Analysis of the small-scale fleet’s coverage under two sampling strategies: from the DCR stock-based to the DCF concurrent sampling in the Northern Spanish coastal gillnets fleet

Jose Rodríguez-Gutiérrez 1, Eva Velasco2, Jose Castro3, Juan J. Acosta4, Hortensia Araujo3

1 Instituto Español de Oceanografía (IEO), Promontorio de San Martín s/n, 39004, Santander, Cantabria, Spain
2 IEO, Avda. Príncipe de Asturias, 70 bis, 33212 Gijón, Asturias, Spain
3 IEO, Subida Radio Faro 50, 36390 Vigo, Galicia, Spain
4 IEO, Muelle de Levante (Puerto Pesquero), 11006 Cádiz, Andalucia, Spain

ABSTRACT

The Northern Spanish coastal small scale fleet represents a major challenge for sampling due to the multi-species and multi-gear character and the complexity of the fleets’ dynamics. Particularly, the small-scale gillnets called “beta” (GNS_DEF_60-79_0_0) represents a complex Spanish métiers in terms of catches, effort, geographical distribution and the number of exploited species. Comparison of data obtained in 2008, under a stock-based approach, versus concurrent sampling realized in 2014 resulted in the increase of the information obtained and provided to ICES without detected failures in data quality. Concurrent sampling could represent a source of information for small-scale fisheries which often target a set of coastal species some of which are presently unassessed.

Keywords: onshore sampling, small-scale, concurrent sampling

The Northern Spanish coastal gillnets fleet

Small-scale fisheries present a major challenge for sampling programmes due to the number of boats, the large number of fishing operations, the diversity and variability of gears and the number of species caught.

The small-scale gillnets called “beta” (GNS_DEF_60-79_0_0) which operates along the ICES Divisions VIIIc and the north component of the IXa represents a complex Spanish métiers in terms of catches (1850 t in 2014; Figure 1), effort (23341 trips), geographical distribution (Fig. 2 and 3) and the number of exploited species. This net has a general mesh size of 60 mm, extended to 80 mm when targeting sole and hake (Spanish Royal Decree RD 410/2001). Each piece of netting can reach a maximum length of 50 meters and a maximum height of 3 meters, while the maximum total length of the gear is 4,500 meters. It is set at depths shallower than...
150 m therefore is mainly used to catch coastal species, targeting hake, red mullet and other species from the families Labridae, Triglidae or Scorpaenidae. There is a multitude of variations of this gear, which adapts well to both topographical and oceanic conditions (Abad et al.).

Changes in the sampling strategy

Implementation of new data collection procedures in the market sampling following EU Data Collection Framework (DCF) provisions in 2009 led to significant changes in the sampling programmes. From a stock-based approach, sampling design moved to a métier-based scheme where species had to be sampled “concurrently”, i.e., all species measured in every sampling event. Concurrent sampling strategy was conceived to facilitate the existing data demands as well as serving the needs for future fishery based management and ecosystem approach. New benefits, as an increase in the information collected (mostly number of species) and the sampling coverage for those sampled, were expected from the new procedures. However, after some years of implementation, the concurrent sampling has proven to be not well-known by end-users (ICES 2015a), generating some controversial points of view regarding the new information provided, including quality, utility and the associated costs.

The approach adopted here is to compare, under statistical and logistical perspectives, the length data compiled for the Northern Spanish small-scale gillnet fleet before and after the concurrent sampling implementation. Concurrent sampling could represent a valuable source of information for small-scale fisheries which often target a set of coastal species some of them presently unassessed. The current implementation of the concurrent strategy is also discussed to consider changes needed.

Sampling coverage for “betas”

Analysis are based on market sampling length information from the Northern Spanish small-scale gillnets (“betas”) collected by IEO during 2008 and 2014. Dataset from 2008 includes information from two Galician ports (Finisterre and Muros) where a stock-based sampling was carried out for hake (*Merluccius merluccius*). The 2014 “betas” data derive from the full concurrent sampling carried out in the same Galician ports, as well as Cantabrian ports (Aviles/Gijón). The sampling frame was stratified by quarter with a systematic monthly allocation of effort. Overall dataset contains sampling information from 195 trips (74 trips from 2008 and 121 from 2014).

