CleanAtlantic

Tackling Marine Litter in the Atlantic Area

Optimized protocol and template for monitoring floating macrolitter by scientific observers onboard research vessels

Action 5.2: Monitoring the presence of ML in the Marine Environment

WP 5: Monitoring and data management

Interreg Atlantic Area European Regional Development Fund
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Clean Atlantic

WP	WP 5.2.1
ACTION	IMPROVING ACTUAL METHODS FOR THE MONITORING OF MARINE LITTER
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AUTHORS	IEO: LUCÍA SOLIÑO, PATRICIA PÉREZ, LETICIA VIDAL, JESÚS GAGO
PARTICIPANTS	

DISCLAIMER

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Introduction

In 2007 the Spanish Institute of Oceanography (IEO) established for the first time the group of Apex Predators (marine mammals, seabirds and turtles) observers during a campaign to evaluate pelagic fisheries in the Bay of Biscay (PELACUS 07). This campaign was performed onboard the RV Thalassa, where researchers from the University of La Rochelle carried out the campaign PELGAS, which included apex predator surveys too. Therefore, the same protocol used by French researchers was applied for PELACUS with the aim of facilitating data collection and sharing. This protocol was also adopted by the Spanish research institute AZTI during their campaigns JUVENA and BIOMAN. Since then floating macro litter was incorporated also to the list of observations to be reported by observers to optimize marine debris surveys and allow for an estimation of its density.

In the frame of the CleanAtlantic project (Tackling marine litter in the Atlantic Area) the protocol and templates used for recording floating litter were further adapted and improved so that they could be used as a common tool for any observer regardless the specificities of R/V and institutions, and also to facilitate the work of the observers. Thus, the optimized and English-translated protocols and datasheets for apex predators and marine litter recording are presented in the next sections. This work was carried out under the Work Package 5.2, whose final aim is to reinforce and support the monitoring of marine litter in the framework of the Marine Strategy Framework Directive (MSFD).

Sampling methodology and analysis

1. SAMPLING

The sampling method is based on the “distance sampling” (Buckland et al., 2001). Briefly, this methodology uses perpendicular distances of the sight to obtain an effective bandwidth which enables the calculation of species/litter density in the sampling area. The difference with other methods (i.e “Strip transect”) is that ‘’distance sampling’’ estimates the effective bandwidth at the end of each transect. This estimation takes into account the percentage of specimens/items that are not detected due to perception and availability bias. This method also presumes certain conditions that must be considered: *i)* animals must be detected before they react against the observation platform/boat, *ii)* the probably of detection in transect (perpendicular distance=0 m) is equal to 1 and *iii)* angular and radial distances should be accurate.

As a general rule, the bridge deck, also denominated ‘’pasarelle’’ will be the preferred sight platform. The platform located on the top of the bridge (‘’pont superior’’) could be also used for observations. However, the observer must use always the same platform for each research vessel to avoid biases and allow for data comparability between different campaigns. The observer must be positioned outside, except in justified cases. In this case, it must be indicated in the data template as ‘’pasarelle_int’’. Nevertheless, it should be taken into account that data will not be valid when taken under weather conditions over 5 according

Beaufort scale. Any observation recorded under these circumstances would be classified as ''opportunistic'' and will not be included in density estimations. At the start of each sighting period, meteorological and observation conditions must be recorded. Observers will work in teams of two, during daylight, at ship constant speed of 10 knots, by scanning an area ahead of the vessel of 90º degrees each. The distance and angle between the observer and the specimen/item will be recorded together with other relevant data. Templates are displayed in the Annex section. Binoculars will be used when necessary for confirmation and identification purposes.

Records of floating litter must be classified attending to different characteristics, such as material (*i.e.* plastic, wood, other), source (*i.e.* fisheries) and size (small trash / trash) and when possible, the object detected identified. ''Trash'' and ''small trash'' classes refer to items of unknown material and source, being ''small trash'' pieces smaller than 20 cm. The categories used to group the litter are presented in the Annex section.

2. ANALYSIS

Direct animal/item-observer distance recorded (r) together with sighting angle (Θ) from the transect line is used to calculate perpendicular distance as r sinΘ.

Distance sampling methodology (Buckland et al., 2015) used to estimate floating litter density has been applied in previous studies (Suaria and Aliani, 2014). The density of specie/floating litter (D) is determined as:

$$D = \frac{n}{2\mu L}$$

Where n is the number of sighting, L is the length of transect and μ is the effective bandwidth (half), meaning the perpendicular distance with the highest probability of animals/objects detection.

References

Buckland, S.T., Anderson, D.R., Burnham, K.P., Laake, J.L., Borchers, D.L., Thomas, L., 2001. Introduction to distance sampling: estimating abundance of biological populations. Oxford Univ. Press.

