# Specific comments

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| Line 18 | Refs? | Done. Removed this sentence. |
| Line 19 | maybe: (e.g., see X, Y, and Z)  I'd like to see what you mean by indices or proxies, so cite a couple example of each? | Done. Removed this sentence. |
| Line 54 | because.....  tell people why. For example, the surface surveys didn't account for egg layers, etc. We have to remember that we suffer "curse of knowledge" and sometimes assume incorrectly that people understand what we mean. | Done. |
| Line 55 | This is an example of a leading sentence that can cause trouble. "Then the judge said, 'why has DFO done inconsistent surveys over time in what should be standardized scientific approach'?"  Suggest give an example or two of what you mean, and why that occured. | Working on it.. added “due to available resources and departmental priorities.” And added a sentence: “For example, in the early years Fisheries Officers dedicated several weeks/months (?) each year patrolling the coast and looking for Pacific Herring spawn.” |
| Line 56 | for what purpose? Are they "incomplete" in all major areas for indexing purposes? What about a time when we might go to spatial approaches - could longer surface survey time periods be available for some areas? If the answer is no, that is fine, just provide an indication of what you mean.  It also raises the question of how "complete" are the survey data now? | Done. “Incomplete for indexing purposes...” |
| Line 61 | Diagram as a figure? | I don’t think a figure is necessary – this is all described later on, and there are references/links to the spawn survey manual which has figures and descriptions. |
| Line 65 | Actually, only major areas matter at the moment.  Do you mean for purposes of developing an index at the major area scale, the data at smaller scales are combined in a weighted manner to produce a single annual value? | Done. |
| Line 77 | This section begs the question of how the data are combined over locations, sections, statistical area, and finally major areas.  We'll come back to this after reading further... :-) | I think this is OK as is. |
| Line 80 | Well now. And so it begins (Theoden King at Helm's Deep).  1. What data were used? Sampled from where, what years?  2. Any evidence that fecundity has changed over time?  3. Size-at-age has changed over time, what is an "average" female over time if weight at age is changing?  In every case where an equation is derived from a paper, it might be good to give some info for the equation's data:  when, where, how many per stratum, actual parameter estimates and CI's if available, and whether the data are available and the relationship reproducible.  A table with rows as equation numbers could be imagined. For example, was the 200,000 eggs per female SOG samples only? Would HG fish have given the same estimate? | MG Seems like most cases where an equation is derived from a paper, there isn’t much (if any) info for the equation’s data (i.e., the what, were, when, CIs etc). Added some description here for fecundity. |
| Equation 1 | Suggest a table of notation. One column for symbol or "name" and another for units, and finally a descriptor for all quantities in the doc. You could separate them by data, parameter, and constant. Oh yes, and index, like i, j, k indicating their respective ranges, e.g., i=1.,...,N, e.g., j=1,...,N\_i, etc. Whatever is appropriate. See any recent herring model paper with Landmark participating for examples or see me. | Done for this section, but need to update tables in the other sections. |
| Line 86 | I'd actually show the dimensional analysis for each equation.  2\*10^6 eggs/kg X 10^3 kg /t X 1/2.  Assumption is pfemale=0.5. Ain't gonna be neat and tidy if it doesn't.  Is pFemale=0.5, within statistical significance coastwide? Probably.... | Added dimensions/units to the table.  Not sure how to (or if I should) address the pFemale issue here. I think it’s in the ‘uncertainties’ section? |
| Figure 1 | Show another plot with statistical areas for one major area, then sections within one statistical area, then locations within one section. Just an example to drive the hierarchy home. | Done. |
| Figure 2 | Maybe three types A, B, C, then number each box so you can refer to "B3" or "C2" in the text? | Done. |
| Line 90 | On the basis of what? Did these authors establish that fecundity is stable? | No, they/we assume it is unbiased. |
