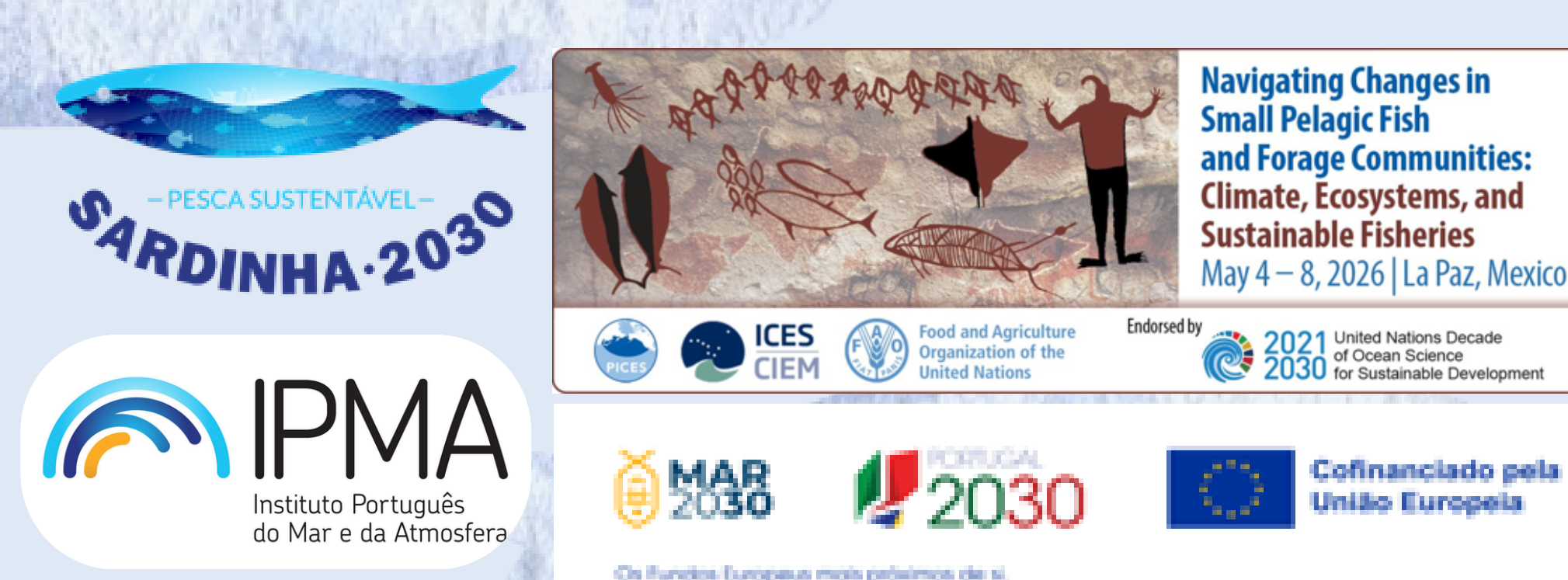


Abundance and length-based indicators to monitor trends for three data-limited stocks from purse-seine fishery in mainland Portugal



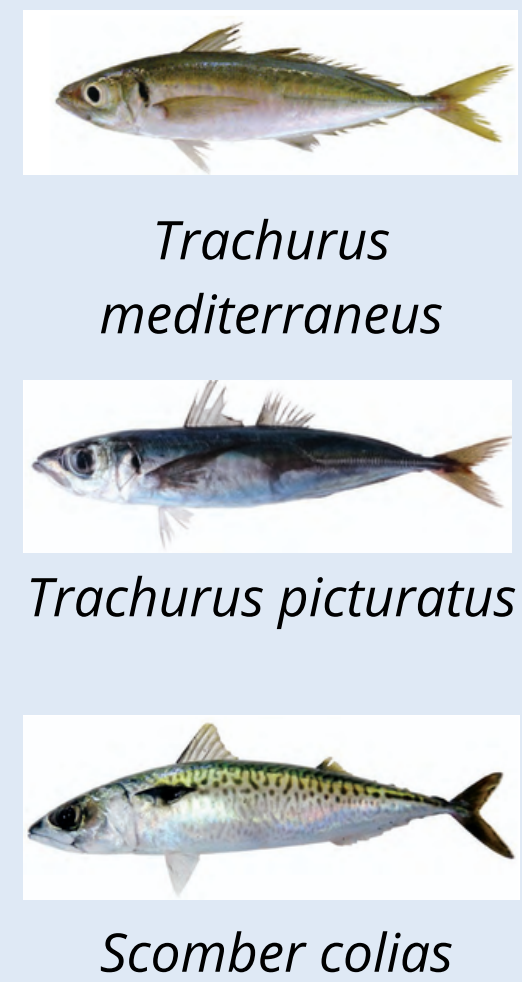
Gaël Grand-Garcia¹, Paola Ossa¹, Ana Moreno¹, Diana Feijo¹, Santiago Cerviño², and Alexandra A. Silva¹

