



The evolution of fisheries in Portugal: A methodological reappraisal with insights from economics

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ABSTRACT

Interpretation of fisheries data can be considerably affected by missing or naïve analyses of economic variables. We analyze the case of Portugal, showing how considering the effects of inflation reverses previous conclusions regarding the evolution of fish prices and revenues (fisheries performance). We further emphasize the importance of variables related to economic drivers, such as the prices of substitute goods for understanding the demand for fish, and of exchange rates as a determinant of fish imports. We call for a stronger contribution from economics and greater interdisciplinary scrutiny of a crosscutting scientific area such as fisheries research.

1. Introduction

Fisheries science bridges issues such as species biology, population dynamics, revenue, labor, management measures and governance, relying therefore on the contribution of different scientific areas and being intrinsically interdisciplinary. Researchers from the natural sciences lead the contributions to the literature on fisheries, most significantly marine biologists, ecologists and oceanographers, but social scientists have also shown interest on the topic through networks or in publications. However, these scholars are often not working together across scientific areas, in interdisciplinary research. As a result, most studies tend to analyze fisheries through the lens of one or just a few disciplines, instead of benefiting from interdisciplinary work which would lead to a better and broader understanding of multidisciplinary topics such as the role of economics in fisheries. Throughout academia and science funding agencies, interdisciplinary understanding of issues and its promotion have been gaining momentum (e.g. [Institute of Medicine, National Academy of Sciences, and National Academy of Engineering, 2004](#)).

Research topics which require the knowledge of several scientific areas are generally more difficult to deal with, particularly when research teams lack sufficient expertise in one or more of those areas. The lack of a common language may also lead to misunderstandings while communicating one's methodology or findings. This may also apply to fisheries research. In addition to the traditional bioeconomic models ([Clark, 1990; Seijo et al., 1998](#)), we believe that this field could benefit

from a greater involvement of economists due to four main problems: (i) the literature misses the fact that understanding fisheries is about understanding human behaviour, and how people react to economic variables and incentives; (ii) the literature misses the fact that the objective of fisheries is about economic value (notable exceptions are [Sumaila et al., 2007; Swartz et al., 2013; Vendeville et al., 2016](#)); (iii) the creation of a Fish Price Index, which could reflect the overall evolution in fish prices, was only recently proposed ([Tveteras et al., 2012](#)); (iv) last, but by no means the least, when economics is used, it is frequently not appropriately applied or interpreted.

In this paper, we demonstrate the importance of including robust economic analysis in fisheries research by using Portugal as a case study. The current literature lacks fundamental methodological contributions from the field of economics when investigating the evolution of fisheries in Portugal, which we illustrate with corrected figures. Since this problem is not exclusive to the fisheries literature focusing on the Portuguese case, we argue that interdisciplinary areas require more methodological precisions to allow for easier revision and to avoid misunderstandings and consequent mistakes.

2. Fisheries and economics literature

Fisheries research is a vibrant field with almost 800,000 articles published in indexed journals, of which more than a quarter were published in the last 6 years – see [Table 1](#). The Portuguese fisheries literature has also been growing quite fast. In comparison to the

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Table 1
Volume of publications in fisheries and related indicators.

		Pre 1986	1986–2010	2011–2016	Total
World					
(1)	All WoS	127,349	441,829	204,981	774,159
(2)	All WoS Social Sciences	5179	35,207	32,029	72,415
(3)	Core collection	25,455	220,441	118,597	364,493
(4)	Core collection Economics	111	770	575	1456
Portugal					
(5)	All WoS	49	1608	1188	2845
(6)	All WoS Social Sciences	4	168	232	404
(7)	Core collection	1	860	600	1461
(8)	Core collection Economics	0	1	1	2
Indicators					
% of literature					
(2)/(1)	Social Sciences World	4.1%	8.0%	15.6%	9.4%
(6)/(5)	Social Sciences Portugal	8.2%	10.4%	19.5%	14.2%
(4)/(3)	Economics World	0.4%	0.3%	0.5%	0.4%
(8)/(7)	Economics Portugal	0.0%	0.1%	0.2%	0.1%
Articles per year					
(1)/years	All WoS World	n.a.	17673	34164	n.a.
(3)/years	Core collection World	n.a.	8818	19766	n.a.
(5)/years	All WoS Portugal	n.a.	64	198	n.a.
(7)/years	Core collection Portugal	n.a.	34	100	n.a.

Note: All WoS include all documents indexed in Web of Science; Core Collection includes only the journals included in the Thomson Reuters core collection. Search words on WoS all collections were ‘fish’, ‘fish [country]’, ‘fish [country]’ & select Social Sciences in research domains. Search words on WoS core collection were ‘fish’, ‘fish [country]’, ‘fish [country]’ & select Economics in WoS categories. For periodization, we used key potential moments for fisheries research in Portugal, including the admission to European Economic Community in 1986 and the budget cuts in 2011 following a structural adjustment plan (Goulart and Veiga, 2016).

