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LAS PALMAS DE GRAN CANARIA
VIII INTERNATIONAL SYMPOSIUM ON MARINE SCIENCES

3AMAR

II INTERNATIONAL WORKSHOP ON MARINE LITTER

LAS PALMAS DE GRAN CANARIA, JULY 06-08

ULPGC Universidad de Las Palmas de Gran Canaria
Universitat de Barcelona
Universidad Católica de Valencia San Vicente Mártir
UCA Universidad de Cádiz
Universitat d'Alacant Universidad de Alicante
Universidade de Vigo

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Wednesday, 6th July 2022

09:00 **Opening Ceremony**

09:30 **Plenary Session 1**
María Damanaki, Greece
Former European Commissioner Maritime Affairs and Fisheries

ORAL SESSION B.
MPs in the marine systems: from beaches to offshore
Moderators: *May Gómez & Ico Martínez*

10:30 **BAMAR-060**
Fagiano et al. BREAKING THE PARADIGM: MARINE SEDIMENTS HOLD TWO-FOLD MICROPLASTICS THAN SEA SURFACE WATERS AND ARE DOMINATED BY FIBERS

10:45 **BAMAR-046**
Pham et al. PLASTIC CONTAMINATES BEYOND SURFACE SEDIMENT LAYERS OF MACARONESIAN BEACHES

11:00 **BAMAR-014 ONLINE**
Saliu et al. DISTRIBUTION OF MICROPLASTICS IN SEA ICE FROM NOVIK BAY (SEA OF JAPAN)

11:15 **BAMAR-048**
Vega-Moreno et al. MICROPLASTICS DISTRIBUTION ON MESOSCALE EDDIES AT THE WATER COLUMN UP TO 1100 METERS DEPTH

11:30 **COFFEE BREAK**

ORAL SESSION D.
Plastic litter and microplastics: sources, transport and distribution
Moderators:
Christopher Pham & Javier Hernández-Borges

12:00 **BAMAR-093**
Basurko et al. COASTAL WATERS OF THE SOUTH-EAST OF THE BAY BISCAY A DEADEND FOR MARINE LITTER AND MICROPLASTICS

12:15 **BAMAR-077**
Quintana et al. ASSESSING PLASTIC POLLUTION IN THE BAY OF CADIZ

12:30 **BAMAR-055**
Cavaleiro et al. MICROPLASTICS IN BLACK SCABBARDFISH FRO M NORTHEAST ATLANTIC

12:45 **BAMAR-049**
Vega-Moreno et al. ASSESSING MARINE DEBRIS TRANSPORT AT OPEN OCEAN IN THEIR WAY TO THE CANARY ISLANDS

13:00 **BAMAR-054**
Vianello et al. PLANKTON-SIZEDU> MICROPLASTICS QUANTIFIED FOR THE FIRST TIME IN THE CANARY ISLANDS WATERS

13:15 **BAMAR-041**
Paluselli et al. VERTICAL DISTRIBUTION AND TRANSPORT OF TEXTILE MICROFIBRES (MFs) IN THE MEDITERRANEAN WATER COLUMN

13:30 **BAMAR-022**
Sugrañes-Pàmies et al. MEDPELLETS: CHARACTERISTICS AND DYNAMIS OF PLASTIC PELLET POLLUTION IN THE WESTERN MEDITERRANEAN

13:45 **BAMAR-043**
Espina et al. USE OF UNMANNED AERIAL SYSTEMS FOR MULTISPECTRAL PLASTIC WASTE DETECTION AND MONITORING ON THE COAST OF GRANADA

14:00 **BREAK**

15:30 **Plenary Session 2**
Lynne Talley, USA
Physical Oceanographer Scripps Institution of Oceanography

ORAL SESSION D
Plastic litter and microplastics: sources, transport and distribution
Moderators: *Roberto Rosal & Francisca Fernández-Piñas*

16:30 **BAMAR-009**
Duncan et al. PREDICITING THE DISTRIBUTION & ABUNDANCE OF ABANDONED LOST DISCARDED FISHING GEAR (ALDFG) IN DEEP SEA HABITATS OF A REMOTE ISLAND

16:45 **BAMAR-064**
Ruíz et al. MODELLING FLOATING RIVERINE LITTER IN THE SOUTH-EASTERN BAY OF BISCAY: A REGIONAL DISTRIBUTION FROM A SEASONAL PERSPECTIVE

17:00 **BAMAR-066**
Cloux-González et al. LAGRANGIAN REGIONAL STUDY TO DETERMINE ACCRETION ZONES IN THE MARINE SPANISH DEMARCATIONS

17:15 **ISMS-256**
Cividanes et al. LAGRANGIAN TRAJECTORIES TO ASSESS MARINE PLASTIC POLLUTION DISTRIBUTION IN THE CANARY ISLANDS

ORAL SESSION G
Harmonization of procedures and characterization of MPs and plastic leachates
Moderators: *Francisca Fernández-Piñas & Roberto Rosal*

17:30 **BAMAR-001**
Rosal et al. MARINE PLASTIC DEBRIS THAT ESCAPES CURRENT MONITORING CAMPAIGNS: VERY SMALL MICROPLASTICS AND NANOPLASTICS

17:45 **BAMAR-051**
Abaroa et al. YELLOWING, WEATHERING AND DEGRADATION OF MARINE PELLETS AND THEIR INFLUENCE ON THE ADSORPTION OF CHEMICAL POLLUTANTS

18:00 **BAMAR-026**
Acevedo-Quilis et al. EXTRACTION AND CHARACTERIZATION OF MICROPLASTICS FROM GASTROINTESTINAL CONTENT OF THE SMALL-SPOTTED CATSHARK (Scyliorhinus canicula): A PARAMETERIZATION AND ANNUAL EVALUATION

18:15 **SIQUIMAR 025**
Egea-Corbacho et al. PRESENCE OF MICROPLASTICS IN AQUACULTURE AND POSSIBLE ENTRY ROUTE

18:30 **POSTER SESSION AND COFFEE**

Thursday, 7th July 2022

08:45 **Plenary Session 3**
Julián Blasco, Spain
Department of Ecology and Coastal Management

ORAL SESSION E.

Plastic additives and leachates: The hidden threat of marine plastic pollution
Moderators: *Rodrigo Almeda & Ico Martínez*

10:00 **BAMAR-025**
Beiras-García et al. MESOCOSM TRIALS REVEAL THE POTENTIAL TOXIC RISK OF DEGRADING BIOPLASTICS TO MARINE LIFE

10:15 **BAMAR-007**
Edo et al. IMPACT OF THE LEACHATE FROM SURGICAL FACE MASKS IN THE MUSSEL MYTILUS GALLOPROVINCIALIS

10:30 **BAMAR-058**
Ledu-Carree et al. IMPACT OF LEACHATE FROM CAR TIRE MICROPLASTICS ON THE MARINE HETEROTROPHIC DINOFLAGELLATE, OXYRRHIS MARINA.

10:45 **BAMAR-016**
Rist et al. HOW CAR TIRE LEACHATES AFFECT SEA URCHIN LARVAE

11:00 **BAMAR-040**
Bautista-Gea et al. EFFECTS OF PLASTIC ADDITIVES AND ORGANIC CONTAMINANTS IN MICROPLASTICS ON ZEBRAFISH

11:15 **SIQUIMAR 035**
León et al. OCCURRENCE AND DISTRIBUTION OF CONTAMINANTS OF LEGACY AND EMERGING CONCERN SORBED ON FLOATING PLASTIC DEBRIS FROM MAR MENOR LAGOON AND EBRO RIVER SURFACE WATERS

11:30 **COFFEE BREAK**

ORAL SESSION A

Effects of plastic litter and MPs on biota
Moderators: *May Gómez & Alicia Herrera*

12:00 **BAMAR-050**
Pereira et al. DEEP-SEA OCTOCORAL FEEDING RESPONSES TO MICROPLASTICS

12:15 **BAMAR-042**
Alonso-López et al. MARINE PLASTIC LITTER RISK-ASSESSMENT, A PROPOSAL BASED ON CHEMICAL AND PHYSICAL PROPERTIES OF PLASTIC

12:30 **BAMAR-023**
Rodríguez-Torres et al. COPEPODS BEHAVIOR REDUCES THE RISK OF ENTRY OF MICROPLASTICS IN MARINE FOOD WEBS

12:45 **BAMAR-068**
Kuddithamby et al. IS ZOOPLANKTON AN ENTRY POINT OF MICROPLASTICS IN THE MARINE FOOD WEB? A CASE STUDY IN THE KATTEGAT SEA

13:00 **BAMAR-069**
Almeda et al. PLASTIC DOESN´T TASTE GOOD! EFFICIENT TASTE-DISCRIMINATION OF MICROPLASTICS IN PLANKTONIC COPEPODS

13:15 **BAMAR-021**
Huelbes- Muñoz et al. IMPACT OF MICROPLASTICS IN THE CRONIUS RUBER SPECIES.

13:30 **BAMAR-071**
Ugwu et al. IMPACTS OF MICROPLASTICS ON MARINE FOOD WEBS: A REVIEW

13:45 **BAMAR-045**
Muns-Pujadas et al. REVEALING THE CAPABILITY OF THE EUROPEAN HAKE TO COPE WITH MICRO-LITTER ENVIRONMENTAL EXPOSURE AND INFERRING ITS POTENTIAL HEALTH IMPACT IN THE NW MEDITERRANEAN SEA

14:00 **BREAK**

15:30 **Plenary Session 4**
Penny Lindeque, United Kingdom
Head of Science: Marine Ecology and Biodiversity
University of Plymouth

ORAL SESSION A

Effects of plastic litter and MPs on biota
Moderators: *Sinja Rist & Rodrigo Almeda*

16:30 **BAMAR-004**
Reinold et al. CULTIVATED SEA BASS INGEST PLASTIC PARTICLES

16:45 **BAMAR-020**
Herrera et al. EFFECTS OF ENVIRONMENTAL MICROPLASTICS INGESTION IN FISH

17:00 **ISMS-029**
Garcés-Ordoñez et al. MICROPLASTIC POLLUTION IN A COASTAL LAGOON: CIÉNAGA GRANDE DE SANTA MARTA, COLOMBIAN CARIBBEAN

17:15 **BAMAR-006**
Sanchez-Guerrero et al. MICROPLASTIC CONTAMINATION IN THE DIGESTIVE TRACTS OF THE COMMERCIAL SPECIES Engraulis encrasicolus AND Sardina pilchardus FROM THE GULF OF CADIZ

ORAL SESSION A

Effects of plastic litter and MPs on biota
Moderators: *Ana Liria-Loza & Emily Duncan*

17:30 **BAMAR-063**
Navarro-Molina et al. PLASTIC INGESTION AND CHEMICAL POLLUTANTS PRESENT IN SEABIRDS OF GRAN CANARIA (CANARY ISLANDS, SPAIN)

17:45 **BAMAR-056**
Ostiategui et al. MARINE LITTER INGESTION RELATED WITH DEBRIS ENTANGLING SEA TURTLES IN THE CANARY ISLANDS

18:00 **BAMAR-030**
Rodríguez et al. ENTWINED IN PLASTIC: INVESTIGATING ENTANGLEMENTS IN MARINE LITTER OF MEGAFAUNA IN THE NE ATLANTIC

18:15 **BAMAR-074**
Puig et al. MARINE LITTER INGESTION IN STRANDED CETACEANS, CANARY ISLANDS (2000-2020)

18:30 **POSTER SESSION (including posters online) AND COFFEE**

21:00 **Conference Dinner**

Friday, 8th July 2022

08:45 **Plenary Session 5**
Gotzon Basterretxea, Spain
Department of Ecology and Marine Resources
IMEDEA (UIB-CSIC)

ORAL SESSION F

Oceanic islands as hotspots of plastic pollution: the case of Canary Islands

Moderators: *Alicia Herrera* & *Rodrigo Almeda*

10:00 **BAMAR-008**
Hernández-Borges et al. UNDERSTANDING MICROPLASTICS DISTRIBUTION IN THE CANARY ISLANDS FROM A GLOBAL PERSPECTIVE

10:30 **BAMAR-003**
Reinold et al. PLASTIC POLLUTION IN SHORELINE WATER AND BEACH SEDIMENT CORES: AN ANNUAL STUDY

10:45 **BAMAR-036**
Campillo et al. SEARCHING HOTSPOTS OF NEUSTONIC MICROPLASTICS CONTAMINATION IN THE CANARY ISLANDS

11:00 **BAMAR-073**
Liria-Loza et al. CANARY ISLANDS, THE HOTSPOT OF SEA TURTLE ENTANGLEMENT IN THE EUROPEAN WATERS

11:15 **BAMAR-031**
Pacheco-Juárez et al. MONITORING OF ORGANIC MICROPOLLUTANTS ADSORBED ON MICROPLASTIC FROM COASTAL AREA OF THE MACARONESIA

11:30 **COFFEE BREAK**

ORAL SESSION C

Iniciatives to reduce marine litter pollution and citizen science

Moderators: *Alicia Herrera* & *Ana Liria Loza*

12:00 **BAMAR-075**
Usategui et al. CITIZEN SCIENCE AS AN IMPORTANT SOURCE OF OPPORTUNISTIC DATA TO IMPROVE MARINE LITTER MONITORING (OCEANLIT PROJECT)

12:15 **SIQUIMAR-024**
Franco et al. INFLUENCE OF TOURISM ON MICROPLASTIC CONTAMINATION AT WASTEWATER TREATMENT PLANTS IN THE COASTAL MUNICIPALITY OF CHICLANA DE LA FRONTERA

13:10 **Plenary Session 6**
Ronald Benner, USA
Carolina Distinguished Professor University of South Carolina

