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Institut Català de Recerca per a la Governança del Mar

Report on the marine litter collected by bottom trawlers in Catalonia

2023

Co-funded by the European Union

Generalitat de Catalunya
Departament d'Acció Climàtica, Alimentació i Agenda Rural

CSIC
Consejo Superior de Investigaciones Científicas

Institut de Ciències del Mar

This report contains information on the marine litter fraction of the catch of the bottom trawl fleet of the northern GSA 6, gathered through ICATMAR's fisheries monitoring program.

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How to cite this document
Institut Català de Recerca per a la Governança del Mar (ICATMAR). Report on the marine litter collected by bottom trawlers in Catalonia 2023 (ICATMAR, 24-08), 24 pp., Barcelona. https://doi.org/10.20350/digitalCSIC/16665

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1

Introduction and Method

The Catalan Research Institute for the Governance of the Sea (ICATMAR) has developed, in the framework of the 2030 Maritime Strategy of Catalonia, a monitoring program in collaboration with the commercial bottom trawling fleet to characterize all fractions of the catch, including marine litter. Data collection began in 2018 and will continue to offer the data needed to sustain fisheries and improve management plans. This report presents the data collected and analyzed throughout the year 2023 as an overview of the marine litter fraction of the catch passively caught by bottom trawlers in the Catalan coast, considered a Fishing for Litter strategy.

Data on catch composition for the bottom trawl fishery are shown by port for each of the nine ports sampled. The object of study is macro-benthic marine litter, in other words, the debris big enough to be caught by the bottom trawling which is accumulated on the seafloor. The Catalan coast was divided in three zones, with a total of 9 base ports sampled, from north to south: Roses, Palamós, Blanes, Arenys de Mar, Barcelona, Vilanova i la Geltrú, Tarragona, L'Ametlla de Mar and La Ràpita (Figure 1). Each zone was sampled monthly with a quarterly frequency per port.

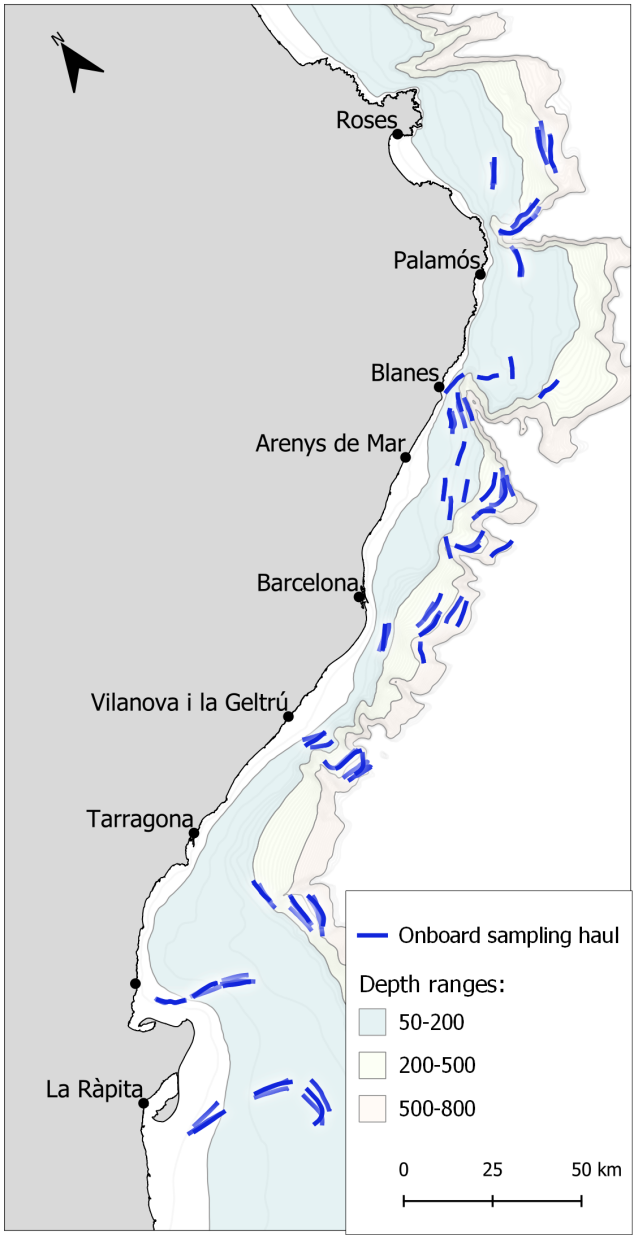

Figure 1. Study area and main fishing ports of ICATMAR bottom trawl fisheries monitoring program in the Northern GSA 6.

In the north and center zones, the sampling depth ranges defined are deep shelf (75 – 200 m), upper slope (200 – 500 m), and lower slope (500 – 800 m). In the southern area, which has a distinct geomorphological structure and bottom sedimentary characteristics, the defined sampling depths are coastal delta

shelf (< 40 m), middle delta shelf (40 – 75 m), and deep shelf (75 – 200 m. Each sampling haul was GPS-recorded with a start and end point, fishing time and gear width. These measurements allowed the calculation of the fishing area to standardize marine litter catches for comparison. The total catch, or a fraction in the case of a very abundant catch, was taken to the ICM-CSIC laboratory to classify and weigh (wet) all marine litter caught in the nets, as described in Table 1. Details on methodology can be found in ICATMAR 24-05.

Table 1. Classification of the marine litter categories in the laboratory, following Balcells et al. (2023).

Category	**Description**
Metal	Items or pieces made with ferrous and non-ferrous metals, i.e. cans, lids
Plastic	Items or pieces made with plastic, i.e. bags, containers
Rubber	Items or pieces made with rubber, i.e. balloons, boots, tyres
Textiles	Clothes and pieces of fabric
Wood	Items and pieces made with wood, i.e. corks, boxes or poles
Other waste	All other marine litter which does not fit in the specific categories, including clinker, the residue from coal-burning steamships

2

Marine litter from the bottom trawl fishery in Catalonia

In 2023, a total of 105 bottom trawl sampling hauls were conducted. Of the total catch, 3% was natural debris mass and 1% was marine litter.

The average marine litter mass was 2% for the period 2019-2022 and 1% for 2023 (Figure 2). For marine litter, i.e. anthropogenic waste, the categories with the highest proportions were plastic in both periods compared (Figure 3).

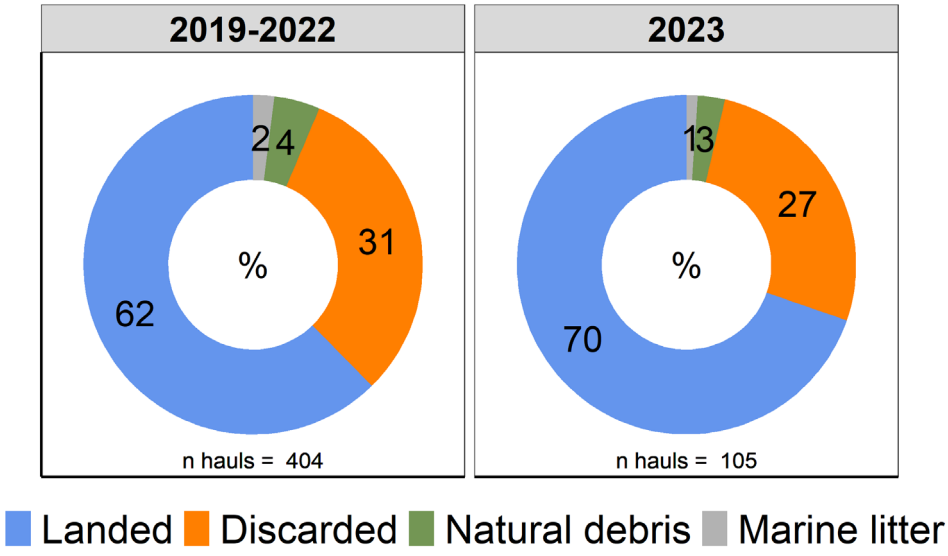

Figure 2. Catch composition in Catalonia. Percentage by weight of landings, discarded, natural debris and marine litter.

