

DATA-LIMITED MIXED FISHERIES TARGETING DATA-POOR SPECIES: THE ARTISANAL PURSE-SEINE FLEET IN THE CANARY ISLANDS

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BACKGROUND

In the Canary Islands, Small Pelagic Fish (SPF) are targeted by artisanal purse seiners, whose activity is monitored by the Canary Centre of the Spanish Institute of Oceanography (IEO) since 2013.

FLEET CHARACTERISTICS:

- Small scale fishery using purse seine (10 mm mesh size) mainly targeting: *Scomber colias*, *Trachurus spp*, *Sardinella spp* and *Sardina pilchardus*.
- Variable number of vessels variable (~26 by year).
- Average technical characteristics: wooden boat hull, 10 m length, 8.5 GRT, 66 hp.
- Daily fishing trips
- Decentralized landing sites.

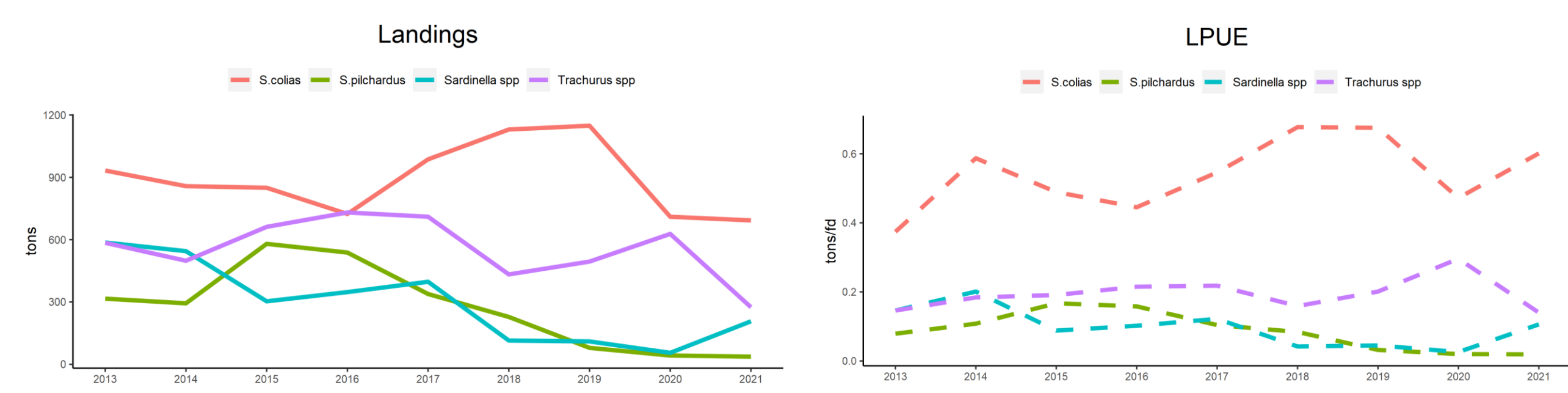


The SPF stocks in the archipelago (considered as single stocks in absence of *ad hoc* studies) are included in the FAO Working Group on the Assessment of Small Pelagic Fish off Northwest Africa. However, the short time-series and the insufficient knowledge of their life history traits had been considered too limited to perform any assessment exercise. In this context, a multi-model approach has been attempted to assess the status of these species for the first time in the area, using both length- and catch-based methods.

MATERIALS & METHODS

INPUT DATA

- Landings in the Canary Islands for the period 2013-2021.
- Proxy of abundance index: LPUE (tons/fishing days of the fleet) in the period 2013-2021.



- Length frequencies of the landings. Availability in the period 2013-2021 differed among species.
- Life-history parameters.

MULTI-MODEL APPROACH

	Assessment models	Data needed	Output
Length-based	LBI (Froese, 2004; ICES, 2015)	• Catch@length in numbers • Biological parameters	Range of indicators and their expected values when exploitation is consistent with sustainability objectives
	LB-SPR (Hordyk et al., 2015a,b)		Estimates F/M and SPR/SPR_0
	LCA+YR (Barros, 2018a,b; Beverton and Holt, 1957; Jones, 1984)		Estimates F_{cur} , F_{max} , $F_{0.1}$
Surplus production-based	CMSY (Froese et al., 2017)	• Time series of catch • Prior ranges of r and B_0/K	F_{MSY} and B_{MSY} (estimated internally, as model parameters) + CI Time series of F/F_{MSY} and B/B_{MSY} + CI
	SPiCT (Pedersen and Berg, 2017)		
	JABBA (Winker et al., 2018)		
	BioDyn (Barros, 2012)		

RESULTS & CONCLUSIONS

Assessment model	Length-based models			Surplus production-based models		
	LBI	LB-SPR	(LCA+)YPR	CMSY	JABBA	BioDyn
<i>Scomber colias</i>						
<i>Trachurus spp</i> (Mixed landings)						
<i>Sardinella spp</i> (Mixed landings)						
<i>Sardina pilchardus</i>						

Length-based approaches

- Parameter values for L_{mat} , growth and natural mortality may not be representative for some stocks.
- Length distribution must represent catch (rather than landings only). Only recent discard information (from 2017) is available for these stocks.
- Assumptions of equilibrium, steady-state stock and predetermined shape of selectivity curve may be violated.

