I Peer Reviewers

Dr. Dean Grubbs
Grubbs Research Lab in Fisheries Ecology

Dr. James Sulikowski
Marine Science Department, University of New England

Dr. Matt Ajemian
Texas A&M University - Corpus Christi, Harte Research Institute

II Peer Review Directive

1. Please provide comments on the scientific information and data contained within the status review.
2. If you believe that justification is lacking or specific information was applied incorrectly in reaching specific conclusions, please specify.

III Summary of Peer Reviews Received

One peer reviewer provided a detailed review of the document without referencing specific sections via a letter. The letter also included unsolicited recommendations regarding whether the agency should list the species. Another peer review provided a line-specific review of the draft document. Finally, the third reviewer provided line-specific review of the draft as well as an overall letter summarizing his review and comments (thus similar general comments and line-specific comments are from the same reviewer).

General comments on the draft report and its major sections as well as line-specific comments are presented in Sections IV and V of this peer review report. All non-substantive edits were incorporated when and where appropriate and are not repeated here. Commenter numbers below do not represent the sequence of peer reviewers listed above.

IV General Comments on the Entire Draft Report

- I find the review is detailed and robust. It is supported be the best available science, the conclusions drawn are scientifically sound and supported by the data. Additional comments are below [see comments under each section intro] and minor edits were made in “Track Changes” to the document.
The impetuous for the listing [petition] appears to be the purported 98% decline by Shepard and Myers (2005) of this species within the northern Gulf of Mexico (GOM). However, based on the information in this document, there appears to be no evidence to support this purported decline. In general, the lesser electric ray appears to be a rare species to encounter during any type of survey over most of its range. However, this is largely due to the habitat preferences (less than 10m), nocturnal activity and cryptic nature (ability to blend in/bury in the surrounding substrate). The only exception appears to be studies by Rudloe et al., (1989a) and Dean and Motta (2004a and b), which encountered large numbers (nearly 4000 specimens for Rudloe) within their respective sampling areas. The study by Rudloe et al. is curious and contradicts the study of Shepard and Myers (2005), as the abundance data is orders of magnitude higher than any other survey data provided in the status report. To me this is a confounding issue, as this would suggest the abundance of this species may in fact be larger then currently estimated by all previous surveys. Although life history information is limited for this species, there is data to support this batoid has a short gestation and potential to produce up to 14 offspring at time. These characteristics would reduce the vulnerability of the electric ray any anthropogenic or natural stressors.

In summary, the scientific information and data contained within the status review is thorough and provides enough detail...

V Comments on Entire Sections and on Line-specific Comments

2.0 LIFE HISTORY, BIOLOGY, ECOLOGY

Comment on full section: The assessment team conducted a thorough review of the published literature concerning the lesser electric ray, recognizing that it is a poorly studied biologically and a data poor species for assessment. With minor exceptions, the best available and most current data concerning electric biology, systematics, habitat use, and life history were included. The team highlighted that there is a need for additional research on this species as age and growth data as well as other life history parameters are lacking

2.1 Taxonomy

Sentence: Rays within the genus Narcine, collectively known as numbishes, occur globally in temperate to tropical marine waters and are composed of at least 22 species (Compagno 2005).

Comment: This is an out of date reference. Several new species have been described since this reference. There are 22 valid species of Narcine according to Eschmeyer’s Catalogue if fishes and Naylor’s Chondrichthyan Tree of Life list 22 species. Three of these have been described since Compagno 2005

2.4 Habitat Use

Sentences: Anecdotal data reveals they bury themselves pretty deep and are firmly planted in the sand with their body acting like a suction cup (Dr. A. Bullard, Auburn University, pers. comm. to
J. Lee, NMFS, August 15, 2014). Dr. Ash Bullard, who has collected lesser electric rays along the coast of Alabama, remarked that even if you prod them they don’t readily swim away.

Comments: “Pretty” deep seems like an inappropriate term, and last paragraph appears to be written to colloquially

2.5 Age and Growth

Sentence: “In March the young born the previous August reappeared in the trawls and grew to the 20-29.9 cm range during the following spring and summer.”

Comment: Were these animals tagged? How do we know these were the same individuals?

2.7 Diet and Feeding

Sentence: Fishes within the order Anguilliformes were the next most abundant prey (30% of individuals), followed by arthropods and molluscs.

Comment: Should arthropods be decapods?

2.8 Predation and Disease

Sentence: Rudloe (1989a) reported that tagged rays released off trawlers were actively avoided by both sharks and *porpoises* that fed heavily on other rays and bony fishes as they were culled overboard.