| Line 91 | The statistical framework is not described here. What is the inference assumption? Is it randomization? I'd lay out the complete two-stage scheme in this section, with notation, and identify clearly what is randomized, if anything, and what is assumed. Transects don't appear to be randomized except possibly via the spawn location relative to the first usable transect. Now, are quadrats along transects randomized, possibly in a systematic sample? In the end, are survey sampling estimators used and the non-randomization ignored? Which may have to be the case.... | Jake re-wrote this section with details. |
| Line 100 | Remember you can use "dot" notation in subscripts to indicate summation over that subscript. e.g., if you have a variable X\_ij, then X\_i. means summation over the j. |  |
| Line 100 | Sounds like this is a two-stage systematic with equal sample size in second stage, rather than 1-in-k. There are references for such a design. Also strengths/weaknesses. |  |
| Line 100 | Very briefly summarize the key relationships that were examined in the studies to confirm that the two-stage design is acceptable. I'm literally thinking of a list, or table. |  |
| Line 109 | Then S needs a subscript for location. | Done. |
| Line 111 | determined how? Surface inspection, aerial determination? Scuba confirmation? | Done. |
| Line 112 | Ambiguous. Mid-point of spawn? Ends of spawn? | Done. |
| Line 123 | how? | Done. |
| Line 132 | Improve with respect to what attribute? Too little information gives the suggestion of fudging..... | Done: “improve the accuracy.” |
| Line 140 | First, move this paragraph to occur just before the preceding paragraph. Then integrate the text on "new transects" into the paragraph. Second, this explanation is not what makes this a systematic sampling design. A systematic random design would choose the first transect at random and that determines the choice of all other transects if a 1-in-k sample is drawn. You might argue that the spawn location is "randomized" relative to the transects but that is thin since the habitat likely determines the occurrence of spawn, i.e., the distribution of spawn is not completely at random with respect to the shoreline. | Moved the paragraph, and working on integrating the text on “new transects.”  Haven’t addressed the ‘systematic sampling design’ issue yet. |
| Line 141 | You have two cases of surface spawn. First, the pre-1988 case. Second, current day practice where dive survey is not possible. Distinguish these cases to allow a clear description of how the pre-1988 data are combined into an index, and how the current data are combined with dive survey data to produce an index. | Done. |
| Line 146 | Do the surveyors follow a repeatable protocol to do this? Reference? | Based on the paragraph, it seems clear that they don’t follow a repeatable protocol. |
| Line 151 | Is this peculiar to "surface spawn" or also used for dive sampling? | Done. Moved up to ‘sampling protocol’ section – applies to both surface and dive. |
| Table 1 | Ok, those first two jokers in 1987 are probably unreliable. I'd like to see the following: for every relationship describe the data and methods used. I can't recall if confidence intervals or a S.E. was provided for the egg layers? | These don’t seem to be available, at least that I can find. |
| Line 193 | OK, maybe a description of the transect lines should proceed this? For example, does each transect line have a shoreward "anchor point" to start the transect chain such that the "first 5 m mark" is consistent from year to year for a given transect? | Done. Added a footnote. |
| Line 194 | What is these occur mid-transect? Really, then, the survey would be an underestimate of spawn even if performed perfectly. I'm assuming the same is true of the deep end... |  |
| Line 204 | This is almost devoid of information. What is happening here? Take your time, add a few lines and describe the meaning of "along transects", "their judgment", "spawn metrics". | Link to surface protocols section. |
| Line 205 | Obtained from where? | Done. Field data sheets. |
| Line 207 | Would it be instructive to have a worked example? So, for a given major areas, work up from the "sample" level to the aggregated index for a year? You don't need to do all locations for example, just one to illustrate the calculations, maybe plotting each step? Then plot the estimates at each level of aggregation leading to the ultimate annual value? | Have some examples in the figures of egg layers to egg density, and examples of locations, section, and stat areas. |
| Line 208 | What is a sample? We just finished talking about quadrats in Section 4, now sample is introduced without being clear what it is.... help. | Done. Added the definition of a ‘sample’ in the sampling protocol section, and a reminder here. |
