Review: Identifying optimal translocation policies given factors associated with adult spring-run Chinook salmon transclocation mortality.

Review:

This MS conducted GLMM analyses to evaluate factors associated with translocation mortality, and used this information to identify optimal translocation policies that minimize mortality risk and effort. The approach is sound; however, model description and data analyses are insufficient to evaluate validity of the model. The 21 model hypotheses are not really hypotheses, but merely casual justifications of considering those as predictor variables. If the authors were really try to test those hypotheses, authors should have (1) experimentally change predictor variables (say, use different trucks, change handling time, change loading density, etc), and then (2) fully conduct null-hypothesis testing regarding each hypothesis and reporting them. But, reality is more likely that that authors collected all data associated with normal translocation operations, and tested statistical significance between each variable and observed transplanting mortality. Variations of operations did not come from experimental planning but came from natural variations came from the normal operations. Simultaneously, if the operation variation are random effects, identifying optimal policy becomes difficult because policy choices should be fixed effects: (i.e. comparing policy 1 vs. policy 2 vs. policy 3 vs….). I reiterate that nothing wrong with this post-hoc approach. But, I am pointing out that correct interpretation of this MS is using GLMM and identifying variables that are controllable by operators and are associated with translocation mortality, not hypothesis testing nor policy setting.

Regarding the GLMM analyses, description of model selection and reporting is too minimal to discern exactly evaluate the results. The authors assigned some variables as fixed and others as random; however, separation of random vs. fixed were unclear. I would like to see a model equation, to see exactly what was done. For instance, the authors did not report the number of events they observed for this analysis. Sample numbers provides crucial implications in evaluating GLMM as well as policy implications they suggest.

GLMM's objective is to identify variables that are controllable by operators and make policy, sensible approach is (1) identify controllable variables, (2) evaluate those with GLMM, and (3) add random effects. Table 3 to show fish density, loading and Total handling time are important. But, total time handling is confounded with loading time (total handling time = loading time + hauling time), and hauling time was not good predictor. This means only fish density and hauling time are significant predictor. (I am not sure if they can control mean daily discharge of degree days from first fish.). The authors show statistical significance of parameters (Table 4); however, the most important thing should be contribution of those parameters to transplant mortality (e.g., how much improvement of transplanting mortality would you expect by reducing loading time in half?). Figure 2 and 3 shows that expected transplant mortality (solid black line) is flat, suggesting that those variables would have little effects in changing transportation mortality. Wider and higher prediction interval form at higher density or loading times are mostly the lack of sample data in those regions, not due to an increase of expected value. Given reading of the figures 2 and 3 loading time and density do not seem to matter about increasing risk of transplanting mortality under the observed operation.

As for policy utilities concept, please explain how minimum and maximum mortality risk was derived. I am also not sure if normalizing it makes sense in decision making. For instance, utility of mortality risk 0.01 is the 0.65 whether the min and max mortality risk is ranging (0.00995,0.001005) or (0.00,0.02), but surely managers would not care if the range was the former. As authors noted (line 264) "is a mortality rate of 0.005 versus 0.01 meaningful within a manager's decision-making process?" To make a good policy utility matrix **useful to managers**, author should first find out mortality range matters to manager's decision-making process. Then, build a utility function that is clearly interpretable to the manager.

I reiterate that the authors' approach is sound. However, there are too many issues in executions, presentation, and interpretation of data and statistics, as well as development of utility functions.