

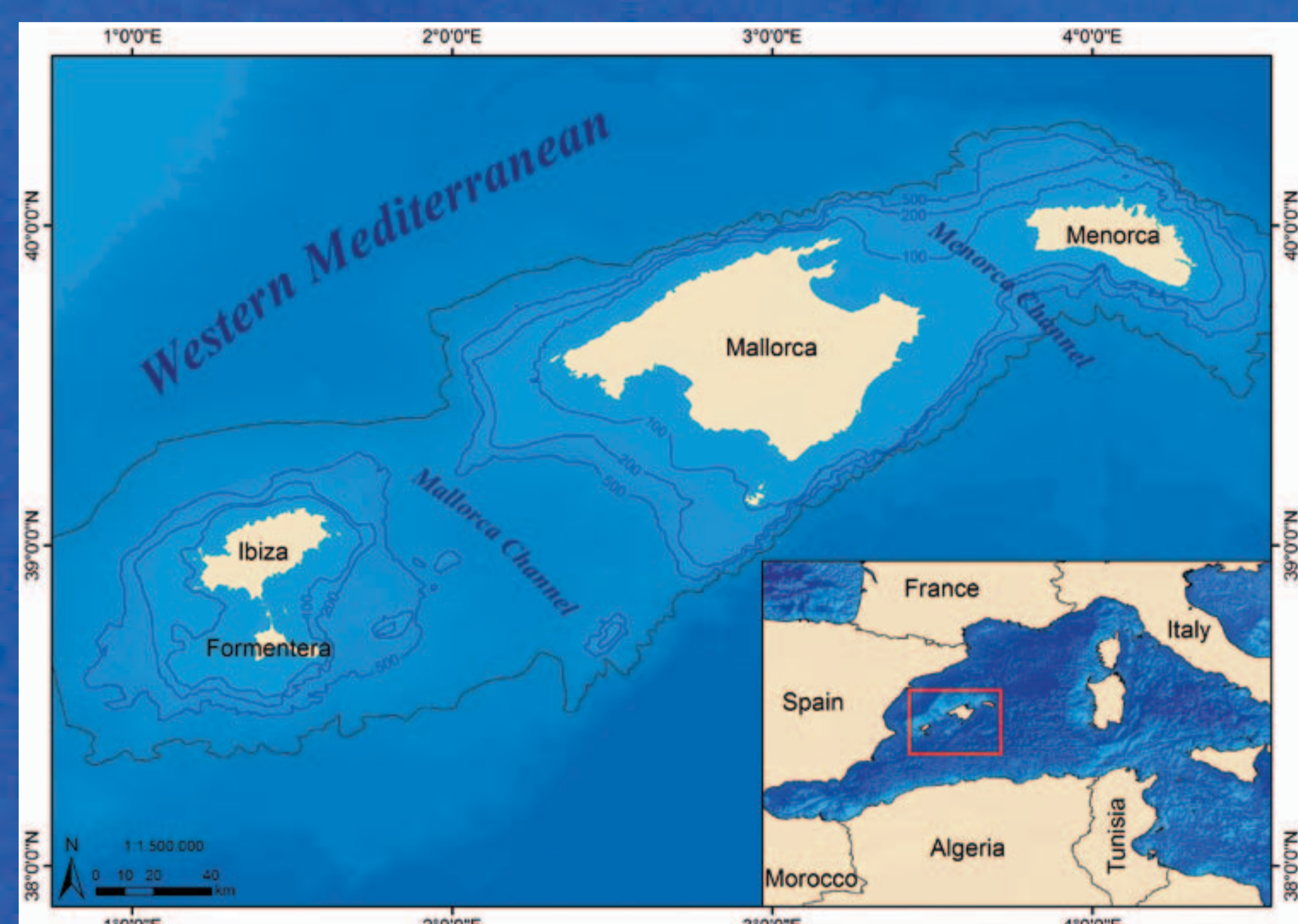
KNOWING THE PAST TO IMPROVE THE FUTURE: ESTIMATING HISTORICAL FISHING CATCHES TO IMPROVE FISHERIES MANAGEMENT IN THE WESTERN MEDITERRANEAN SEA