14:00 **Closing Ceremony**

15:30 **Visit "Aquarium Poema del Mar"**

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3AMAR

ORAL COMMUNICATIONS

ULPGC Universidad de Las Palmas de Gran Canaria

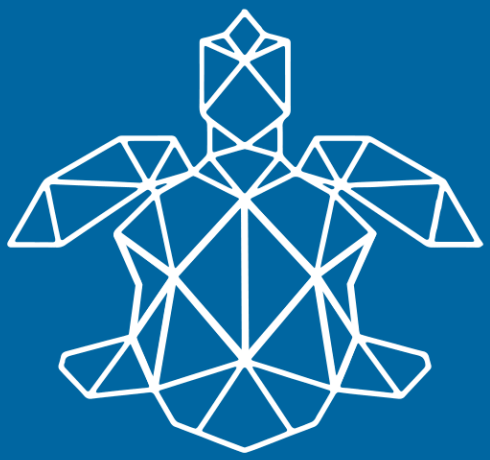
Universitat de Barcelona

Universidad Católica de Valencia San Vicente Mártir

UCA Universidad de Cádiz

Universitat d'Alacant Universidad de Alicante

Universidade Vigo



BAMAR

ORAL COMMUNICATIONS

EFFECTS OF PLASTIC LITTER AND MPS ON BIOTA

ULPGC Universidad de Las Palmas de Gran Canaria

Universitat de Barcelona

Universidad Católica de Valencia San Vicente Mártir

UCA Universidad de Cádiz

Universitat d'Alacant Universidad de Alicante

Universidade Vigo

CULTIVATED SEA BASS INGEST PLASTIC PARTICLES

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Abstract: The presence of microplastics (MPs) in the marine environment is a concerning topic due to the ecotoxicological effects and possible seafood contamination. Data is needed to evaluate human exposure and assess risks, in the context of a healthy and beneficial seafood consumption. While microplastic ingestion by wild fish has been reported since the early 70‘s, farmed fish are rarely investigated. Here, for the first time the presence of microplastics in fish cultivated in the coastal water of Tenerife (Canary Island, Spain) was evaluated. From 83 examined individuals, 65% displayed microplastics in their gastrointestinal tracts, with averages between 0.6 ± 0.8 (SD) and 2.7 ± 1.85 (SD) particles per fish. The total number of microplastics detected was 119. Fibres (81%) and fragments (12%) were the predominant shapes. FTIR analysis showed that fibres were mostly composed by Cellulose (55%) and Nylon (27%), whereas fragments by PE (25%) and PP (25%).

Key words: Pollution, Plastic, Microparticles, Aquaculture, Seafood, Canary Islands

Acknowledgments: We are grateful to the IEO for the help to process the samples of this study. This work was funded by the project RICOMAR (GOB-ESP2019-03) which supported the Marine Ecophysiology Group (EOMAR).

MICROPLASTIC CONTAMINATION IN THE DIGESTIVE TRACTS OF THE COMMERCIAL SPECIES *Engraulis encrasicolus* AND *Sardina pilchardus* FROM THE GULF OF CADIZ

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Abstract: Fragments of plastic called microplastics (MPs; < 5mm) are an issue of global concern and they have been identified in commercial species of fish, crustaceans, and bivalves. The bioaccumulation of MPs in different levels of the food webs may provoke unwanted impacts in marine ecosystems and cause pernicious effects regarding human health. In the present context, the main aim of this work is to study the presence of anthropogenic particles (APs) and the fraction of MPs in the target organ of two representative commercial fish species in Spain; the European anchovy (*Engraulis encrasicolus*) and Iberian sardine (*Sardina pilchardus*). The individuals were sampled in the ECOCADIZ-202008 campaign along the continental shelf of the Gulf of Cadiz, from the Bay of Cadiz to Cape Santa Maria. The isolation of the MPs was carried out with a complete alkaline-oxidant organic digestion (KOH-H_2O_2) of the digestive tract, including both the contents ingested and the muscle tissues. APs were found in all individuals (n = 176) of both species with 8.94 ± 5.11 items·ind^{-1}. Fibres accounted for 93 % while fragments and film for 7 % of the total items recovered. The average size of the APs was 0.89 ± 0.82 mm. A 29.8 % of the total fibers isolated was confirmed as microplastics by FTIR. Thus, in conjunction with the fragments and film confirmed by visual identification, the fraction of MPs corresponds to 34.4 % of the total APs isolated. The main polymer found in both species was Nylon. No significant correlation was found in the abundance and size of APs ingested with individual size or other body variables. Analysis of similarities (ANOSIM) and the distanced-based multiple linear regression model showed a high homogeneity in APs contamination in both species throughout the study area along the continental shelf of the Gulf of Cadiz.

Key words: Microplastics, Anthropogenic particles, KOH, H_2O_2, Anchovy, Sardine

Acknowledgments: The authors would like to thank the staff involved in the ECOCADIZ 202008 Survey (IEO)

EFFECTS OF ENVIRONMENTAL MICROPLASTICS INGESTION IN FISH

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Ingestion of microplastics can pose a health risk to fish, especially due to the associated chemical contaminants. In the present study, we have designed an experiment to determine whether there is trophic transfer of chemical contaminants from environmental microplastics (EMPs) to the liver of sea bass (*Dicentrarchus labrax*) by testing two different feeding treatments with realistic concentrations (in the worst-case scenario) of virgin MPs, and with EMPs. Fish were fed for 60 days with three treatments: Control (feed), MP (feed with 10% virgin microplastics) and EMP (feed with 10% environmental microplastics), being the first study to evaluate long-term accumulation of contaminants due to ingestion of environmental microplastics in fish. Polybrominated diphenylethers (PBDEs), polychlorinated biphenyls (PCBs) and dichlorodiphenyltrichloroethane (DDT) were analyzed in the EMP, feed and liver.

Our results show that PBDEs present in EMPs bioaccumulated in the liver after 60 days of treatment with a diet consisting of feed plus 10% microplastics collected from beaches. In the case of contaminants that were found adsorbed to microplastics, such as DDT and PCBs that are ubiquitous in all environments, these contaminants also appeared in control diet and

diet with virgin MPs, but for both contaminants bioaccumulation was significantly higher in the liver of sea bass fed 10% EMPs with the diet, so ingestion of microplastics in the environment may increase exposure to these contaminants, adding to that of the surrounding water and diet.

Key words: Microplastics, marine pollution, environmental microplastics, chemical pollutants, POPs, additives.

Acknowledgments: This work was funded by European Union in the Project INDICIT II (Implementation Of Indicators Of Marine Litter On Sea Turtles And Biota In Regional Sea Conventions And Marine Strategy Framework Directive Areas), Project number: 11.0661/2016/748064/SUB/ENV.C. European Commission, Directorate General Environment, Directorate C "quality of life", Unit C2 "Marine environment & water industry".

IMPACT OF MICROPLASTICS IN *CRONIUS RUBER* SPECIES

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Abstract:
Microplastic pollution in the ocean is a growing problem. It affects the entire ecosystem and, therefore, the species that inhabit it. Plastics can be filtered or ingested by organisms, entering, and negatively affecting individuals. One of the populations affected are crustaceans. In previous studies, fibers have been found mainly in the stomach contents of these animals (Brennecke et al., 2015; Villagran et al., 2020; Waite et al., 2018), although other types such as pellets have also been found. In this study we determined the amount of microplastics found in the stomach contents of *Cronius ruber* (Lamarck,1818), an invasive species, of the family Portunidae, which has recently appeared in the Canary Islands with a great capacity for predation and expansion (González et al., 2017). This is the first study focused on microplastic contamination in this specie. Sixty-three samples from different points of the island of Gran Canaria (Agaete, Anfi del Mar, El Puertillo and La Laja), were studied. Of all the samples, 52% (n=63) were found to be contaminated. This contamination produced mostly by plastic fibers, has been more noticeable in El Puertillo, where high prevalence of plastic ingestion was detected detected (58% of the samples, n=33). In contrast to the samples taken from Agaete, where 40% of the individuals had plastic in their stomachs (n=22), the lowest percentage found, being from these two points where most of the samples were obtained. These data corroborate the negative impact of microplastic ingestion caused by pollution on the Cronius ruber species.

Key words: Microplastics, *Cronius ruber*, fibers, ingestion, contamination.

Acknowledgments: RICOMAR project (GOB-ESP2019-03), which supported the Marine Ecophysiology Group (EOMAR).

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COPEPODS BEHAVIOR REDUCES THE RISK OF ENTRY OF MICROPLASTICS IN MARINE FOOD WEBS

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Abstract

The entry of microplastics (MPs) into marine food webs is a major environmental concern. We investigated how planktonic copepods behavior influences the risk of MPs to enter marine food webs, by applying a trait-based approach and by combining experiments with biogeographical analyses. We aim to evaluate which type of feeding behavior is most risky in terms of MP ingestion, and which marine geographical areas are more susceptible to MP ingestion by planktonic copepods. We used different planktonic copepods as models of the main foraging behaviors in planktonic copepods: feeding-current, cruising, ambush and mixed behavior feeding. All the behaviors show a similar low risk of MP ingestion, up to one order of magnitude lower than for similar sized microalgae. No influence of the prey type or MP size (8 µm and 20 µm) was observed on MP ingestion for any of the behaviors. By estimating the global distribution of feeding behaviors, we demostrated that feeding current feeding is the most common behavior. However, the risk of MP ingestion remain similarly low across the global ocean, independently of the predominant behavior. Overall, our results suggest low risk of MP ingestion by marine planktonic copepods and therefore a minimal risk of MP trophic transfer via copepods or fecal pellets in marine ecosystems.

Key words: microplastics, copepods, trait-based approach, feeding behavior, ingestion.

ENTWINED IN PLASTIC: INVESTIGATING ENTANGLEMENTS IN MARINE LITTER OF MEGAFAUNA IN THE NE ATLANTIC

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Abstract

Marine megafauna species are known to play an important ecological role in the oceans, however, they are highly affected by several threats including plastic litter. In fact, entanglement in plastic litter has become a widespread disturbance for key marine animals. Most of these events are still largely unknown given the challenges of monitoring their occurrence. In this study, we investigate the incidence of entanglements in the Azores using two distinct sources of information; 1) data collected by the regional stranding network and 2) entanglement events reported by sea users (i.e., tourist operators and fishers). Overall, entanglements of sea turtles, seabirds, and cetaceans were detected as present by the stranding network over a period of 16 years. In addition, sea turtles and cetaceans were the most frequent species reported to be entangled by sea users. Abandoned, lost, and discarded fishing gears (ALDFG) were the most common plastic typology described to cause this threat. Moreover, high mortality and harmful long-term consequences such as the amputation of forelimbs were common in entangled animals. Although the occurrence of entanglement events in marine megafauna appears to be low when compared with plastic ingestion in the same species, our results show that the impacts caused by entanglement in plastic might be more severe. Oceanic islands are known to be important habitats for different migratory species and resident biodiversity. However, our results suggest that the conspicuous presence of floating plastic in these remote locations has turned these areas into potential traps for marine megafauna.

Keywords: North Atlantic; marine debris; ALDFG; ghost gear; stranding networks

Acknowledgments: The authors would like to express their sincere gratitude to the *Direção Regional dos Assuntos do Mar* (DRAM) who were involved in the collection of stranded animals throughout the regional stranding network (RACA), also in addition to the team of Flying Sharks at the Porto Pim aquarium in Faial for their relentless efforts towards the well-being of sea turtles under their care. We further acknowledge the sea users and fishers that share information with us. YR is funded by a PhD scholarship from the *Fundo Regional para a Ciência e Tecnologia* (reference M3.1.a/F/022/2020).

MARINE PLASTIC LITTER RISK-ASSESSMENT, A PROPOSAL BASED ON CHEMICAL AND PHYSICAL PROPERTIES OF PLASTIC

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Abstract: Marine plastic pollution has become a worldwide environmental concern and its effects must be evaluated for an effective management of the problem. Although, many works describe the distinct deleterious effects of macroplastics in the marine environment focusing on the harm to wildlife, their toxic effects, or the debris size and abundance, few try to relate them in one holistic classification. In this work we propose a risk-based classification for the most common plastic litter found in the marine environment based on their physical and chemical properties. Plastic debris items were classified by most common shape and chemical composition and these characteristics are associated to 4 different factors relevant to environmental hazards. Therefore, 4 different criteria are chosen as risk enpoints: entanglement, ingestion, degradability and toxic potential. Entanglement and ingestion are mainly driven by physical properties of an object as the shape and color, while toxicity and degradation are mostly influenced by polymer type and additives content. Each factor is classified individually from very low to very high risk, based on data obtained from peer revied papers and environmental regulation. Once all the factors are evaluated, they can be linked to commonly found objects in marine environment. This scale can also be transposed to marine litter monitoring programs, to give plastic typologies different weights in a given sample, according to their risk potential, thus, granting to litter monitoring programs a greater ecological relevance.

Key words: Risk-assessment, Macroplastic, Entanglenment, Ingestion, Toxicity, Degradation

Acknowledgments: The corresponding authors contributed equally to this research. This research is supported by The Toward a risk-based assessment of microplastic pollution in marine ecosystems: RESPONSE project. Funding entity: Joint Programming Initiative, Healthy and Productive Seas and Oceans (JPI Oceans), In Spain, supported by the Spanish National Research funding Agency (AEI), reference: PCI2020-112110 / AEI / 10.13039/501100011033. S.L.