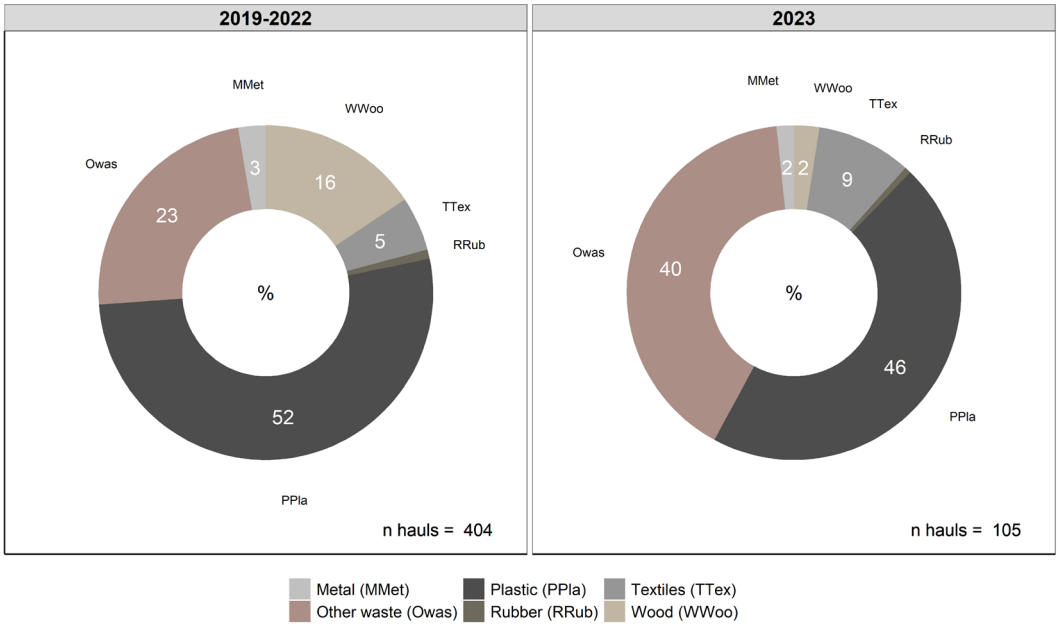

Figure 3. Categories of marine litter with higher mass including all hauls in each year.

Regarding the different depths, the composition of marine litter was found in all fishing grounds, representing a similar fraction within the whole catch (Figure 4).

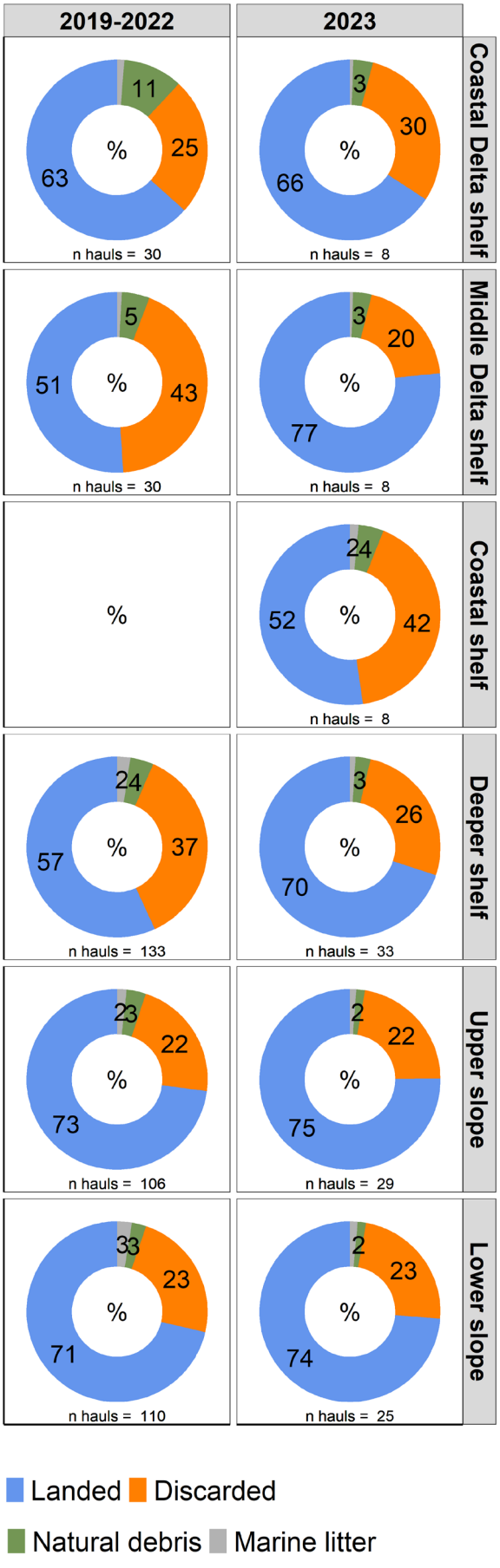

Figure 4. Catch composition for Catalonia. Percentage by weight of landings, discarded, natural debris and marine litter fraction in each métier including all hauls in each period.

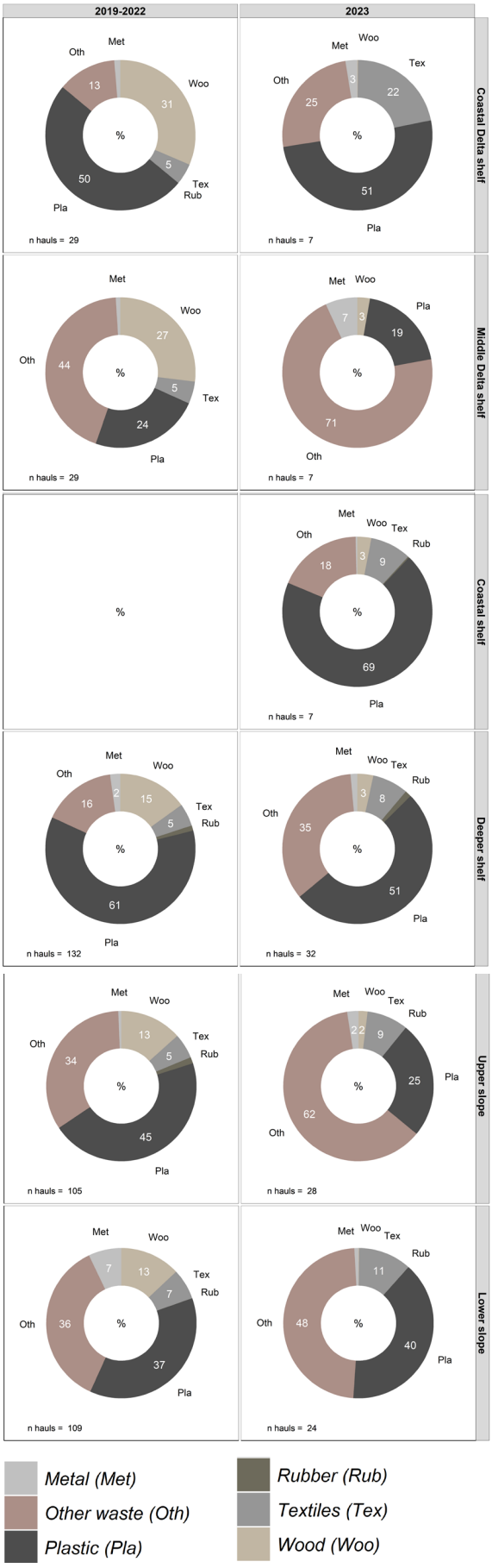

Figure 5: Categories of marine litter with higher mass. Percentage in weight including all hauls within each period and métier.

The composition of marine litter at different depths was variable but plastic was the category that accounted for the highest proportion globally. This proportion was similar through time, with an average of 20.32 kg/km2 in the period 2019-2022 and 17.33 kg/km2 in 2023 (Table 2, Figure 5). The second most common category was other waste, in all studied periods. This category includes clinker, which is the residue of burned coal from steamships (Galimany et al. 2019). This item is heavy and thus, since the data is presented in mass units, it represents a considerable fraction of waste despite this item is not generated anymore as there no steam ships navigating the Mediterranean Sea. Rubber was the category with the lowest proportion, both in global average but also at all depths.

