**Comments from Sue Grant on Case Study Working Paper; Sept 2021**

(Our responses are in blue)

As a bit of background, we are working on two companion working papers that will be reviewed together. The first working paper will provide the overarching guidelines on steps / considerations for developing LRPs. The second working paper (the case study paper that you reviewed) is intended to document the detailed case study applications that we used to support developments of the guidelines. Lots of the major issues you raise are probably things that can be best addressed in the first working paper; however, your comments are obviously still relevant to the way we develop, frame, and communicate our case studies.

**Major Comments (from email text)**

**Comment 1:** The multi-metric approach can tackle a range of data sets, from relative abundance (index) data up to absolute abundance. The better the relative abundance BM, the more accurate the results are to identifying ‘true’ status, which is what came out of detailed integrated status assessments. These integrated status assessment results align with COSEWIC results largely (Red=EN, for example). So all the work in the report here can help fine tune these BM. All approaches presented in your paper require expert input in regards to data sets used, relative-abundance BM developed, and final assessment on whether or not MU is below the LRP. So there is nothing additional necessarily in the multi-metric approach, and in fact it will all be automated, so there would be ways to streamline expert-input required including perhaps fine-tuning rel-abd BM’s, so that it would not be required annually. We already can say what CUs are Red in the Fraser, so don’t think anything extra is needed too much. We have run this through experts already, and no major disagreements with statuses. Though if used for this purpose, then more vetting required. However, it goes back to trade-offs: how much work do we want to put into perfecting LRP’s, when we have much bigger issues to tackle in regards to climate change adaptation. We are cashing in on biodiversity now, as hope we have enough to withstand climate change, to some extent; we are going to lose stocks. Further, I imagine if we did a qualitative assessment with experts on all the SMUs, probably very few would be above their LRP. So that means already, we should be thinking about the bigger issues right away i.e. climate adaptation, since writing up detailed rebuilding plans one-by-one will not be efficient**.** The aggregate approach, versus proportional method, does not feed directly into this work for WSP, COSEWIC etc. so creates new workloads, to do identical things: i.e. flag concerns for recovery/rebuilding.

On the point that very few SMUs will be above their LRPs: we can highlight in the discussion of the guidelines working paper that the large number of red statuses in the PSE tool suggest that most SMUs will be below their LRPs, and that there is a need to think about efficiencies when planning next steps on rebuilding plans.

One the point about the aggregate abundance-approach creating new workloads: Our inclusion of these as an option for setting LRPs is based on feedback from the technical working group. For example, North Coast biologists have highlighted their interest in developing aggregate abundance-based LPRs for Skeena and Nass stocks that they can use to support PST requirements. In these cases, there is an existing mismatch between the PST and WSP, so our aggregate abundance-based LRPs have the potential to offer a way to link these together because they attempt to look for an aggregate abundance that has a high probability of ensuring WSP goals for maintaining CU diversity are met. While our plan is to offer methods / guidelines for how these aggregate abundance-based methods can be developed, we are not recommending them as an additional required step for all SMUs. Instead, we present them as a separate, supplemental method available to support some decision contexts.

We plan to adapt our working papers to better describe out current thinking in which the proportion of CUs > lower benchmarks is the primary LRP threshold, and aggregate abundance-based LRPs are provided as a supplemental method when such metrics are needed to support a specific decision context. We are planning to emphasize that even when aggregate abundance-based benchmarks are applied, they should be evaluated relative to proportion-based benchmarks to ensure that results do not differ. So, the proportion-based approach is really a default LRP that any other approaches (such as abundance-based) should be based on and compared to.

**Comment 2:** The multi-metric approach did not anchor the methods in the current paper, and it would be helpful to have more complete comparisons there, since if it gets at the same answers, not sure why this approach would not be considered to streamline workloads for this, since we are already doing this, its complete largely for the Fraser, and is also required for SARA & COSEWIC scales. For example, the Fraser is already largely done. These comparisons are quite limited in the paper and would be good to say for IFC they have already been done, for example, and also Fraser Chum and Pink as examples. I also found it redundant to present two proportional methods, relative abundance versus multi-metric. They are a continuum as the multi-metric does all, and relies on the abundance metrics if they exist to drive statuses for a CU. If they are both included, then a better tie in b/w the two would be helpful to explain this continuum and why you are looking at it alone. The multi-metric produces the same results as the relative abundance, since it is where you go on the tree when you have this information. The advantage of this continuum is that it places all CUs (and MUs) on the same continuum so they can be compared.

