GENERAL REVIEWER COMMENTS, AND OUR RESPONSES

LGL ECOLOGICAL RESEARCH ASSOCIATES, INC.

Reviewer #1

Reviewer #1 Comment:

Overall, this project report is a fine piece of work; I had worked with LGL personnel previously, so I was not surprised by its quality. However, I did not expect the breadth of the study (106 sampling sites border to border) and the number of sampling techniques employed (from traditional to state of the art). There were large expenditures of time both in gathering the data and in examining the data. Had I designed this study, I would have used the same methods.

Response:

We appreciate the Reviewers comment, especially given his long history of similar research in the Gulf of Mexico.

Reviewer #1 Comment:

To complete my review, I will expand on a few of the many comments (some important, some not so much) contained in the hard copy of the report that I return to you. Many of my written comments will not be expanded upon, but you will get the gist. I will provide a page number directing you to the subject on which I have expanded commenting below.

Response:

Each individual comment contained in the hard copy of our report has been addressed. These comments and our responses are attached at the end of this section.

Reviewer #1 Comment:

Hydroacoustic Data Processing Methods, pages 12-18. My apologies, but this is largely out of the realm of my knowledge and experience. However, from the bit I do know, their methodologies seem to be scientifically sound. However, the Dr. James Cowan lab at LSU has been doing hydroacoustics in the offshore areas of the Louisiana Gulf for several years, but I can find mention only of Emily Reynolds' and Kirsten Simonsen's efforts. Much of the data processing methods (like noise removal) were developed by Dr. Kevin Boswell while here at LSU and subsequently; no mention of him either.

Response:

This is a fair comment and apologies for neglecting reference to these studies. Additional studies have now been referred to in the revised version of the document.

Reviewer #1 Comment:

Camera Surveys, page 18: Were there any lights on any of the camera arrays, either stationary or towed? Were the camera arrays baited, as is common in such efforts? Were the camera arrays deployed both day and night?

Response:

Sampling occurred during daylight hours. Both camera arrays, stationary and towed, were not baited and without light systems.

Comment:

Vein vs. Vane, page 19: This one is self-evident.

Response:

Noted.

Reviewer #1 Comment:

Vertical Hook-and-Une Effort, pages 21-22: It has been my long experience that, depending on how one ties up (either bow or stem) to a standing rig and the length of the vessel, red snapper catches can vary quite a bit among bandit rig deployments. If nothing else, I would have had one bandit rig each with squid and menhaden at the stern and one of each farther forward.

Response:

Vessel used at discrete sampling sites utilized a dynamic positioning trolling motor to hold position. Orientation of vessel to sampling sites was dictated by prevailing wind and wave directions. Bait and hook deployments shifted around and were not held static as depicted in Figure 12.

Reviewer #1 Comment:

Statistical Analyses and Modeling, pages 26-31: I am a fish biologist and not a fisheries management person, so most of this section was once again largely beyond my ken.

Response:

N/A. Appreciate the Reviewers candor on this issue.

Reviewer #1 Comment:

Growth and Condition, pages 32-33: The authors should have forced their von Bertalanffy growth models through the origin by designating to= 0. The lack of small, young Red Snappers offshore means that your model will not be able to adequately describe early growth; this will affect other areas of the growth curve and your growth coefficients.

Response:

Length at age was modeled with a three parameter Von Bertalanffy growth equation, where to was estimated. Two-parameter versions of this model 3 (i.e., fixing to=0 and estimating only K and L∞) have been applied in the literature and justified with the argument that the age when length is zero (to) lies outside the range of observed data and therefore cannot be well defined. However, Knight (1968) as well as Schnute and Fournier (1980) warn of the misinterpretations that occur when these parameters are regarded as facts of nature rather than mathematical artifacts of a model. As the reviewer points out, to, K, and L∞ are highly correlated; thus, fixing one parameter constraints estimation of the others. Sebastian et al. (2013) demonstrated that fixing to actually increases the risk of biasing K while providing little reduction in variance. In short, biological interpretation of any single Von Bertalanffy parameter in isolation has always been nebulous; using all three to estimate the average length at a given age within the range of the data is still an accepted approach.

Response Sources:

Knight, W. (1968) Asymptotic growth: an example of nonsense disguised as mathematics. Journal of the Fisheries Research Board of Canada, 25, 1303–1307.