Table 2. Marine litter mass by métier for the previous 5 years (top) and for the year analyzed (bottom). SE: standard error.

2019-2022 Marine litter Mass (kg/km^2)	Coastal Delta shelf		Middle Delta shelf		Deeper shelf		Upper slope		Lower slope		TOTAL
Type	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	
Plastic	3.31	1.49	1.14	0.33	10.24	2.19	3.31	0.50	2.33	0.51	20.32
Other waste	0.84	0.36	2.10	0.86	2.76	0.52	2.45	0.34	2.27	0.76	10.42
Wood	2.07	0.82	1.30	0.43	2.59	0.52	0.97	0.28	0.81	0.34	7.75
Textiles	0.30	0.10	0.23	0.08	0.79	0.26	0.39	0.10	0.42	0.23	2.13
Metal	0.09	0.05	0.05	0.04	0.38	0.17	0.05	0.02	0.45	0.42	1.01
Rubber	0.00	0.00	0.00	0.00	0.20	0.11	0.10	0.08	0.00	0.00	0.30
Total	6.61		4.82		16.96		7.26		6.27		41.92

2023 Marine litter Mass (kg/km^2)	Coastal Delta shelf		Middle Delta shelf		Coastal shelf		Deeper shelf		Upper slope		Lower slope		TOTAL
Type	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	
Plastic	2.35	1.60	0.47	0.15	7.96	3.36	4.18	1.82	1.12	0.29	1.24	0.72	17.33
Other waste	1.16	1.15	1.72	0.80	2.11	1.34	2.82	0.82	2.75	0.78	1.50	0.75	12.07
Textiles	1.01	0.94	0.00	0.00	1.02	0.64	0.63	0.26	0.40	0.19	0.36	0.25	3.41
Wood	0.01	0.01	0.07	0.07	0.35	0.28	0.28	0.16	0.09	0.08	0.00	0.00	0.79
Metal	0.12	0.12	0.17	0.11	0.04	0.04	0.12	0.05	0.11	0.06	0.03	0.02	0.59
Rubber	0.00	0.00	0.00	0.00	0.03	0.03	0.11	0.11	0.00	0.00	0.00	0.00	0.15
Total	4.64		2.43		11.51		8.14		4.47		3.14		34.33

3

Marine litter composition by port

This section contains information on the composition in weight of the marine litter fraction of the catch by port, for the 9 ports sampled. Each port recorded different amounts of marine litter being Barcelona the port with the highest global amount, i.e., 43.54 kg/km^2 in the period 2019-2022 and 17.74 kg/km^2 in 2023 (Table 3). The port with the lowest amount was l'Ametlla de Mar with0.58 kg/km^2 in the period 2019-2022 and 2.06 kg/km^2 in 2023 (Table 3). .

Table 3. Marine litter mass by port for the previous 5 years (top) and for the year analyzed (bottom). SE: standard error.

2019-2022 Marine litter Mass (kg/km^2)	Metal		Plastic		Rubber		Textiles		Wood		Other waste		TOTAL
Port	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	
Roses	1.63	1.00	1.12	0.28	0.00	0.00	0.74	0.48	6.94	2.66	4.53	0.71	14.96
Palamós	0.49	0.32	1.78	0.53	1.08	0.84	0.25	0.06	2.40	0.84	3.34	0.85	9.33
Blanes	8.57	6.23	4.05	0.83	4.28	4.10	0.66	0.17	7.08	2.62	8.04	2.62	32.67
Arenys de Mar	0.00	0.00	0.19	0.08	0.02	0.00	0.06	0.02	0.03	0.01	0.28	0.12	0.58
Barcelona	2.28	1.25	22.27	4.96	3.19	1.90	2.60	0.98	7.61	1.69	5.60	1.30	43.54
Vilanova i la Gelrú	0.15	0.04	6.05	1.73	1.57	1.52	0.90	0.32	1.10	0.35	1.00	0.25	10.76
Tarragona	0.29	0.13	3.65	2.11	0.41	0.03	0.42	0.24	3.77	1.09	2.33	0.45	10.87
L'Amellla de Mar	0.53	0.19	2.65	0.92	0.46	0.00	0.67	0.12	3.00	1.10	3.53	1.10	10.83
La Ràpita	0.40	0.31	2.40	0.92	0.03	0.00	0.88	0.54	4.74	0.97	1.63	0.35	10.07
TOTAL	14.34		44.16		11.03		7.16		36.65		30.28		143.62

2023 Marine litter Mass (kg/km^2)	Metal		Plastic		Rubber		Textiles		Wood		Other waste		TOTAL
Port	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	
Roses	0.26	0.13	1.05	0.42	0.00	0.00	1.40	0.99	0.96	0.94	6.93	1.53	10.61
Palamós	0.39	0.39	0.40	0.12	0.00	0.00	0.44	0.41	0.07	0.00	2.86	1.66	4.16
Blanes	0.15	0.13	3.93	1.96	0.00	0.00	2.03	0.66	1.19	0.63	4.72	1.26	12.01
Arenys de Mar	0.32	0.00	0.26	0.09	0.00	0.00	0.25	0.20	0.00	0.00	1.86	1.23	2.68
Barcelona	0.26	0.09	10.43	4.18	0.85	0.83	3.35	0.91	0.00	0.00	2.86	1.20	17.74
Vilanova i la Gelrú	0.35	0.21	3.02	1.34	0.12	0.11	0.48	0.29	0.22	0.15	0.46	0.32	4.65
Tarragona	1.35	0.00	0.31	0.09	0.00	0.00	0.24	0.15	2.18	0.00	2.73	1.74	6.81
L'Amellla de Mar	0.00	0.00	0.32	0.06	0.00	0.00	0.22	0.19	0.25	0.20	1.26	0.89	2.06
La Ràpita	0.48	0.14	2.88	1.23	0.00	0.00	4.43	2.20	2.01	1.99	3.86	1.24	13.66
TOTAL	3.56		22.60		0.97		12.85		6.88		27.53		74.38

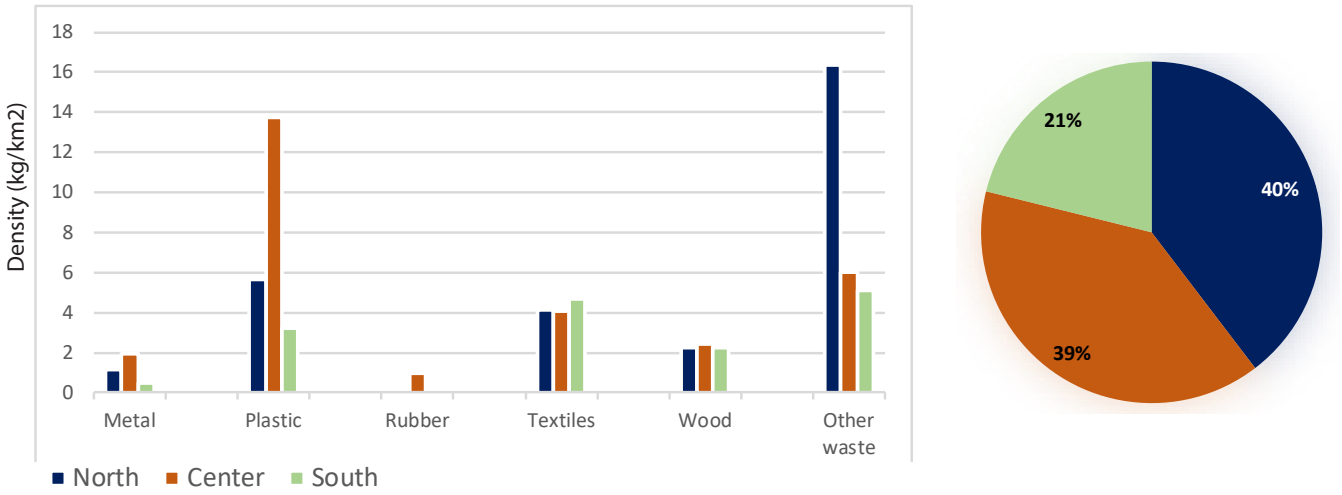

Figure 6. (Left) 2023 marine litter density (kg/km2) per zone and category, and (Right) 2023 proportion of marine litter in weight per zone. North zone: Roses, Palamós, Blanes, Arenys de Mar; Center zone: Barcelona, Vilanova i la Geltrú, Tarragona; South zone: L'Ametlla de Mar, La Ràpita.