| Table 2 | Suggest redoing table with all notation for the section. You have "indices", each of which has notation and a range, e.g., j=1,..., J. You have variables like Layers\_i. All have a descriptor. | Done. |
| Equation 3 | EggLyrs has a subscript j. Thus, EggLyrs\_ij is correct. Watch for other instances at various levels of the sampling hierarchy. If you want to suppress a particular dimension, tell the reader you are doing so. | Done. |
| Equation 4 | Again, based on data from when and where, how much, does this regression have variance estimates for the parameters, a figure showing relationship, is it reproducible or now lost in time? | Have a figure showing the relationship. The other info seems to be lost in time. |
| Footnote 1 | Why this comment? It is cryptic, is there a mistake in Scweigert et al. that is being corrected, or ....? | Made this more clear: “There is an error in Schweigert et al (1997); surface egg density is in thousands per square metre...” |
| Equation 5 | EggDens has a subscript s....  Maybe look in a survey sampling book for two stage systematic to get notation? | Done. |
| Line 225 | Yikes. I'll be curious how median is justified. Now have read it in appendix. Yikes. Some EDA required to support the approach. This could be problematic if sample sizes small. See appendix for suggestions. |  |
| Equation 6 | Is the hat indicative of something that the bar doesn't define? So, a bar is conventionally a mean, the hat is generically an estimate. Is this what is intended? | Removed the hats. |
| Equation 6 | Does the dimensional analysis work here? i.e., does tonnes actually result? I haven't checked it. | Yes. |
| Line 229 | Reference Figure 2 where I suggested a numbering scheme like B3, etc. It would be helpful for each of the sections/sub-sections describing calculations if the step in Figure 2 was referenced by such a code. "This section describes step B3 of Figure 2". or similar. | Done. |
| Line 230 | This is the second time "spawn metrics" has appeared. I do not recall a sentence explaining what is meant. Remember the Curse of Knowledge. Your audience may not be so blessed. | I’m using ‘metrics’ as in a measure of quantitative assessment. Added this definition to the document. |
| Table 3 | P has a bunch of subscripts.... within "sample", within transect, within section, within location, etc. Tell your reader when you are suppressing subscripts and which ones. This looks as tho there are the same number of plants P in each sub-unit. Same for T. Your notation table should define them, then in text you could say you are suppressing subscripts corresponding to x, y, z. etc. | Done. |
| Line 233 | Would a diagram be helpful to show the various distance measures for an example spawn section? | I think this is OK as is. |
| Line 234 | It would be really helpful to give a vertical list of the steps you are going to preform in each section where there is a long list. Not in gory detail, that is the job of the equations, but rather the basic flow of the subsequent equations, starting with what the observed variables are, then the major steps to move from observed data to some summary statistic. | Done. Added a flow diagram. |
| Line 235 | Actually, Swath\_t. It just happenes to be 2 m at this time, until some bright light changes it.... | Done. |
| Line 237 | Divers cannot collect mean height, that is a statistic calculated from observed data, i.e., mean of plant heights.... or, if not, what is being done?  Same for mean number of egg layers. Surely they count egg layers and record, then the code takes means... | They actually do. I changed the wording to “divers estimate summary statistics”... |
| Equation 8 | Are the number of plants completely enumerated along the transect? Or just in the "sample" or quadrat? If the latter, then this is not the total number of stalks per transect. Explain. | Yes, all plants in the swath are counted. I made this more clear. |
| Line 239 | Equation please, unless this is observed data, in which case the table of notation should show it as data. | Done. |
| Line 241 | A long sequence of steps follows. Why not tell the reader what you are attempting to estimate, then so "tada" here is how it is done. | Done. |
| Line 242 | What happens if there is more than one Macrocystis bed in the spawn? Don't you need another subscript for the bed.... b=1,..., B\_s ? | Done. No, the spawn number is specific for the spawn type (surface, macro, under) – so each type has it’s own spawn number within the Location. I think this is clear from text I added under the Sampling Protocol section: “Spawns are numbered s = 1 , 2 , 3 , ..., S\_lxy where S\_lxy is the number of spawns at a given Location l for a given spawn survey type x (e.g., surface, Macrocystis, or understory) in a given year y.” |