Schnute, J., and D. Fournier. 1980. A new approach to length-frequency analysis: Growth structure. Canadian Journal of Fisheries and Aquatic Sciences 37:1337–1351.

Pardo, Sebastián & Cooper, Andrew & Dulvy, Nicholas. (2013). Avoiding fishy growth curves. Methods in Ecology and Evolution. 4. 353–360. 10.1111/2041-210X.12020.

Reviewer #1 Comment:

Discrete Habitats Natural Banks. page 37: Once again based on my extensive experience, Red Snapper populations on the shelf edge natural banks off Louisiana are quite variable both among banks based on depth and location and spottily distributed within a given bank based largely on preferred habitat. I believe the estimate of 39,556 Red Snappers on all the shelf edge banks, dependent on three surveys at three different banks, is a severe underestimate. The 157,151 estimate is more realistic. And I may as well get it off my chest right now: Calling 10-17-year-old Red Snappers "old" (as is done throughout) is just plain wrong! Where are the truly old (30-55 years) Red Snappers? I guess after being overfished for so many years, it will take some years, perhaps decades, until we see any authentic "old" Red Snappers once again.

Response:

We agree with reviewer. Red Snapper in this study are only relatively old or middle aged in the context of their life history. Text modified as suggested. These numbers do seem low for natural banks; however, they were based on just the observed averages. Our modeled estimate for total Red Snapper on Natural Banks was 621,133 (Table 7) and is the value we recommend. Yes, everything is relative, and the definition of an “old” Red Snapper is no exception.

Reviewer #1 Comment:

Reefed Platforms. page 43: When platforms are decommissioned and removed, the explosives used in their demolition at the bottom knocks off all the biota growing on the legs, crossbeams, etc. Really, the rigs look very clean when they are craned up on to the barge that will haul them off and perhaps reefed. Until a reefed platform can grow back this diverse biota, the platform will remain marginal habitat for Red Snappers. Not surprising that there are fewer of them found at artificial reefs.

Response:

We agree with the reviewer. Makes sense.

Reviewer #1 Comment:

Uncharacterized Bottom Habitat, pages 49-54: <u>Even going back to the Great Snapper Count (GRSC), I have been uneasy with how free and fast some are playing with extrapolating a relatively few Red Snapper observations to the vast expanse of the UCB.</u> However, in the early 2000s Chuck Wilson and I proposed that after a few years of residence, Red Snappers would emigrate away from platforms and other high-profile habitats to move to oil pipelines, depressions in mud/sandflats. natural banks, and such (see attached reprint).

Response:

We agree that more uncharacterized bottom needs to be sampled. Nevertheless, the sampling afforded by this study produced an estimate of essentially "unfished" Red Snapper abundance that is within reason.

Reviewer #1 Comment:

SUMMARY AND CONCLUSIONS, page 77: I am very much more comfortable With the LGL estimate of 6 million Red Snappers off the Louisiana coast than I am with the GRSC estimate of 26-28 million Red Snappers. However, both estimates are one shot efforts based on data collected over a very short time span. Then again, the GRSC had very little data from the waters off Louisiana; much of the results was based on extrapolating data from supposedly similar habitats in adjacent Texas waters. I suspect both estimates would converge somewhat were the sampling to continue in Louisiana waters over several more years. The GRSC was also, in my opinion, funded at the behest of politicians to generate, by any means possible, very much higher numbers of Red Snappers in the Gulf than those proposed by NOAA Fisheries. I suspect that part of the mission of the GRSC also was to undermine and embarrass NOAA Fisheries.

Response:

No response.

Reviewer #1 Comment:

LIERATURE CITED: I get the feeling that the authors could have expanded their literature search to update some of their methods for analyzing their data. For instance, they use the growth performance index (φ) to compare Red Snapper von Bertalanffy growth parameters among habits and among regions. <u>A more recent alternative would be to apply Akaike's Information Criterion https:/ / www.scribbr.com /stat istics/ akaike-in forrnation-criterion/.</u> This is what I always used after it was suggested by a reviewer of one of my publications. There are also few recent hydroacoustic articles cited, especially those coming out of LSU. The three articles cited from Stanley and Wilson are of dubious merit.

