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Uruguayan fisheries under an increasingly globalized scenario: Long-term landings and bioeconomic trends

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ABSTRACT

The systematic dwindling over time of many commercially important fish stocks in developed countries and the increasing demand of international markets provided a window of opportunity for fishery sector development in many developing countries. Science-based assessments of how market forces impact on fisheries trends are particularly limited in developing countries. This study assessed long-term trends (1960–2013) of the Uruguayan industrial fishery sector, including: (i) landings discriminated by species and resource type; (ii) variations in nominal effort and fleet capacity; (iii) bioeconomic patterns for most important species; and (iv) export and import volumes at the Uruguayan seafood market. Results indicate the sector underwent four phases that depict long-term patterns: development, expansion, stabilization-diversification and declining yields and market contraction. The development of the sector was mainly due to the Argentine hake fishery, which was characterized by a sustained increase in landings, nominal effort and fleet capacity during the initial decades, but showed a decreasing trend afterwards. In response, a fishery diversification policy based on more valuable target species but with lower trophic levels was developed. Uruguay adopted a seafood net exporter role since the very beginning, with exports increasing linearly through time. More recently, seafood imports, with more competitive prices than locally caught seafood, have been gaining ground in the domestic market, reaching a third of all seafood currently consumed. Nowadays, the Uruguayan fishery sector is facing a crisis that is clearly reflected in the decreasing yields of the main species targeted, exports dwindling and increasing seafood imports. These results highlight the pressing need of the industrial sector to shift its model of fisheries exploitation. This study also provides evidence of the need to consider additional bioeconomic analysis to fully understand the behavior of the fishery sector as a dynamic social-ecological system operating in a globalized seafood trade scenario.

1. Introduction

Developing countries played a critical role in the rapid increase in global catch after the 1950s. The systematic dwindling over time of many commercially important fish stocks in developed countries (Worm and Branch, 2012) and the increasing demand of international markets, provided a window of opportunity for fishery sector development in many regions (Swartz et al., 2010; Watson et al., 2016). By the beginning of the 1980s, developing countries already accounted for half of global landings (Platteau, 1989). The increasing fishing pressure driven by the international demand in these countries was not accompanied by an appropriate development of science-based management and by accurate assessments of how market forces impact on the status of fish stocks and fisheries trends. Currently, unassessed stocks, mostly occurring in developing countries, provides more than 80% of global landings (Costello et al., 2012), highlighting the mismatch between research needs and fisheries knowledge development. Therefore, there is an increasing need to expand fishery research in the developing world, where better information of fisheries trends at national levels is required to cover existing data gaps (Worm and Branch, 2012; Agnew et al., 2013).

Most fishery research has been aimed to assess ecological issues, while assessments of socioeconomic and market aspects of fisheries are not as plentiful. This situation is exacerbated in developing countries where data acquisition directed to assess the economic performance of fisheries is even more uncommon. Fish products are one of the most traded food commodities (FAO, 2016), and there-

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fore, international trade and market globalization have become a major driver in landings trends worldwide (Asche and Smith, 2010; Swartz et al., 2010; Crona et al., 2015; Gephart and Pace, 2016). Price fluctuations or foreign market variations led to immediate and pronounced effects on fishery products highly embedded in global markets, affecting local fishery sectors and economies (Gephart and Pace, 2016). These market trends are most profoundly felt in developing countries, where poor institutional adaptability precludes alternative trading strategies to cope with external drivers of change (Berkes et al., 2006; Swartz et al., 2010; Crona et al., 2015). Indeed, weak fisheries governance, which is the prevailing characteristic in most developing countries (Defeo et al., 2016), has traditionally encouraged a trade system in which seafood is exported to developed regions and surplus value is used to purchase other goods and services (FAO, 2016), giving less room to portfolio alternatives such as the development of domestic markets. Another critical barrier for developing countries to overcome relies nowadays on the inability to satisfy constantly evolving import requirements, such as quality, safety, technical standards and ecolabelling (FAO, 2016; Gutiérrez et al., 2016). Recently, developing countries have increased trade among themselves as a strategy to cope with the challenges that pose exporting to developed countries (FAO, 2016).

The foregoing concepts highlight the need to consider interconnected markets and the global seafood trade scenario in order to gain insights about local landing trends. This is particularly important in Latin America, which has historically maintained a positive net seafood exporter role, generating surplus value from this sector of the economy since mid 1970s (FAO, 2016). Nowadays, for each ton of seafood imported, three tons are exported to international markets (FAO, 2016). Therefore, market price time series and seafood trade statistics could complement landing data by providing a rich source of information that has been largely neglected in Latin America fisheries management. This could be valuable in assessing fisheries status and assisting managers to understand fisheries as dynamic social-ecological systems operating under a globalized scenario (Pinnegar et al., 2006; Sumaila et al., 2007).