Roses

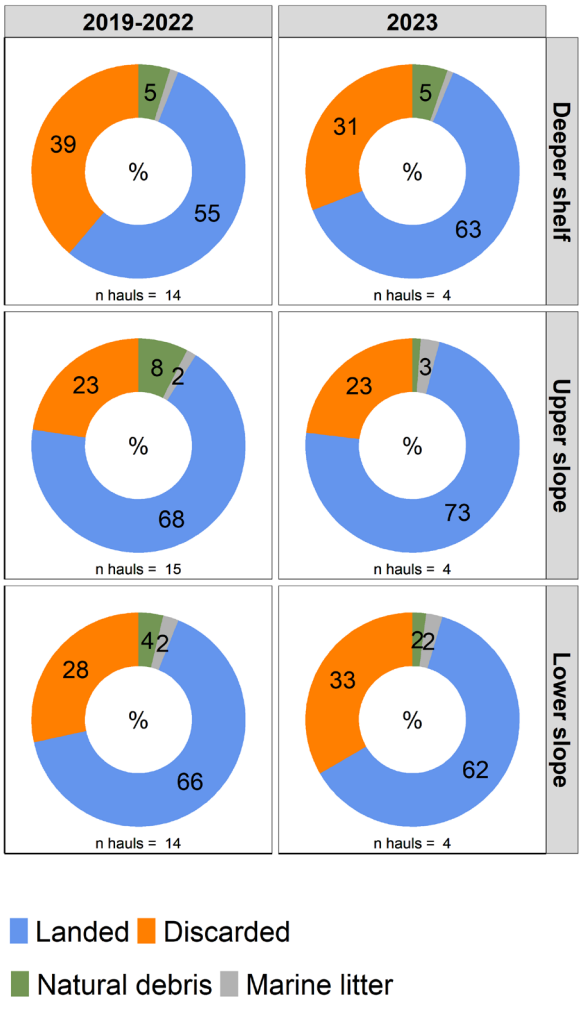

Figure 7. Catch composition for Roses. Percentage by weight of landings, discarded, natural debris and marine litter fraction in each métier including all hauls in each period.

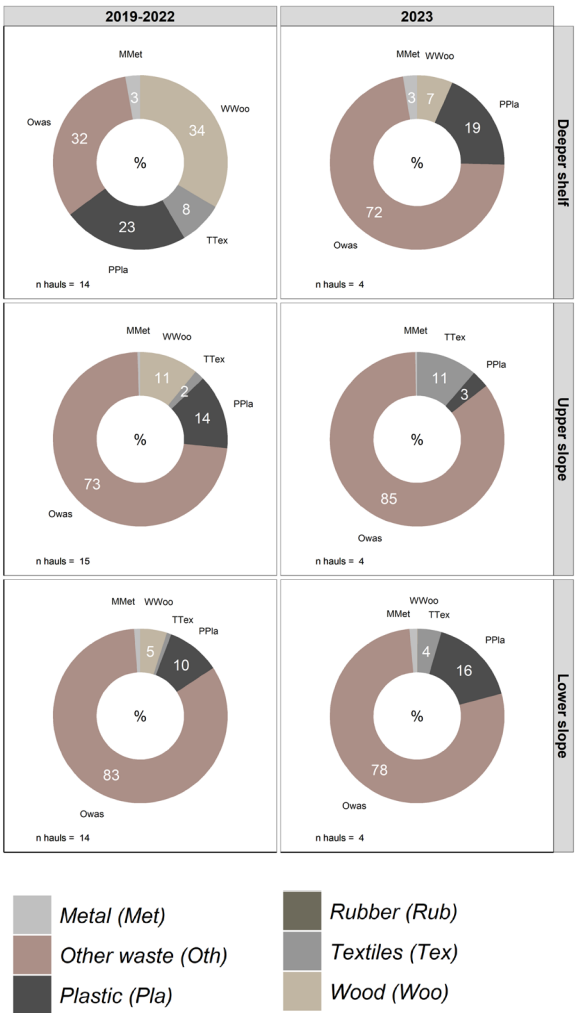

Figure 8. Categories of marine litter with higher mass for Roses. Percentage in weight including all hauls within each period and métier.

Palamós

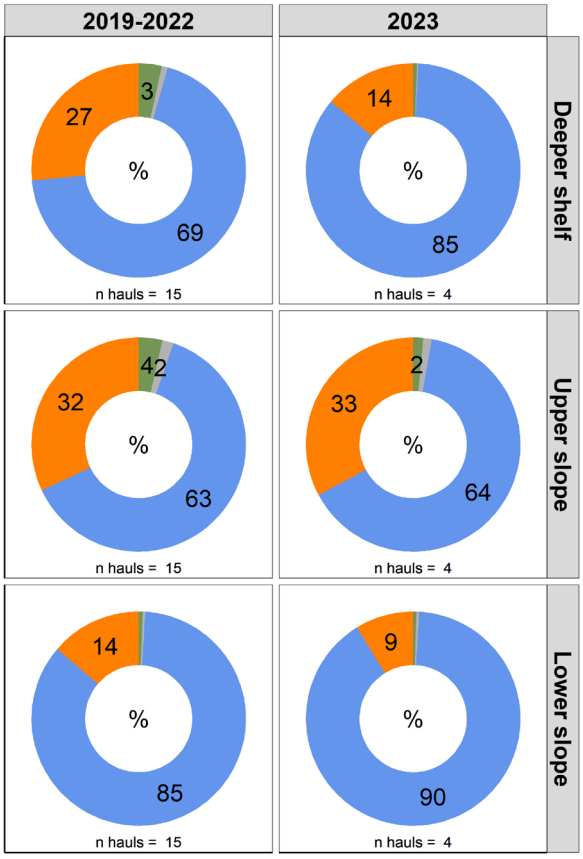

Figure 9. Catch composition for Palamós. Percentage by weight of landings, discarded, natural debris and marine litter fraction in each métier including all hauls in each period.

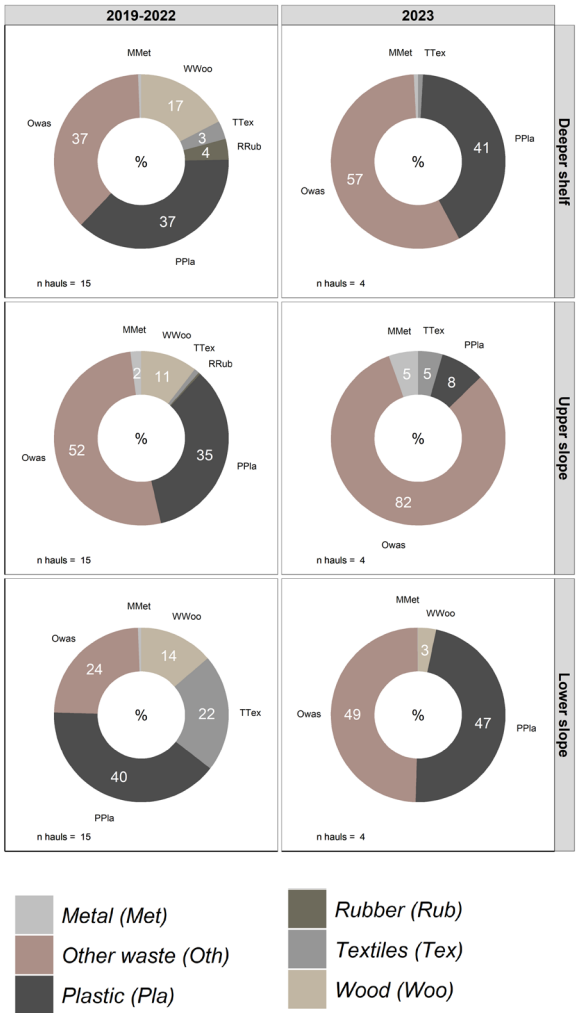

Figure 10. Categories of marine litter with higher mass for Palamós. Percentage in weight including all hauls within each period and métier.