Response:

<u>We agree that use of the growth performance index to compare growth parameters is antiquated and that AIC is a better approach. The growth index results have been removed from the report. However, a more robust statistical analysis comparing growth and condition will be performed at a later time.</u> For now, visual inspection of differences in growth for various comparisons should suffice. We have amended/added respective graphs to facilitate these comparisons.

Reviewer #1 Comment:

Again, LGL has provided a very, very good report on their activities relative to Purchase Order Number 20004617881 It certainly fills the Louisiana hole in the GRSC, as I am sure you intended it to do! Thank you for this opportunity to be of service to LDWF! I remain at your service!

Response:

Much appreciated!

Reviewer #2

Reviewer #2 Comment:
Scope of Review and Terms of Reference: This document constitutes a technical review of the Draft Final Report; Estimation of Total Red Snapper Abundance in Louisiana and Adjacent Federal Waters by LGLEcological Research Associates, Inc. June 2021 (hereafter referred to as LGL 2021). LDWF asked for this technical review in order to more fully evaluate the strengths and weaknesses of the scientific data and estimates of red snapper abundance in support of management policies for this important species. LGL 2021 noted that the objectives of their contract were to: 1) determine species composition at 106 sampling sites at predetermined locations in the Gulf of Mexico and offshore Louisiana per approved sampling methodology; 2) conduct hydroacoustic, Submersible Rotating Video (SRV), and composition sampling for finfish at the 106 sampling sites; 3) conduct water column surveys at the 106 sites and 4) conduct a mark/recapture study at a subset of six sites (1 platform and 1 artificial reef site in each of three regions). The study was required to be compatible with Stunz et al. 2021 (Stunz, G.W., W.F. Patterson III, S.P. Powers, J.H. Cowan Jr., J.R. Rooker, R.A. Aherns, K. Boswell, L. Carleton, M. Catalano, J.M. Dryon, J. Hoenig, R. Leaf, V. Lecours, S. Murawski, D. Portnoy, E. Saillant, L.S. Stokes, and R.J.D. Wells. 2021. Estimating the absolute abundance of age-2+ red snapper (Lutjanus campechanus) in the U.S. Gulf of Mexico. Mississippi-Alabama Sea Grant Consortium, NOAA Sea Grant. 303 pages). As noted in Stuntz et al. unforeseen circumstances curtailed the plan for sampling in Louisiana by their study. Therefore, they developed an ad hoc estimate based largely on sampling results in waters adjacent to Louisiana in Texas. However, it was determined that sampling directly in Louisiana waters was needed. Thus, the LDWF contract was let to LGL to sample 106 sites during 2020 and provide estimates of La red snapper abundance based on those samples. It is important to note that the scope of this report is to review the LGL results for Louisiana and not to review the results of Stunz et al. The Stunz et al methodologies at both the sampling and overall estimation levels differed (by design) in Texas, AL/MS and Florida from those in LA. While LGL 2021 makes a number of comparisons of their results and methodologies with the Stunz report, the technical review herein focuses on the LGL results using their methodologies. <u>However, since the Louisiana estimates in LGL are based solely on sampling in Louisiana and adjacent Federal waters, whereas Stunz et al. used extrapolated samples from outside that area, this provides some prima fascia support for using the LGL results in support of management.</u>

Response:
We agree with all these scope statements, especially the conclusion of this paragraph.

Reviewer #2 Comment:

Also, it should be noted that LGL 2021 indicated that they were supplied with the locations of the 106 sampling sites. The implication is that these sites were selected based on a stratified random design and provided to LGL and then LGL sampled those sites and analyzed the results based on that premise. While it does not appear to be within LGL's remit to justify the specific selection of the 106 sites, estimation methods that were used or might be used in the future are contingent upon this premise. <u>So, at some point there should some discussion of that selection by the suppliers of the site locations.</u>

Response:

Additional text added on page 1 of the report and the RFP is now attached as Appendix 9. The RFP provides more detail on site selections.

Reviewer #2 Comment:

This technical review will be addressed in three sections. The first section addresses the sampling methodologies associated with acoustic and video sampling to obtain fish density and red snapper proportions, respectively, and the mark/recapture studies. The second section examines the actual estimation of red snapper abundance, how the site samples were expanded to larger strata and comparisons to mark/recapture results. And, the third section is for conclusions and recommendations; in particular whether the LGL estimates of red snapper are useful for integrating into future assessments and management decisions.