1986–2010 period, the number of articles published per year tripled during the 2011–2016 period, in contrast to the doubling in the number of articles per year of the overall fisheries literature. However, less than 10% of the world literature on fisheries is published in outlets indexed in areas of social sciences. Publication of research focusing on fisheries in economics outlets is much scarcer, representing only 0.4% of the fisheries literature, even if it has reached top outlets such as the American Economic Review (e.g. Ling and Smith, 2015). Anecdotal evidence suggests that the lack of cooperation may also reflect unwillingness or disinterest of economists and/or economic outlets in fisheries research. Regarding Portugal, while fisheries articles published

in social sciences outlets reach a share of 14%, in economic outlets they represent only 0.1%.

This fact may help explain why variables such as the value of fish landings are largely absent from the literature. The quantity and quality of fisheries data has also been a key problem recorded worldwide, which the fisheries literature has recently started to address (e.g. Tveteras et al., 2012; Belhabib et al., 2016; Pita et al., 2017). First, price series have been less used and less explored, perhaps because of the inflation issue. Regarding Portugal it is not different, with the data available from Statistics Portugal (INE) being somewhat unclear regarding the methodology of valuation of prices and revenue. Second, landing quantities measured in metric tons have been frequently used, but are affected by the endemic cross-country problem of the size of the informal market, with the scale of illegal landings underestimating the official statistics (Leitão et al., 2014; Pauly and Zeller, 2016). This incentive to escape the official market (and evade taxes) is larger for the most valuable species, which further aggravates the problem of valuing fisheries.

In spite of its limitations, useful fisheries data for Portugal is available. Researchers have more frequently worked with fish landings in metric tons (Almeida et al., 2015) or with annual landings per unit effort, i.e. ton/day (Gamito et al., 2016).

3. Deflating the revenue

While the emphasis on these physical measures can be explained by a focus on sustainability, fisheries revenues are a key variable that deserves greater attention. Revenue combines the landings and price variation to measure the economic dynamism of a sector, but also the capacity to distribute income to all who depend on it. In fact, as mentioned above, the use of fish landing values is somewhat rare, and those values are often misinterpreted. To illustrate, Fig. 1 shows the evolution of the quantity (in metric tons) and value (in USD) of fish landings in Portugal, as reported by others (e.g. Bjørndal et al., 2015). As we explain in greater detail below, these values in current USD are potentially deceiving, as they do not account for inflation.

While articles on fisheries frequently discuss the evolution of the quantities, or of the prices of species, few actually discuss the evolution of revenues, which may be partially explained by the greater scarcity of reliable data. Additionally, in some of the few studies which use revenue data, the latter is not correctly handled or interpreted. A common mistake is to compare revenues of different years, expressed in dollars or euros, without taking inflation into account. Since the prices of goods and services tend to increase over time, what could be bought with 1000 US dollars in 1970 was certainly much more than what can be acquired today. Thus, it does not make sense to compare dollar revenues of 1970 with those of 2016, as the purchasing power, or real

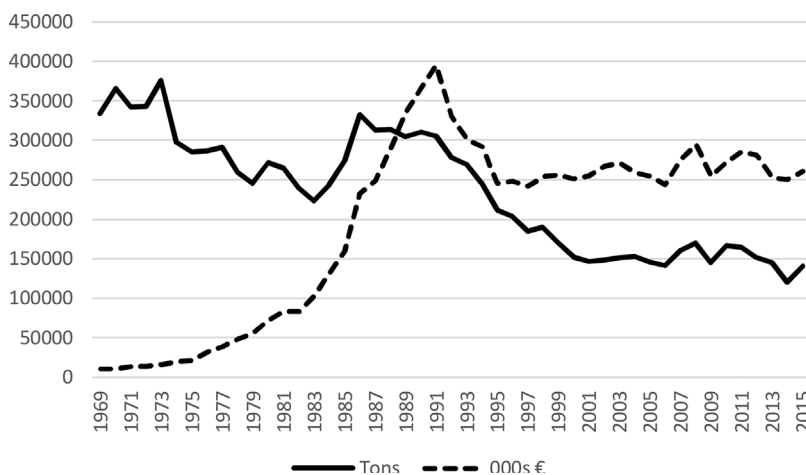


Fig. 1. Evolution of quantity and value of fish landings.
Note: Value is measured in thousand euros. Quantity is measured in metric tons.
Source: Instituto Nacional de Estatística (INE), Portugal.

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