Results and Discussion

Results showed a high increase in the number of species measured, from 1 species in 2008 to 48 species in 2014 (Figure 4). However, the 2014 length data are concentrated in a set of 6 species surpassing 500 individuals measured and accounting for the 90% of the total individuals: hake, pouting (*Trisopterus luscus*), Atlantic horse mackerel (*Trachurus trachurus*), striped red mullet (*Mullus surmuletus*), axillary seabream (*Pagellus acarne*) and Atlantic mackerel (*Scomber scombrus*). Total number of lengths rose 176% due to an increase in the number of trips sampled and an overall increase in the number of lengths by trip (Figure 5). Considering hake, the average number of lengths by trip decreased in 2014 while the median is
similar. Both, the third and specially the first quartile, are smaller in 2014 (Figure 6) as a result of not carrying a species-driven selection of trips. Random selection of trips within the betas fishing activity implies hake landings may occur to be low. No failures where reported concerning this in 2014.

Qualitative analysis was carried using the open-source software developed in R COST (Anon., 2008). This software allows the detection of outliers in length frequencies in the most disaggregated level through the Delta measure and the estimation of precision estimates (coefficient of variation: CV) for length structures according to the DCF. The qualitative analysis of hake length frequencies provided similar Delta values for both years (Figure 7). Same analysis on the rest of species in 2014 provided results equally robust (Figure 8). Precision estimates for hake length structures revealed better CV in 2014 while CV of the rest of species show similar levels to hake (Table 1).

As a conclusion, concurrent sampling on betas resulted in an important increase in the number of species and lengths measured, while the quality indicators improved slightly. The importance of the sample size (number of individuals) for trips sampled in 2008 was overestimated in the past. The number of trips (primary sampling unit) sampled and the direct estimation of CVs are seen as better quality indicators (ICES, 2014a). Besides not affecting the quality of the information collected, the concurrent sampling approach allows extending the provision of scientific fishery data to ICES for more stocks. Particularly related to the Northern Spanish coastal gillnet fleet, the respective length frequency distributions are currently provided to ICES for hake, striped red mullet, Atlantic horse mackerel and Atlantic mackerel (ICES, 2014b,c,d; ICES, 2015b). Other species with significant biometric data from Spanish “betas”, as axillary seabream or pouting, are not yet assessed by ICES.

Results suggest concurrent market sampling could be optimized through a prioritization of species—not limitation by species list— by métier based on the analysis of data obtained from current implementation. This operational concurrent sampling strategy would ensure the collection of statistically robust information for key species—as required for assessment—without compromising other benefits and uses of concurrent data.
REFERENCES


Abad, E.; J. Artetxe; F. Cardador; J. Castro (coordinator); D. García; M. Marín; A. Murta; A. Punzón; I. Quincoces; M. Santurtún; C. Silva; L. Silva. 2007. Identification and segmentation of mixed-species fisheries operating in the atlantic Iberian peninsula waters. IBERMIX project (Contract Ref.: FISH/2004/03-33).


Figure 1. Total landings of “beta” by ICES Division, 2014.

Figure 2. Distribution of landings of “beta” by statistical rectangle, 2014.

Figure 3. Distribution of landings of “beta” by port, 2014.
Figure 4. Number of species and individuals sampled.

Figure 5. Total number of lengths (left) and average number of lengths by trip (right).

Figure 6. Number of lengths by trip.
Table 1. Cv calculation (COST) for main species.

<table>
<thead>
<tr>
<th>Species</th>
<th>CV 2008</th>
<th>CV 2014</th>
</tr>
</thead>
<tbody>
<tr>
<td>Merluccius merluccius</td>
<td>0.276</td>
<td>0.219</td>
</tr>
<tr>
<td>Trachurus trachurus</td>
<td>-</td>
<td>0.331</td>
</tr>
<tr>
<td>Trisopterus luscus</td>
<td>-</td>
<td>0.185</td>
</tr>
<tr>
<td>Mullus surmuletus</td>
<td>-</td>
<td>0.153</td>
</tr>
<tr>
<td>Pagellus acarne</td>
<td>-</td>
<td>0.222</td>
</tr>
<tr>
<td>Scomber scombrus</td>
<td>-</td>
<td>0.378</td>
</tr>
</tbody>
</table>

Figure 7. Graphical display of delta values for hake in 2008 (above) and 2014 (below).
Figure 8. Delta values for horse mackerel, red mullet, axillary seabrem and pouting in 2014.