Response:

We appreciate this review organization scheme.

Reviewer #2 Comment:

Field Sampling for Fish Density and Proportion Red Snapper: The red snapper sampling frame was defined in terms of region (east, west, central), depth zone (shallow, mid, deep and shelf) and then habitat type (uncharacterized bottom (UCB), natural banks and artificial reefs (including artificial reefs, platforms, and pipeline crossings). Of the 106 total sampling sites, 37 were located in the West Region, 33 were in the Central Region and 36 were in the East Region. Of these, 55 were discrete reef sites whereas 51 were UCB sites (of which 39 sites were uniquely sampled and the other 12 sites were paired with pipeline samples. Total area by habitat type was estimated as: natural banks 724 km2, UCB 49,003 km2 whereas there was a count of 1777 artificial sites known. Final estimates of red snapper abundance were made for the aggregate habitat types and not for finer strata (see Estimation section). Tables 1-3 in LGL 2021 are particularly helpful in understanding the relative sampling that has been applied.

Response:

This is an accurate characterization.

Reviewer #2 Comment:

Note that this reviewer does not have technical expertise in the physics of acoustic signals and the optics of underwater visual camera systems, therefore the criteria being examined are: is the methodology documented in the report? Is it consistent with standard practices employed by others in the field? And are possible biases noted? **In the case of the hydroacoustic sampling, these criteria appear to be fulfilled (see LGL 2021 discussion on pages 12-17.**

Reviewer #2 Comment:

However, from a statistical standpoint I note that there are instances where variance issues are “glossed over”. For example, I am unclear (this may be due to my lack of expertise) about the conversion of signal strength to a number of swim-bladdered fish. LGL 2021 used in situ Target Strength. The methods to determine TS/swim-bladdered fish that were used are not clear. More importantly, is this a source of variance that is measurable and can be integrated into the density estimation? Is it likely to be important? I suspect that these sorts of issues will not impact the point estimate very much but could affect variance estimates.

Response:

Similar to the Stunz et al. paper, in-situ Target Strength (TS) was indeed used. The methods to determine the in-situ TS of swimbladdered fish involve specified detection parameters within Echoview and a number of analysis steps including the decibel differencing process as described in Hydroacoustic Data Processing Methods section (pages 12-17). The decibel differencing technique assists in the in-situ TS process by essentially helping to filter out acoustic data resultant from non-swimbladdered fish and other particulate matter such as plankton, thereby reducing confounding signals. Stunz et al. also employed this technique in their Florida data but did not in their Texas data, which used only a single frequency echosounder.

Reviewer #2 Response Continued:

In terms of the variance, as the data processing uses in-situ TS, a TS value for single echoes is measured after filtering and thresholding the raw data and is used directly in the subsequent density calculations (i.e. echo integration). This differs from when ex-situ TS (in the form of established TS-length equations) is used, in which variance in density can be calculated by applying different sizes of fish, therefore resulting in differing TS estimates. With the in-situ scenario, in theory a change in threshold values and filtering could result in differences in the estimated density and final numbers. The difficulty, however, is that all thresholds and settings are on a sliding scale and are employed at most of the different operators visible in Figure 8. The process of discerning variances due to such changes would therefore become almost infinite, changing each parameter within each operator to determine successive cumulative results. In practice much of the thresholding and filtering is done by subjective scrutinization of the processed echograms by an experienced user and is an iterative process, making changes until signals from obvious non-fish particles are removed while obvious fish remain. Final threshold values are also based on and compared to methods in previous studies. This process does preclude calculation of variances within the raw data, which is standardly not reported. Variance estimates may be calculated from subsequent steps in data analysis.

Reviewer #2 Comment:

Also, the overall goal of the study is to estimate age 2+ red snapper or red snapper approximately greater than 300 mm. I did not see any discussion of the filtering of fish TS relative to size. Again, it may be to my lack of expertise.

