



Is entanglement a relevant indicator of the impact of marine litter on biota?

*The contribution of **INDICIT** European project.*

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11.0661/2016/748064/SUB/ENV.C2





1

Context

2

Methods

3

Results and discussion

4

Perspective

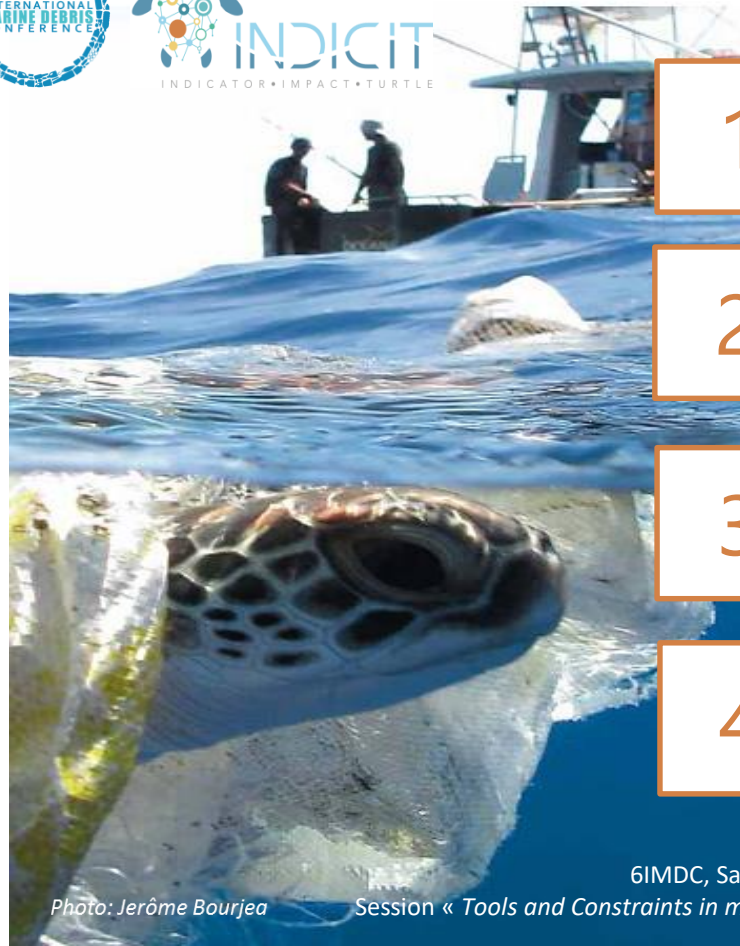


Photo: Jérôme Bourjea

Session « Tools and Constraints in monitoring interactions between litter and Megafauna »

6IMDC, San Diego USA, March 14 2018



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Regional Sea Conventions and European directives for marine environment



Target = good environmental status of seas
(MSFD GES = “Properties and quantities of marine litter do not cause harm to the coastal and marine environment”)



3 indicators (criteria) for litter: abundance; repartition;



**impact
on biota**

↓
ingestion

↓
entanglement



Indicator of entanglement to be defined for long-term monitoring programs

2 Methods

evaluating a new possible indicator



Feb 2017- Jan 2019
7 countries, 12 partners



State of art ➡ **analysis of literature** (5 global publications, 52 within target area)



Feasibility ➡ **survey** (8 countries, 21 quest.) +
data collection (7 data sets= turtles, birds)

Targeted species



Photo: Picardie nature

Marine mammals



Photo: Guy Flohart/GON

Sea birds



Photo: HCMR

Sea turtles



Sharks



Photo: C. Iokeimidis

Invertebrates



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2 Methods



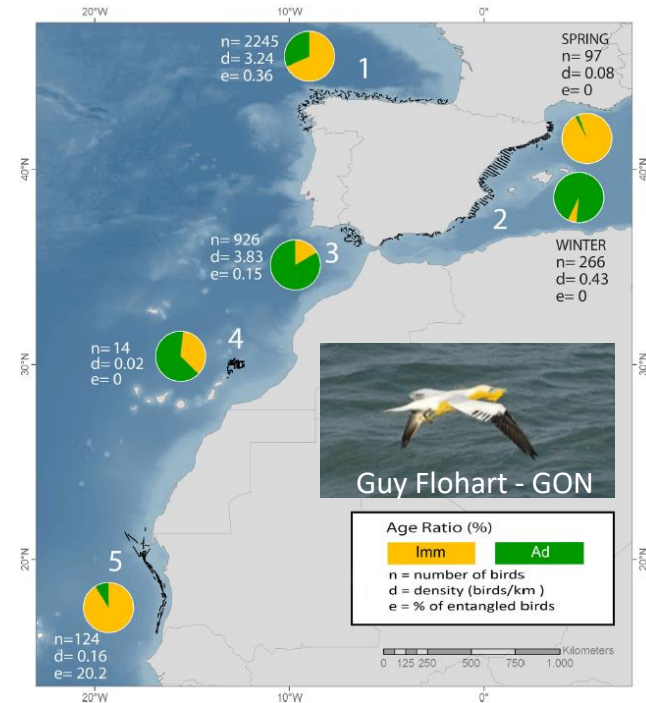
Knowledge: sensitive taxa, occurrence, circumstances of interaction, spatio-temporal variability, factors for sensitivity



Feasibility : distribution of species, availability of data, constraints (biological, methodological, environmental, logistic, regulatory)