While we want to highlight the SoS scanner tool as an option, and make links between it and LRPs under the Fisheries Act, we are hesitant to put this forward as the only way to assess the proportion of CUs above lower benchmarks / red status because it has not yet been CSAS peer-reviewed, and your group is better placed to lead that rather than integrating it into our paper. We have therefore opted to keep the two methods separate for now because we think there is value in having a simple method that doesn’t depend on the larger SoS process. That said, once the SoS process starts to get implemented coastwide, it will likely make sense for analysts to rely on the outcomes of those assessments. We will make some changes to the document to better emphasize that the two proportion methods are on a continuum, and to acknowledge that it is redundant to present both. We will also better highlight how these methods will line-up for the coho case study.

**Comment 3:** I would think we need a consistent and Regional approach to how we assess LRP’s, so we have apples-to-apples comparisons. This is particularly important, since the MU is not the scale to actually develop rebuilding or SARA recovery plans. It is the CU scale. The CU scale can include considerations of component populations for hatchery intervention. They can also be rolled up to habitat groupings across CUs intra- and inter-species. We need to be able to quickly roll up and down to develop meaningful ways forward. Layered onto this is more important work on downscaled climate projections in marine and freshwater to determine what CUs even have a chance under climate change. **So I do worry that different species groups in different areas will be doing things differently, and this work will not be as easy to roll up and down the scales we need**. **I also worry they will be decoupled with the WSP status work we are doing in the Scanner to do this broad scale comparison**. The more we improve relative abundance BM, the better the multi-metric approach will be, and we are developing an easy approach to be able to standardize make comparisons across statuses with different degrees of confidence. For example, if we only have index data and only trend metrics, then this is one factor that would drop the confidence in the status relative to others, same with length of time series, etc. etc. We do need a way, whatever approach we use to place everything on a similar scale, and then rapidly be able to move to the bigger picture, what is worth adapting and what isn’t. With climate change this is no longer about protecting and ‘rebuilding’ every CU, and this is such a big problem, we need to move to a broader scale fast.

As noted above, our current thinking is that the proportion of CUs above red status is the primary LRP threshold, and aggregate abundance-based LRPs are available as a supplemental method when such metrics are needed to support a specific decision context. Our guidelines will emphasize that the proportion-based approach is really a default LRP that any other approaches (such as abundance-based) should be based on and compared to. This last step should help prevent decoupling of the scanner tool from the LRP development.

On the mismatch between SMU-level LRPs and CU-level rebuilding, there are sections of the guidelines working paper (i.e., the other working paper) on “PROCESS FOR DEFINING LRPS AND ASSESSING STATUS AGAINST LRP” as well as a section on “RECOMMENDATIONS FOR FUTURE WORK”. I think we could include some discussion of this scale mismatch in this section. I agree that triggering a rebuilding plan at the aggregate SMU level is fisheries-centric, but given that the trigger itself will come with identification of which CU(s) are driving the LRP breach, I can imagine a case could easily be made for rebuilding plans to really just focus on the relevant CUs when discussing habitat actions, enhancement, etc.

**Comment 4:** The paper as structured is sort of disconnected from all the background on WSP status assessments. To me that would be the foundation, since it directly also relates to COSEWIC, another regulatory requirement we have to feed into, and actually what we are trying to protect (i.e. CU’s as underlying biodiversity). So streamlining how we feed into both and limiting work to the Areas is important. The background seems to focus on how benchmarks are not developed for CUs, as a gap. In fact they exist for all CUs, through the trend metrics. Short-term trend benchmarks apply to all, so they exist for all, same with absolute abundance. The key gap is that CU statuses are not rolled up to MU levels, which while I continue to not really understand this aggregation level, that box apparently needs to be ticked. You have developed a way forward through the proportional method: 100% CUs not in the Red status zone. So think more background on WSP statuses, and then how all these approaches fit within this context would be helpful, since the WSP is still be considered foundational given emphasis on the CU level.