Response:

The hydroacoustic data processing primarily uses decibel differencing to obtain in-situ TS and a resultant density estimate of all swimbladdered fish, which is then apportioned by all swimbladdered fish observed via camera surveys to obtain numbers of red snapper. The decibel differencing process to discern swimbladdered fish is as far as one can reliably go within hydroacoustics in picking out the fishes of interest in a mixed species community such as this. This process provides a step towards narrowing potential targets other than red snapper, but TS of individual red snapper still overlap with a variety of other fish. An additional minimum signal threshold is applied to both Sv and TS at -50 dB in the study, which filters out smaller organisms including non-swimbladdered plankton and small swimbladdered fish. Simmonds and MacLennan (2005) describe the range of TS for almost all fish as -60 dB to -20 dB, with the lower end of the range approximating a 4 cm sprat or similar fish. A -50 dB threshold represents a significant change in energy and size from the -60 dB minimum, since TS measurements are on a logarithmic scale, and a difference of 3 dB represents a twofold change in backscattered energy. Additionally, the area of backscatter of a red snapper is attributable to its swimbladder, not the length of the fish as a whole, and very young red snapper are likely to have been filtered out. However, TS remains highly variable depending on size, shape, angle, and tilt of the swimbladder, and consistent filtering of a precise size of fish cannot be done reliably. Furthermore, using in-situ TS entails Sv being scaled by representative TS signals nearby, thereby calculating an appropriate number of fish whether large or small, which is then apportioned using camera species proportions. We believe the possible inclusion of young red snapper in both hydroacoustic and camera surveys is likely to be minimal and have a negligible affect on final numbers of age 2 red snapper.

Simmonds, J. and MacLennan, D., 2005. Underwater sound. Fisheries Acoustics Theory and Practice, 2nd edn. Oxford, England, Blackwall Science.

Reviewer #2 Comment:

The areal acoustic coverage of each sampling site was done by parallel transects. The choice of the amount of area to be covered at each site was pre-specified for each habitat type. In the case of structures, that area extended beyond the location of the natural or artificial structure. To some extent the choice of how much area to include beyond the structure is arbitrary. More area than the structure itself was included to account for daily movement and attraction of the habitat. Possibly some of that area could be classified as UCB rather than structure, but given the large disparity between the total UCB and structure areas, this will be a minor concern. Also, the strength of the LGL approach is that the design is internally consistent. However, I mention this issue because inevitably natural and artificial structure densities arising from LGL will be compared to densities in other areas. In doing so, it should be made clear the exact definitions of the area associated with a structure in LGL's La study versus densities elsewhere.

Response:

On pages 31 and 32, the areas sampled for each habitat type are made clearer.

Reviewer #2 Comment:

Submersible Rotating Videos (SRVs) were conducted over structure sites and UCB transects. Additional composition data was collected by hook and line over structure sites and towed video and longline sets over UCB transects. Most of the observations came from the SRVs (LGL 2021 Table 5). The methodologies were consistent with standard practices and assumed no catchability variation due to sampling. While there may be biases in the sampling, the protocols were consistent and thus, it was felt that catchability effects on red snapper composition would be minimal.

Response:

We agree.

Reviewer #2 Comment:

Estimation of Red Snapper Abundance: The basic estimation method to obtain red snapper abundance estimates was to obtain a density estimate of swim-bladdered fish from acoustic methods from a site, then multiply it by the proportion of red snapper from the SRV (and other sampling methods) samples from that site, then get the "average" red snapper density from all sampling sites within a habitat strata and then finally multiplying that density by the total area of that habitat strata (UCB) or the total number of structures for artificial and natural structures. However, there often was a mismatch of sampling of composition versus fish density in some sites leading to very skewed data. There was a concern that this could lead to bias in the estimates. <u>Therefore, LG modified the estimation methodology in several ways and presented the results for each.</u>

Response:

Accurate characterization.

Reviewer #2 Comment:

LGL's two basic methods were referred to as: 1) Mean Site Abundance and 2) Modeled Site Abundance. The Mean Site Abundance methodology is the basic estimation design outlined in the 1st paragraph of this section. In the case of the estimates for artificial structures, this was the exact methodology used. However, for natural structures and UCB sites the worries about skewness and composition-density mismatch induced LGL to utilize the geometric mean as the point estimates of density and composition. Then these point estimates were carried forward into the expansion to total abundance, as with artificial structures. The Modeled Site Abundance protocols modeled density within a strata as: ln(density)=BX + DZ where B and X were vectors of parameters (including an intercept) and fixed effects, respectively; and where D and Z were vectors of parameters and random effects. Then red snapper composition was modeled as: ln(Proportion RS/(1-Proportion RS))=BX

The suite of fixed effects included oceanographic data specific to the site, depth and region. Final models were chosen using AIC and in the end, the random effects in the ln(density) model were not significant and not included. Total abundance for a strata was the product of the predictions appropriately weighted by the proportions.

