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Study On Bio DIVERSITY OF SHELLFISH IN MANAPAD ESTUARY

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Abstract

This study presents practical and easy-to-implement approaches for determining appropriate, or "safe" sample sizes for routinely conducted statistical surveys. Finite populations are considered holistically and independently of whether they are continuous, categorical or dichotomous. It is proposed that in routinely conducted sampling surveys variance-ordered categories of populations should be the basis for calculating the safe sample size given that the variance within a target population is a primary factor in determining sample size a priori. Several theoretical and operational justifications are presented for this thesis. Dichotomous populations are often assumed to have higher variances than continuous populations when the latter have been standardized and have all values in the interval (0 1). Herein, it is shown that this is not a valid assumption; a significant proportion of dichotomous populations have lower variances than continuous populations. Conversely, many continuous populations have variances that exceed the limits that are broadly assumed in literature for determining a safe sample size. Finite populations should thus be viewed holistically. A simple first step is to partition finite populations into just two categories: convex and concave. These two categories are relative to a flat population with a known variance as the threshold between them. This variance is used to determine a safe sample size for any continuous population with a flat or positive curvature, including approximately 20% of dichotomous populations. For all other populations the value of 0.25 is recommended for approximating the actual population variance as the primary parameter for sample size determination. The suggested approaches have been successfully implemented in fisheries statistical monitoring programs, but it is believed that they are equally applicable to other applications sectors.

Keywords: Statistical surveys; Sampling techniques; Finite populations; Sample size determination

Introduction

This study stems from the experience in implementing sample-based data collection programs in the fisheries sector. In such situations the surveys are implemented on a routine basis with the purpose of systematically monitoring the exploitation of marine and inland fishery resources. A typical fishery statistical monitoring program consists of two sampling surveys that are conducted in parallel and are independent of each other.

In the first survey the target populations are fish landings made by different fleet segments, such as trawlers, purse seiners, small artisanal boats, etc. The reason for segmenting the boats by vessel type and fishing method is to form statistical strata in each of which fish production is more homogeneous with respect to species composition, quantities caught, fishing grounds exploited, etc. The objective is to estimate on a monthly basis the average daily harvest of a boat from each fleet segment separately. Landings populations are continuous with frequency distributions that are specific to the boat type and fishing method employed. For instance, the distribution of landings by trawlers or boats using traps is usually skewed and at times approximately normal. Landings by purse seiners targeting small pelagic fish are at times U-shaped since in this type of fishery there are days of large catches and others of little or no catch at all. Consequently, these data tend to be thin around the mean and denser near the lower and upper boundaries of their range. Small-scale fisheries that are practiced by small craft have

During the planning phase of a fisheries sample-based program it is essential to set-

Property (d) indicates that the relative error can be measured directly from the unitless standardized population generated according

$\frac{t}{\sqrt{n}}$

f

The classification for convex populations relies on the use of flat variance, σ_f^2, as a pessimistic substitute for the variances of all convex populations,

max

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Citation: Stamatopoulos C (2019) A Holistic View curves, which were used for convex and flat populations (dotted and dashed lines, respectively) are no longer adequate as there are several error points that lie outside them due to their lower variance limits rather than the chosen alpha level.

Example 4: Here, the target population is dichotomous with elements of 0 and 1 and a proportion of p=0.765. This standardized population represents the average state of activity of fishing boats over a period of one month. Its proportion expresses the probability that a boat is active on any day. The pessimistic variance used in the error-prediction formula (4) is again set to a maximum of 1/4, which applies to concave populations (category (iii) in Section 2.3). Again, alpha level and error margin are set to 0.05.

The error-prediction curve

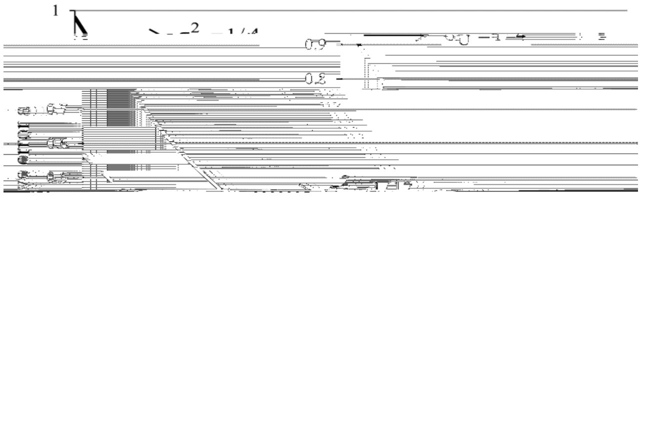

Figure 6: Determination of the safe sample size by using error-prediction functions.

Section 2.3. Alpha level and error margin are both set to 0.05. The upper boundaries of the variance for the different populations are as follows:

Population in Example 1: $\sigma^2_N = \frac{1}{24}$

**Populatio

max

models for the target populations. For dichotomous populations the model variance is 1/4=0.25; this has already been discussed thoroughly in this study. For a standardized distribution shaped like a right triangle

For instance, we may encounter dichotomous populations (which are generally thus follows that the new safe sample size for convex and concave populations will be 4 × 32=128 and 4 × 96=384, respectively.

However, it is stressed here that the maximum population variance in use (e.g. 0.25) also applies to continuous populations, specifically to those with a negative curvature. When dealing with continuous data that are convex this study tends to yield higher sample sizes than those presented in the literature, the reason being that the pessimistic variance of the flat population used in this study (e.g. 1/12) is higher than those used in other studies to approximate the population variance in the sample size formula.

Further, it was demonstrated that the presented holistic approach is open to more refined population groupings in which, for the same error margin, a more economical sample size can be achieved. It is worth emphasizing however that in regular surveys statistical parameters that are based on refined categorizations tend to be less stable than those that use broader ones because of the variance eventually falling outside the foreseen category boundaries.

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Conflicts of Interest

There are no conflicts of interest to declare.

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