Comment: Dolphins?

3.0 ABUNDANCE AND TRENDS

Comment on full section: The primary evidence used by the listing petitioners was the assessment conducted for the IUCN Red List that concluded the lesser electric ray was critically endangered (Carvalho, McCord and Myers, 2007). This assessment was based primarily on the analyses from Shepherd and Myers (2005), a widely cited paper that claimed, based on a single fishery-independent survey index (SEAMAP Trawl Survey), that shrimp bycatch had led to drastic declines in small coastal elasmobranchs (including *Narcine bancroftii*) while longline catch of large sharks led to rapid increases in deeper water elasmobranchs. A more parsimonious explanation for such disparate trends is that there had been changes in aspects of the survey design, gear characteristics or temporal and spatial distribution of sampling. Indeed, this is precisely why all available data sets are used in stock assessments. For example, Shepherd and Myers (2005) also reported that bonnethead sharks (*Sphyrna tiburo*) had declined in the Gulf of Mexico by 96% based on this single SEAMAP data set. In the recent stock assessment for bonnethead sharks (http://sedarweb.org/docs/sar/S34_Bonnethead_SAR.pdf), nine (9) indices were use, including the SEAMAP index. Three of these indices were decreasing, five were increasing, and one was stable. If the stock assessment team subjectively chose to only use the one SEAMAP data set, the results of the stock assessment would be very different and inaccurate. Similarly, predictions regarding changes in lesser electric ray abundance based on one index should be viewed with caution until corroborated by additional data. In my view, the sensational claims made by Shepherd and Myers (2005) that fishery effects led to drastic depletions of some taxa and predation release on others should have been rejected outright by
critical reviewers since it was based on data from a single data set that the authors had no part in collecting, with no consideration for alternative explanations such as published changes in survey design.

The Status Review team used all appropriate fishery-dependent and fishery-independent datasets that are available for examining trends in relative abundance of lesser electric rays. This included the index used by Shepherd and Myers (2005). Of interest is the fact that Shepherd and Myers (2005) reported only 78 lesser electric rays were encountered in the SEAMAP survey, but the status review team here documented 351, more than four times as many. Recognizing that there had been multiple changes in the Gulf of Mexico SEAMAP survey over time, the assessment team divided it into three separate indices, Fall survey from 1972-1986, Fall survey from 1988-2013, and Summer survey from 1982-2013. This assessment extends the analysis of these survey data 11 years beyond the analysis by Shepherd and Myers (2005). No discernible trends in relative abundance of lesser electric rays appear in any of the three Gulf of Mexico SEAMAP indices. Even if one truncates the assessment team’s analyses to 2002, the last year analyzed by Shepherd and Myers (2005), the major declines reported in that paper were not replicated.

The IUCN Red List assessment states that drastic declines (95%) in lesser electric rays have occurred in U.S. Atlantic waters from North Carolina to Florida; however, I could not find a reference or analysis to support this. The Status Review Team conducted an analysis of the SEAMAP survey data for southeastern U.S. Atlantic waters. There was high inter-annual variability in lesser electric ray catch rates in this survey and catch rates were very low throughout, but as in the Gulf of Mexico SEAMAP data, there was no trend in the catch rates suggestive of a decline in lesser electric rays. Use of the Atlantic SEAMAP data for long-term analyses is problematic due to the major shifts in effort and changes in spatial effort allocation, particularly the elimination of deep strata in 1991. The Status Review team acknowledged these changes but I am unclear how they dealt with them in the analysis. More discussion is needed for clarity concerning how the changes in effort allocation between shallow and deep strata were treated in the analysis by the team.

The ESA petition and the IUCN Red List assessment also state that there had been dramatic declines in electric ray observations in the REEF diver survey data. This survey is conducted by public divers of varying skill levels and training. Accurate identification is a major issue in these data and in my view they should never be used to analyze trends at the species lever, except for very distinct species such as goliath grouper or spotted eagle rays. These data are likely fraught with errors, particularly for relatively cryptic species like the lesser electric ray that primarily reside in habitats not frequently visited by divers. I have personally witnessed divers misidentify yellow stingrays (Urobatis jamaicensis) as lesser electric rays. Nevertheless, the Status Review team analyzed the REEF database and found that relative abundance fluctuated dramatically between years but found no trend. Again, regardless of the presence or absence of a trend, I do not think this is an appropriate dataset for a species such as the lesser electric ray that does not inhabit areas frequented by divers.