Buckland, S.T., Rexstad, E.A., Marques, T.A., Oedekoven, C.S., 2015. Distance sampling: methods and applications, Methods in Statistical Ecology. Springer International Publishing.

Suaria, G., Aliani, S., 2014. Floating debris in the Mediterranean Sea. Mar. Pollut. Bull. 86, 494–504. https://doi.org/https://doi.org/10.1016/j.marpolbul.2014.06.025.

Annex 1: Apex predator and marine litter template for data collection

DATE: ____/____/____ TEMPLATE FOR OBSERVATION OF APEX PREDATORS AND FLOATING LITTER

SURVEY_____

OBSERVERS: 1: _____ 2 : _____ 3 : _____

CODE LEG	S/P	Hour	Species	Age (I/J/A)	Number	Distance (m)	Angle (°)	Route (°)	General behaviour	Behaviour 2	Behaviour 3	Juvenile (S/N)	Photos (S/N)	Observations

Annex 2: Environmental and observation conditions template

TEMPLATE FOR ENVIRONMENTAL CONDITIONS - SURVEY____

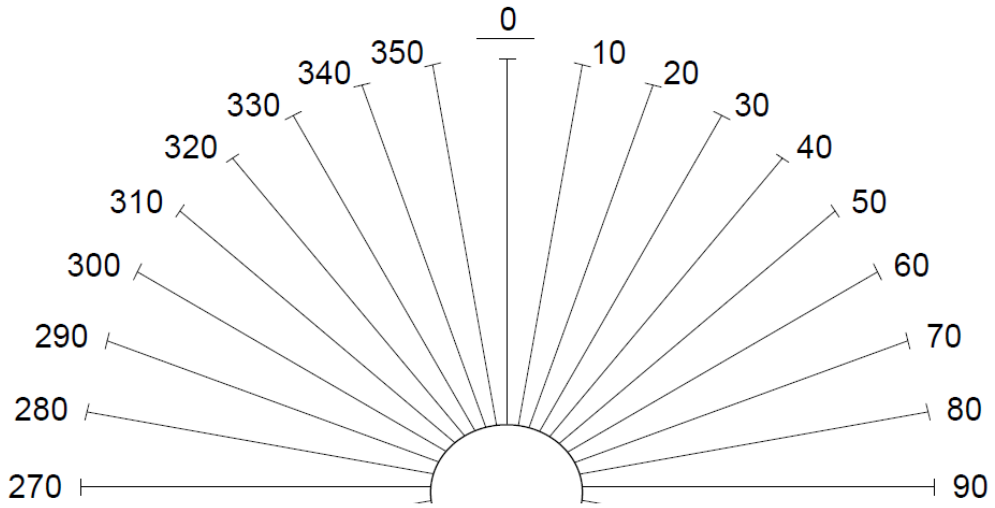
DATE : ____/____/____

OBSERVERS: 1 : _____ 2 : _____ 3 : _____

ID RADIAL	CODE LEG	Obs. Por.	Obs. Star.	Starting hour	End hour	Platf. Ext/Int[1]	Speed [2] (kn)	Route (°)	Beauf [3] (1-5)	Wave Direct.[4] (º)	Wave Height[4] (m)	Wind Direct.[5] (º)	Wind Speed [5] (kn)	Visib.[6] (1-6)	Cloud [7] (0-8)	Reflect. from [8] (º)	Reflect. until [8] (º)	Reflect (N/W/M/S/T) [9]	Condit. (Ex/G/M/Nu) [10]	Observ.

[1] ***Observation platform:*** *Exterior (Pontsuperior) or interior (Passarelle).*
[2] ***Speed/Route****: speed for PELACUS: 10 knots/ route (degrees according radial).*
[3] ***Beaufort, wind scale*** *:* ***0 : CALM*** *(mirror-like, <1kn),* ***1 : LIGHT AIR*** *(1-3 kn),* ***2 : LIGHT BREEZE*** *(4-6 kn),* ***3 : GENTLE BREEZE*** *(7-10 kn),* ***4 : MODERATE BREEZE*** *(11-16 kn),* ***5 : FRESH BREEZE,*** *(17-21 kn),* ***6. STRONG BREEZE*** *(22-27 kn),* ***7. NEAR GALE*** *(28-33 kn),* ***8. GALE*** *(34-40 kn).*
[4] ***Wave direction and height****: record wave direction (direction towards) in degrees and eight in meters.*
[5] ***Wind direction and speed****: record wind direction in degrees (direction from) and speed in knots.*
[6] ***Visibility*** *:* ***0****: null,* ***0,5:*** *0,5 m,* ***1****: 1 m,* ***2****: 2 m,* ***5****: 5 m,* ***10****: 10 m.*
[7] ***Cloud cover****: cloud proportion measured in okta* ***0****: sky completely clear,* ***8:*** *sky completely covered.*
[8] ***Solar reflection****: blindness sector: record angles delimiting observer blindness sector (from-until) in degrees.*
[9] ***Reflection solar intensity****: Null/Weak/Middle/Strong/Total.*
[10] ***Observation conditions****: general appreciation: Excellent/Good/Middle/Null.*