Year 1962.
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Summary

We developed for the first time the commercial fishing catches reconstruction of the Balearic Islands (Western Mediterranean) between 1950 and 2010, by adding non-reported components, including unreported landings and discards, to the official reported landing data. To back-estimate historical unreported landings and discards, collaboration and information acquired from fishermen were essential, as gathered through interviews and observer programs of the Spanish Oceanographic Institute (IEO) on board commercial bottom trawl vessels. We estimated a total catch of 511,500 t over the period 1950-2010, of which official landings represented 49% (around 248,000 t), followed by unreported catches (32%) and discards (20%). A decrease in unreported catches was observed during the period 1950-2010 (from 58% to 38%) due to a reduction of unreported landings, but substantial efforts are still required to improve the recordings of actual fishing catches. This work contributes to the global assessment of fisheries removals led by the *Sea Around Us* and aims to provide the basis for an improved management of the Balearic Islands and Mediterranean Sea fisheries.

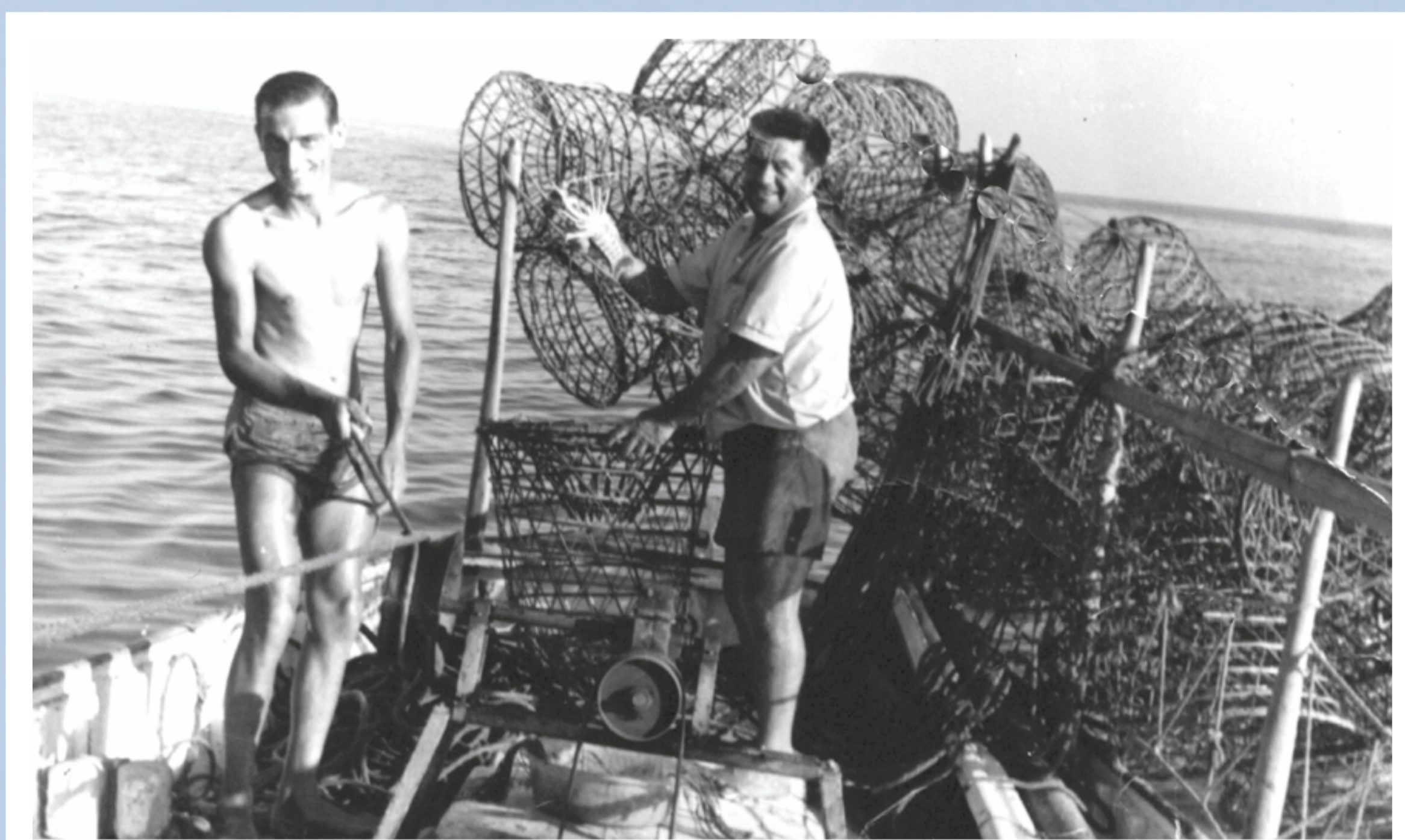
Introduction

Accurate fisheries removal data is crucial for developing effective fisheries management and assessing the impact of fisheries on ecosystems. Unfortunately, official statistics underestimate catches in most countries and regions. A significant proportion of landings is not registered as it is sold on “black markets” or intended for the self-consumption of fishermen - “subsistence fishing”. Discards are also an important component of unreported catches. The *Sea Around Us* is an international initiative whose main goals includes estimating fisheries extractions from marine ecosystems - including reported and unreported landings, and discards - to reconstruct marine fisheries withdrawals for all countries in the world from 1950 to the present. This project assumes that interpolations and bold assumptions for catch reconstructions are justified by the unacceptability of considering non-reported or missing data as zero (Zeller and Pauly 2007). Fishing sector collaboration is a useful tool for estimates of unknown data (Coll *et al.* 2014a) such as unreported catches. We have contributed to this global catch data reconstruction by providing estimates for total commercial catches from the Balearic Islands (Western Mediterranean).

Materials and methods