REVEALING THE CAPABILITY OF THE EUROPEAN HAKE TO COPE WITH MICRO-LITTER ENVIRONMENTAL EXPOSURE AND INFERRING ITS POTENTIAL HEALTH IMPACT IN THE NW MEDITERRANEAN SEA

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Abstract: Micro-litter ingestion by fish has been widely reported in the literature but there are still gaps of knowledge on how debris from the surrounding marine environment interact with fish species. This study aims to characterize quantitatively and qualitatively the anthropogenic items (AIs) (both synthetic and non-synthetic) ingested by the European hake (*Merluccius merluccius*), the AIs from near-bottom water samples from the same fishing areas and to infer their potential effect on fish health. Samples were taken from different sites off the Catalan coast (NW Mediterranean) exposed to different anthropogenic pressures. AIs were analysed in terms of prevalence, abundance, concentration, size and composition, and fish health was assessed through condition indices, presence of alterations at macroscopic and histologic level and parasitological descriptors. As a result, for a mean of 0.85 items/m^3 of AIs from the surrounding water, fish ingest a mean of 1.39 (SD=1.39) items/individual. Cellulosic fibres appeared to be the predominant polymer in fish and environmental samples from all sites (77.8% of total AIs composition). Environmental samples off Barcelona presented higher abundances of large-sized AIs (> 6mm) than those off Blanes and Delta. In general, AIs ingested matched in terms of composition with the small AIs from the surrounding environment, which were the ones ingested by hakes. Thus, hakes do not ingest large fibres although they are present in the environment (e.g. those present off Barcelona) thanks to their particular feeding behaviour. A major prevalence and abundance of ingested AIs was detected off Blanes. No adverse health effects potentially associated to AIs were detected (in neither condition indices, histological alterations nor parasitological descriptors), as they pass through the digestive system.

Key words: *Merluccius merluccius*, micro-litter, ingestion, cellulose, near-bottom water, fish health.

Acknowledgments: This work was supported by the Spanish Ministry of Science, Innovation and Universities project “PLASMAR” (RTI2018-094806-B-100) and i-plastic project (JPI-Oceans—Grant PCI2020-112059). We thank all fishermen from commercial fishing vessels involved in the “PLASMAR” project. L.M-P. benefits from an FI-DGR Ph.D. student grant from the Generalitat de Catalunya (2022 FI_B 00405).

DEEP-SEA OCTOCORAL FEEDING RESPONSES TO MICROPLASTICS

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Abstract: Microplastics pollution is ubiquitous in the oceans, threatening the health of marine ecosystems. The deep sea is recognized as a sink for microplastics but there is a paucity of information on how deep-sea organisms are being affected by this stressor. Considering their vulnerability to disturbance, this information is crucial to fully understand the threat caused by microplastics. In this presentation, we provide a detailed characterisation on the behavioural responses of the deep-sea octocoral *Viminella flagellum* to microplastics exposure under laboratory conditions. Coral fragments were individually exposed to a high concentration (1500 items/L) of fluorescent green polyethylene microspheres (125-300 µm) for a period of 24h, and carefully monitored using high resolution time-lapse video. After exposure each fragment was transferred to another tank, free of microplastics, and monitored for another 24h. The coral fragments were dissected at the end of the experimental period to assess the number of microplastics that remained in the digestive tract of each polyp. Our results showed that during this short-term exposure period, *V. flagellum* was able to ingest and egest microplastics, and to trap microplastic beads in their mucus and tissue surface. In this presentation, a detailed account of polyp feeding behavioural responses of *V. flagellum* to microplastics (including rates of ingestion, egestion and adhesion) are provided along with a discussion of its possible implications for deep-sea corals health.

Key words: *Viminella flagellum*, North Atlantic, microplastic exposure, marine litter

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MARINE LITTER INGESTION RELATED WITH DEBRIS ENTANGLING SEA TURTLES IN THE CANARY ISLANDS

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Abstract:
The European Project INDICIT had proposed sea turtles as marine litter indicator on the European waters, using both litter ingestion and entanglement on marine debris. Standardized protocols have been developed for sampling and shared homogenized data collected in different European regions to conduct regional and global analysis.
Standard protocols developed by INDICIT project has been used for sampling litter ingestion on stranded loggerhead turtles in Canary Islands from May 2018 to December 2020. In other hand, several data were collected from all stranded turtles according to the standard protocol implemented by the Canary Islands Government, including the stranding cause and litter causing entanglement, based on INDICIT protocols and litter classification approved by the European Commission.

Aim of this study was to determinate if there exist a relation between the marine debris causing entanglement and the litter ingested by these turtles, based on the hypothesis that entangled turtles will try to remove debris causing entanglement by biting and ingesting them.

Results showed that 100% of sea turtles stranded in Gran Canaria (both live and dead) presented marine litter ingested. The 63% of turtles analysed were stranded due to entanglement. The material causing entanglement were found ingested by more than the 50% of the animals analysed. These results will help us to have a better understand of the different hazards that marine debris could impact sea turtles and to know which turtles are most likely to have ingested marine litter.

Key words: sea turtles, litter ingestion, entanglement.

PLASTIC INGESTION AND CHEMICAL POLLUTANTS PRESENT IN SEABIRDS OF GRAN CANARIA (CANARY ISLANDS, SPAIN)

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Abstract:

Seabirds populations are showing a decreasing trend worldwide. Plastic pollution is one of the threats facing these species. This type of litter can affect birds directly through entanglement and ingestion, leading to injuries that can result in death. Moreover, the ability of plastics to adsorb and concentrate chemical contaminants makes them potential vehicles for the transmission of these substances to fauna. The Canary Islands are an important breeding and migration spot for several species of birds, nevertheless, studies analyzing the effect of plastics on these animals are scarce.

In this work, 88 birds of 14 species were sampled. Most of the animals were marine birds, although some freshwater birds were also included. The digestive contents were studied for the presence of plastic and their livers were analyzed for the detection of chemical contaminants using a QuEChERS-based method.

A high prevalence of plastic ingestion was detected in *Calonectris borealis* (88.9%, n = 45) and *Oceanodroma castro* (100%, n = 5) and a lower frequency in *Larus michahellis* (35%, n = 20). Plastic debris was also observed in one of the two *Chroicocephalus ridibundus* analyzed and in the only *Bubulcus ibis* sampled. Among the most frequently detected pollutants were PCB 153, hexachlorobenzene, DDE, naphthalene, PCB 138, fluorene and PCB 180.

Our results emphasize the problems posed to these species by plastic debris (mainly to seabirds) as well as organic pollutants, being necessary a biomonitoring in order to accurately define the impact of both issues.

Key words: seabirds, waterbirds, plastic ingestion, Canary Islands, organic pollutants

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IS ZOOPLANKTON AN ENTRY POINT OF MICROPLASTICS IN THE MARINE FOOD WEB? A CASE STUDY IN THE KATTEGAT SEA.

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Abstract: Microplastics (MPs) are ubiquitous contaminants of emerging concern in the ocean. MPs overlap in size with phytoplankton, and they can be ingested by zooplankton and transferred to higher trophic levels. Copepods are the most abundant organisms in the ocean, where they link the marine foodweb between autotrophs and upper trophic levels. However, we still know little about the role of copepods in the entry of MPs into the marine foodweb and the occurrence of MPs in the zooplankton communities. This study, we collected zooplankton samples at fourteen stations using MOCNESS at Kattegat strait (Denmark) during the research cruise R/V DANA in October 2020. We analyzed MPs' concentration, polymer type composition, and size in natural zooplankton assemblages (community-level approach) and sorted copepod species. Individual copepods were thoroughly rinsed to remove the external MPs attachments before being stored in 5% SDS; then, they were pooled and treated following an enzymatic-oxidative approach for MP analysis. All the samples were scanned and MPs were detected using FPA-µFTIR-Imaging in combination with siMPle software for automated polymer identification down to 11 µm. The concentration of MPs in water ranged between 8 to 102 MPs m^{-3}. Considering the volume of water filtered with the multi-net, the concentration of MPs in the natural zooplankton samples ranged from 0 to 1.77 MPs m^{-3} with an average of 0.02 MPs per individual. The MP concentration in sorted copepod samples ranged between 0.00-0.04 MPs per individual. The results indicate a low occurrence of MPs in natural zooplankton communities and copepods in the Kattegat and non-bioaccumulation of MPs in zooplankton. These results suggest that zooplankton are not expected to be a major entry route of MPs in marine food webs.

Key words: Microplastics, zooplankton, Copepods, Ingestion, Kattegat Sea

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PLASTIC DOESN´T TASTE GOOD! EFFICIENT TASTE-DISCRIMINATION OF MICROPLASTICS IN PLANKTONIC COPEPODS

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Abstract: Planktonic copepods are the most abundant animals in the ocean and key players in global biochemical processes. Recent modeling suggests that zooplankton ingestion of microplastics (MPs) can disrupt the biological carbon pump and accelerate a global loss of oceanic oxygen. Here we investigate the behavioral responses and ingestion rates of a model feeding-current generating copepod when exposed to microplastics of different characteristics by small-scale video observations and bottle incubations. We found that copepods rejected 80% of the microplastics after touching them with their mouth parts, in essence exhibiting a kind of taste discrimination. High rejection rates of microplastics were independent of polymer type, shape, presence of biofilms, or sorbed pollutant (pyrene), indicating that microplastics are unpalatable for feeding-current feeding copepods and that post-capture taste discrimination is a main sensorial mechanism in the rejection of microplastics. In an ecological context, taking into account the behaviors of planktonic copepods and the concentrations of microplastics found in marine waters, our results suggest a low risk of microplastic ingestion by zooplankton and a low impact of microplastics on the vertical exportation of fecal pellets.

Key words: zooplankton, copepods, feeding behavior, microplastic, taste discrimination

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IMPACTS OF MICROPLASTICS ON MARINE FOOD WEBS: A REVIEW

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Abstract: Plastics are the most abundant component in marine debris. In turn, microplastics (<5 mm) are those most found to be ingested by marine biota. This review will show the current state of studies of effects of microplastics on marine biota, specifically what groups of vertebrates most affected by ingestion of microplastics, and the type and predominant colour of ingested microplastics. Additionally, we evaluate how plastic additives and leachates can affect marine organisms, particularly plankton. With respect to vertebrates, we review a total of 180 articles published from January 2010 to April of 2022. Our results show that the group most affected are turtles with 88% of the specimens contaminated by microplastics and median of 122 particles per individual. The predominant type was fibers (67.3%), the dominant polymer was polyethylene (27.3%), the size was less than 2 mm (73.6%), and colour was blue (32.9%). Regarding plastic additives, we found that plastic leachates are toxic to marine planktonic organism, from bacteria to copepods, causing lethal and sublethal effect (decreased growth and development, malformations, etc). Therefore, microplastics and their associated chemical additives are a serious threat for marine food webs, particularly in coastal areas and hotspots of plastic debris such as the Canary Islands.

Key words: Microplastics; Marine vertebrates; Plankton; Marine food webs; Additives.

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MARINE LITTER INGESTION IN STRANDED CETACEANS, CANARY ISLANDS (2000-2020)

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Abstract:

The consequences of litter in marine ecosystems are a global concern. In the last decades, interaction with marine fauna has been reported widely (Provencher et al., 2017), especially interactions with plastics, the most prevalent and widespread element (Cózar et al., 2014). Stranded cetaceans represent a significant opportunity to study the interaction of marine megafauna with plastic debris (Montoto et al., 2021). In the Canary Islands, the major hotspot for cetacean biodiversity in European waters, 7.7% of stranded cetaceans ingest foreign bodies (FB), and almost 3% of studied cases die due to this lethal interaction (Puig-Lozano et al. 2018). Eisfeld-Pierantoni et al. (2022) warned about the environmental consequences of the COVID-19 pandemic to marine plastic pollution, which is expected to produce serious consequences for marine life, including cetaceans. In this study, we update the data on FB ingestion in stranded cetaceans from 2000 to 2020. We found a slightly lower prevalence of FB ingestion (6.7%;46/682) and deaths due to lesions produced by FB (2.05%;14/683). One more affected species was described (a total of 16 cetacean species), being deep divers more affected. Plastics were the most prevalent item found (91.3%; 42/46), being classified as plastic bags and other domestic plastic debris (69%; 29/42), ropes (19%;8/42), nylon fishing line (9.5%; 4/42), packing (2.4%; 1/42) and net remains (2.4%; 1/42). Lesions varies due to severe ulcerative gastritis (28.3%; 13/46), gastric impactions (26%; 12/46), gastrointestinal perforations (0.04%; 2/46), stomatitis (0.04%; 2/46), glossitis (0.02%;1/46), cicatrized ulcers in stomach (0.02%;1/46), and absence of lesions or not possible to evaluate due to the advance decomposition of the carcasses (32.6%; 15/456). Also, metal filaments (4.3%; 2/46), clothes (2,2%; 1/46), and glass fragment (2,2%; 1/46) has been found. Ongoing studies on FB ingestion in stranded cetaceans are crucial to monitoring ocean health and future environmental conservation policies in this archipelago.

Keywords: marine litter, plastic debris, cetacean, foreign body, Canary Islands

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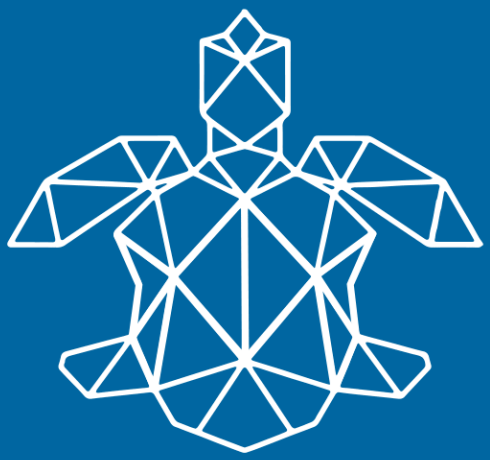

BAMAR

ORAL COMMUNICATIONS

MPS IN THE MARINE SYSTEMS: FROM BEACHES TO OFFSHORE

ULPGC Universidad de Las Palmas de Gran Canaria
Universitat de Barcelona
Universidad Católica de Valencia San Vicente Mártir
UCA Universidad de Cádiz
Universitat d'Alacant Universidad de Alicante
Universidade Vigo

DISTRIBUTION OF MICROPLASTICS IN SEA ICE FROM NOVIK BAY (SEA OF JAPAN)

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Abstract: Sea ice may represent a sink for plastic debris, especially for microplastics (plastic particles <5mm, MPs), however this topic is still poorly explored in the scientific literature (Kim et al, 2021). Being sea ice a multiphase anisotropic material whose structure depends on both past and current environmental conditions, the accumulation of MPs in sea ice is expected to show patterns that may be related both to the plastic particles physio-chemical characteristics and to the specific mechanisms leading to the formation of sea-ice. Starting from this basis, the aim of this study was to study microplastic distribution in sea ice. Ice cores from one-year sea ice in the Novik bay (Peter the Great Bay, Sea of Japan) were sampled and submitted to visual inspection, μ-FTIR and RAMAN analysis An average level of contamination of 180 items/dm^3 was found for the MPs in the size range of 0.3-5 mm, whereas MPs 0.03-0.3 mm resulted 168 items/dm^3. Fibers resulted prevalent (76%) in the highest size range and with significative differences in the relative abundance from the top to the bottom of the ice cores. Differently, the smallest particles resulted to be prevalently fragments and displayed a patchy distribution. A slight influence of the salinity profile in the overall particles' vertical distribution, and different accumulation patterns for the different polymers at a different photo-oxidative degradation state were also highlighted.