Annex 3: Observation category and codes sheet



CETACEANS	
BALPHY	Fin whale
BALACU	Common minke whale
BALSPP	Minke whale sp
PHYMAC	Sperm whale
LARCET	Large cetacean
PHOPHO	Harbour porpoise
TURTRU	Bottlenose dolphin
DELDEL	Common dolphin
STECOE	Striped dolphin
DELSPP	Dolphin sp.
GRAGRI	Risso's dolphin
GLOMEL	Long-finned pilot whale
ZIPCAV	Cuvier's beaked whale
MEDCET	Medium cetacean
SMACET	Small cetacean
BEHAVIOURS	
Gen_behav	**General behaviour**
DEPLACEMENT	Displacement
STATIONNAIRE/POSE	Posing
ATTRACTION	Drawn to boat
FUITE	Flight
FORAGING	Foraging
Cet_behav	**Cetaceans behaviour**
ETRAVE	Come to boat
MILLING	No direction
NAGE_LENTE	Slow swimming
NAGE_RAPIDE	Fast swimming
PLONGE	Plunge
SAUTE	Jump
Group	**Type of group**
GROUPE_COMPACT	Compact group
GROUPE_DISPERSE	Scattered group
MSFA	Mixed spp. group
CHASSE	Chasing

SEABIRDS	
SULBAS	Northern gannet
LARMIC	Yellow-legged gull
LARFUC	Lesser black-backed gull
LARGUL	Large gull sp.
CATSKU	Great skua
LARMAR	Great black-backed gull
LARMEL	Mediterranean gull
LARMIN	Little gull
LARRID	Black-headed gull
RISTRI	Black-legged kittiwake
ALCSPP	Alcid spp
ALCTOR	Auk
URIAAL	Common guillemot/murre
FRAARC	Atlantic puffin
FULGLA	Fulmar
PUFPUF	Manx shearwater
PUFMAU	Balearic shearwater
CALDIO	Cory's shearwater
STESAN	Sandwich tern
STEHIR	Common tern
BEHAVIOURS	
Gen_behav	**Association**
DEPLACEMENT	ALGUE (algae)
STATIONNAIRE/POSE	BANC_POISSON (school of fish)
ATTRACTION	BATEAU_PECHE (fishing boat)
FUITE	BOUEE (buoy)
FORAGING	CARCASSE (carcase)
Birds_behav	DECHET (litter)
ATTAQUE (attack)	MM_HETERO (with cetaceans)
CHAROGNARD (scavenger)	OIS_HETERO (with other birds)
VOL_DIRECT (direct flight)	**Misfortune**
VOL_ALEAT (random flight)	MALADE/BLESSE (sick-injured)
VOL_CIRCUL (circular flight)	MORT (death)
AVEC_PROIE (with prey)	PRIS_ENGIN_PECHE (entangled in fishing gear)
NAGE (swim)	ATTAQUé (attacked)
PLONGE (plunge)	KLEPTOPARASITé (prey stolen)
KLEPTO (steal a prey)	MAZOUTé (oiled)
SCAVEN_BATEAU (fishing discards scavengers)	

BOATS	
CARGOB	Cargo boat
PLEABO	Pleasure boat
SAILBO	Sailing boat
FISHBO	Fishing boat
Boat_behav	
PECHE	Fishing
ROUTE	On the way
FISHING	
BUOY	Fishing buoy

LITTER		
PLATRA	BAGPLA	Plastic bag
	BOTPLA	Plastic bottle
	BOXPLA	Plastic box
	CLOPLA	Gloves and clothes
	SMAPLA	Plastic < 50 cm
	BIGPLA	Plastic > 50 cm
	SFOPLA	Foam/EPS < 50 cm
	BFOPLA	Foam/EPS > 50 cm
	RUBPLA	Rubber
FISTRA	NETFIS	Fishing net
	BOXFIS	Fish box
	FOAFIS	EPS box
	BUOFIS	Fishing buoy
	ROPFIS	Rope
	LINFIS	Fishing line
WOOTRA	PALWOO	Pallet
	BOXWOO	Wood box
	TABWOO	Board
METTRA	CANMET	Can
	DRUMET	Drum

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Equipo de observadores de depredadores superiores
PELACUS