Blanes

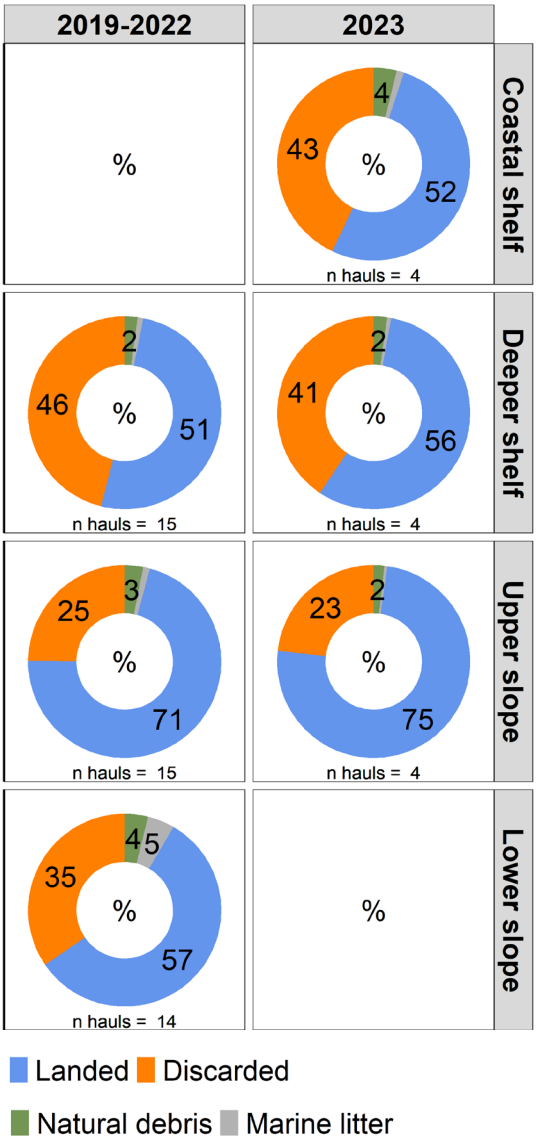

Figure 11. Catch composition for Blanes. Percentage by weight of landings, discarded, natural debris and marine litter fraction in each métier including all hauls in each period.

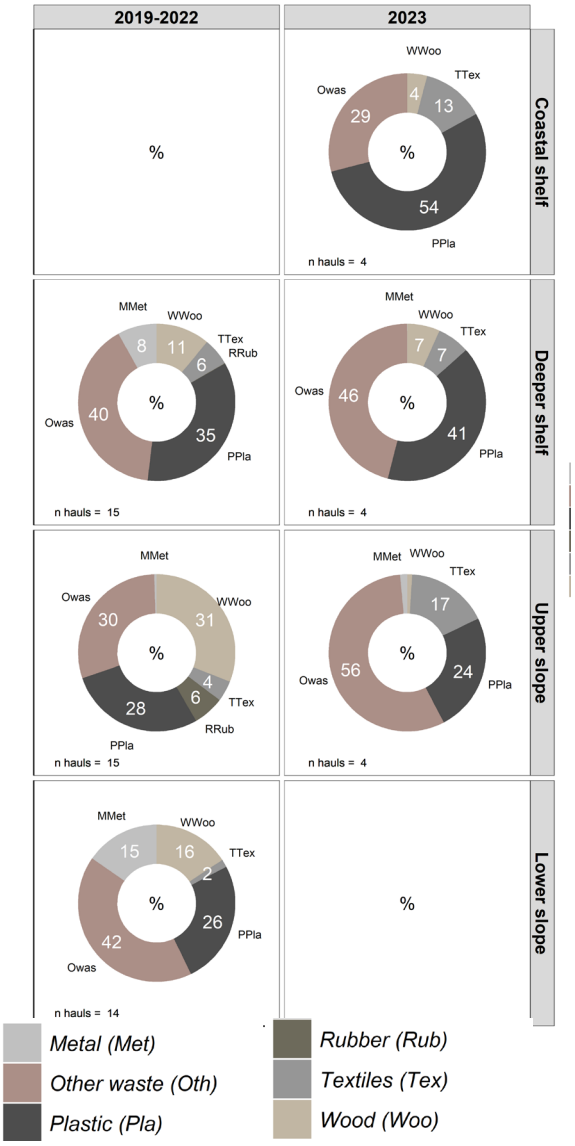

Figure 12. Categories of marine litter with higher mass for Blanes. Percentage in weight including all hauls within each period and métier.

Arenys de Mar

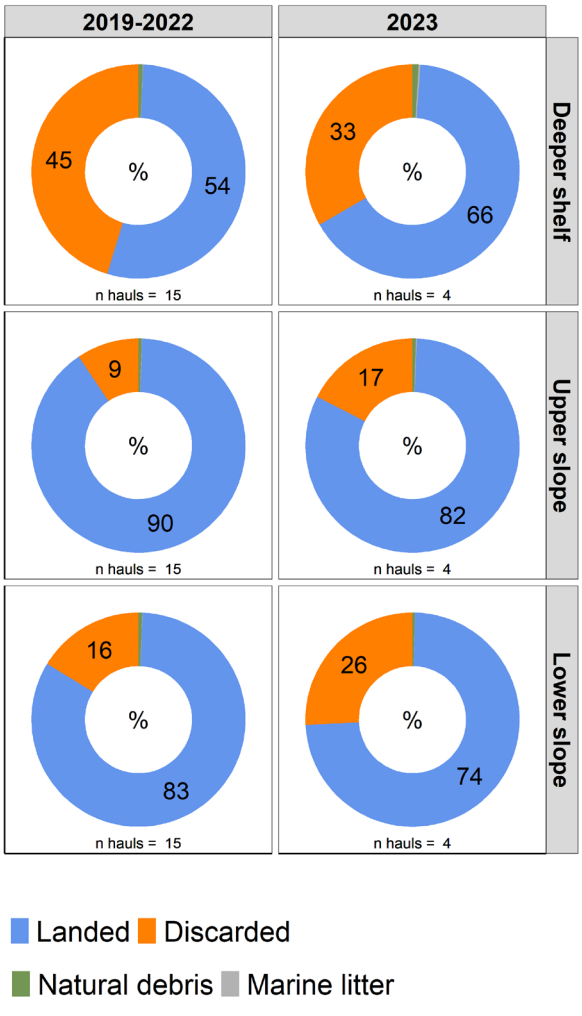

Figure 13. Catch composition for Arenys de Mar. Percentage by weight of landings, discarded, natural debris and marine litter fraction in each métier including all hauls in each period.

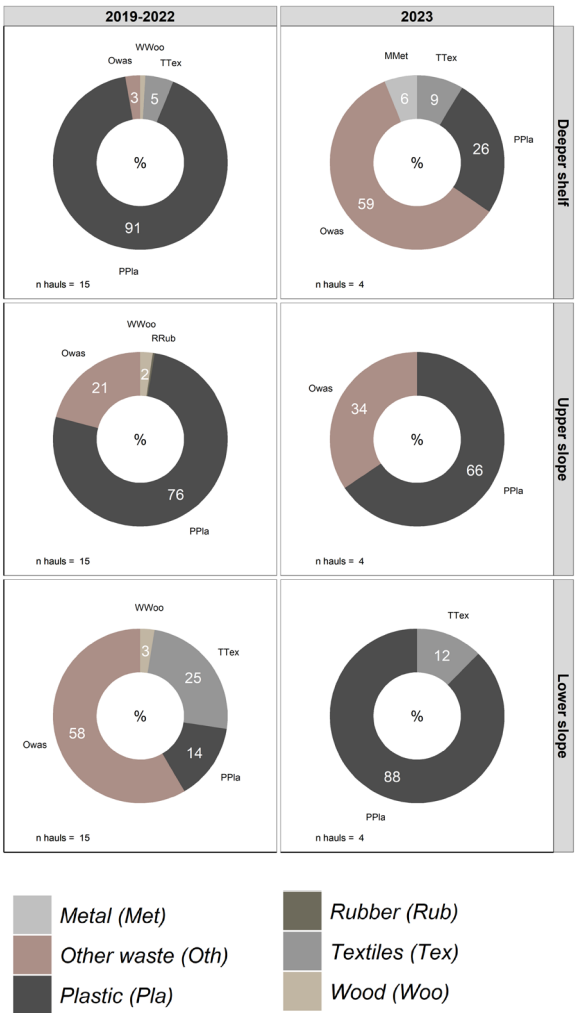

Figure 14. Categories of marine litter with higher mass for Arenys de Mar. Percentage in weight including all hauls within each period and métier.