¹Instituto Português do Mar e da Atmosfera (IPMA), Lisboa, Portugal.
E-mail: gael.garcia.formacao@ipma.pt

²Centro Oceanográfico de Vigo, Instituto Español de Oceanografía (IEO-CSIC), Vigo, Spain



INTRODUCTION



- Purse seine most important fishery in mainland Portugal, capturing mainly sardines
- Other species caught but not subjected to stock assessment and management: *T. mediterraneus*, *T. picturatus* and *S. colias*.
- No information about their status and are Referred as data-limited stocks (DLS).

This study assessed the status of the three DLS in mainland Portugal by evaluating the presence/absence distribution abundance trends and length-based indicators (LBIs).

METHODOLOGY

(1) Acoustic survey data for *T. mediterraneus* and demersal survey data in autumn for *T. picturatus* and *S. colias*.

(2) Long-term abundance through linear regression and short-term abundance estimated with 2-over3 rule (I_{203}) (ICES, 2012).

(3) LBIs screen catch / landings-length composition to classify stocks according to conservation OY and MSY considerations (ICES, 2018).

Table 1: Summary of data input

SPECIES	L50 (cm)	Linf (cm)	REFERENCES	DATA TIME SERIES	DATA SOURCE
<i>Trachurus mediterraneus</i>	20	39	Fishbase	2006-2023	Acoustic surveys
<i>Trachurus picturatus</i>	24,8	50,89	Fishbase, Neves et al. 2022	1991-2023	Demersal surveys
<i>Scomber colias</i>	19,47	41,4	Nunes et al., 2019; Landa et al., 2022	1991-2023	Demersal surveys