The status review team sought additional datasets that were not included in the IUCN Red List Assessment. Based on SEAMAP data, lesser electric rays primarily inhabit the southern Texas coast and the area from the Louisiana delta to Mobile Bay. Recognizing that SEAMAP may not adequately sample electric ray habitat in Florida Gulf waters due to the extensive continental
shelf and the minimum sampling depth of 9 meters of the survey, the team gathered data from numerous long-term surveys from the Florida Fish and Wildlife Research Institute. However, lesser electric rays were a very uncommon species in all surveys. Trawl data from three regions of the Texas coast were analyzed. One region showed high inter-annual variability in relative abundance but is suggestive of an increase from 1985 through the early 1990’s, followed by a period of relatively high abundance followed by a decrease over the last decade back to the 1980’s levels. Lesser electric rays were virtually absent from two regions analyzed from 1985 until the early 2000’s but have dramatically increased over the past decade. Such dramatic changes in survey abundance often either indicate a major shift in the distribution of a species or some change in the survey. The assessment team should make sure that no survey changes occurred that could account for this dramatic increase in catches of lesser electric rays, but there is clearly no evidence from these data sets that the species’ population is declining.

Based on all time series analyzed by the status review team, including those used to support the listing petition, there appears to be no evidence for a decline in lesser electric rays in U.S. waters.

3.1 Fishery Independent Data Sources, SEAMAP Data

Sentence: Gill nets and bag seines were used to monitor the relative abundance and size of all species caught in each gear in each bay system (Mambretti et al. 1990).

Comment: Why are these gears mentioned if not analyzed? The bag seine data could be of interest for this species. I assume this dataset as not useful because it ended in 1981.

Sentences: When marked ‘Select’, it indicates that each individual was removed from the overall catch and the count is the true number of individuals. Alternatively, when marked ‘Sampled’, the final count is extrapolated using the size of the sample retained compared to the overall size of the catch

Comment: According to the table, select is greater than sampled. Perhaps labels are switched?

Table Title: Annual index of abundance for lesser electric from the Fall SEAMAP Trawl Survey from 1972 – 1986, including observed catch per unit effort (obscpue) and standardized cpue (STDcpue) 95% confidence intervals (LCl= lower confidence interval, UCl=upper confidence interval) (Note that the survey has been conducted annually since 1972; in 1977, 1980, 1981, 1983, and 1984 no lesser electric ray were captured during the survey.)

Comment: What was the method used to standardize CPUE?

3.2 Fishery Dependent Data Sources, SEAMAP Data

Sentence: The low number of animals captured across all years would make the index relatively uninformative.

Comment: OK. But if all animals were caught in 2001 (but not in later years) couldn’t this simple analysis be Somewhat informative? I think a simple histogram if the number of samples over time could suffice here.
3.3 Andectodal Reports

Sentence: He indicated that they are often buried in the sand and describes their habitat as an open sandbar, high-energy beach with good water clarity.

Comment: So, he sees them where they can be seen. This doesn’t mean it is their only or preferred habitat. Is the point here to show that this species can still be observed in the wild?

3.4 Summary

Sentence: This is not surprising based on the description of their habitat use as they appear to have a clumped but patchy distribution over shallow, sandy habitats.

Comment: Sounds like a distribution pattern that would make the species vulnerable to exploitation?

4.0 ANALYSIS OF LISTING FACTORS

Comment on full section: The assessment team thoroughly discusses the five listing factors specified in section 4(a)(1) of the ESA for listing a species as threatened or endangered. My only comment regarding this section is relevant to the paragraph regarding oil and gas exploration and production. The team states that most direct activities by this industry take place outside the range of the lesser electric ray and that the primary direct threat is through oil spills. Though it is true that the drilling platforms and oil rigs are offshore of lesser electric ray habitat, there are more than 30,000 miles of pipelines associated with them. These pipelines run to shore and given that the primary areas of lesser electric ray abundance are directly inshore of areas of oil and gas production off Alabama, Louisiana and Texas, these pipelines must run across lesser electric ray habitat. While the effects of these pipelines on electric rays may be unknown, they could have more of an influence on electric ray populations than threats due to coastal development or fisheries.