Barcelona

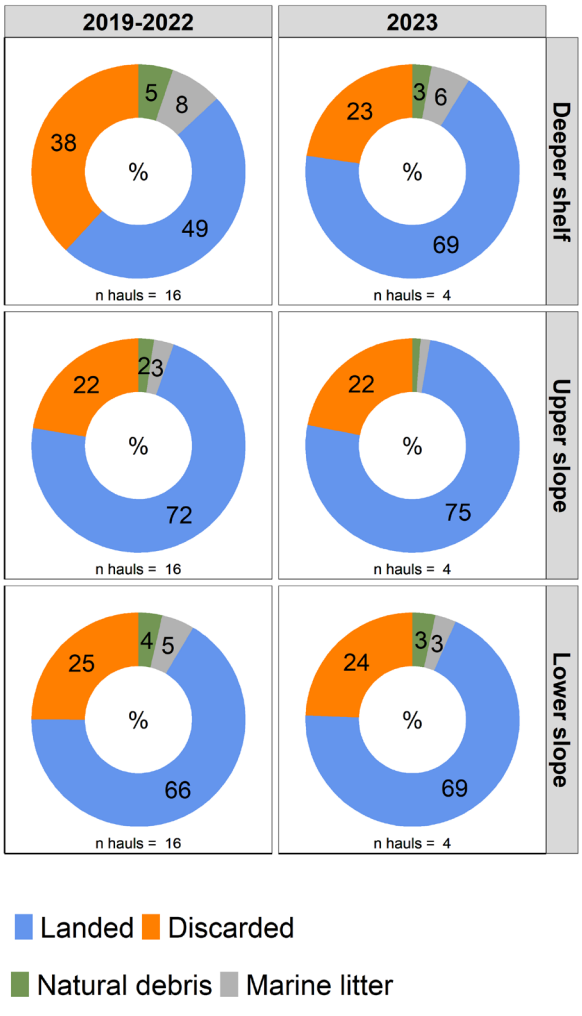

Figure 15. Catch composition for Barcelona Percentage by weight of landings, discarded, natural debris and marine litter fraction in each métier including all hauls in each period.

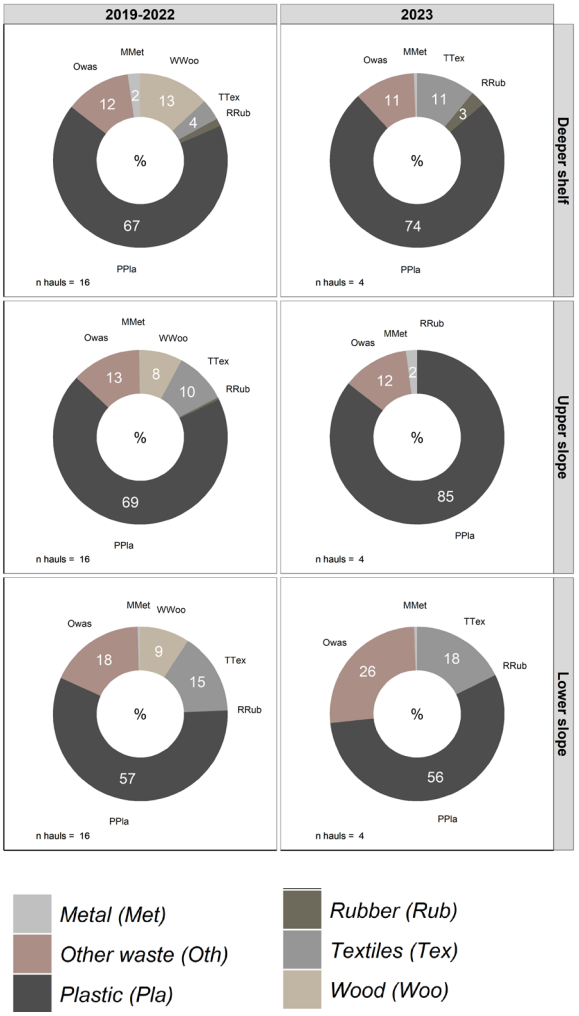

Figure 16. Categories of marine litter with higher mass for Barcelona. Percentage in weight including all hauls within each period and métier.

Vilanova i la Geltrú

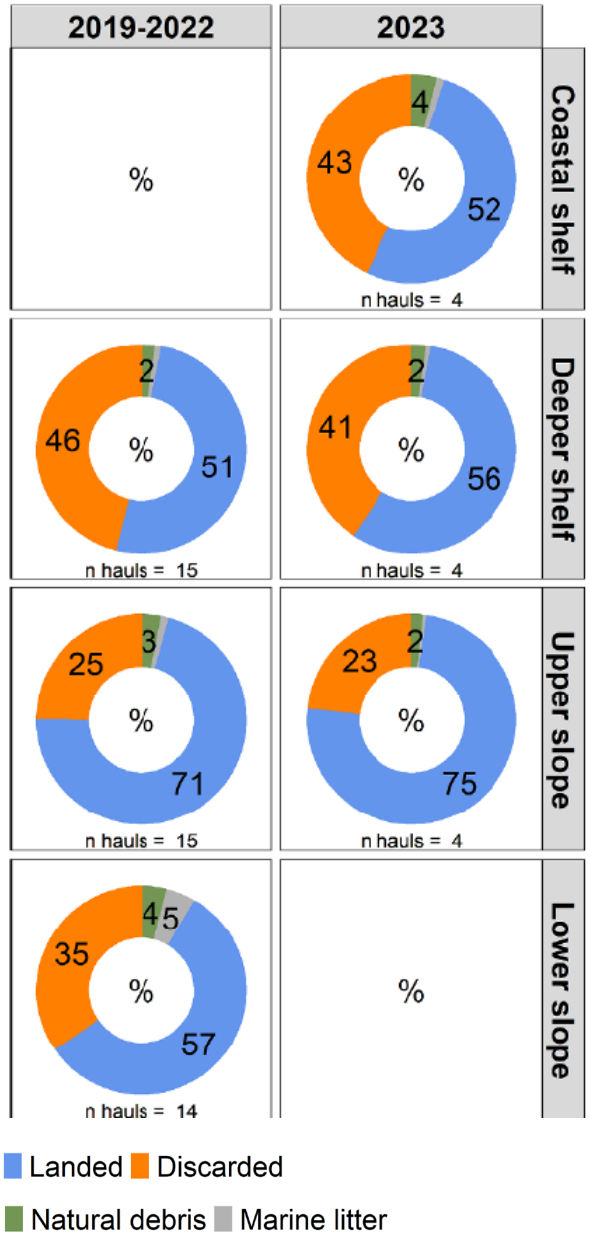

Figure 17. Catch composition for Vilanova i la Geltrú. Percentage by weight of landings, discarded, natural debris and marine litter fraction in each métier including all hauls in each period.