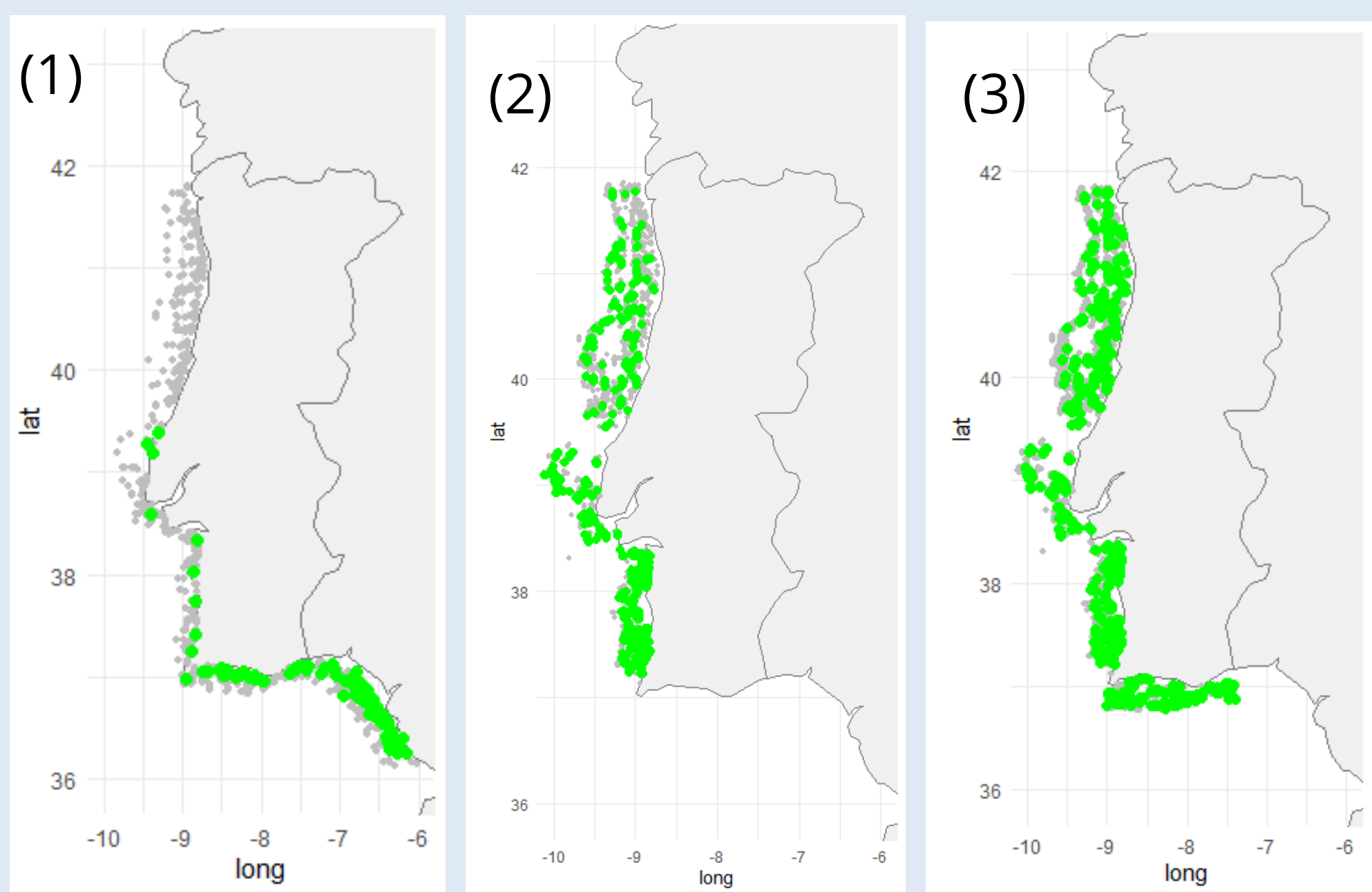
Indicator	Calculation	Reference point	Indicator ratio	Expected value	Property
Lmax5%	Mean length of largest 5%	Linf	Lmax5% / Linf	> 0.8	Conservation (large individuals)
L25%	25th percentile of Length at 50% of modal abundance*	Lmat	L25% / Lmat	> 1	Conservation (immatures)
Lmean	Mean length of individuals > Lc	Lopt = 2/3 Linf	Lmean / Lopt	= 1	Optimal yield
Lmean	Mean length of individuals > Lc	LF=M = (0.75Lc + 0.25Linf)	Lmean / LF=M	≥ 1	MSY

Table 2: Set of length-based indicators, their references, the corresponding indicator ratios, and their expected values grouped in terms of conservation/sustainability, optimal yield and MSY considerations.

Table 3: List of assumptions

Abreviation	Definition	Formula
Lopt	Individuals with optimal length length + 10%	2/3 x L [∞]
LF=m	Length-frequency = mortality	0,75 x Lc + 0,25 x L [∞]

PRESENCE DISTRIBUTION



RESULTS

ABUNDANCE

Figure 1: Maps of the presence absence distribution for (1) *T. mediterraneus*; (2) *T. picturatus*; (3) *S. colias*. Grey dots = Coordinates of stations; Green dots = presence of individuals.