Response:

We are glad to see the reviewer was able to follow our methodology.

Reviewer #2 Comment:

The basic results by strata of the two methods are given in LGL Tables 6 and 10, respectively. I am uncomfortable with the use of the geometric mean (GM) in the Mean Site methods. While I understand the reasons for this approach, including it as a point estimate for a strata introduces some inconsistency in interpreting the results. Through the geometric mean inequality, we know that the GM is <= the arithmetic mean (AM). So, mixing some strata with AM's and some with GM's confuses the issue. I would have preferred a presentation of AM results for all strata then if inconsistencies showed (which I expect they did), then that creates support for the Modeled Site method. <u>LGL did not explicitly recommend that the Modeled Site method was preferred to the Mean Site, but their final conclusions focused on the Modeled Site. So, the implications are that the results from that method are preferred. And I agree with that conclusion.</u>

Response:

Apologies for the confusion. Yes, we are recommending that the modeled estimates be used for any decision support made possible by this study. The "raw" arithmetic or geometric mean estimates was more or less a back-of-the-envelope verification that the model was not grossly mis-specified.

Reviewer #2 Comment:

Interestingly, the Mean Site result for artificial structures which used the AM was close to the estimate of the modeled site (1.5 million versus 1.6 million Tables 6 and 10). This is comforting and somewhat expected because the sampling frame for this stratum was reasonably well known and the sample sizes were reasonable. However, the Mean Site estimates using the GM were substantially lower than the Modeled Site. I expect that the Modeled Site variances would be substantially lower than those arising from AM Mean Site variances for natural structures and UCB. Indeed, the reason for using the Modeled Site method was to stabilize the estimates, both point and variance. However, the estimation of variance should be explored further. Variance estimates may become important if the results of this study are to be integrated into variance weighted stock assessment models such as Stock Synthesis.

Response:

We agree and will address further as necessary.

Reviewer #2 Comment:

Finally, I will comment on the mark/recapture results. These studies were conducted at selected sites so the results should be viewed as demonstrations of the degree of congruence between the M/R methods and the Acoustic/Video methods for specific sites. In examining the M/R results I could find nowhere in the report what the elapsed time between release and recapture. Was it hours? Days? Weeks? Nevertheless, the results are not out of line between the M/R estimates and the AM estimates for the specific sites as shown in Figures 20 and 21. The M/R estimates were generated with the sequential Bayesian algorithm. I am interpreting the distributions plotted in Figures 20-21 as the estimated posteriors. In that case the MR point estimates noted on the plots are the modal values. Whereas, the other point estimate on the plots are the acoustic AM estimates. Judging from the implied probability distributions, the modal MR estimates are not inconsistent with the expected values (AMs) from acoustics.

Response:

We agree with the comments and conclusion expressed by this reviewer. The elapsed time between mark and recapture are provided in the last two columns of Appendix 4. Elapsed days ranged from 16 (2 sites) to 19 (2 sites) to 28 total days for 2 sites. Also we have added M/R data to the report in new Tables 5 and 8.

Reviewer #2 Comment:

Conclusions and Recommendations: As in any study there were a number of data analytic filtering choices made especially when determining site densities from acoustics data. Another set of scientists might have made alternative decisions. In LGL 2021 Appendices they mention some of these decisions and alternatives. However, the LGL approach was internally consistent and well documented. Thus, it would be possible to reevaluate at some later time if further research limits the acceptable approaches. Ideally, this sort of survey should be conducted periodically (perhaps every 3 to 5 years?). This would allow results to be viewed as indices with consistent biases (catchabilities) over time and/or provide the research to address and minimize those biases. However, experience shows us that regular periodic surveys of this type are not likely. Therefore, the current results are to be interpreted as absolute abundance estimates for 2020. Given that, I recommend that the preferred estimates of La red snapper absolute abundance at this time be those generated by the Modeled Site method as summarized in Table 10. These estimates were generated from La data using consistent and documented methodologies and not extrapolated from adjacent areas. This provides further support for using these estimates.