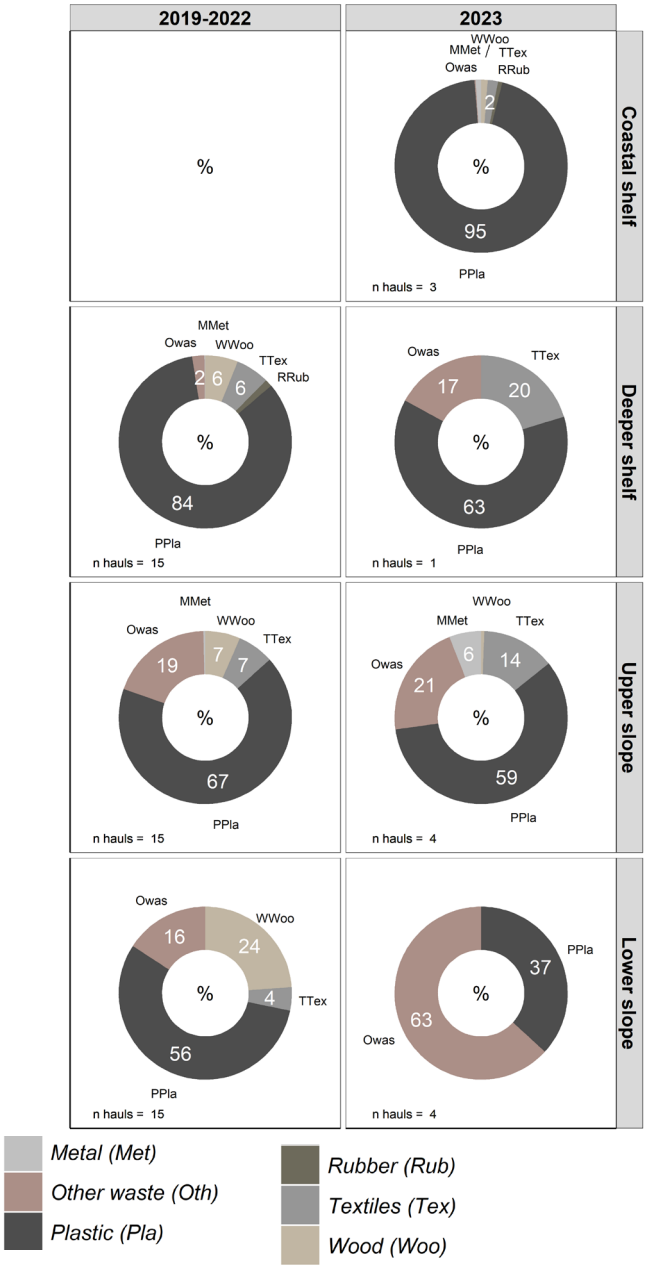

Figure 18. Categories of marine litter with higher mass for Vilanova i la Geltrú. Percentage in weight including all hauls within each period and métier.

Tarragona

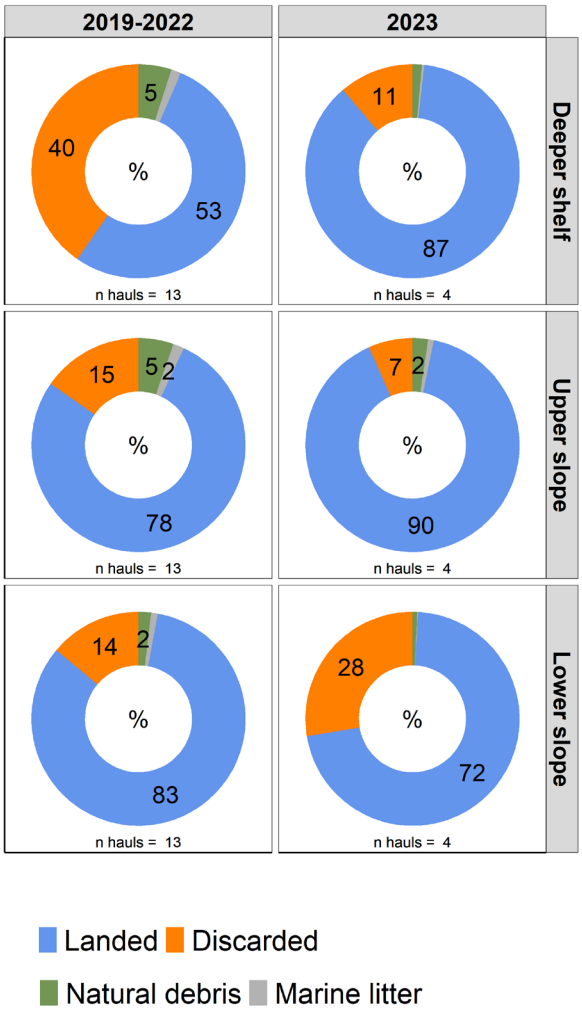

Figure 19. Catch composition for Tarragona. Percentage by weight of landings, discarded, natural debris and marine litter fraction in each métier including all hauls in each period.

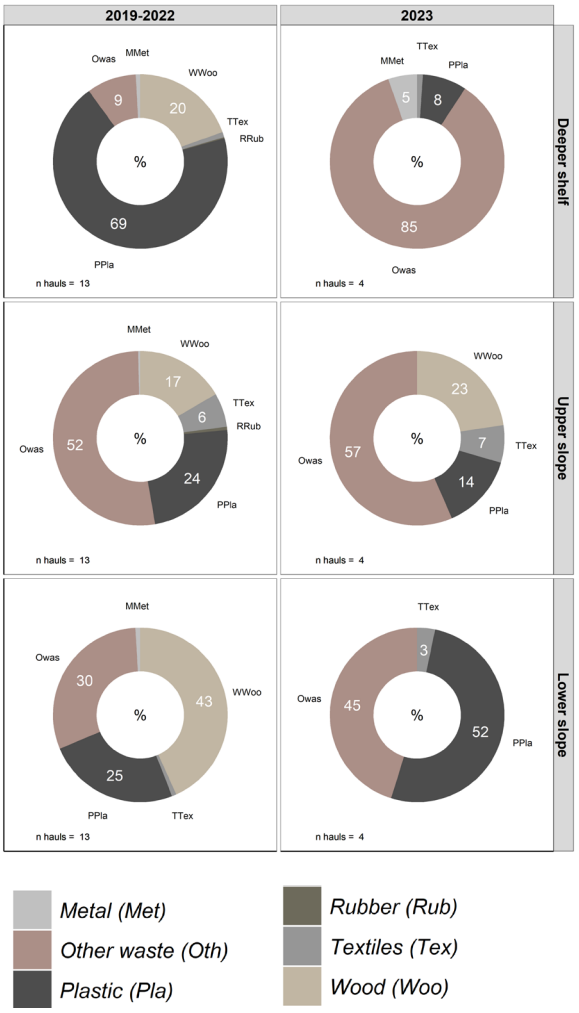

Figure 20. Categories of marine litter with higher mass for Tarragona. Percentage in weight including all hauls within each period and métier.

L'Ametlla de Mar

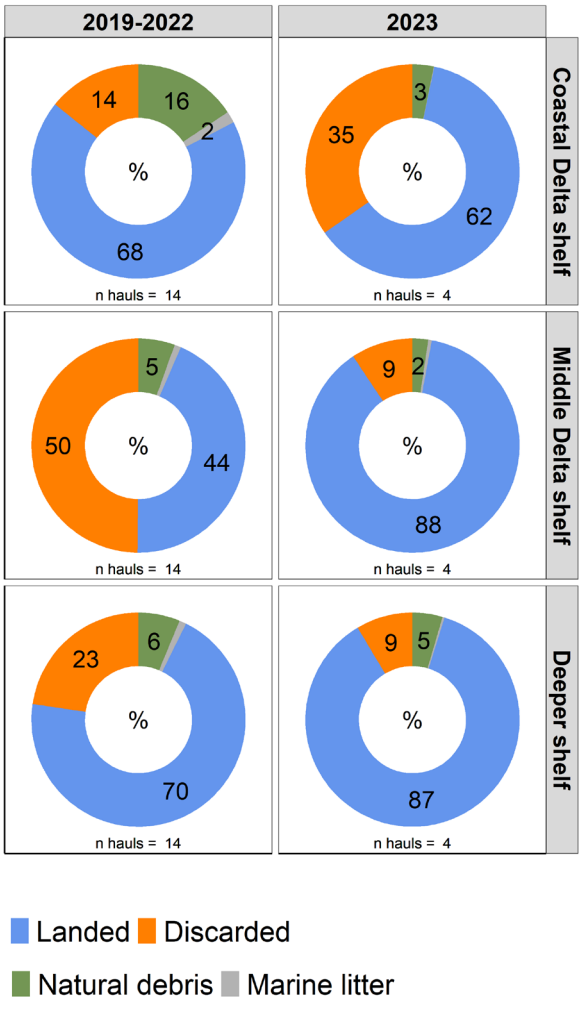

Figure 21. Catch composition for L'Ametlla de Mar. Percentage by weight of landings, discarded, natural debris and marine litter fraction in each métier including all hauls in each period.