Comment on full section: The assessment team thoroughly discusses the five listing factors specified in section 4(a)(1) of the ESA for listing a species as threatened or endangered. My only comment regarding this section is relevant to the paragraph regarding oil and gas exploration and production. The team states that most direct activities by this industry take place outside the range of the lesser electric ray and that the primary direct threat is through oil spills. Though it is true that the drilling platforms and oil rigs are offshore of lesser electric ray habitat, there are more than 30,000 miles of pipelines associated with them. These pipelines run to shore and given that the primary areas of lesser electric ray abundance are directly inshore of areas of oil and gas production off Alabama, Louisiana and Texas, these pipelines must run across lesser electric ray habitat. While the effects of these pipelines on electric rays may be unknown, they could have more of an influence on electric ray populations than threats due to coastal development or fisheries.
4.1 Present or Threatened Destruction, Modification, or Curtailment of Habitat or Range

General comment on this subsection: Although it is likely the geographic areas in which the lesser electric ray occurs are being impacted by human activities, this could be said for most species that share the same inshore habitat. Given the uncertainties surrounding future impacts to coastal areas, predicting how changes to these near shore environments may impact the lesser ray in the foreseeable future would be largely speculative.

Sentence: Routine oil and gas activities generally occur outside of the known

Comment: I think this is a bit misleading. Yes, the wells are generally outside lesser electric ray habitat. But there are 31,000 miles of pipelines associated with these, and many run right through lesser electric ray habitat. So oil and gas activities do directly affect lesser electric ray habitat. The direction (positive versus negative) or magnitude of these effects may be unknown.

4.2 Competition, Predation, and Disease

General Comment: Not sure if this is worth mentioning, but I have observed consumption of electric rays by large Red Drum captured on bottom longlines and dissected. It was not clear whether these rays were discarded bycatch that were opportunistically consumed or not.

Comment on full subsection: No information exists to indicate that competition predation or disease is negatively affecting the lesser electric ray abundance or survival now or in the foreseeable future.

4.3 Inadequacy of Existing regulations

Comment on full subsection: Based on the given information, there appears to be adequate regulatory mechanisms in place to help conserve this species. For instance, no directed fisheries for lesser electric exist in state or federal waters. In addition, future regulations addressing bycatch in federally managed fisheries are unlikely to benefit lesser electric rays given this species inhabits relatively shallow waters, often within the surf zone. However, regulations within state waters may benefit the species.

4.5 Other Natural or Manmade Factors Affecting Continued Existence, Life History and Habitat Use

Sentence: Given that the species reproduces annually (Rudloe 1989a, Moreno et al. 2010) with brood sizes ranging from 1-14 young (Bigelow and Schroeder 1953, de Carvalho et al. 1999, Moreno et al. 2010)

Comment: This is fairly productive for an elasmobranch but this is still a vulnerable life history considering the primary source of bycatch is in shrimp trawls

5.0 EXTINCTION RISK ANALYSIS

Comment: The approach the status review team took with assessing extinction risk is reasonable, given there are no objective or quantitative methods for determining extinction risk, particularly
for data poor species. The conclusions of the team that there is a low risk of extinction currently and in the foreseeable future due to any of the five assessment criteria are appropriate and reasonable. When all available data were analyzed, including those data sets that were initially used in the IUCN Red List assessment that led to a listing of Critically Endangered, no decreasing trends in abundance were found. Having read the original paper by Shepherd and Myers (2005) thoroughly in preparation for this review, it appears the petition to list the lesser or Caribbean electric ray under the ESA is a prime example of faulty science leading to misguided conservation efforts that ultimately take resources away from taxa that need the attention. It is also clear that an updated IUCN Red List assessment for this species is needed given that the 2007 listing as Critically Endangered was based heavily on Shepherd and Myers (2005). Given that the lead author of the Status Review Report for lesser electric ray is a Regional Vice-Chair for the IUCN Shark Specialist Group that conducted and approved the original assessment in 2007, perhaps he can encourage a re-assessment.

5.1 Qualitative Risk Analysis of Demographics

Sentence: Lesser electric rays have a relatively broad distribution in the western Atlantic Ocean generally in habitats dominated by sand bottom substrate.

Comment: Are there not hot-spots in the Gulf of Mexico? South Texas? Easters Louisiana barrier islands?

5.2 Qualitative Risk Analysis of Threats

Sentence: Regarding habitat threats to the species, man-made activities that have the potential to impact shallow sandy habitats include dredging, beach nourishment, and shoreline hardening projects (e.g., groins).

Comment: Pipeline construction: Given that lesser electric rays appear to mainly populate sections of the coast with extensive offshore oil and gas production, I think the team should add a caveat regarding the potential effects of pipeline development on lesser electric ray habitat