Key words: Microplastics, Sea Ice, Sea of Japan

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PLASTIC CONTAMINATES BEYOND SURFACE SEDIMENT LAYERS OF MACARONESIAN BEACHES

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Abstract: The quantification of plastic debris on beaches has been extensively used as an indicator of plastic pollution in the marine environment. However, most studies have focused their analysis on surface layers, with few investigations looking deeper into the substrate, thus underestimating total standing stocks. Such information is crucial to improve our understanding of where plastic accumulates in our oceans. In this study, we investigated the three-dimensional distribution of plastic (>1mm) in three sandy beaches of Macaronesia that are previously known to accumulate significant quantities of small plastic debris. On each beach, we collected a total of 16 sediments cores from the high tide line up to the backshore following a stratified random sampling design spread across four different levels. The samples were taken every 10 cm down to 1 meter in depth. Our results revealed the presence of plastic items in the deepest layer sampled on the beaches with sub-surface layers accounting for 84% of the total abundance in the sediment column. Furthermore, we found increasing plastic concentrations through the sediments towards the backshore. Collectively, this study suggests that the plastic items washing on the selected sandy beaches of Macaronesia are being incorporated into its deepest layers.

Key words: beaches, sink, Macaronesia, North Atlantic, Fourier transform infrared spectroscopy

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MICROPLASTICS DISTRIBUTION ON MESOSCALE EDDIES AT THE WATER COLUMN UP TO 1100 METERS DEPTH

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Abstract:
During April 2021 an anticyclonic eddy passed by south of El Hierro Island (Canary Islands). Ten months later, in February 2022, a cyclonic eddy also moved along the same area. Physical characteristics of both eddies as density, temperature, salinity or oxygen concentration were determined up to 1100 meters depth. Microplastics (MPs) concentration was also determined at 50, 150, 600 and 1100 meters depth for both eddies. Fragment, fibers, lines, films and microbeads present in each sample were identified and quantified.

Below the sea surface, all MPs found were smaller than 1 mm and most of them had a size lower than 300 µm. MPs are present at every single sampled depth, but their distribution is not homogeneous, and it is clearly related with the ocean dynamics. MPs distribution varies with depth and also with the convergence-divergence areas, being different between cyclonic and anticyclonic eddies (Brach et al., 2018; Van Sebille et al., 2020).

MPs transport and distribution are related with ocean dynamics not only at the sea surface but also along the whole water column (Vega-Moreno et al., 2021). The drift of these small particles (mainly lower than 300 µm) is clearly not influenced by density forces. MPs are being transported as passive drifters by currents following physical patterns of these mesoscale processes as eddies. Moreover, this behaviour is similar at macroscale processes at the water column (at least up to 2000 meters depth), being MPs transported with the water masses as Mediterranean Water (MW). Maximum concentrations of small MPs (around 100 µm particle size) are found at 1100 meter depth (higher than at the sea surface). These MPs have been transported with the water mass from the strait of Gibraltar to the Canary Islands, and from the sea surface to 1100 meters depth where MW is located at this region.

Key words: microplastics, deep samples, eddies, transport, ocean dynamic, water mass.

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BREAKING THE PARADIGM: MARINE SEDIMENTS HOLD TWO-FOLD MICROPLASTICS THAN SEA SURFACE WATERS AND ARE DOMINATED BY FIBERS

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Marine compartments are often considered independent environments in studies on plastic pollution (Ali et al., 2021). Consequently, little is known about microplastic (MPs) distribution amongst those habitats closely linked. Here, we perform an interactive assessment of MPs abundance and composition from the pelagic habitat to beaches integrating shallow seafloor sediments of a coastal Mediterranean marine protected area and evaluating MPs ingestion in holothurians, echinoderms, molluscs, and fishes inhabiting the area. We observed a gradient in the accumulation of MPs from the sea surface (0.17 ± 0.39 MPs/m^2) to and beach sediment (13418 ± 28787 MPs/m^2), with a skip of two orders of magnitude. Microplastic abundances fit with those reported for more anthropized Mediterranean areas and suggest coastal environments as potential debris sinking areas. Fibers dominate all the studied habitats. Holothurians showed the highest general MPs and fibers ingestion occurrence (91%), with greater values (9.48 ± 8.05 MPs/individual and 8.24 ± 7.95 fibers/individual) than those reported previously (Bulleri et al., 2021). Considering ecological key role, species distribution, and MPs ingestion values, we suggest Holothuroidea as suitable bioindicators for plastic pollution, particularly for fibers. Fibers are composed primarily of cellulose acetate (29%), whereas styrofoam of polystyrene (64%), and films, fragments, and filaments of a variable percentage of polyethylene and Differences found in the polymer composition amongst plastics´ morphologies are reflected in the variability observed between habitats and marine organisms. Particularly the polymer composition of fibers coincides with that of one of the MPs ingested by invertebrates. Results suggest that shape is a key plastic characteristic in determining polymer distribution patterns along with habitats and in marine species. Finally, this study highlights once again the importance and urgency of local and global actions needed to mitigate plastic pollution and particularly fiber release into the marine environment.

Key words: microplastics, microplastics ingestion, marine protected areas, plastic pollution

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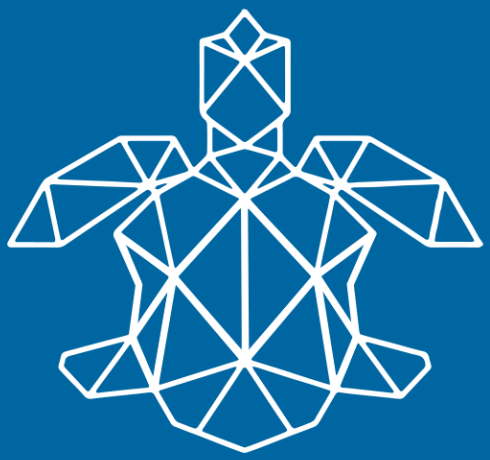

3AMAR

ORAL COMMUNICATIONS

INITIATIVES TO REDUCE MARINE LITTER POLLUTION AND CITIZEN SCIENCE

CITIZEN SCIENCE AS AN IMPORTANT SOURCE OF OPPORTUNISTIC DATA TO IMPROVE MARINE LITTER MONITORING (OCEANLIT PROJECT)

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Abstract:

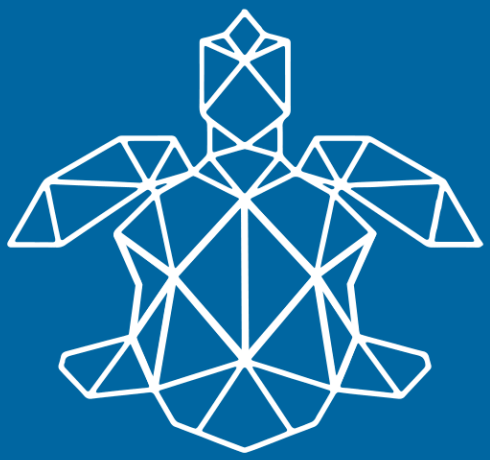
During last years, plastic pollution has become into an important menace. The concern about it has raised quickly during the las decade withing the scientific community as well as the general public.

Focusing on marine debris, every day there are more people concerned and moving against plastic pollution, such us social groups and public institutions organizing beach cleanups, recreative boats taking out marine debris from the seas, or diving centers arranging cleanups on seafloors. Every day there are more people collecting marine debris from beaches, seashores, sea surfaces and seafloors, but only in few cases an adequate identification and classification of debris collected are conducted. Improve capacities, simplify protocols, and conduct adequate trainings could provide important datasets to enhance marine debris monitoring.

For this reason, OCEANLIT project in Canary Islands aims to reinforce citizen science within local groups and institutions, harmonizing data collection on different levels: i. *Awareness and educative level*; ii. *Basic level*: identifying and quantifying most common litter items; iii. *Scientific level*: with protocols based on scientific designs.

To date, an important review on activities related with marine debris (cleanups, scientific studies, data collection, etc.) has been conducted within scientific and divulgative media, including social media, and main results has been analyzed. Also, more than 70 local teams and 40 recreative boats were identified and contacted, and specific trainings will be conducted during 2022.

Key words: marine debris, citizen science, beach litter, floating debris, Canary Islands



3AMAR

ORAL COMMUNICATIONS

PLASTIC LITTER AND MICROPLASTICS: SOURCES, TRANSPORT AND DISTRIBUTION

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PREDICITING THE DISTRIBUTION & ABUNDANCE OF ABANDONED LOST DISCARDED FISHING GEAR (ALDFG) IN DEEP SEA HABITATS OF A REMOTE ISLAND ARCHIPELAGO; THE AZORES, NORTH ATLANTIC

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Abstract: Abandoned, lost or discarded fishing gear (ALDFG) comprises of a significant amount of global plastic pollution, being a major source from sea-based activities. The amount and distribution of ALDFG have likely risen in recent decades with the rapid expansion of fishing effort and the transition to synthetic, cheaper and durable materials used for fishing gear. But because most fishing gear is specific to target species, varying geographically, ALDFG information is frequently limited in spatial scope. The deep sea is known to be a major sink for plastic pollution however surface waters and coastlines have received the most research attention due to the obvious visibility of impacts. Potential threats such as plastic pollution is concerning for the biodiversity of deep-sea ecosystems due to numerous species being highly endemic and exhibiting very slow growth rates, therefore recovery will be difficult once they are severely damaged. In this study data on the ALDFG presence was obtained from a large video archive of seafloor footage (346 dives) collected in the region for over 14 years (2006-2019), by different imaging platforms. General Additive Modelling (GAMs) were used to model the distribution and abundance of ALDFG over the seabed of deep-sea habitats of the Azores Archipelago EEZ using a suite of environmental and anthropogenic factors. Results aided in predicting hotspots of ALDFG in sensitive benthic habitats and areas of potentially high abundance with the EEZ. In addition, the database was analysed for interactions between ALDFG and deep-sea benthic organisms, of these entanglement interactions were numerous, for example in Anthozoa and Porifera species. Additional knowledge about the sources, amounts, fates and impacts of ALDFG is key to help address this global issue. Novel techniques such as modelling can be a tool to aid in mapping both historic, current and potential ALDFG hotspots and marine fauna interaction zones.

Keywords: marine debris, ghosting fishing, distribution maps, marine litter

Acknowledgements: The study done within the project PLASTDEEP (ACORES 01-0145-FEDER-000125) through the Operational Program AÇORES 2020

MEDPELLETS: CHARACTERISTICS AND DYNAMICS OF PLASTIC PELLET POLLUTION IN THE WESTERN MEDITERRANEAN

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Abstract:
Industrial pre-production plastic pellets are primary microplastic particles with size between 1 and 5 mm, used as the raw material to produce plastic items. Due to lack of regulation in the value chain and bad practices, pellets are lost in different stages of the plastic supply chain, representing one of the most important sources of primary microplastics in the marine environment. Since 2018 local NGOs have been reporting an alarming case of pellet pollution in Catalonia's southern coastline (Tarragona), adjacent to the largest petrochemical complex of southern Europe..

MEDPELLETS project aims to set a knowledge basis about the current state of pollution by plastic pellets on this Western Mediterranean area, including Tarragona's coastline and the Balearic islands, obtaining information about the sources, transport processes and final accumulation areas.

Two beaches in Vila-seca (Tarragona) and one beach in Es Mercadal (Menorca island) were monitored for microplastics >1 mm in length. Microplastics were collected from the high tide line on a bimonthly basis for quantification and characterisation of the plastic pellet category by using a flatbed scanner, and chemical characterization (polymer type) by Fourier-transform infrared spectroscopy. In addition and in order to enlarge the sampling area a citizen science program had also been launched to identify hotspots of plastic pellet pollution in the Western Mediterranean, where citizens were able to send the location, pictures and area information through an online form. This study will be the most specific approach ever done before in Tarragona and Menorca about plastic pellet pollution, which will provide information of its dynamics, accumulation areas, chemical nature and physical appearance in sandy beaches. Furthermore, it will help the promotion and design of more efficient countermeasures that prevent this primary microplastic from spilling into the environment.

Key words: pellets, microplastics, Mediterranean Sea, plastic pollution

Acknowledgments: in collaboration with Fundación Biodiversidad, the Ministry for the Ecological Transition and the Demographic Challenge, through the Programa Pleamar, co-financed by FEMP.

