9. Discussion

9.1 General applicability aspects

As mentioned in the introduction, the presented approach attempts to assist statistical developers with some practical guidance prior to the implementation of data collection operations and when very little is known about the populations under study. The author is of the opinion that such *a priori* guidance would offer a methodological supplement compatible with conventional statistical techniques and tools that are commonly applied in survey planning and design. Some questions, however, are likely to arise relating to the applicability of the presented approaches in the following instances:

(a) Size of the population is not known.
(b) The general shape of the distribution of the target population (i.e. whether convex, flat or concave) is not known.
(c) Aspects relating to data collection tactics, data representativeness and operational constraints.
(d) Criteria for setting-up minimum accuracy levels.

Question (a) can be answered in two ways.

If the population size is difficult to determine or guess but the population is considered sufficiently large, then Table B.3 for infinite populations can be used. This will be a rather pessimistic approach and the sample size will be, in fact, slightly larger than necessary. If, on the other hand, the target population is not very large then a maximum must be assumed. In catch/effort assessment surveys this is usually feasible (see case study in Section 7).

For question (b) the answer is simple. Boat activities always constitute a concave population with 0-1 elements, whereas landings are in most cases convex or occasionally flat.

Regarding question (c) the presented approaches do not go beyond the formulation of indicators relating to sample size and guaranteeing a minimum level of accuracy. What the survey planner knows is that if at the end of the month, n representative samples are available, then the expected accuracy of the estimated population parameter (CPUE, activity level, unit value, etc.), will be higher than the minimum accuracy limit used for determining sample size. The question of "how" to collect these data is the responsibility of the user.

As for question (d) the author's view is that it is up to the researcher to assess whether a certain level of proximity of the sample to the population mean is satisfactory or not. In general, any statement of accuracy desired is equivalent to expressing the amount of error that the user is willing to tolerate in the sample estimates and it is determined in the light of the uses to which the sample results are to be put (see Cochran, 1977; for discussion on this topic).

9.2 Stratification and its impact on sample size

Another factor is the impact of stratification on the sampling requirements in a fishery statistical programme. A more refined stratification applied to an existing data collection scheme would certainly improve the homogeneity aspects of the target population but would also have an impact on sampling effort. This factor is at times overlooked by statistical developers who continue to apply old sampling schemes proportionally to the size of the newly created target populations while maintaining the same total number of samples collected over the reference period. According to the observations and conclusions of the presented study this approach is not appropriate and safe sample sizes ought to be reviewed and adjusted after stratification.

9.3 Concluding remark

The presented approaches stress the point that in assessing sampling requirements, the target population of an estimation context (such as

daily catches of a specific boat-gear category over a month), ought to be viewed as a unique case and handled with criteria and sampling practices specific to its size and properties. This means that adapting criteria and practices applicable to other populations, however effective these are known to be, would not always constitute an appropriate approach. Experience shows that statistical developers, including the author, tend at times to think in terms of proportionality and assume that if a *sample proportion* has proved adequate for a population of given size and distribution, it would be expected to operate well also for a population of different size and/or distribution. The presented study indicates that if a sample proportion were good for a large population it would definitely not be as good for a much smaller population. Conversely, if a sample proportion has known to be effective for a small population, a much larger population would certainly require a lower sample proportion to achieve the same level of accuracy. It is the author's opinion that proportionality aspects (i.e. in what proportions samples should be collected from sampling sites), are relevant to the representativeness of samples, and ought to be considered only after the required number of samples has been determined.