The Balearic Islands is an independent fisheries management unit considered as a Geographical Subarea GSA05 of the General Fisheries Commission for the Mediterranean (GFCM). To estimate total fisheries removals, we followed the catch reconstruction approach of Zeller and Pauly (2007), the protocol developed for the Spanish Mediterranean Sea (Coll *et al.* 2014b) and we adapted this methodology to the local conditions of the Balearic Islands (Carreras *et al.* 2015). We followed five general steps: 1. Gather official landing time series; 2. Identify missing catch data (by sectors, time periods); 3. Gather alternative information on missing data using literature searches and secondary data sources (interviews with fishermen, grey literature, etc.); 4. Develop anchor points in time between which missing catches could be interpolated; 5. Estimate total fisheries catch time series as the sum of total official landings and unreported catches (unreported landings and discards).

Collaboration with fishermen contributed significantly to the estimation of missing data. This was undertaken in two ways. Firstly, seventeen fishermen were interviewed. Secondly, we acquired information from IEO observers on board commercial bottom trawl vessels, who verified discard percentages and real landings. We thus gathered estimations on unreported landings and discard percentages and could monitor how these changed over time.



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Results and Discussion

While the official landings showed a certain stability at around 4,000 t, the reconstructed total catches tended to decline, after a peak in 1969 (13,200 t) and in 1977 (12,500 t), and reached a minimum in 2007 with 5,400 t (Fig. 1).

Total estimated catches over 1950-2010 were 511,500 t. Official landings represented 49% (around 248,000 t), followed by unreported catches (Black market and subsistence; 32%) and discards (20%) (Fig. 1). Unreported catches decreased during the period 1950-2010 (from 58% to 38%), mainly due to a reduction of unreported landings (Fig. 1). Total fisheries removals from the Balearic Islands came primarily from industrial sector landings (mainly trawling) (Fig. 2), which accounted for 63% of reconstructed total catches from 1950 to 2010 (81% when discards are included). Discards (regardless of sector) followed with 20% of the total catch, then artisanal landings and subsistence fishing with 12% and 5%, respectively (Fig. 2). Subsistence fishing decreased from 11% (around 900 t) to 3% (around 140 t; Fig. 2).