*Spatio-temporal variability in non-breeding *Morus bassanus* in Spain and Mauritania, after Rodriguez et al (2013)*

criteria documented



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3

Results:

4 relevant taxa in project area

Literature : 26 Megafauna sp.



gap of knowledge , data about prevalence but no standardized sampling



main material: abandoned fishing gears +package

Feasibility:



available data and devices/ marine compartment constraints identified



TAXA	PREVALENCE	OCEANIC COMPARTMENTS /SAMPLING DEVICES									CONSTRAINTS		
		coast			surface		water column		floor		method.	biol.	logist.
		RC	STN	NN	AES	RC	ASC	RC	ASC	ASC			
MAMMALS													
seals	0.25-6.5%												
cetaceans	0.1-30%												
BIRDS*	0-20%												
SEA TURTLES	0.1-58%												
INVERTEBRATE:	1-23%												(ROV)

prevalence and criteria for feasibility

P. aristotelis*, *M. bassanus*, *C. diomedea* **STN= stranding network **NN**= nesting monitoring networks **ASC**= at sea campaigns **RC**= rescue centers **AES**= aerial surveys **ROV**= remotely operated vehicles **method.**= methodological ; **biol.** = biological ; **logist.** = logistical.



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Methodological constraints

Marine turtles & mammals:

possible confusion between litter from fisheries and material from active bycatch



Birds: "entanglement in nest" overcomes this issue in certain species (*Phalacrocorax aristotelis* and *Morus bassanus*) = interaction clearly due to debris.



Photo: Jérôme Bourjea

Methodological constraints



Specimens floating or in water **column uneasy to detect**, as well as material responsible for entanglement



Specimens **sinking** towards sea floor or being **predated**



Strandings = **unknown part** of entangled number



Isolated events over wide distribution area, few long term studies, no standard method



Photo: Cari/RTMMF

Availability of data / networks



Seals, birds, sea turtles: rescue centers, stranding networks, naturalists: **widely**



Sharks: fisheries observers, **restricted**

Monitoring feasibility



Factors : standard method, training, stable funding resources



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3

Discussion

megafauna as indicator species?

Pros

Cons



possible terrestrial monitoring, existing networking

wide distribution, existing networking

existing monitoring in nest, lower misidentification risk

existing fisheries observer campaigns

localized (Helcom and Ospar), possible mis-identification litter /bycatch

mobility, possible misidentification litter/bycatch

mobility, localized (species)

localized to fisheries areas

Methodological constraints: exclude fishing material? What about risk of missing specimen?



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Is entanglement a relevant indicator of the impact of marine litter on biota? Too early to confirm: more work needed

Better approach: species or compartment?

Fossi et al (2017): approach for choosing bio-indicators

RAC/SPA (2017) for Mediterranean :

« consider several zoological groups

(cetaceans, birds, reptiles, fishes, and invertebrates)

and organize monitoring by compartments

(beaches via stranding networks, surface and seabed via during oceanographic campaigns) »



Further steps advised to Regional Sea Conventions and EU



provided per type
of constraint:
list of gaps of
knowledge and
actions requested



Constraints	Type of knowledge	Action requested	Recommendation
biological	number of species to monitor	choose small number of target species or whole taxon	draw a proposal
	biology and life cycle	test data sets	continue data collection
	probability of encountering litter	mapping risk areas	study
	prevalence /rate of entanglement	prioritize at risk populations	draw a proposal
	description of induced pathologies	list criteria for diagnosis	veterinary workshop
environmental	confirm significance/ representativity as a pollution indicator	test data sets	study
methodological	standard protocols (ROV-invertebrates; examination-megafauna)	improve/ develop protocols	disseminate/ test protocol proposal
	criteria distinguishing entanglement/strangling due to litter from active fishing gear.	draw typology of material responsible for entanglement	workshop with halieutic experts
	identify possible factors interfering with results	acquire knowledge on movements, speed of decomposition	study
	organise data collection taking in account seasonal variations (litter -fishing activity, tourist season; species - migration)	acquire / compile knowledge	study
	quality insurance and banking arrangements and procedures	survey	pursue survey with data producers
logistic	cost of the monitoring	survey	pursue survey with data producers
	accessibility of samples and data	survey	draw a recapitulative table per country
	prior existence of permanent (no constraints related to seasonal variations) or seasonal data collection arrangements	survey	draw a recapitulative table per country

4

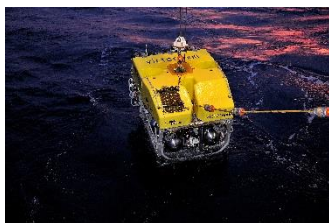
Perspective

*seafloor: unmissable organisms***Epibenthic invertebrates (Corals) = promising multispecies indicator?**

Pros: sessile (long term monitoring), known spatial distribution, mutualization of sampling, a lot of available data (archives) on seabed: data about debris and images of entangled invertebrates; categories of impact easy to describe: no damage, broken or death



Cons: no present standardized method, data (images) analysis time consuming (archives); heavy and costly logistics (Vessels, Remotely operated vehicles, Towed cameras, Submersibles...); very linked to fishing effort (other debris = smothering)

Logistical constraints

photos: IFREMER and S. Canese/ISPRA



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Enlarging networking /technical exchanges on entangl. indicator ?

Indicit dissemination meeting (Athens, December 4, 2018)



presentation of tools (protocols / video tutorial (ingestion))



panel discussion with RSCs and EU stakeholders:

all participants welcome (video streaming)

Other initiatives following the present 6IMDC session?



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Thank you



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