The aim of this study was to assess long-term trends (1960–2013) of the Uruguayan industrial fishery sector, including: (i) landings discriminated by species and resource type (i.e., marine fishes, freshwater fishes, mollusks and crustaceans); (ii) temporal variations in the industrial fishing nominal effort and fleet capacity; (iii) bioeconomic patterns for the most important species in terms of landings; and (iv) export and import volumes. We also describe the temporal extractive phases which these fisheries have experienced, and the corresponding economic and managerial scenarios. Finally, we discuss the role of market drivers as potential factors influencing past and current status of Uruguayan fisheries.

2. Materials and methods

2.1. Study area and characteristics of the Uruguayan fishing fleet

The operation area of the Uruguayan industrial fishing fleet covers the Río de la Plata estuary (the widest estuary in the world), its contiguous shelf waters and the Argentinean-Uruguayan Common Fishing Zone (AUCFZ). The AUCFZ includes most of the Exclusive Economic Zone (EEZ) of Uruguay, area that extends beyond the territorial sea and adjacent to this, up to 200 nm (Fig. 1).

The Uruguayan fishing sector is formally divided into small-scale (vessels <10 Gross Registered Tonnage, GRT) and industrial subsectors, which are also clearly separated by the level of technology applied, fishing operation areas and the destination of landings (Defeo et al., 2011). The industrial fleet represents >95% of total landings and currently consists of 60–65 vessels (15–60 m length) with a mean of 360 GRT. Industrial vessels operate, by law, beyond 7 nm offshore. Most industrial vessels use bottom and midwater trawls, although longlines and pots are also used to target pelagic and benthic resources, respectively. More than 50 species are caught by the Uruguayan fishing fleet. Among them, the main ones landed are the Argentine hake (*Merluccius hubbsi*), the whitemouth croaker (*Micropogonias furnieri*) and the stripped weakfish (*Cynoscion guatucupa*). In addition, Uruguay has an intermittent fleet operating in international waters, mainly targeting tuna species and Patagonian toothfish (*Dissostichus eleginoides*). Industrial fishing rights are assigned in the form of fishing licenses for a five-year period to physical or juridical persons through individual non-transferable quotas. Typically, quota allocations are based on a combination of catch history, vessel characteristics, long-term objectives and socio-economic factors of the recipients.

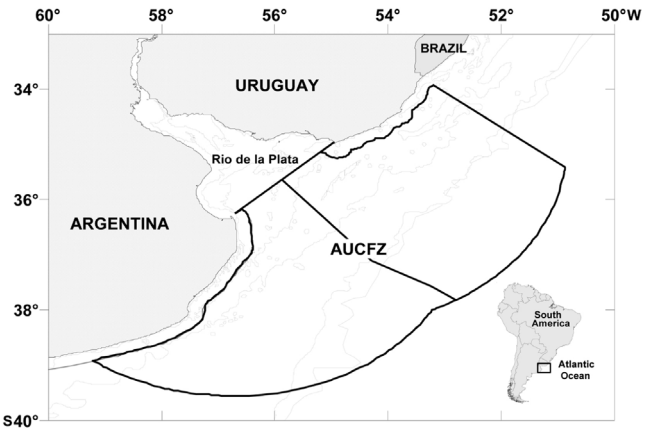

Fig. 1. The operation area of the Uruguayan industrial fishing fleet comprises the Río de la Plata estuary and the Argentinean-Uruguayan Common Fishing Zone (AUCFZ).

2.2. Data and analysis

Data sources used in this study include official information about landings and seafood trade statistics published by the National Direction of Aquatic Resources (Dirección Nacional de Recursos Acuáticos: DINARA for its acronym in Spanish) for the period 1960–2013, unpublished reports and media sources compiled and disseminated by DINARA (i.e., booklets and biannual reports). Complementary sources, such as official statistics of the Joint Technical Commission of the Maritime Front and The International Commission for the Conservation of Atlantic Tunas, were consulted to corroborate national statistics. Annual landings for each species were calculated as the sum of the landings recorded in each month. Annual fishing effort was measured by the number of active vessels and by GRT estimates. Export volumes (t) and economic revenues (US$) were obtained from official reports provided by DINARA for the period 1975–2013, whereas importation records were available since 1999. Unit export prices were obtained as the ratio between export revenues and export volumes. Demand curves were computed using long-term variations in unit price against landing/export volume. For whitemouth croaker and stripped weakfish a single demand curve was considered, because these coastal species are targeted jointly by the same fleet and traded internationally under the same trade code. In this case, two demand curves were estimated: (i) including every year of the dataset; and (ii) excluding the last 4 years, which have a particular behavior when compared with the rest of the dataset (see Results). Unit price for this demand function was estimated by averaging each unit price weighted by annual landings for each species. In order to assess the potential telecoupling (i.e., distal connections) between the Argentine hake fishery and international