Fishing sector collaboration provides valuable information to estimates of missing catch data. Substantial efforts are still required to improve the recording of actual fishing catches in order to advance fisheries management in the future.

Figure 1. Total commercial fisheries removals.

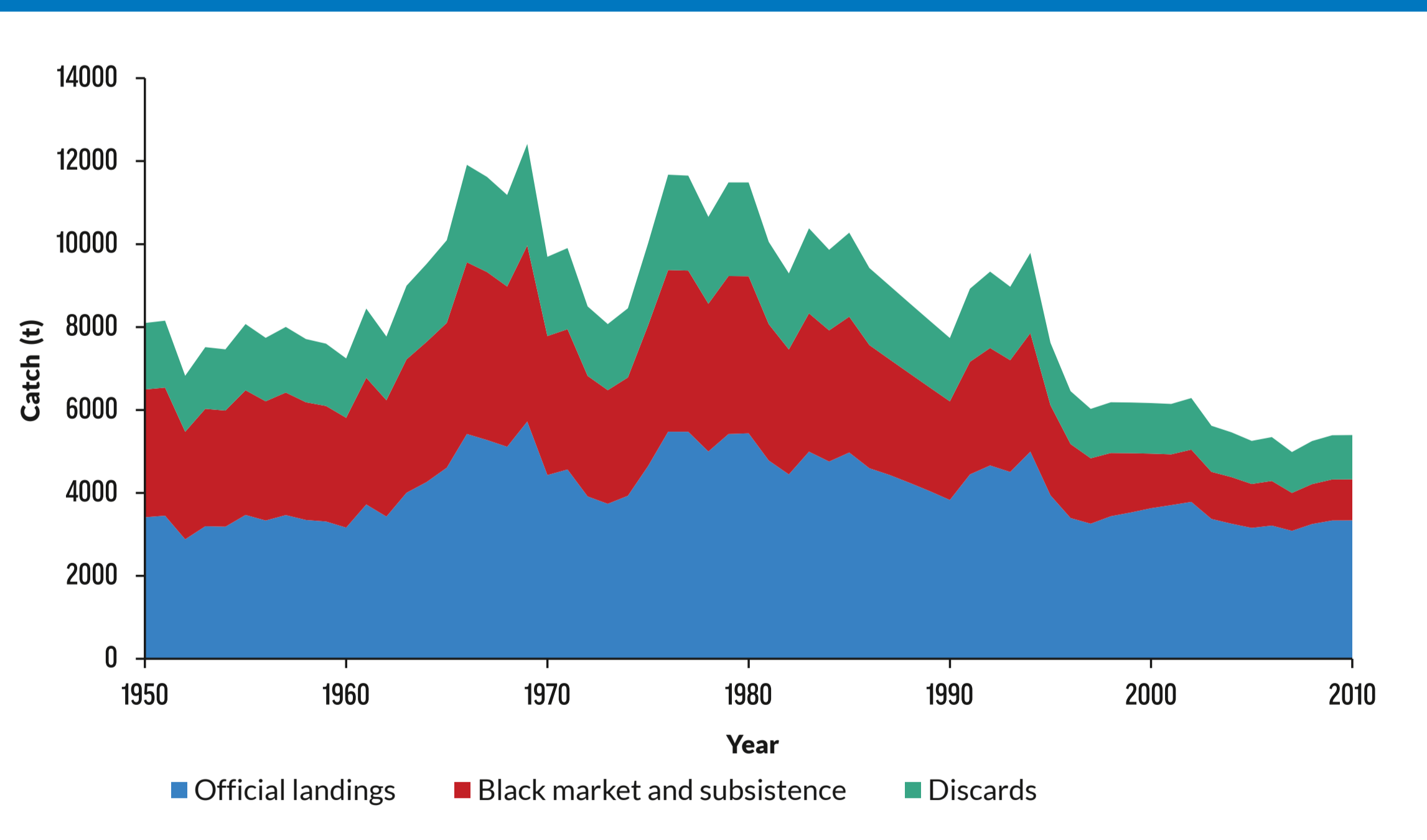
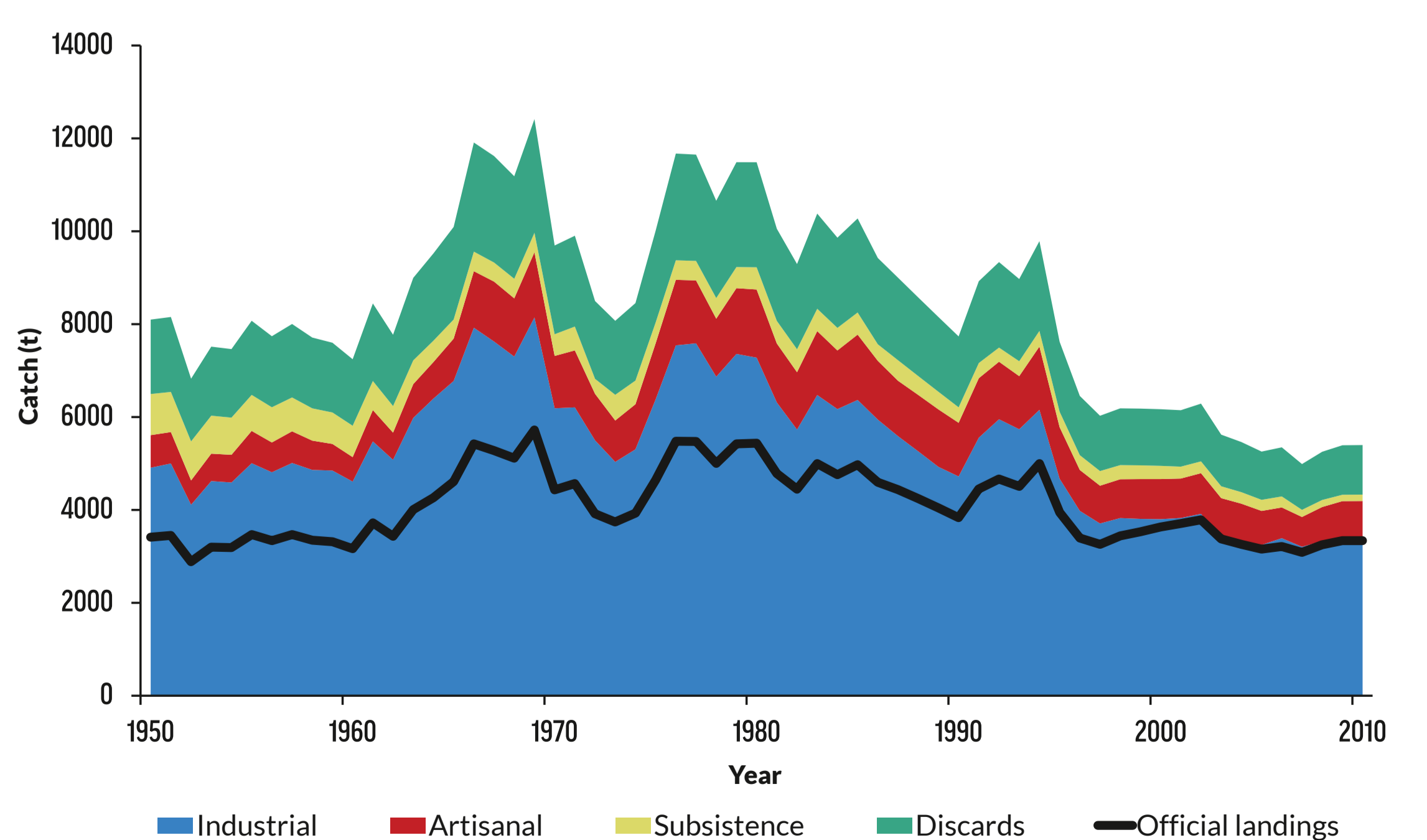


Figure 2. Total commercial fisheries removals by sector with comparison to official landings (discards shown separately).



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