| Equation 10 | And how might Area be calculated? As LengthMacro\_s \* mean(Width)\_s? Equation please.  I can see some spawn geometries brining in some error here. | Done.  Mentioned spawn geometry errors (length and width) in Uncertainties. |
| Line 246 | This is the total observed plants, not the total plants. What about the plants in all the "transects" that you did not observe? Where's the expansion? | Done. |
| Equation 15 | OK, so there are two ways to do this. Sum the stalks, total the plants, and divide as shown here. The other way is the mean of the stalks per plant. Like ratio of means OR mean of ratios estimators for CPUE. Justification for this choice? | Added this second option to the Future Research section. |
| Line 252 | This is only useful if you also tell us what the units of the predictor variables are.... | Done. Units are in the tables. |
| Equation 16 | Again, same again. A little info on when, where, how many, S.E.s of parameter estimates, explained variation, etc. Maybe a plot... Can it be reproduced with the same data? Lost in time? | Lost in time I think. |
| Equation 18 | Does the dimensional analysis work? In fact, for each complex equation, you may wish to have a table with rows as equation numbers and the dimensional analysis. | Yes they work. Units are now in tables. |
| Line 262 | How come algae has a subscript "a", but substrate does not? | This should now be clear in the text: quadrats can have several algae types, but only one substrate type. |
| Equation 19 | Again, when, where, how many, parameter estimates and SEs, a figure. This is a goofy looking regression, 0 intercept (does the plot suggest that is so?) and is it reproducible or lost? | Seems to be lost in time. |
| Line 267 | Here is where the dimensional analysis does not work unless you note that it is a 1 m square quadrat.... units. Always units. They could be in the global table of notation. Subscripts missing here too. | Done. |
| Equation 20 | Are these models fit on the log scale and back-transformed? Everybody do their bias corrections correctly? Again, the usual, where, when, etc. I'm worried about the stability of some of these relationships over time. Maybe not a problem, but is anybody collecting information on egg size, or plotting trends in layering, etc.?  This one looks like it is a separate intercept for each algal type, be good to see figures for all relationships as previously noted (sorry for redundancy). | Done. |
| Equation 23 | In general, when you use previously defined quantities, try to help the reader by deferring back to the defining equation. EggDens\_q happened to be a few lines above, but others won't be.... | Done. |
| Line 284 | EggDens\_q is total understory egg density per quadrat form Eq. (22), | I added this detail here, but I should add details like this for all the other equations. |
| Line 287 | Is that what is happening here? I don't see it. Each transect is getting equal weight 1/Q. Further, it seems the assumption is that that all quadrats along a transect have the same mean egg density since that is being multiplied by the width. If I observe 5 quadrats, take the mean, and then multiple by the width, then each quadrat has the same mean density by assumption. Evidence that is reasonable? | Done. |
| Equation 28 | Do the dimensional analysis. Just to be sure... :-) | Done. |
| Equation 30 | This has to have subscripts for r and y, if the result has subscripts r and y. | Done. |
| Line 314 | What about spawn on bough? Negligible? | Done – added text to include SOB. |
| Line 319 | Really? Evidence that it is substantial? There are two issues here:  1. Mortality of spawning fish during ponding operations (a "catch" mortality).  2. Accounting for the biomass of spawning fish by counting eggs from SOK.  The latter is the relevant issue for this report. The sustainability argument is for later, drop it. | Done. Reworded this sentence: “Although SOK fisheries do not directly remove spawning Pacific Herring, they do remove eggs that could otherwise have contributed to recruitment.” |
| Line 324 | The egg deposition survey is to account for spawning fish that must have been present. Who cares if the eggs are removed if they are accounted for? The effect of that removal of eggs will be reflected in a few years when the adults from the current year begin to spawn and their eggs are surveyed. We do care about mortality of adults during ponding, etc, because that applies as removals to current year. | True. |
