
4 October 2010	The COTR distributes the final CIE reports to the NMFS Project Contact and regional Center Director

Modifications to the Statement of Work: Requests to modify this SoW must be approved by the Contracting Officer at least 15 working days prior to making any permanent substitutions. The Contracting Officer will notify the COTR within 10 working days after receipt of all required information of the decision on substitutions. The COTR can approve changes to the milestone dates, list of pre-review documents, and ToRs within the SoW as long as the role and ability of the CIE reviewers to complete the deliverable in accordance with the SoW is not adversely impacted. The SoW and ToRs shall not be changed once the peer review has begun.

Acceptance of Deliverables: Upon review and acceptance of the CIE independent peer review reports by the CIE Lead Coordinator, Regional Coordinator, and Steering Committee, these reports shall be sent to the COTR for final approval as contract deliverables based on compliance with the SoW and ToRs. As specified in the Schedule of Milestones and Deliverables, the CIE shall send via e-mail the contract deliverables (CIE independent peer review reports) to the COTR (William Michaels, via William.Michaels@noaa.gov).

Applicable Performance Standards: The contract is successfully completed when the COTR provides final approval of the contract deliverables. The acceptance of the contract deliverables shall be based on three performance standards:

- (1) each CIE report shall be completed with the format and content in accordance with **Annex 1**,
- (2) each CIE report shall address each ToR as specified in **Annex 2**,
- (3) the CIE reports shall be delivered in a timely manner as specified in the schedule of milestones and deliverables.

Distribution of Approved Deliverables: Upon acceptance by the COTR, the CIE Lead Coordinator shall send via e-mail the final CIE reports in *.PDF format to the COTR. The COTR will distribute the CIE reports to the NMFS Project Contact and Center Director.

Support Personnel:

William Michaels, Contracting Officer's Technical Representative (COTR)
NMFS Office of Science and Technology
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William.Michaels@noaa.gov Phone: 301-713-2363 ext 136

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Roger W. Peretti, Executive Vice President
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Key Personnel:

NMFS Project Contact:

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Annex 1: Format and Contents of CIE Independent Peer Review Report

1. The CIE independent report shall be prefaced with an Executive Summary providing a concise summary of the findings and recommendations, and specify whether the science reviewed is the best scientific information available.
2. The main body of the reviewer report shall consist of a Background, Description of the Individual Reviewer's Role in the Review Activities, Summary of Findings for each ToR in which the weaknesses and strengths are described, and Conclusions and Recommendations in accordance with the ToRs.
3. The reviewer report shall include the following appendices:

Appendix 1: Bibliography of materials provided for review

Appendix 2: A copy of the CIE Statement of Work

Annex 2: Terms of Reference for the Peer Review

Status Review of Bumphead Parrotfish

Evaluate the adequacy, appropriateness and application of data used in the Status Review document.

6. In general, does the Status Review include and cite the best scientific and commercial information available on the species, its biology, stock structure, habitats, threats, and risks of extinction?
7. Are methods used valid and appropriate?
8. Are the scientific conclusions factually supported, sound, and logical?
9. Where available, are opposing scientific studies or theories acknowledged and discussed?
10. Are uncertainties assessed and clearly stated?

Evaluate the findings made in the Status Review.

2. Are the results of the Extinction Risk Analysis supported by the information presented?

All information associated with the Status Review document is to remain strictly confidential until the Status Review is posted to the PIFSC website and/or the Federal Register by NMFS.