VERTICAL DISTRIBUTION AND TRANSPORT OF TEXTILE MICROFIBERS (MFS) IN THE MEDITERRANEAN WATER COLUMN

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Abstract:

Microfibers (MFs) are ubiquitous in natural environments and are considered as an anthropogenic litter that has become a global concern. Approximately 2 million tons of MFs are released into the ocean every year and once in the marine environment, it can be hypothesized that their accumulation and transport are largely controlled by oceanographic processes. We collected water column samples for MFs separation and polymeric characterization at 38 stations located in the Central-Western Mediterranean Sea and Tyrrhenian Sea from the surface to the seafloor (down to 3465 m). The aim of our study was to investigate MFs distribution in different water masses and the transport through different Mediterranean basins. MFs were detected in all samples collected with a median concentration of 3.8 MFs/L (IQR: 3.1 MFs/L) and a median fiber length and diameter of 1023 µm (IQR: 1007 µm) and 15 µm (IQR: 3 µm) respectively. Polymeric analysis highlighted cellulosic-based fibers as the dominant polymer (85%) in the whole water column over synthetic fibers (5%) and processed cellulose (8%), while fibers of animal origin were detected occasionally. MF concentration was locally characterized by vertical variations according to water mass characteristics, and by changes in size, with surface and deep fibers being generally longer and larger than mid-water fibers. Mediterranean surface waters showed homogeneous MF content (range 3.0-4.9 MFs/L), while intermediate and deep waters were characterized by two opposite trends. Intermediate waters showed decreasing MFs concentration moving from the Eastern to the Western Mediterranean basin (9.6-1.6 MFs/L) while MF content increased in deep waters at the same stations (3.7-9.1 MFs/L). Along the Sardinia Channel, we estimated a negative MF flux of 6 X 10^{13} MF/day entering the Tyrrhenian Sea at intermediate depths, and a positive flux of 12 X 10^{13} MF/day in the deep-water mass. We also estimate a 10-fold flux of synthetic fibers leaving the Tyrrhenian Sea, compared with the daily inflow. Our findings suggest that: i) there is a predominant MFs input on surface waters by atmospheric deposition; ii) MFs vertical distribution is size-dependent; iii) MFs transport between Mediterranean basins is mediated by Levantine waters; iv) a potential export of MFs to deep waters occurs in the Tyrrhenian Sea.

Key words: Microfibers, Cellulose fibers, Synthetic fibers, Mediterranean Sea, Water column

USE OF UNMANNED AERIAL SYSTEMS FOR MULTISPECTRAL PLASTIC WASTE DETECTION AND MONITORING ON THE COAST OF GRANADA

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Abstract: Satellites have been broadly used for marine plastic debris detection and monitoring in remote sensing research. However, few studies have assessed plastic pollution on dry riverbeds with the use of spectral data acquired by drones. These riverbed channels represent a key source of plastic litter accumulation before it reaches the marine systems if actions are to be taken. In this research, high resolution multispectral and RGB (red, green, and blue) imagery data acquired by Unmanned Aerial Vehicles was combined with in situ surveillance to detect mismanaged macroplastics accumulation due to intensive farming on dry riverbeds in Castell de Ferro, a town located in the central part of the Granada coast in Spain which is famous for its tourism and plastic greenhouses. The data acquired with the sensors was then processed with a Supervised Classification Plugin used in QGIS and validated with in situ identification of the macroplastics. As a result, the multispectral sensor was considered to deliver the necessary data for accurate plastic litter detection, whereas the RGB imagery and the in-situ surveillance data acquired provided the required validation improving accuracy in the plastic litter detection achieving the main goal set for this research study. The aim of this study was to develop a methodology to detect plastic litter on coastal areas as a practical and cost effective assessment tool for detecting and monitoring intensive agriculture residues for academic researchers and decision makers.

Key words: Low altitude remote sensing, intensive farming, greenhouses, UAV multispectral sensor, drones, Geographic Information Systems

ASSESSING MARINE DEBRIS TRANSPORT AT OPEN OCEAN IN THEIR WAY TO THE CANARY ISLANDS

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Abstract:

Canary Islands is a region identified as a hot spot of marine plastic debris, with the arrival of significant amount of macro-, meso- and microplastics to the coast (Hernández-Sánchez et al., 2021; Villanova-solano et al., 2022). An important variability on marine debris concentration has been observed along the eight islands (specially microplastic) and the main factors that might explain this variability are still under study. On the one hand, beaches with high debris concentration are usually oriented to north or north-east, although some other beaches with the same orientation present a low marine debris concentration. On the other hand, microplastic temporal distribution do not present any seasonal pattern (Reinold et al., 2020), though it seems that storms might help to explain a higher arrival of microplastic to the coast. Additionally, the orography and bathymetry of the sampled beaches are still factors to analyse in detail.

This work focuses on two of the main hot spots of marine plastic debris at the Canary Islands to address their relationship with the transport of these particles, modelling their trajectories in their way from the open ocean to the coast.

Key words: marine debris, microplastic, transport, drift, ocean dynamic, modeling.

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PLANKTON-SIZED MICROPLASTICS QUANTIFIED FOR THE FIRST TIME IN THE CANARY ISLANDS WATERS

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The ocean is a major recipient of plastic pollution, from large to microscopic debris (microplastics – MPs < 5 mm), and the impact of plastics on marine ecosystems is an emergent area of concern. MPs are nearly ubiquitous in marine waters, and the Canary Islands archipelago, in particular, is a hotspot of plastic pollution due to the accumulation of plastic litter rafted from the North Atlantic Ocean by the southward flow of Canary Current. Until now, the concentration, composition and distribution of small fraction MPs (down to 10 µm) in the Canary Islands' coastal waters has been unknown. In October 2021, a survey onboard the sailing boat "Windfall" was conducted in the coastal waters of Lanzarote, Fuerteventura, Gran Canaria, Tenerife, and La Gomera to assess for the first time the concentration and composition of small MPs (10 µm > MPs > 500 µm). Surface seawater (1 m^3) were filtered with a 10 µm steel mesh using a plastic-free pump-fed device (AAU "UFO"). The MPs were analyzed by µFTIR-Imaging spectroscopy followed by automatic MP detection. MPs were ubiquitous, but high spatial variability was observed within stations. The concentration of MPs ranged from 50 MPs m^{-3} (Lanzarote) to 1664 MPs m^{-3} (La Gomera), with a median concentration of 265 MPs m^{-3}. The polymer composition was dominated by polyester (46%) and polyethylene (36%). The concentration of MPs down to 10 µm in coastal waters of the Canary Islands was the highest found in surface waters using this methodology (e.g., 2-10 times higher than Greenland or the Kattegat Sea). The dominant MP size fraction detected (90 % < 150 µm) overlaps with the prey size for plankton-feeding marine animals, raising concerns for future exposure levels of marine biota to increasing MP pollution in the coastal waters of the Canary Islands.

Key words: microplastics, plastic-free sampling pump, Canary Islands, µFTIR-Imaging.

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MICROPLASTICS IN BLACK SCABBARDFISH FROM NORTHEAST ATLANTIC

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Abstract:
The presence of litter and microlitter in our oceans increased in the last decade, becoming a worldwide problem affecting different trophic guilds and contributing to the degradation of the good environmental status of marine ecosystems (Ugwu ate al. 2021). Nowadays, plastic waste constitutes more than 80% of marine debris (Galgani et al. 2015), that when exposed to environmental factors breakdowns into small particles known as microplastics (MPs; < 5mm) (Galgani et al. 2015, Boucher & Friot 2017). Recent studies have shown the presence of MPs in several organisms, highlighting their wide distribution in our oceans (Galgani et al. 2015, Ugwu et al. 2021).
This study aimed at verifying, for the first time, the presence of MPs in black scabbardfish, *Aphanopus carbo* Lowe, 1839, one of the most landed and consumed fish species in Madeira archipelago (Hermida & Delgado 2016).
Samples (n=60) from *A. carbo*, landed in Madeira archipelago, were collected in order to verify the presence of MPs in the digestive gut.
The methodology used included digestion of samples in a solution of KOH (10%), for 24h at 25ºC, followed by its filtration, after which MPs were counted and identified individually.
Results confirmed the widespread distribution of MPs, and their presence in deep-sea A. *carbo*, as MPs were detected in more than 90% of the sampled specimens. Three main categories of MPs were identified: fibres, lines and fragments.
Our results are in agreement with those reported by Carreras-Colom et al. 2018 and Valente et al. 2019, that found MPs in deep-sea shrimps and sharks.

Key words: Microplastics, northeast Atlantic, Madeira, black scabbardfish, *Aphanopus carbo*

Acknowledgments: Authors acknowledge financial support of the Transnational Cooperation Program Azores-Madeira-Canary Islands for the "IMPLAMAC" project

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MODELLING FLOATING RIVERINE LITTER IN THE SOUTH-EASTERN BAY OF BISCAY: A REGIONAL DISTRIBUTION FROM A SEASONAL PERSPECTIVE

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Abstract: Rivers contribute to the flux of litter to the coastal and marine environment; however, estimates of riverine litter amounts are scarce and the behaviour of riverine litter items is highly uncertain. Here we provide a comprehensive overview of the seasonal trends of floating riverine litter transport and fate in the south-eastern Bay of Biscay (SE BoB) based on the simulations performed with the Lagrangian model TESEO. Numerical particles were released (for a period 2009-2021) close to the river mouths as a proxy of litter entering the ocean from rivers. Particles were forced by wind fields and surface currents provided by HF radars covering selected seasonal week-long periods. Simulations were parameterized with a wind drag coefficient (Cd) to represent the trajectories and destiny according to the buoyancy of litter items. Items were grouped into two categories according to field experiment with a riverine barrier: low buoyant items (objects not exposed to wind forcing, e.g. plastic bags and parametrized with Cd=0%) and highly buoyant items (objects highly exposed to wind forcing, e.g. bottles and parametrized with Cd=4%). The Cd=4% for highly buoyant items was calculated by comparing modelled and observed trajectories of four satellite drifting buoys released at Adour (FR), Deba (ES) and Oria (ES) river mouths. Simulations of riverine litter parametrized with Cd=4% showed that particles drifted faster towards the coast by the wind, notably during the first 24 hours. When comparing coastline concentrations, the highest concentrations (>200 particles/km) were recorded during summer in the region of Pyrénées-Atlantiques. Regions were highly affected by rivers within or nearby the region itself. The coupling of observations and a river-by-river modelling approach can assist policy decision making on emergency responses to high fluxes of riverine litter and on future monitoring strategies for heavy polluted regions within the study area.

Key words: Marine litter, Riverine, Lagrangian modelling, Bay of Biscay, Buoys, Windage

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LAGRANGIAN REGIONAL STUDY TO DETERMINE ACCRETION ZONES IN THE MARINE SPANISH DEMARCATIONS

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Abstract: Marine pollution is a current problem widespread throughout the world due to the recent growth of the plastics industry. There are several methodologies designed to study the movement and accumulation of plastics in the oceans, such as satellite remote sensing, drifters, numerical simulation, and beach collections (Davaasuren et al., 2018; Lavers et al., 2016). In this work we use the MOHID-Lagrangian model (www.mohid.com) to simulate the motion of plastics in the North Atlantic Ocean. For this purpose, different emission sources (rivers, land-based and maritime sources) were characterized. This allowed us to determine potential points of accumulation of garbage in the different marine Spanish demarcations, as well as the relative contribution of each source. In this sense, this work seeks to determine the origin of the waste accumulated in each area. We have established the relative contribution of the peninsular sources in the areas of greatest accumulation. It was also possible to determine the seasonality of the different sources in each target area. Although we present a study on a national scale, the scope of this model also includes different spatial resolutions (Cloux et al., 2022).

Key words: Marine litter, Lagrangian, Model, North Atlantic

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ASSESSING PLASTIC POLLUTION IN THE BAY OF CADIZ

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Abstract: Plastic pollution has been reported in all areas of the environment, yet our limited knowledge of plastic sources and pathways makes it difficult to assess the risks and develop appropriate mitigation strategies. The Marine Litter Laboratory (https://marinelitterlab.eu/) of the University of Cadiz develops several projects dedicated to the study of plastic pollution in multiple aquatic systems. Particularly, under the PLAn project, that aims to understand and act on the problem of marine litter along the coasts of Andalusia by studying its origin, distribution, and potential impacts.

This study presents different standardized methods to obtain representative data of plastic debris in the main coastal reservoirs of the Bay of Cadiz: surface water, water column, sediments, shallow and deep bottoms. In the water surface, a Trinet with a mesh size of 200µm is utilized for meso- and microplastics (5-25 and <5mm, respectively) sampling. Meanwhile for the water column, a Bongo net and a Multinet (200µm mesh size) has being used. The advantage of the Multinet method is the ability of taking multiple samples at different stratus of the water column. Finally, for the study of sediments, a box corer with a sampling surface of 0.25 m^2 is used to analyze the upper 2 cm of the bottom surface.

The combination of different techniques allows the comparison and applications beyond the scope of individual projects, providing a useful transfer of information from research to policy making. Furthermore, the project collaborates with partner initiatives (ECOPUERTOS and ECOFISH) to assess marine litter retrieved by fishermen and plastic in marine biota. It also includes education activities on marine litter pollution and responsible consumption habits in educational centers, including citizen science activities with schools in Andalusia.

Key words: Plastic, Sampling Strategies, Reservoirs, Bay of Cadiz

COASTAL WATERS OF THE SOUTH-EAST BAY OF BISCAY A DEADEND FOR MARINE LITTER AND MICROPLASTICS

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Abstract: Numerical models point to the Bay of Biscay (BoB), and particularly to its south-eastern coastal waters (SE BoB), as a convergence area for floating particles including marine litter (van Sebille et al., 2012; Ruiz et al., 2022). However, only few studies have quantified its abundance; hence the knowledge on its marine litter is limited. To fill this gap 3 types of surveys (i.e. neustonic plastic surveys, visual observations, and floating macro-litter survey) were conducted in the BoB with different spatial and temporal coverage (whole BoB and coastal SE BoB, period 2017-2020) onboard oceanographic and small-scale fishing vessels. Results show that: (1) plastic abundance in coastal waters of SE BoB is medium-high (739,395±2,625,271 items/km^2), French waters being the most affected; (2) oceanic waters (BoB level) present half the average found in coastal waters (363,732±443,197 items/km^2); (3) visually sighted floating macrolitter abundance barely varied amongst studied years (3.25 items/km^2); (4) floating macro-litter tends to accumulate in 'marine litter windrows' (Cózar et al., 2021); and (5) a strong positive correlation was found only between micro and mesoplastic abundances. We conclude that macro-litter seem to behave differently to micro and meso litter, being their drift and retention probably driven by different physical processes linked for instance to their different buoyancy. This evidences the contrast between litter concentration within and beyond aggregation structures as well as the capacity of the windrows to retain floating litter in the SE BoB. Thus, the need of studying these type of aggregation structures when assessing the overall litter concentrations at sea cannot be overlooked in scientific surveys to avoid underestimation. The information collected coupled with numerical modelling helped us to determine the typology, abundance, sources, and seasonal distribution of floating marine litter and microplastics in the sea surface of the BoB and in coastal waters of the SE BoB.

