Regarding the Precision of an Estimate of the Amount of Rock Lobster Poaching Obtainable using the Amahlo approach

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February 2016

Summary

An illustrative computation is developed for the precision of an estimate of the amount of rock lobster poaching using the Amahlo approach. Using initial coarse estimates provided by Amahlo of typical numbers poached per day and the number of units (vessels, etc.), a CV of about 15% is indicated. However care should be taken in interpreting this in the light of the difficulties of evaluating Amahlo's data gathering approaches in a manner that readily provides the values needed to estimate the precision of a final estimate of rock lobster taken annually by poachers.

Introduction

For west coast rock lobster assessment purposes, it is desirable not only to have an improved estimate of the present amount poached annually, but also an estimate of the precision (e.g. CV) of that estimate. A further consideration is that obtaining such an estimate using the Amahlo approach will be costly, with higher cost operations bringing greater precision, so that it is important to establish the trade-off between cost and precision, which in turn can be factored into assessment and OMP computations to assess the value of having this information.

Amahlo use an "Activity Based Intelligence" approach to obtain their results. This approach is very different to the norm for scientific estimation, and understandably in discussions the two "sides" present both struggle to follow the others *modus operandi* fully. Improved understanding will no doubt come about in time, but at this stage it is important to stress that what follows in very much by way of a coarse first cut analysis.

Data and Methods

The approach to estimate the amount poached per area (P) may be characterised as follows:

$$P = \sum_{i=1}^{3} a_i b_i \tag{1}$$

where a_i = amount poached per day[1] and b_i = number of poaching units (vessels, etc.). It is assumed that the a_i and b_i estimates follow normal distributions with means and CVs as given in Table 1. Note that all the values in this Table are coarse estimates; they are based on one area where Amahlo have made observations, and would not necessarily apply to other areas.

A distribution for P is then generated from 5000 draws of replicates using equation (1).

Results and Discussion

For presentation purposes, results have been normalised to have a mean of 1. The median of the distribution is effectively identical to the mean, and the CV is 0.154.

Figure 1 shows the corresponding estimated probability density function, produced using a normal kernel smoother.

To determine the relative contribution of each poaching source, we calculate:

$$w_i = \frac{a_i b_i}{\sum_{i=1}^{3} a_i b_i} \tag{2}$$

which yields relative percentages for commercial vessels, small vessels and subsistence of 68%, 29% and 3% for this example.

Clearly though, the 15% CV result is highly dependent on the inputs for the CV's of the a_i and b_i in Table 1. Amahlo stress that they have difficulty in converting their appraisals into representations on the level of uncertainty of this form. Equally, when asked how these CVs would change were they to receive only half the funding on which their initial estimates were based, they responded that they would prefer to discuss the best research strategy with the WCRL SWG first, because this raises the issue of the trade-off between intensity of coverage, and number of areas to be covered.

Reference

Amahlo Consulting, January 2016. Proposal Assessment: Quantification of Poaching Estimates – West Coast Rock Lobster.

[1] Per day values have been used since it is a simple task to determine exactly how many days in total the vessels would have been able to go out to sea.

Table 1: Initial "typical" estimates provided by Amahlo Consulting pers. commn.

i	Numbers poached per day	Number of units	CV for a_i	CV for b_i
1 – Commercial vessels	5 500	9	0.2	0.05
2 – Small vessels	1 200	18	0.2	0.05
3 – Subsistence (using bakkies)	120	20	0.5	0.5

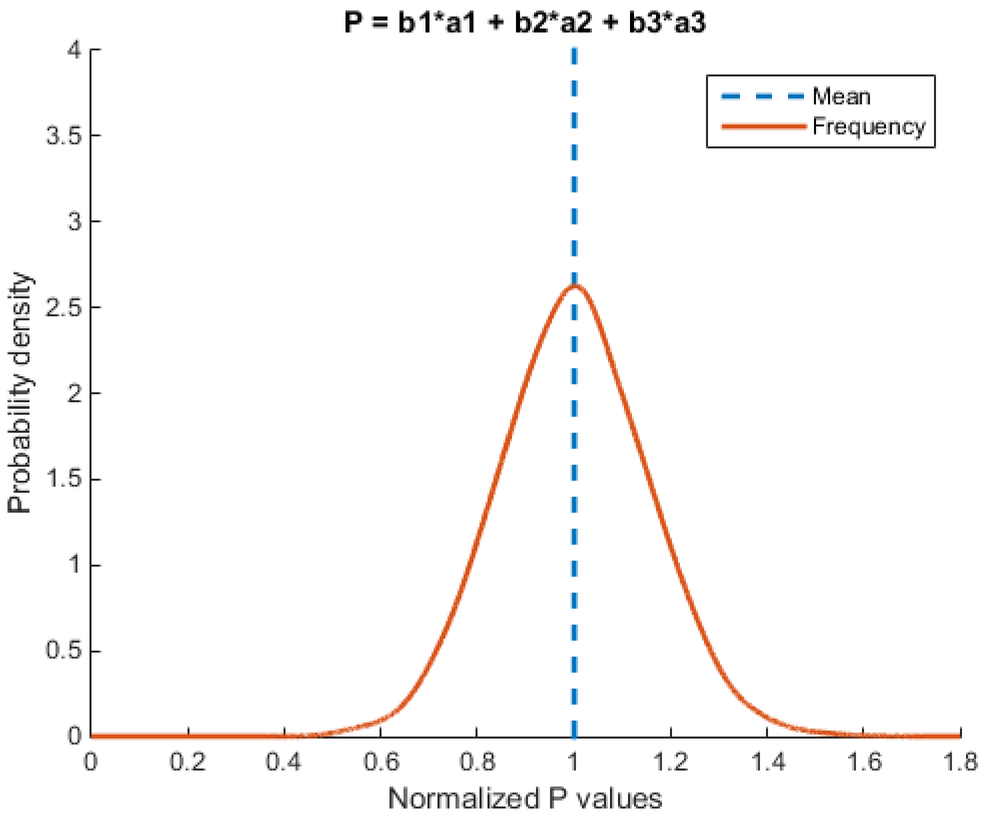

Figure 1: Probability density estimated for P