| Line 327 | Sorry, this makes no sense to me whatsoever.  1. Estimate the eggs deposited due to SOK, and convert to biomass. add to other sources in the index.  2. Estimate the adult mortality incurred by SOK fisheries and add to catch-at-age for current year because they are not available in subsequent years. it's like these fish have a discard mortality rate.  The sentence reads as tho you are giving the future spawning biomass credit for eggs that were removed from the deposition. They are dead Dave, all of them.... (Red Dwarf). That's like giving future biomass credit for eggs eaten by seabirds and crabs. Maybe I'm not understanding something - reword? | Done. Re-written to make more sense. |
| Line 340 | What's all this for? Are you trying to say that the method for estimating eggs deposited for SOK relies on measuring product weight which requires accounting for kelp weight and processing weight?  Or you could sample the product and count eggs using similar methods to that used in the field. No need to adjust for kelp and brining, only a mean density and an estimate of the number of fronds or stalks or whatever. Which could be accommodated by mean product weight, i.e., on average a "box" of product contains 10 fronds, on average the number of eggs/frond is X., etc.  If the product must be weighed, then how stable is egg weight over space and time? | Yes, but there are multiple ways to do this as you suggest. Probably strengths and weaknesses for each method. |
| Equation 31 | Dimensional analysis? | Done. |
| Line 347 | Seriously? This has to be a very small number (hello rounding error). Would it not be something like the average number of eggs / kg for a conversion factor? | Yes, seriously. The report says the average is 0.00238 g. |
| Line 353 | This could possibly be illustrated by obtaining all similarly quantified fecundity data and plotting over time and space. If the samples were highly restricted in time and space, there's a potential problem to put on the worry list.  Further, you can test sensitivity of the index to such things by drawing values from the error distribution of the fecundity relationship, think of drawing from a Bayes posterior - you may not have that for the regression, but you probably have a (log)normal density to draw from... | That’s a good idea for if/when we try to address some of these issues. |
| Line 353 | You have data for this? If so, plot it over time and space. | No data; these are just things that ‘could’ affect the spawn index. |
| Line 355 | reference here please | Done. |
| Line 356 | Ref here | Done. |
| Line 361 | Careful, if this is true, why haven't the index calculations been updated to reflect that understanding. This is hypothetical unless you can cite specific examples. | Hypothetical. Done. |
| Line 364 | Who did what? | Done. Added “who estimated the variance.” |
| Line 366 | No, the observed data may have measurement error (not quantified here). Statistics or parameter estimates have uncertainty, i.e., anything above the level of the observed data. I'm not sure this is a risk. What is a risk is that the model will interpret it as being more certain than it is, hence the estimate of status and future prognosis will be artificially precise (ignoring bias for now, which is probably there too). | Added this issue (over precise in a modeling framework). |
| Line 370 | You can't control those. You might want to observe data to check for non-stationarity. | Good point – done. |
| Line 372 | This should have been done in the source papers. If not, yes, then this will help with sensitivity analysis. A first question is if the existing  relationships can be reproduced. I would try, as a $35M fishery depends on it, as well as socio-cultural values. | Should have been, but can’s see where – seems to be lost in time. |
| Line 373 | Meh. I maybe wouldn't go there first. Sensitivity first I think. For (3), one would have to have specific questions. Also, no good bootstrapping when you are not sure whether the sequence of equations is still relevant. | Maybe not, but I’m going to leave this in. |
| Line 374 | Here you go, what is the sequence of calculations most sensitive to? Then you know where to invest in data and analysis. But as there is a feedback simulation, you can also see if it matters to the decision before you do... | Thanks. |
| Lines 375 to 382 | Delete. Another paper, I think. Fill your boots if you wish. | I’m going to leave this in too. |
| Line 384 | How will quantifying uncertainty help with accuracy? Experimentation might help with accuracy. | Edited, done. |