Key words: Bay of Biscay 1, Microplastic 2, Marine litter 3, marine litter windrow 4, plastic 5, coastal waters 6

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3AMAR

ORAL COMMUNICATIONS

PLASTIC ADDITIVES AND LEACHATES: THE HIDDEN THREAT OF MARINE PLASTIC POLLUTION

IMPACT OF THE LEACHATE FROM SURGICAL FACE MASKS IN THE MUSSEL *MYTILUS GALLOPROVINCIALIS*

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Abstract: COVID-19 pandemic has become a watershed moment in terms of production, consumption and therefore, of plastic litter generation. Disposable items became essential in the fight against the virus. Surgical face masks are an example of this phenomena. With a production of more than 129 million monthly (Prata *et al*. 2020), this item has revealed a high environmental price, due to its ultimate fate in coastal and marine ecosystems. In general, disposable face masks are made of polyethylene or polypropylene and, once in the environment, they may undergo weathering by UV radiation, mechanical, chemical, and biological degradation, accountable for the generation of micro and nanosized plastic fragments and the leaching of organic chemical compounds from its matrix.

The present study aimed to evaluate the ecotoxicological responses that disposable face mask may generate on marine biota after weathering and leaching of contaminants into the seawater column.

A mask leachate was prepared by the immersion of disposable blue face masks in sterilized filtered seawater (concentration of 10 g/L), and shaked over 72 hours, to simulate wave abrasion. FTIR Spectroscopy was used to confirm the composition of the masks used in the assay (polypropylene). Visual evaluation of filtered leachates with a stereomicroscope showed that micro particles were present in the liquid. For the evaluation of biological responses caused by contaminants leached from face mask weathering, marine mussels *Mytilus galloprovincialis* were exposed to mask leachates (100 mg/L), over 14 days, in an *in vivo* experiment. After that, mussels were collected from tanks, dissected, and gills and digestive glands obtained for the multibiomarker assessment.

We have studied the effects of mask leachates on *M. galloprovincialis* through the analysis of antioxidant defence mechanisms (Superoxide Dismutase (SOD); Catalase (CAT) and Glucose 6 phosphate dehydrogenase (G6PDH)), biotransformation processes (Glutathione-S-Transferase (GST)), determination of oxidative damage (Lipid Peroxidation (LPO)) and genotoxicity.

Results indicated that the weathering of disposable face masks in the marine environment may generate toxic responses to *M. galloprovincialis*, by disturbing its antioxidant system, generating oxidative damage and DNA damage.

Key words: Face masks, Plastic, Leachate, Toxicity, Marine mussel.

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HOW CAR TIRE LEACHATES AFFECT SEA URCHIN LARVAE

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Abstract:
Abrasion of car tires has been recognized as a major source of microplastics in the environment. The composition of these particles is highly complex, including rubber, a diverse array of chemical additives and heavy metals. Various of these compounds can leach from the particles into the marine environment presenting a cocktail of chemicals to marine biota. Still, little is known about the effects of car tire leachates on marine species. The aim of this study was to test the effects of car tire leachates on the early development of the sea urchin *Paracentrotus lividus*. We prepared leachates of micronized car tires (<250 µm) at a concentration of 1 g/L for 72h on rollers in darkness. The car tires as well as their leachates were analyzed for polycyclic aromatic hydrocarbons, selected additives and heavy metals. Embryos of *P. lividus* were exposed to a range of leachate dilutions (100%, 75%, 50%, 25%, 12.5%, 6.25%) at static conditions for 72h. At the end of exposure, we analyzed the level of mortality, the occurrence of abnormal development, and the size of the larvae. We found concentration-dependent mortality (4.9-37%) in the 50-100% treatments. However, a diverse set of malformations occurred at lower dilutions, starting at 12.5%. The number of larvae with such abnormal development as well as the severity increased with leachate concentration. Concurrently, there was a concentration-dependent decrease in larval growth. The analysis of leachate composition revealed high levels of naphthalene, zinc and strontium, which may be responsible for some of the observed effects. These results show that chemicals from car tires can be hazardous to marine invertebrates and a better understanding of their concentration, fate, and impact in the natural environment is needed.

Key words: tire wear particles, *Paracentrotus lividus*, early development, mortality, microplastics

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MESOCOSM TRIALS REVEAL THE POTENTIAL TOXIC RISK OF DEGRADING BIOPLASTICS TO MARINE LIFE

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Abstract: As concern for marine plastic pollution increased, bioplastics have been suggested as a possible solution (Avio et al., 2017; Balestri et al., 2017; Beiras & Schönemann, 2020; Menicagli et al., 2019). But whether those novel materials are tackling the problem sufficiently remains questionable (Bagheri et al., 2017; Tosin et al., 2012). To gain more insight in degradability, performance, and the impact of degradation on the toxicity, commercial bags made from two biodegradable plastics and one conventional plastic (PE) were exposed for 120 days in a mesocosm featuring benthic, pelagic, and littoral habitat simulations. Degradability was assessed as weight loss, and specimens were tested for toxicity using *Paracentrotus lividus* sea-urchin larvae after different exposure times. Both biodegradable bags showed degradation within 120 days, with the littoral simulation showing the highest and the pelagic simulation the lowest decay. Disregarding habitat, the home-compostable plastic showed higher marine degradation than the industrial-compostable material. The relevant initial toxicity of both biopolymers was lost within 7 days of exposure, pointing towards easily leachable chemical additives as the cause of initial toxicity. Interestingly, littoral exposed specimens gained toxicity after 120 days, suggesting UV- induced modifications that increase biopolymer toxicity.

Key words: Plastic, Mesocosm, Marine Ecotoxicity, Plastic Degradation, Marine Litter

Acknowledgments: This research was supported by RisBioPlas Project, financed by the Ministry of Science and Innovation - Spanish Agency of Research (AEI, project reference PCI2020-112110); by LABPLAS Project (Landy-Based Solutions for PLAStics in the Sea, Grant Agreement Nr.: 101003954, financed by the EU H2020 program). S.L.I. was supported by the Ministry of Universities of Spain (FPU grant reference FPU19/02280). EcoCost and CIM received funding by Xunta de Galicia. Jakob Quade received support by the ERASMUS+ program.

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EFFECTS OF PLASTIC ADDITIVES AND ORGANIC CONTAMINANTS IN MICROPLASTICS ON ZEBRAFISH

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Plastic pollution is an emerging threat with serious consequences for animal health and the environment. Among them, microplastics (MPLs) with a size below 5mm are the ones that could cause harmful effects to biota since they can be ingested by a wide variety of species. The risks associated with these small fragments come from the material itself and the chemical contaminants that are absorbed into it from the surrounding water. To assess bioaccumulation in tissues, a feeding study of 4 laboratory treatments was conducted with zebrafish for 60 days. In a preliminary study, MPLs collected from 3 beaches, Lambra, Porís and Famara, were analysed to assess those from more contaminants areas. The analysis showed that Lambra and Porís had the most contaminated MPLs, which were selected to perform separated experiments with zebrafish. Exposure experiments were carried out through the diet (10% of total). In parallel, two more experiments were carried out, a control experiment using clean pellets from a factory and a blank control experiment without MPLs in the fish diet. The analysis of polymers bioaccumulated by zebrafish consisted ultrasound-assisted extraction with toluene and analysis by size exclusion chromatography using an advanced polymer chromatography column coupled to high-resolution mass spectrometry with an atmospheric pressure photoionization source under negative ionization conditions (LC(APC)-APPI (-)-HRMS). For plastic additives and other organic contaminants adsorbed onto MPLs a suspected screening was applied based on UASE with methanol followed by ultra-performance liquid chromatography coupled to HRMS. The chromatographic separation was achieved using a C18 analytical column coupled to HRMS equipped with an electrospray ionisation source working in negative and positive ionization conditions. Data analysis was carried out by Compound Discoverer 3.0, where the first screening generated 130,539 tentative identifications at confidence level 5. After refining 23 plastic additives were confirmed at level 1. Among other contaminants potentially adsorbed from surrounding environments, polycyclic aromatic hydrocarbons (PAHs) were dominant, likewise, most of them were found in the Porís beach, between 300-550 ng/g, followed by polychlorinated biphenyls (PCBs) at 20 ng/g. Our main findings support the hypothesis that, in this real scenario, plastic additives and chemical contaminants adsorbed on environmental microplastics (EMPLs) bioaccumulate in the fish liver due to long-term ingestion of MPLs.

Key words: Microplastics, plastic additives, Bioconcentration, Zebra Fish experiment, HRMS

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IMPACT OF LEACHATE FROM CAR TIRE MICROPLASTICS ON THE MARINE HETEROTROPHIC DINOFLAGELLATE, OXYRRHIS MARINA.

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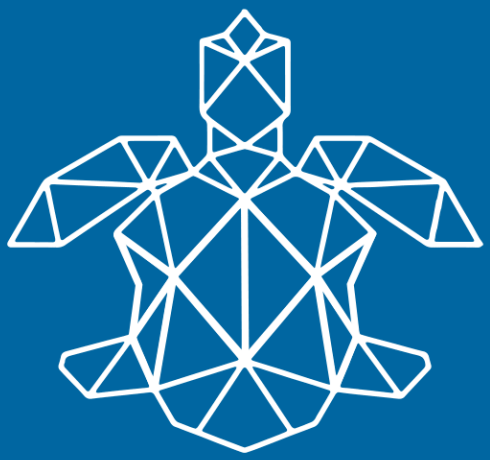
Abstract: Tire wear particles (TWP) are the major contributor to microplastic pollution in the marine environment. There is increasing evidence that leached plastic additives are the main responsible for microplastic toxicity to plankton. In this study, we tested the effect of leachates from micronized car tire particles on the growth of the marine heterotrophic dinoflagellate *Oxyrrhis marina*. Heterotrophic dinoflagellates play key roles in marine food webs as major grazers of phytoplankton and as a link for trophic upgrading of food quality. However, little is known about the impact of TWP leachates on this planktonic group. Our experimental design was constituted of closed glass bottles of 33 mL containing 500 cells mL^{-1} with triplicate of six leachate doses from 0% to 100%. Leachate extract from 1 g of TWP L^{-1} was prepared following four steps: micronization, size fractionation, particle size characterization, lixiviation, and leachate filtration. After a period of incubation of 72 hours, cell concentration and cell size were evaluated. Our results have shown that *O. marina* was sensitive to leachates creating a dose-dependent (EC50=32.3±5.7%) increase in population mortality observed from the lowest tested dose (i.e. 6.25%). Leachate toxicity could be due to the cocktail effect of chemical compounds detected in the TWP leachates, which included metals (e.g. zinc and strontium), flame retardant (e.g. tris (2-chloroisopropyl)phosphate)) and polycyclic aromatic hydrocarbon (e.g. naphthalene). In conclusion, our results demonstrate leachate solution of micronized car tire particles is highly toxic for the marine heterotrophic protist *O. marina.* . This implies that further research has to be conducted to characterize the main plastic additives responsible for this observed toxicity. In the end, these results could be used to improve ocean protection practices and regulations regarding the use of environmentally safer plastic additives.

Key words: Microplastics, leachate, tire wear particles, Heterotrophic dinoflagellate, plastic additives



3AMAR

ORAL COMMUNICATIONS

OCEANIC ISLANDS AS HOTSPOTS OF PLASTIC POLLUTION: THE CASE OF CANARY ISLANDS

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PLASTIC POLLUTION IN SHORELINE WATER AND BEACH SEDIMENT CORES: AN ANNUAL STUDY

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Abstract: Sediment core samples from high tide lines and in submerged zones as well as surface water samples from eight beaches of Tenerife were analysed. Sampling was conducted over a period of one year in intervals of 5 weeks. The majority of particles were found in the high tide sediment (66%), followed by water samples (23%) and finally in sediment from submerged zones (11%). Regarding the particle amount per volume (items/L), accumulation in sediment samples was statistically higher compared to water samples. Mean values of items/L were higher in high tide sediments. In high tide and water samples, mostly white and transparent particles >1 mm were found. More than 70% were represented by fragments. In sediments from submerged zones, yellow and blue microparticles (<1 mm) were predominant and 61.9% consisted of fibres. Larger particles were mainly identified as PP, PE, PS, PTFE and PVC, while polymer types of smaller particles were more variable.

Key words: Microplastic, Marine pollution, Beach pollution, Sediment, Core sampling

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UNDERSTANDING MICROPLASTICS DISTRIBUTION IN THE CANARY ISLANDS FROM A GLOBAL PERSPECTIVE

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Abstract:
Microplastics (MPs) pollution is undoubtedly one of the most important environmental problems that human beings have to face, from the marine environment to the air and soil, as well as its presence in the biota. Understanding the distribution of MPs in a certain region requires the study of their occurrence in the different environmental compartments and their migration between them to achieve a global vision of the way they are transported and their final fate.
In this work, the results of MPs monitoring in complex environmental samples of the Canary Islands in relatively close periods (i.e. seabed sediments, sea urchins, fish stomachs, soils, recycled wastewater and desalinated brackish water) are presented, providing an overview of the current degree of MPs contamination; furthermore, the similarity between the distribution pattern found (sizes, shapes, colours and composition) shows the connection

between such compartments and, in particular, the need to develop interdisciplinary and long-term studies to fully evaluate this issue in sufficient detail (Pérez-Reverón et al., 2022, Sevillano-González et al., 2022, Villanova-Solano et al., 2022).