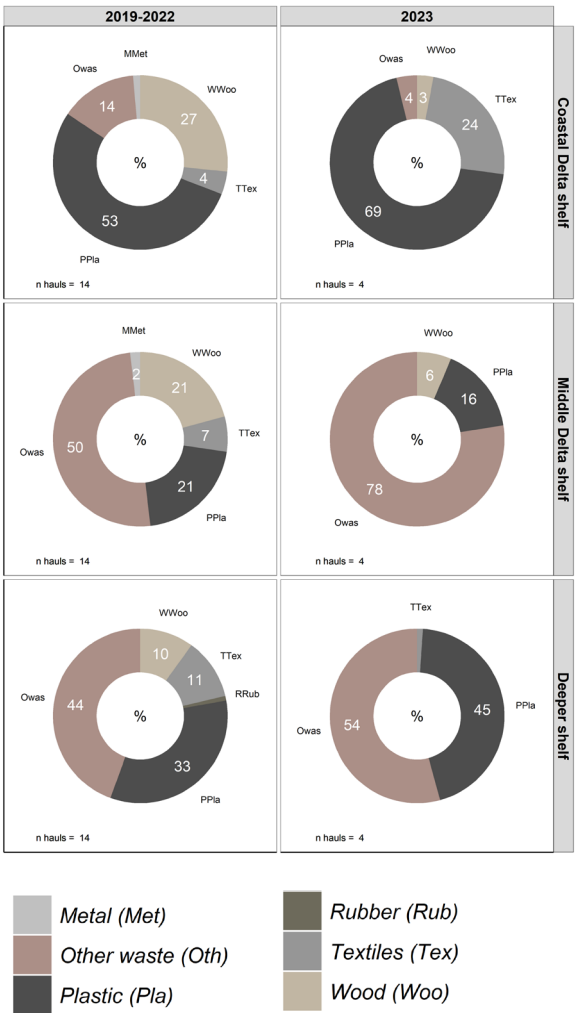

Figure 22. Categories of marine litter with higher mass for L'Ametlla de Mar. Percentage in weight including all hauls within each period and métier.

La Ràpita

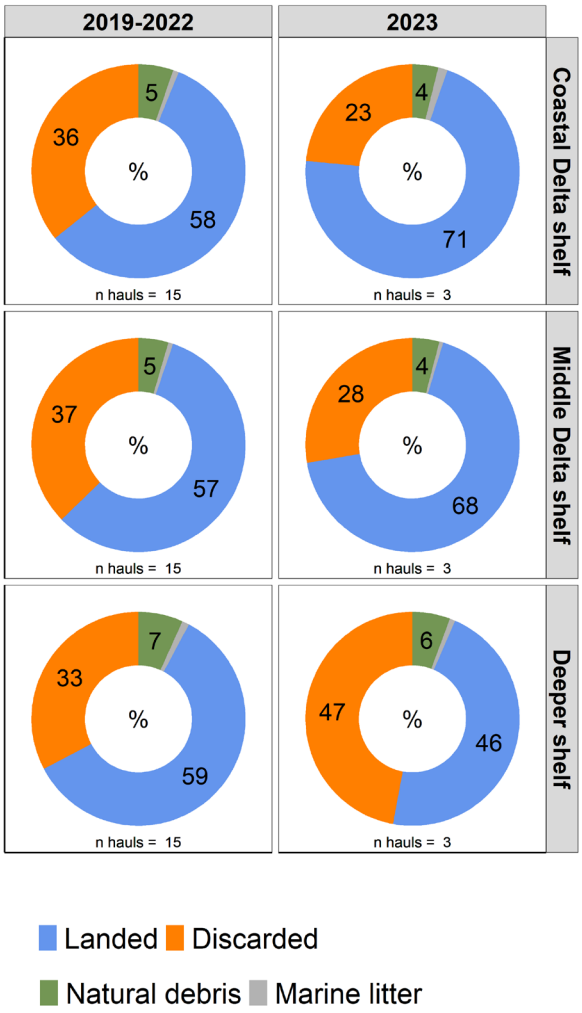

Figure 23. Catch composition for La Ràpita. Percentage by weight of landings, discarded, natural debris and marine litter fraction in each métier including all hauls in each period.

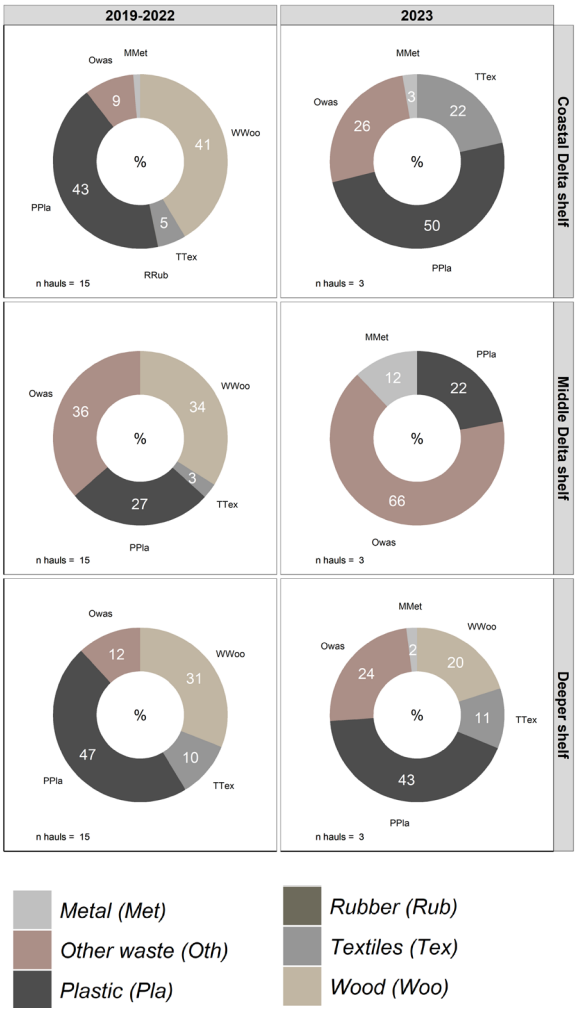

Figure 24. Categories of marine litter with higher mass for La Ràpita. Percentage in weight including all hauls within each period and métier.

4
Conclusions

Marine litter is a global problem, also found along the Catalan coast, at all studied depths. Fishing for Litter strategies can provide useful information and help identify the type and location of the marine litter accidentally caught by bottom trawlers. Using this strategy, the main findings include:

- Marine litter represent the lowest fraction of the catch for bottom trawlers in the Catalan continental shelf, both historically and at present time;
- Both, coastal and deeper shelf métiers, accumulate the largest amount of marine litter from fishing grounds;
- The category Plastic, even if they are items made of out a very light material, represents the greatest proportion of the marine litter fraction, with an average of 20.32 kg/km^2. In contrast, Rubber is the least frequent fraction, with only 0.30 kg/km^2 in average;
- When analyzed by port, the amount and type of marine litter varies along the coast. The greatest amounts, though, were observed in the central area of Catalonia, with the plastic fraction dominating the marine litter. The southern area is the only area where Wood is abundant.

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Institut Català de Recerca per a la Governança del Mar

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Co-funded by the European Union

Generalitat de Catalunya
Departament d'Acció Climàtica, Alimentació i Agenda Rural

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