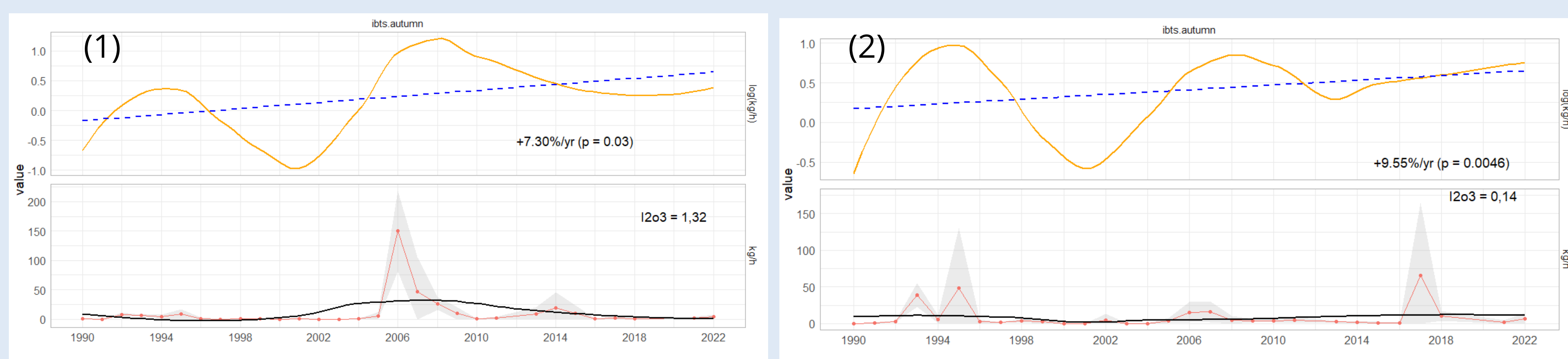


Figure 2: Graphics of temporal abundance for (1) *T. picturatus* and (2) *S. colias* with raw data (kg/h) and their logarithmical representation (LOESS) and linear regression model with slope coefficient. Long-term abundance show positive trends for both species. I_{203} rule show increasing trend for *T. picturatus* ($I_{203} = 1,32$) while decreasing trend for *S. colias* ($I_{203} = 0,14$).

LENGTH FREQUENCY DISTRIBUTION

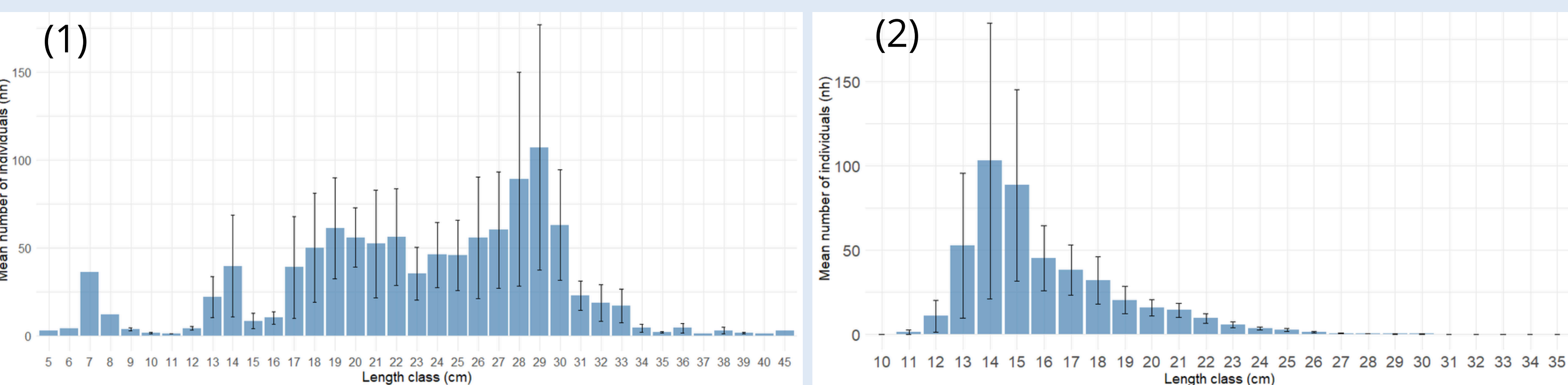


Figure 3: Graphical representation of length frequency distribution for (1) *T. mediterraneus*; (2) *T. picturatus*; (3) *S. colias*.

Year	CONSERVATION		OPTIMUM YIELD		MSY	
	Lc/L50	Lmax5%/Linf	Lmean/L50	Lmean/Linf	Lmean/L50	Lmean/Linf
1991	1,03	0,67	1,07	0,83	1,03	0,83
1992	0,98	0,76	1,10	0,87	1,03	0,87
1993	0,92	0,58	0,93	0,76	1,03	0,79
1994	1,03	0,66	1,06	0,81	1,03	0,81
1995	1,03	0,61	1,03	0,79	1,03	0,81
1996	1,23	0,69	1,23	0,85	1,03	0,85
1997	1,13	0,65	1,16	0,84	1,03	0,84
1998	1,23	0,64	1,22	0,84	1,03	0,84
1999	1,28	0,73	1,31	0,87	1,03	0,87
2002	1,13	0,58	1,12	0,81	1,03	0,81
2005	0,92	0,69	1,04	0,85	1,03	0,85
2006	1,08	0,65	1,10	0,82	1,03	0,82
2007	1,08	0,69	1,11	0,83	1,03	0,83
2008	0,87	0,67	0,96	0,81	1,03	0,81
2009	1,18	0,66	1,17	0,82	1,03	0,82
2010	1,23	0,72	1,20	0,82	1,03	0,82
2011	1,03	0,62	1,03	0,79	1,03	0,79
2013	1,08	0,65	1,13	0,85	1,03	0,85
2014	1,28	0,75	1,28	0,86	1,03	0,86
2015	1,18	0,68	1,19	0,84	1,03	0,84
2016	0,82	0,66	0,92	0,81	1,03	0,81
2017	0,98	0,53	0,98	0,78	1,03	0,78
2018	0,96	0,53	0,96	0,79	1,03	0,79
2021	1,18	0,65	1,19	0,84	1,03	0,84
2022	0,98	0,62	1,03	0,82	1,03	0,82

Table 4: Traffic light table for *S. colias*. Green colour = above the threshold. Red = below the threshold.