Key words: Microplastics, sediments, living organisms, Canary Islands, Fourier Transform Infrared microscopy, Raman microscopy

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MONITORING OF ORGANIC MICROPOLLUTANTS ADSORBED ON MICROPLASTIC FROM COASTAL AREA OF THE MACARONESIA

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This work aims at evaluating the presence of different organic micropollutants adsorbed on microplastics debris collected in coastal area from 4 archipelagos of the Macaronesia.
Microplastics debris show strong hydrophobic properties and they exhibit a remarkable adsorption capacity of the organic pollutants that surround them and thus, can act as a vehicle for the transmission of these micropollutants.
For such goal, in the IMPLAMAC Project, the microplastics debris collected in coastal area from 4 archipelagos of the Atlantic Ocean (Azores, Cape Verde, Canary Islands and Madeira) were analysed. The incidence of the following contaminants adhered to the samples are studied: 12 UV filters (UVFs) and UV stabilizers (UVSs), 13 hormones and 10 drugs.
The analyses were carried out by ultrasound-assisted extraction (UAE) and ultrahigh-performance liquid chromatography with tandem mass spectrometry detection (UHPLC-MS/MS). (Montesdeoca-Esponda *et al*., 2021, Guedes-Alonso *et al*., 2021, Santana-Viera *et al*., 2020).
This process was applied a microplastics debris collected in 2020, 2021 and 2022 from 30 different beaches of Macaronesia. In total, 150 samples have been analysed, of which 108 were fragments and 42 were pellets.
Results showed the presence of mostly all the analytes through all archipelagos. UV filter were present in all the sampling beaches, where octocrylene was the most frequently found. Regarding to the Steroid hormone up to up to thirteen of the different steroid hormones were detected, being the highest concentrations of steroid hormones corresponded to the progestin norgestrel.
In the case of drugs, several pharmaceutical compounds were detected being the caffeine the most frequently found. The concentration ranged from <LOQ to even up to 6690.27 $ng \cdot g^{-1}$, obtaining higher concentrations for UV filters and UV stabilisers, then hormones and lastly drugs.

Key words: UV filters, hormones, drugs, UAE, UHPLC-MS/MS

Acknowledgments: Both funds and samples were provided by Project MAC 2/1.1ª/265 (IMPLAMAC) Cooperation Programme INTERREG MAC 2014-20.

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SEARCHING HOTSPOTS OF NEUSTONIC MICROPLASTICS CONTAMINATION IN THE CANARY ISLANDS.

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The Canary Islands are in the North Atlantic subtropical gyre and influenced by the African coastal upwelling and the Canary Current, which is fed by the Azores Current that transports high concentrations of plastics that end up reaching the Canary Islands archipelago (Eriksen et al., 2010). In the study by Herrera et al. 2020 on neustonic microplastic in the Macaronesia region, they found a high variability in the concentration of microplastics, with values ranging from 15283 items/km^2 in Los Gigantes (Tenerife) to 1007872 items/km^2 in Las Canteras (Gran Canaria). The results showed a microplastics to zooplankton dry weight ratio of 2 ± 1.3, so that in some areas were found double the microplastics as zooplankton. These values reveal the potential negative impact of microplastics and associated chemical pollutants on the marine environment and biota, especially on filter-feeding animals. To study the current state and impact of sea surface microplastics the IMPLAMAC expedition was carried out in October 2021 from Lanzarote to La Gomera, and 12 surface water samples were collected from the Canary Islands with a manta net. The objectives of this study were found hotspots of microplastic pollution in surface waters, to quantify and characterise microplastics and neustonic zooplankton. With this study it will be observe the evolution of microplastic pollution in surface waters respect to the study previously carried out by Herrera et al. 2020.

Key words: Canary Islands, neustonic microplastics, zooplankton, hotspots.

Acknowledgments: This work was financed by IMPLAMAC project (MAC2/1.1a/265) Interreg MAC (European Fund to Regional Development, Macaronesian Cooperation).

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CANARY ISLANDS, THE HOTSPOT OF SEA TURTLE ENTANGLEMENT IN THE EUROPEAN WATERS

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Abstract:

The European Project INDICIT proposed sea turtles as marine litter indicator in the European waters, using both, litter ingestion and entanglement on marine debris. Standardized protocols were developed for sampling and shared homogenized data collected in different European regions to conduct regional and global analysis.

Important difficulties were found to harmonize marine debris classification involved on entanglement. Based on litter classification developed by the Marine Strategy Framework Directive (MSFD), an innovative tool was used to identify the most important debris involved on entanglement, through a deep search of pictures and videos of entangled macrofauna on most popular social media (Facebook, Instagram, YouTube, Google, Twitter).

A total of 744 images of entangled macrofauna in the European waters were obtained by INDICIT Partners. Moreover, most part of images were entangled sea turtles (72,3%) and were in the Canary Islands (53,2%), identifying this region as a hotspot of entanglement in the European waters, and matching with the great impact of entanglement on sea turtles observed on data collected by stranding networks in this region.

Important results were obtained from this research: 1. Improvement of the Standard protocol to monitor entanglement on marine debris in the European waters (included on INDICIT project); 2. Images are fundamental to identify litter impact on marine biota, so image storage tools are highly recommended to be included on stranding networks (*RedPromar App* in Canary Islands); 3. Main litter items involved on sea turtle's entanglement in the Canary Islands were identified.

Key words: sea turtles, loggerhead, entanglement, marine debris, social media, Canary Islands

Acknowledgments:

The DG-Environment (EU) funding INDICIT project and all INDICIT partners for collaborate in the process to develop this important protocol and conduct this deep research. The people in charge of stranding networks in the Canary Islands (*Cabildos Insulares*) for letting us deep inside their databases to confirm the great impact of entanglement on sea turtles in the Canary Islands. The Canary Islands Government (Environmental department) to support us to develop a common protocol to collect data on stranded sea turtles in the Canary Islands, including the *RedPromar* tool and all the results obtained by INDICIT project.

3AMAR

ORAL COMMUNICATIONS

HARMONIZATION OF PROCEDURES AND CHARACTERIZATION OF MPS AND PLASTIC LEACHATES

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Universitat de Barcelona

Universidad Católica de Valencia San Vicente Mártir

UCA Universidad de Cádiz

Universitat d'Alacant Universidad de Alicante

Universidade Vigo

MARINE PLASTIC DEBRIS THAT ESCAPES CURRENT MONITORING CAMPAIGNS: VERY SMALL MICROPLASTICS AND NANOPLASTICS

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Abstract:

This work addressed the generation of small MPs and NPs from the mechanical, and photochemical degradation of real marine debris. Fragments of PE, PP and PS were recovered from beaches in Spain and Portugal and irradiated in the 280-400 nm range with the equivalent to five years of solar exposure. We used laser diffractometry combined with flow cytometry to measure the number distribution of particles in the 1-100 μm range. The results demonstrated the generation of small MP particles, mostly < 2 μm, in concentration as high as 10^5-10^6 MPs/mg of plastic. Particle size distributions followed a power law: log(abundance) = c − α log(size), with scaling exponent α = 3.0 ± 0.3 consistent with a pattern of progressive fragmentation of MPs in the three spatial dimensions. This distribution is consistent with theoretical simulations but differs from most results observed in sampling campaigns suggesting a high underestimation of the environmental presence of small MPs. We also demonstrated the generation of nanoplastics (NPs) in the fraction < 1 μm from irradiated runs. The results showed that the mechanism that produced nanoplastics (NPs) from MPs was irradiation, which yielded up to 10^{11}-10^{13} NPs/g with particle size in the few hundreds of nm range. FTIR studies showed functional groups indicating photooxidative transformations in the original MP fragments and in the small MPs obtained after irradiation, as well as NPs obtained from the precipitation of the colloidal fraction. The latter allowed the identification of PE, PP and PS NPs in 1 μm filtrates. The results were consistent with a scenario in which mechanical degradation led to a quick generation of small secondary MPs, subsequently converted into NPs by photochemical reactions. Our results are relevant for the assessment of fate and risk of plastic debris in the environment showing that the number of small plastic fragments produced during the ageing of MPs are much larger than expected from the extrapolation of the existing data on relative microplastic abundance for different sizes.

Keywords: Microplastics, Nanoplastics, Fragmentation, Photochemical ageing, Particle size distribution

EXTRACTION AND CHARACTERIZATION OF MICROPLASTICS FROM GASTROINTESTINAL CONTENT OF THE SMALL-SPOTTED CATSHARK (Scyliorhinus canicula): A PARAMETERIZATION AND ANNUAL EVALUATION

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Abstract:

Plastic pollutions are widely diffused in the oceans and their ingestion by marine organisms is raising concern for potentially adverse effects. Microplastics have become a problem of high-profile pollutants due to their widespread presence in aquatic environments and the degradation of these materials requires long periods of time. The risk of harmful interactions with marine plastic pollution depends on the biology of the species as well as the distribution and abundance of the different plastic types.

The aim of this study was to assess the presence of plastic pollutants from digestive tracts by the small-spotted catshark (*Scyliorhinus canicula*), one of the most abundant elasmobranchs in the Mediterranean Sea. To carry out this project, the digestive tracts were dried and digested with 10% potassium hydroxide (KOH) for 24 hours, an extraction and characterization protocol of microplastics in biological samples adapted from Foekema *et al.* (2013). Digested samples were filtered and analysed by visual observations. Plastics particles extracted from digestive tracts of *Scyliorhinus canicula* were found and classified according to size, shape, and colour. Different samples of plastic particles were filed as microplastics (1 - 1000 μm), mesoplastics (1 - 10 mm) and macroplastics (> 1 cm). All individuals had a minimum of 3 plastics in their digestive tracts and a maximum of 54 plastics. Fourier transform infrared spectroscopy (FTIR) was used for the identification of types of polymers from digested filtered samples. Different plastic polymers were identified, with a higher presence of Polyethylene terephthalate (PET), Polyamide (PA) and polypropylene (PP).

The results of this study represent a first evidence that plastic pollution represents an emerging threat to *S. canicula*, the Mediterranean food web and human consumers.

Key words: *Scyliorhinus canicula*, microplastics, alcalyne digestion, spectroscopy.

YELLOWING, WEATHERING AND DEGRADATION OF MARINE PELLETS AND THEIR INFLUENCE ON THE ADSORPTION OF CHEMICAL POLLUTANTS

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Abstract:

Marine microplastics (MPs) are exposed to environmental factors, which produce aging, weathering, surface cracking, yellowing, fragmentation, and degradation of plastic polymers (Fernández-González et al., 2021). This degradation also has an influence on the adsorption of persistent organic pollutants over MPs, increasing their concentration with aging (Luo et al., 2021).

Degradation state of MPs can be quantified using the yellowness index (YI) and it is related with changes on FTIR spectrum of plastic composition due to the oxidation of chemical compounds. In this study, the degradation state of marine microplastic polyethylene pellets with different aging stages is evaluated and quantified by YI determination and FTIR spectra analysis. A color palette, which is related to the color of the microplastic and the YI, was developed to obtain a visual percentage of this index (downloadable at https://bit.ly/microplasticYI).

The proposed quantified color palette allows to obtain an approximate YI value of the MP color for PE pellets. Samples with high YI values also showed a relevant modification on FTIR signals.

Moreover, aging and weathering of MPs over time in the environment are directly related with higher adsorption rate of POPs on these particles. It has been studied in PE pellets for 15 OCPs, 8 PCBs and 6 PAHs. The increase in POP adsorption rate has two different (but related) reasons: the high relative surface/volume value due to MP surface fragmentation and cracking; and the increase in the age of the MPs, which have undergone weathering and yellowing processes due to photo-oxidation of the plastic composition (Abaroa-Pérez et al., 2022).

Key words: microplastic, pellets, weathering, FTIR, Yellowness index, persistent organic pollutants.

Acknowledgments: This research was funded by DeepPLAS project (Microplastics evaluation at deep water at Canary region and their chemical pollutants associated, ProID2020010030) from Canary Government with FEDER co-financing European Regional Development Fund. Some microplastic pellet samples were provided by the Marine Litter Obser- vatory (OBAM). This project belongs to Fuerteventura Biosphere Reserve in collaboration with the Biodiversity Foundation of the Ministry of Ecological Transition and Demographic Challenge co- financed by the PLEAMAR program of the European Maritime Fishing Fund. We would like to thank the Oceanic Platform of the Canary Islands (Plataforma Oceánica de Canarias, PLOCAN) for their support and sharing their research facilities with us.

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BAMAR

POSTER COMMUNICATIONS

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3AMAR

POSTER COMMUNICATIONS

EFFECTS OF PLASTIC LITTER AND MPS ON BIOTA

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CHANGES IN TISSUE CHEMICAL COMPOSITION IN BLUE CRAB BY MICROPLASTIC EXPOSURE

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Abstract: The marine environment is under great pressure by microplastics (MPs) pollution, which has generated considerable social and scientific concern. This creates the need to understand the response of animal life to these pollutants, being the bioassay a useful tool to develop experimental studies under controlled conditions. In this study, blue crabs (*Callinectes sapidus*) were exposed to two types of MPs (virgin and oxidized), and the inorganic elements (Ca, Cu, Fe, K, Mg, Mn, Na, P, Se, S, Sr and Zn) composition in haemolymph, hepatopancreas, gill and muscle were analysed. For this proposal, three groups of eight crabs each were considered, and two of them were exposed during 118 days to 25 μg L^{-1} of virgin and oxidized MPs (MPP 1241 and AQUATEX® 230, respectively), the level predicted to be present in oceans in 2025 (Jambeck et al., 2015; Green et al., 2017). For haemolymph and tissues, statistical differences in the elements' concentration were found, without a common pattern, except from Na, which presented differences ($p<0.05$) between groups in haemolymph and all tissues. For elements with statistical differences, MPP 1241 was the crab group with the lowest concentrations. To study the relationship between chemical composition and tissue distribution, a Principal Component Analysis was performed, and differences in crab exposure to MPs were found. In conclusion, chemical composition of relevant elements in haemolymph and tissues of crabs can be affected by MPs present in the marine environment.

