

Temporal variability of landings composition in the Conil artisanal fishery (SW Spain): octopus collapse, subsidies and climate.

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Summary

The Conil harbour (Southern Atlantic coast of Spain) hosts a multi-gear, species-diverse artisanal fleet. Monthly records of species landed from 1992 to 2006 were analysed by multivariate and time series methods. From 1992 to 1995, landings presented a strong seasonality, with an almost octopus (*Octopus vulgaris*) mono-specific fishery in winter and high diversity in summer (e.g. *Mullus spp.*, *Pagellus erythrinus*, *Pagrus auriga*, *Pagrus pagrus*, *Conger conger*, *Diplodus spp.*). The octopus stock collapsed between 1995 and 1997, when landings were reduced to less than 1%. The effect was notorious on the seasonality of landings, with some species (e.g. *Pagrus pagrus* and *Dentex dentex*) being targeted all year round. This was momentarily interrupted by the highest landings of octopus in the winter of 1999-2000 that thereafter decreased again to very low levels. Besides, the collapse of the octopus also provoked gradual changes in the landings composition as a progressive adaptive process to the scarcity of their formerly main resource. This was accelerated by the end of the 90's as reflected by the landings of new species (e.g. *Lepidopus caudatus* and *Pagellus bogaraveo*) by the longest vessels. The latter suggests that subsidies at that time helped the renewal of the fishery that facilitated the exploitation of new areas. Temporal dynamics of octopus landings were related with the patterns of rainfall and the Guadalquivir river discharges that may have contributed to the collapse of the octopus stock in the mid 90's.

Introduction

The lack of information about Small Scale Fisheries and their resources and, furthermore, the inherent characteristics of this type fisheries, characterized by the use of different fishing gears and exploiting a large variety of resources, present a challenge for their management. The Conil harbour (Southern Atlantic coast of Spain) hosts a multi-gear, species-diverse artisanal fleet. Monthly records of species landed from 1992 to 2006 were available. We show herein how basic information about landings can be used to analyse the dynamics of this fishery and study the effects of factors of very different nature (i.e. fleet characteristic and the consequences of subsidies, life history characteristics of the exploited species and climate variability) on the temporal patterns of landings composition.

Materials and methods

Monthly records of species landed from 1992 to 2006 were analysed by multivariate and time series methods. Data were obtained from the data base IDAPES of the Junta de Andalucía (www.cap.junta-andalucia.es) and from Anonimous (2005). A principal component analysis (PCA) was performed on the covariance matrix obtained from a total of 70 taxons (as variables) and their corresponding monthly landings (as samples). A second PCA was performed on the 12-month running mean of each variable (taxon).

Results and Discussion

From 1992 to 1995, landings presented a strong seasonality, which was reflected in PCs 1 to 4. In the beginning of the series PC1 and PC2 present stronger seasonality due to an almost octopus (*Octopus vulgaris*) mono-specific fishery in winter and high diversity in summer (e.g. *Mullus spp.*, *Pagellus erythrinus*, *Pagrus auriga*, *Pagrus pagrus*, *Conger conger*, *Diplodus spp.*). Thereafter the seasonal fluctuation of these two PCs was reduced due to the collapse of octopus stock between 1995 and 1997, when landings were reduced to less than 1%. The effect was notorious on the seasonality of landings, with some species (e.g. *Pagrus pagrus* and *Dentex dentex*) being then targeted all year round. This was momentarily interrupted by the highest landings of octopus in the winter of 1999-2000 that thereafter decreased again to very low levels. Besides, the collapse of the octopus also provoked gradual changes in the landings composition as a progressive adaptive process to the scarcity of their formerly main resource. This was accelerated by the end of the 90's as reflected by the landings of new species (e.g. *Lepidopus caudatus* and *Pagellus bogaraveo*) by the longest vessels. The latter suggests that subsidies at that time helped the renewal of the fishery that facilitated the exploitation of new areas, although the vessels that exploited these new areas based their landings in a much reduced number of species. Temporal dynamics of octopus landings were related with the patterns of rainfall and the Guadalquivir river discharges that may have contributed to the collapse of the octopus stock in the mid 90's. The fishery presented a high capability to adapt to new situations (forced by antropogenic or climatic factos) based on the high diversity of resources exploited. Subsidies, however, allowed the introduction of larger vessels that thereafter based their landings on a much reduces number of resources. This lower diversity and their larger effort capacity challenge their adaptive response and can be a risk for the rest of the "more traditional" fleet that already is exploiting resources at a level that in the past possibly contributed to the collapse of the octopus stock and did not allowed it to recover to early levels.

References

Anónimo. 2005. Estadística pesquera: Conil de la Frontera (Cádiz) 1992-2003. Consejería de Agricultura y Pesca. Junta de Andalucía. 551 pp.