LENGTH BASED INDICATORS

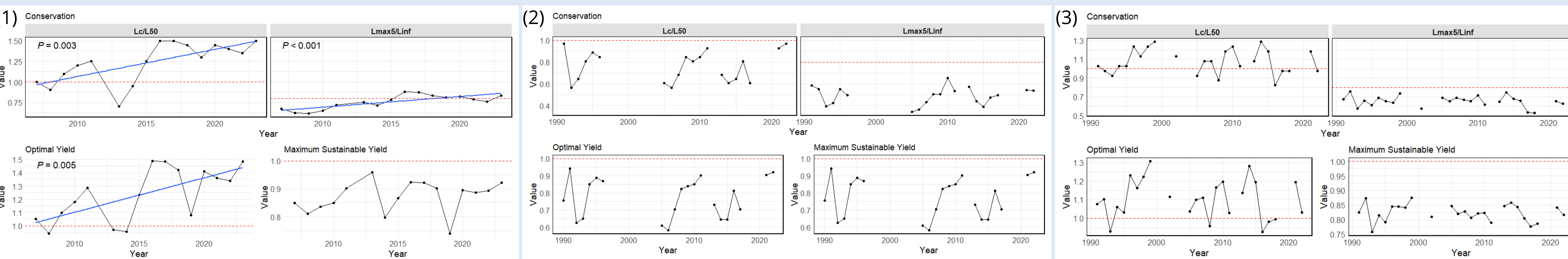


Figure 4: Temporal graphic evolution of LBIs ratios for (1) *T. mediterraneus*; (2) *T. picturatus*; (3) *S. colias* according to conservation yield optimization and MSY considerations (ICES, 2018).

DISCUSSION

- The three species are mainly present in the southern part of the portuguese mainland coast, specially in Algarve and Gulf of Cadiz waters (no data for *T. picturatus*).
- Survey data used as a first approach to counter the lack of fishery data in the case of DLS (Kell et al., 2022).
- T. picturatus* was the only specie with all the indicators below the reference points, but no tendency observed. *T. mediterraneus* and *S. colias* indicators were mainly above the threshold, with increasing trends for the first.
- Use LBIs as cost-effective and easy approach in data-limited contexts, requiring only length-frequency data and life-history parameters while still providing robust indicators of stock status (Froese, 2004).
- Traffic light indicator for *S. colias* show results below threshold in recent years. These results, combined with the ones from I_{203} are consistent with the ones Silva et al. (2025) suggesting a declining short-term trend in abundance and length for *S. colias*, indicating potential recent population pressure.
- Preliminary phase, too early to conclude the status of each stock something.

FUTURE WORKS

- Refine stock definition and improve life-history parameter selection.
- Develop spatio-temporal analyses of abundance and presence-absence trends.
- Address survey limitations, particularly the lack of selectivity relative to minimum landing sizes. Expand to additional data sources to improve robustness and reduce uncertainty (e.g., acoustic surveys and fishery-dependent data).
- Apply alternative data-limited methods: (1) Abundance-based: surplus production (e.g., SPiCT) and depletion models (ICES, 2012); (2) Length-based: LB-SPR, LBB (ICES, 2018).

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AKNOWLEDGEMENTS

This work was made possible through the project "SARDINHA2030 - Gestão da pesca do cerco com vista à sustentabilidade do ecossistema pelágico" (MAR-1114.1-FEAMPA-0001), funded by the program Mar2030 and by the Fundo Europeu dos Assuntos Marítimos, das Pescas e Aquicultura (FEAMPA). Gaël G. Garcia is funded by PhD grant IPMA-2024-022-BI, awarded by the Instituto Português do Mar e da Atmosfera (IPMA). Travel grant awarded by the International Council for the Exploration of the Sea (ICES).