Response:

We now have added text on page 28 recommending the modeled site abundance estimates as being the best estimates.

Reviewer #2 Comment:

As we go forward, I would recommend that further exploratory analyses be conducted to better define the uncertainty and variance in the estimates. I suspect that the variance is underestimated both in terms the modeled site approach and the incorporation of variance components in the density estimation (TS-> # fish; % red snapper, etc). Having a reliable variance will be useful in future stock assessments as well as in planning for future surveys. Also, within this uncertainty framework there should be an evaluation of the original site selections as they relate to purported random designs.

Response:

We agree that further exploratory analyses should be conducted as we go forward. All good recommendations!

Reviewer #3

Reviewer #3 Comment:

Additional comments from LDWF internal review
Three primary issues for me:

1) Not enough presentation of the actual data or summary of the information that the final estimates are derived from. Those could be in appendices, but the appendices that I reviewed did not have what I was looking for in order to be able to validate the estimates. The results are presented, but not the data that are compiled to derive those values.

Response:

The actual data were required by the contract to be submitted under separate electronic cover. A hard drive of the data were submitted and accepted by the LDWF. We understood this requirement to mean that LDWF wanted control of data distribution or availability.

Reviewer #3 Comment:

2) The goal was to get comparable data to compare across the two studies. But the LGL hydroacoustic work used different thresholds than the Stunz et al. work, and though that's mentioned, it's not evaluated to see what difference that would make in the final estimates. It's kind of like using MRIP and LA Creel data without having any calibration between them. I don't think LGL needs to match the Stunz et al. process completely, if they have professional reasons to take a different approach. But they should try to explain what those different approaches mean in terms of the resulting stock size.

Response:

The LGL study was not informed of detailed methodology of the Stunz et al. study to enhance comparability prior to conducting data analysis, but did use similar methods to those used by the Stunz et al. study in Florida, including multi-frequency decibel differencing techniques which assist in removing non-swimbladdered organisms and other particulate matter from the data. These methods were not employed in Texas in Stunz et al., from which Louisiana data were extrapolated. Exact thresholds for decibel differencing filtering could not coincide between the two studies, as Stunz et al. used four frequencies and the LGL study used three.

Reviewer #3 Response Continued:

<u>We did indeed use slightly different minimum signal thresholds from those </u>used in parts of the Stunz et al. study, and the choice of these depends largely on the nature of the data. A -50 dB threshold was applied to TS echograms in both studies in order to exclude smaller organisms that were not of interest. Simmonds and MacLennan (2005) describe the range of TS for almost all fish as
-60 dB to -20 dB, with the lower end of the range approximating a 4 cm sprat or similar fish. The LGL study also applies a -50 dB threshold to Sv echograms for the same reasons (i.e., to prevent more signal returns being allowed through than were from fish of interest), whereas the Stunz et al. study uses a -60 dB threshold in this case to help retain fish aggregations while still filtering out a portion of acoustic backscatter from plankton and small fish. This is a rather nuanced matter of methodology, with threshold values being set partly by subjective scrutinization of the processed echograms by an experienced user in an iterative process to obtain targets of interest. As small fish and other targets are not of interest in this study and were not captured in camera surveys used to apportion hydroacoustic data, we found it appropriate to use a stricter threshold. A lower threshold as used in the Stunz et al. study would lead to a slightly higher overall estimate. More detail has been provided and the text has been revised to make this clear.

Reviewer #3 Comment:

3) The discussion of the differences between the Stunz et al. estimates of red snapper on artificial structures and the LGL estimates needs more explanation / review of those differences. It's not possible to compare the two studies, and this is the part of the stock that the fisheries really target most directly. So having a 6- fold difference in those two numbers deserves more analysis than the couple lines that it gets in the report. Some of this might have to do with the prior point on hydroacoustic techniques, but not sure if that's the whole issue.

Response:

More detail has been provided. Reviewer 1 commented that he is much more comfortable with our estimates for Louisiana than those estimated based on north Texas data with the Final GRSC report estimates provided for Florida, Mississippi/Alabama and Texas.