We can revise the background to say that methods have been developed that can calculate benchmarks for all CUs; however, DFO does not yet have a formal CU status for most CUs outside of select Fraser / Southern BC stocks. We can also spend some time better describing WSP status assessments, as well as how they link to the aggregate LRP requirements of the fisheries act to help reduce the disconnect.

**Comment 5:** I’m not exactly sure for triggering rebuilding plans, when and why the aggregate method would be applied. It seems to have challenges in some of the cases you presented where you have results, and so would be only applicable to very few CUs, and would require considerable work on the part of the Areas to implement. If results are compared and they are the same to the multi-metric approach, then I am not sure why this approach would be used. It has been mentioned on calls that Areas might want this approach, but if it is just to trigger rebuilding plans that largely will relate to hatchery and habitat intervention, why not make it easy on the areas and the meaningful work required, to rely on what has been done, and just improve relative abundance BM. Fisheries management is decreasingly playing a role as a lever, and using this alone to justify all this new work by the Areas for this purposes, is out of sync with the information we need for mostly hatchery and habitat intervention.

As noted above, we are planning to better communicate that the aggregate methods should be seen as an additional option available to Areas if preferred, which will make it so that Areas only take on this extra work if they see that there is a benefit to them. Our intention has always been to present a toolkit of options so that there is flexibility for Areas to choose which approach works for them; however, all methods are anchored in needing to ensure that the required proportion of CUs are above lower benchmarks / red status to ensure links are maintained with the WSP. There are some stocks for which harvest is still a substantial management component, and for these stocks, abundance-based LRPs that can be incorporated into harvest control rules and PST requirements may still be preferred.

**Comments Embedded in Word Document**

See LRPs-CaseStudyWP-17Sept21\_sg edits2+KH.docx for most responses. I have just pulled out a couple major ones here.

**Comment :**Re: Coho case study methods. Why didn’t you use the multi-metric approach here? We have this all coded into the Salmon Scanner and can already do this work…seems like a miss to not explain this, but rather do new work that does not take advantage of previous work; do the experts agree with your SR results, lots of issues with the data to estimate BM in the actual WSP status process, but assume others will weigh in on who are experts on these data and analyses?

There are a number of complexities that would need to be resolved before using the Scanner outputs as a point of comparison with the other methods we are using for our coho case study. For example, I received an updated data set from Michael Arbeider this summer that included some substantial changes to the marine survival rate time series. Because the marine survival rate is used in SR modelling for this stock, this resulted in some changes in Sgen compared to what was done previously. In addition, the 2014 WSP assessment used a hierarchical SR model; however, we have opted to go back towards individual modelling for some of the reasons listed in the case study working paper (high sensitivity of HM to hyperparameters on shared productivity distribution; no clear gains for using hierarchical modelling due to no missing data). Given that the goal of our work it to demonstrate the various methods at a high-level rather than to estimate stock status, I don’t know that going down the path of getting the two methods to line up is worth it right now given time constraints. We will however do a better job of describing the overlap between the multi-dimensional status tool and the approach we use for coho in this working paper, and highlight that better integrating / merging these two methods is a high priority for future work.

Happy to talk about this more if you would like. Michael Arbeider and Chuck will be reviewing the next version of the working paper that includes a completed IFC chapter, so there will be a chance to draw them into this discussion then as well.

**Comment:** We wrote in our rapid status algorithm draft paper that maintaining underlying biodiversity is important so it can buffer production during periods of declining productivity, and also ensure we have the diversity to maintain a species through environmental change…However, now we are cashing in on that biodiversity and hoping we have enough to get us through climate change. We will loose CUs, which is why I struggle with focusing on ‘rebuilding plan’ triggers, when we have to step back and look at what makes sense to adapt and what we just will lose. All the money spent on Sakinaw, and we have neglected the bigger picture and if this even makes sense.

We will add some discussion around this point about trade-offs to the guidelines paper. The decision about when it is ok to lose CUs and which ones to lose is a management decision, so is beyond the scope we have to work with in our paper. But, we can highlight that this is a reality, and that triggering LRP breaches based on CU status can take this into account by requiring <100% of CUs to be above red status.