Impact of management measures, fish prices and stock abundance in the fleet dynamics of the otter-trawlers operating in Galician-Cantabrian Sea fishing ground

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Summary

The diversity of species targeted by Spanish otter trawl fleet results it in limitation for the fisheries management in the Galician-Cantabrian Sea fishing ground. The effort pressure of this fleet is shared in two main métiers, a demersal métier targeting hake, megrims and anglerfish and pelagic métier targeting horse mackerel and mackerel. A descriptive analysis of the fleet dynamics in terms of landings volume and economic value was carried out across the period 2007-2012. A discrete model choice framework was used to identify factors involved in fisher decision-making to select a métier. The approach was applied using a binomial logit model to data from 2007 to 2010. Economic variables, management measures and previous experience of each vessel were considered as potential explanatory variables. Our results indicate that the tradition and the past experience are the most important factors to make decisions about a future métier. The anglerfish price had a positive effect on the probability of demersal métier. None of the seasonal management measures imposed to restrict hake and blue whiting catches had a significant effect on métier choice.

Introduction

The Spanish bottom otter trawl fleet operating in the Galician-Cantabrian Sea fishing ground harvests a high variety of demersal and pelagic species. Based on the species composition of the landings, fishing operations of this fleet have been grouped into two métiers (Castro, 2011). To achieve the maximum profits from fishing activity, fishers must adapt their exploitation pattern to changes in the species abundance, the market conditions (fish prices, supply/demand) and the implementation of management policies. This work aims to improve the knowledge on fleet dynamics and understanding the drivers of fisher behavior to share the fishing effort between alternative métiers for the particular case of Spanish bottom otter trawler. The results obtained could be taken into account in the stock assessment of exploited species and in the development of fishing management measures.

Materials and methods

Analysis was based on sale notes data from 2007 to 2012. Individual trip records were available with the following main variables: landing date, landing port, landing weight by species, landing value by species. The identification of métier was also available for each trip (J. Castro, *personal communication*). Records from vessels and ports with very low number of trips and non reliable records were excluded from the analysis. The final dataset consisted of 53 495 trip records from 84 vessels across years 2007 to 2012. The drastic change in the species composition of landings occurred in 2011 and 2012 was not considered sufficiently reliable and, therefore, the model analysis was restricted to the years 2007-2010.

Random Utility Models (McFadden, 1974) have been used to model individual trip choices. These models predict the decision that maximizes its level of utility (profitability). A binomial logit model was applied to fit the dichotomous options (demersal or pelagic) of fishers' decision-making process. The explanatory variables included in the model specification were economic, related to the previous week: average price for megrims, hake, anglerfish, mackerel and horse mackerel and average total landing value. The specific individual variables: experience by métier (number of trips in previous

week) and tradition (accumulated number of trips by métier). The total volume of landings in previous week and two regulation (restriction of hake catches in 2010 (July-December) and the limited quota for blue whiting in 2009-2011) were also considered. Final model was built following a backward stepwise elimination process using likelihood ratio test. All the analyses were performed in R environment (R Core Team, 2014).

Results and Discussion

The final model had a reasonably goodness of fit (McFadden's pseudo R^2 = 28 %) and all variables included in the model were highly significant (p<0.0001). The past experience variables were responsible of the 73 % of the model fit, following by tradition that represented the 19% of the fit. The price of anglerfish, megrims, hake and horse mackerel were also included in the model although their effect was lower than experience. The total value of landings in previous week had a positive significant effect on pelagic métier. The model trends to overestimate the effort allocation towards pelagic métier. The percentage of corrected predicted cases by week indicated that the effect of the unobserved random components of the model might be affecting the selection of métiers by fishers together with other factors not considered in the present approach such as vessel attributes, weather, fishing area and landing port.

The experience in previous week and the tradition were the most influential variables in the fisher behavior suggesting that fishers tend to be conservative in their métier choice. This fact was already pointed out in previous studies of fleet dynamic (Holland and Sutinen, 1999; Marchal *et al*., 2009). Factors as seasonal high abundance of a species and price increase are probably considered by a fisher to choice an alternative métier to the "classic" métier. However, the certainty that these conditions constitute a more profitable métier option must be high enough to break the inertia of the fisher experience.

References

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