| Line 385 | A little awkward, re-write? | Done. |
| Line 391 | You can answer this question now, with existing data by doing calculations both ways and comparing. | I’m not sure what you mean, but I’m going to leave this in for now. |
| Line 398 | I'm being picky here because no evidence is presented that demonstrated higher precision with more survey effort. Maybe precision doesn't increase, and in any case, you don't have a means of quantifying it yet. | Good points. Done. |
| Line 401 | As requested above, a table summarizing this issue would be good... We know little based on the years of the references since they tell us nothing about where, when, how much data, etc. |  |
| Line 403 | make a list, you'll find there are more. | These are just some examples, I think it’s Ok as is. |
| Line 404 | Summarize in a table as suggested. | Again, these are just some examples. |
| Line 406 | Could be, maybe sampling error dwarfs uncertainty in the regression relationships. A systematic plan to resolve this would be a next step. | Changed from “should” to “could.” |
| Line 408 | There you go! Although the parameter estimates and their error estimates are probably sufficient statistics. You won't need to redo each regression each time you calculate the index unless you are adding new data over time and space. | Thanks. |
| Line 409 | This seems important. I worked on these data 30+ years ago and never saw the calculations. I am a little surprised that there is no survey sampling expansion. It seems means are used and then applied to an approximation of the area, which I think are assumed rectangular (length times width). I'd have to re-read to see if that idea is correct - it may not be. IDK. I think some playing with diagrams would probably help. I view a spawn as a field of potential quadrats to sample from, and then expand by sampling fractions. That is not what is being done here, I don't think. It is more like it is being treated as a simple random sample (find a mean and multiple by area). you can correct me please. |  |
| Line 411 | Explain more please. |  |
| Line 419 | More details that are not documented here? | Done. Revised. |
| Line 424 | Then why not include the R help files in an appendix? i.e., make this reproducible research by actually making things an R package. | Done. |
| Line 559 | OK! Well, probably good to note where the underwater estimates come from.... are you applying recent observation to historical period? What evidence is there for consistency of spawn width over time at a range of abundance levels? Plot of widths per transect over time? |  |
| Line 563 | The issue is not that the data are not normally distributed. It is that the distribution is skewed so somebody though a rank-based method like the median would be good. However, the efficacy somewhat depends on the sample sizes (number of transect widths). I'd do some plotting to see if the mean, or a trimmed estimator (say trim the first and last 10% or something). The median is a 50% trimmed estimator. I'm having trouble here since I don't know the typical range of the data. For example, 4-6 transects per spawn, or 20+? Hey, you know a table summarizing the counts of various levels of the sampling within each area, stat area, etc. might be helpful early on in the doc. Some might vary by year, but then just indicate the range. | Changed to “We summarise spawn width by the median because widths are skewed.” |
| Line 569 | Does the median change a lot? | Not sure, but I added this to the Future research section. |
| Line 576 | This is a metric "chain". | <https://en.wikipedia.org/wiki/Chain_(unit)> |
| Line 611 | So now you need to reassure people that it is standard maintenance to re-measure the chains to confirm that the shrinkage problem has not returned due to another change in manufacturing. |  |
| Footnote 4 | I think what might be happening is that the first season was a reduction of 1 m per 20 m segment. But the chain kept shrinking in subsequent years of use, and measurements at some point suggested ~15%. Then, it reads as tho there was a further 15% shrinkage until the lines stabilized. The issue with the R script should be easy to find - plot the transects before and that step. If on the 1:1 line then they weren't touched and you can select which ones are 1:1 to sleuth it out. | Done -- this is addressed in the table of spawn width correction factors by SAR and year. |
| Line 638 | Were the induced changes significant or negligible in terms of the index values? | No. Added “These changes had negligible effects on spawn index values.” |