Surplus production-based approaches

- SPiCT multiple trial assessments with different configurations failed to converge or estimate parameters.
- Short time-series and lack of contrast in data negatively affect the performance of these models.
- LPUE might not be a suitable indicator of population abundance.
- CMSY and JABBA provide opposite perception of *S. colias* and *Trachurus spp* status.
- CMSY and BioDyn assessments are strongly dependent on good knowledge of priors of initial depletion and 'guesstimates' of r and K .
- Since clupeids landings (mainly *S. pilchardus*) have drastically decreased during last years of the time series, BioDyn results for these species might not be realistic.

The models tested are a simplification of the dynamic process of populations, and they rely on strong assumptions which are not always fulfilled.

- ✗ The exploratory multi-model approach to assess the small pelagic fish in the Canary Islands by using seven different data-limited methods proves that a quantitative assessment is not yet feasible.
- ✗ It is not possible to provide scientific advice in terms of catch or effort limits.

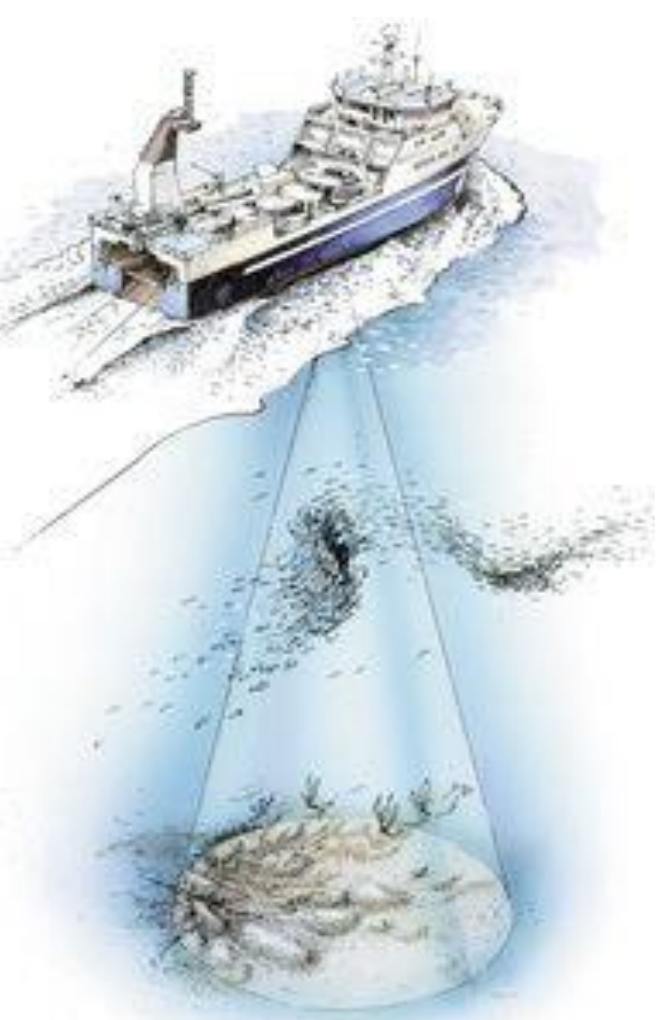
CHALLENGES AND NEXT STEPS

Issues/events to be monitored:

- Catches taken for bait purposes (both as dead-bait for the demersal fleet and as live-bait for tuna fleet) are underreported and, along with discards, make that the actual total removals remain unknown.
- During the **COVID-19 pandemic**, the closure of the hostelry businesses (hotels, restaurants, etc.) caused market demands drastically decreased. Whereas fleet behaviour most likely has changed from 2020, COVID-19 pandemic impact on the fishery cannot be quantitatively determined although it may be assumed to have reduced fishing effort and, hence, catches. Likewise, sampling levels decreased due to scarce landings and lower availability.
- The **vulcano eruption in La Palma** in 2021 seemed to impact the marine populations (maybe because of distribution changes), leading to changes in the fishing behaviour of the artisanal fleets in the Canary archipelago.

NEEDS:

- To obtain abundance/biomass indices from scientific acoustic surveys would allow more reliable assessments, although it is a long term improvement.
- To address uncertainties around these species, both by improving the knowledge of their life histories (growth, fecundity, etc.) and by solving the shortfalls related to the artisanal and multispecific fishery targeting them.
- **Further work (total catch data rather than landings, standardized CPUE, sensitivity analyses...)** and (ideally) longer time-series is required to improve the quality of the assessments.



References:

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*This project has been partially funded by the EU through the European Maritime and Fisheries Fund (EMFF) within the National Program of collection, management and use of data in the fisheries sector and support for scientific advice regarding the Common Fisheries Policy.