Key words: blue crab, gill, haemolymph, hepatopancreas, inorganic element, microplastic, muscle.

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ASSESSMENT OF MICROPLASTIC CONTENT IN *DIADEMA AFRICANUM* SEA URCHIN FROM TENERIFE (CANARY ISLANDS, SPAIN)

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Microplastics (MPs) have become a growing problem in the marine environment, producing a negative impact on ecosystems and living organisms. The Canary Islands, mainly due to their geographical location, are vulnerable to the arrival of plastics pollution, since they are influenced by the Canary Current, as shown by different studies on certain beaches on the archipelago, especially those facing northeast (Álvarez-Hernández *et al.*, 2019; Reinold *et al*., 2020). Therefore, it is of great interest for the conservation of biodiversity to study the impact generated by MPs in marine organisms, especially in key species in food chains such as sea urchins.

In this work, the presence of MPs in the digestive tracts and gonads of 33 *Diadema africanum* sea urchins collected at two sampling points in Tenerife (Canary Islands, Spain) was studied. After separation and digestion of the digestive tracts and the gonads with H_2O_2, the filtrates were visualized under a stereomicroscope and analyzed by μRaman spectroscopy, revealing the predominant presence of cellulose, polypropylene and polyethylene terephthalate microfibers. This study confirms for the first time the presence of MPs in sea urchins from the Macaronesian region and Spain.

Key words: Microfibers, sea urchins, Canary Islands, μRaman spectroscopy.

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METABOLIC AND BIOCHEMICAL RESPONSE TO ENVIRONMENTAL MICROPLASTICS IN CULTURED ZEBRAFISH (*Danio rerio*)

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Once the distribution of microplastics (MPs), their composition, and their hazard to marine organisms are widely understood, it would be time to investigate polluted MPs' impact on marine organisms' biochemistry. Dangers at cellular levels as well as at different food-web levels should be explored.
Here, we studied the effect of beach-stranded microplastics (MPs) on vertebrate model organism, *Danio rerio* (zebrafish). MPs were collected from two beaches of Canary Island, Lambra-beach in La Graciosa, and Poris-beach in Tenerife. These beaches were selected for the type and amount of pollutants that their MPs had absorbed (plasticizers, UV filters, lubricants, etc). Zebrafish were exposed to four different diets during 30 days: a control diet(A), food with 10% virgin MPs (B), food with 10% Lambra-MPs (C), and food with 10% Poris-MPs (D). We sampled the organisms at the beginning of the experiment (T_0), after 7 (T_7), and after 30 days (T_{30}). We measured *D. rerio*'s electron transport system activity (ETS), proteins (PROT), lipids (LIP), and carbohydrates (CARB) content and, in energetic terms, energy available (Ea), energy consumed (Ec), and the CEA index (a proxy to study the energy budget balance).
Proteins were the most prevalent energy-rich compound (80-84% Ea), followed by carbohydrates (10-13% Ea) and lipids (4-7% Ea). These percentages remained stable over time and treatments, showing no change in composition in response to MP-ingestion. Furthermore, except in one case, no significant differences ($p<0.05$) were found between the different treatments, nor during the time-periods of each treatment.
We conclude that, under our conditions, for at least 30 days, zebrafish are not significantly affected by microplastic ingestion.

Key words: Microplastics, zebrafish, electron transport system, metabolism, CEA index

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SEAGRASS MEADOW ROLE AS MICROPLASTICS SINK IS MEDIATED BY ABOVE-GROUND STRUCTURAL COMPLEXITY

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Abstract: Ocean microplastic pollution constitutes a recognized pressing and concerning issue. These particles are spread throughout the trophic chain, with potential risk for ecosystems' and human health. Identifying the traits that favor their accumulation across ecosystems is vital to tackle the problem and guide management. Sedimentary depositional habitats are known to have a higher exposure to this pollution. Seagrass meadows are amongst the most relevant ecosystems of soft bottoms worldwide, in terms of ecosystem services provision. Seagrass leaves trap particles from the water column, favoring their burial and accumulation into the sediment. Recent few studies have confirmed the presence of microplastics in sediments inhabited by seagrass meadows, yet less attention has been paid to identifying the traits that mediate their accumulation.

Here we assessed the potential role of above-ground seagrass structural complexity in mediating microplastic accumulation, using intermediate-sized seagrass species *Cymodocea nodosa* as a model. Two replicated habitat types (seagrass-vegetated vs. unvegetated) and levels of seagrass above-ground structural complexity (high vs. low), using canopy height and leaf area as proxies, were assessed in natural meadows of the Canary Islands. Sedimentary microplastic abundance was determined from cores of superficial sediment, following a protocol consisting on sample digestion with H_2O_2, floatation in NaCl saturated solution, and microplastic visualization with stereomicroscope.

Microplastic retention was 4-fold higher in highly complex meadows than in low complex ones. Microplastic abundance in the sediments inside highly complex meadows significantly exceeded that of their surrounding unvegetated sediments, yet inside low-complex meadows microplastic abundance equaled that of their surrounding unvegetated sediments. Microplastic abundance in unvegetated sediments surrounding low complex meadows was significantly higher than that of unvegetated sediments surrounding highly complex meadows. Our results indicate that above-ground structural complexity of seagrass meadows mediate their microplastic sink capacity, with highly complex meadows functioning as enhanced sinks when compared to unvegetated sediment.

Key words: microplastic sink, seagrass meadow, above-ground structural complexity, canopy, leaf area.

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PLASTIC INGESTION BY THE SMALL-SPOTTED CATSHARK *(SCYLIORHINUS CANICULA)* FROM THREE DIFFERENT SITES OFF THE CATALAN COAST (NW MEDITERRANEAN SEA)

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Abstract: Plastic and microplastic pollution has increased worldwide and specially in the oceans, where it turns out to be a concerning threat regarding marine wildlife. The present study analyses the ingestion of anthropogenic items (AIs, that include plastics and microplastics fibres and particles, and cellulosic fibres) by the most common elasmobranch species in the Mediterranean Sea, the small-spotted catshark *(Scyliorhinus canicula)*. Ingested AIs were examined in 61 small-spotted catsharks, quantified in terms of prevalence and abundance and characterized in terms of size and composition. For the latter, ITR-FTIR and micro-FTIR techniques were used. Results were expressed discriminating between stomach and intestine contents and among three locations off the Catalan coast (Blanes, Barcelona and Ebro Delta).

No fragments nor films were detected in the digestive system of *S. canicula*. A total of 359 anthropogenic fibres ranging between 0.17 and 133.63 mm long were found with an overall prevalence of 86.89% and a total mean abundance (MA) of 5.89 ± 8.33 fibres/fish. AIs were mainly found in the intestine and the spiral valve (71.87%).

There were also differences among locations, with sharks off Blanes showing the lowest values of AIs (prevalence = 68.42%, mean abundance = 2 ± 1.91fibres/fish) and those off Ebro Delta the highest ones (prevalence = 100%, MA = 9.80 ± 12.89 fibres/fish). Sharks off Barcelona displayed a prevalence of 90.91% and a MA of 5.68 ± 4.08 fibres/fish. Cellulosic fibres seemed to be noteworthy in terms of fibre composition in all locations.

These prevalences and abundances seem to be higher compared to those reported in other fish species from the same locations (e.g., *Mullus barbatus, Merlucciu merluccius*) probably due to the non-selective feeding behaviour of *S. canicula*. Overall findings indicate that this shark species may be suitable as a bioindicator for monitoring spatial and temporal trends of ingested fibres.

Key words: *Scyliorhinus canicula*, Fibre ingestion, Microplastics, Antrophogenic items, Mediterranean Sea, Sharks

Acknowledgments: This study was supported by the Spanish Ministry of Science, Innovation and Universities project “PLASMAR” (RTI2018-094806-B-100) and by the Catalan Department of Agriculture, Livestock, Fisheries and Food (European Maritime and Fisheries Fund (EMFF)) project “SOMPESCA” (ARP059/19/00003). We thank all fishermen from commercial fishing vessels involved in the “PLASMAR” project. A. H.

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USING BIOMARKERS TO INDENTIFY OXIDATIVE STRESS RESPONSE IN ZEBRAFISH *(Danio rerio)* FED WITH MICROPLASTICS (FRAGMENTS AND VIRGIN PELLETS)

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The widespread use of plastics correlated with its potential toxic effects is an emerging problem today. Thus, we aimed to test the hypothesis that pairing a commercial fish flake with a 10% microplastic diet can be associated to an increased amount of oxidative stress in adult zebrafish *(Danio rerio)*. The induction of stress response pathways is an important indicator of the presence of chemical and non-chemical stressors in cells. To do so, four different treatments were prepared to feed daily and at scheduled time the animals that were divided into 12 distinct tanks, each one with 36 animals. The first treatment was with normal fish flake (A); the second one was with virgin pellet (B); the third one was with collected microplastics at Lambra's beach in Lanzarote (C) and the fourth contained microplastic collected at Porís' beach in Tenerife (D). Three replicates of each diet were prepared to compare a possible oxidative response difference among the treatments with the control. At T_0, T_7 and T_{30} we used biomarkers such as catalase (CAT), glutamate S-transferase (GST) and lipid peroxidation (LPO) to analyse the animal's muscular tissue. We used a spectrophotometer to evaluate the variation of oxidative stress accumulated. Data analysis revealed that the activity of antioxidant enzymes of GST seems to increase throughout the study, especially in the muscular tissue of the MPs- fed group in comparison with the control and that the activity of CAT and LPO show no significant difference. Further, we weighted and measured the length of animals at T_0, T_7 and T_{30}. Results show that animals exposed to collected MPs experienced a slight loss of weight while the longitude remained stable. In conclusion, MPs exposure during 30 days has affected weight increase in *Danio rerio* and may have induced an oxidative stress response.

Key words: Water pollution, plastic particles, *Danio rerio,* biomarkers, oxidative stress

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MICROPLASTIC PRESENCE IN THE PELAGIC FISH, *Seriola dumerili*, FROM BALEARIC ISLANDS (WESTERN MEDITERRANEAN), AND ASSESSMENT OF OXIDATIVE STRESS AND DETOXIFICATION BIOMARKERS IN LIVER

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Abstract: Microplastics (MPs) are characterized by their high persistence in marine ecosystems, and due to their small size, they can be easily ingested by very diverse organisms. Although the presence of MPs in wild fish is well documented, there is still limited information on their potential to induce adverse effects. Pelagic fish species, because of their wide distribution, are considered good bioindicators for monitoring environmental pollution of marine ecosystems. This study investigated the presence of MPs in the gastrointestinal tract of the predatory pelagic fish (*Seriola dumerili*) in the Balearic Islands (Mediterranean Sea), and the possible relationship with oxidative stress through the analysis of biomarkers in liver tissue. The results showed the presence of MPs in 98% of total samples examined (n = 52) with an average of 12.2 ± 1.3 MPs/individual. A greater amount of fibre-like particles were isolated compared to fragments. No correlation between the presence of MPs in the gastrointestinal contents and the size of the fishes was noted. Antioxidant enzymes (superoxide dismutase and catalase) and the phase II detoxification enzyme glutathione-S-transferase showed increased activities in fish with higher MPs load. The activity ethoxyresorufin-O-deethylase and the levels of malondialdehyde were similar in all specimens. In conclusion, the present results provide an important database on the assessment of the presence of MP particles in *S. dumerili* gastrointestinal tract and, the potential capability to cause oxidative stress in liver.

Key words: *Seriola dumerili*; Plastic ingestion; Microplastic; Oxidative stress; Balearic Islands; Mediterranean Sea

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EFFECT OF TIRE WEAR LEACHATES ON PHYTOPLANKTON COMMUNITIES OF THE CANARY ISLANDS

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Abstract: Half a million tonnes of microplastics derived from car tires is estimated to reach marine environments every year. Microparticles generated by abrasion of tires, tire wear particles (TWP), are major contributors to microplastic pollution in the marine ecosystems. The composition of TWP consists of a mixture of the main polymer (rubber) and a variety of chemical additives both organic and inorganic. Some of these additives can easily leach from the main polymer into marine environments. Currently, there are few studies about the effects of tire particle leachates on marine phytoplankton; while toxic effects have been observed in monocultures, the consequences of TWP pollution on marine planktonic communities remain unknown. The aim of this study is to evaluate the acute effects of car tire leachates on the coastal phytoplankton communities of Gran Canaria. For this purpose, leachates of micronized car tires (<250 μm) at a concentration of 1 g/L were prepared by incubation on rollers in darkness for 72h. The car tires as well as their leachates were analyzed for selected additives. Samples of natural microplankton communities were exposed to 6 different leachate dilutions (100%, 75%, 50%, 25%, 12.5%, 6.25%) on rollers with 15 rpm for 72h. The chemical composition of the TWP leachates includes polycyclic aromatic hydrocarbons (e.g. naphthalene), flame-retardants, and heavy metals, especially zinc and strontium, suggesting a potential cocktail toxic effect on the phytoplankton community. We assess how exposure to TWP leachates can affect the structure of the microplankton community level, including changes on the abundance and composition of planktonic organisms, and evaluate the potential impacts of TWP on coastal areas exposed urban and road runoff.

Key words: Car tire leachates, microplastic additives, phytoplankton community.

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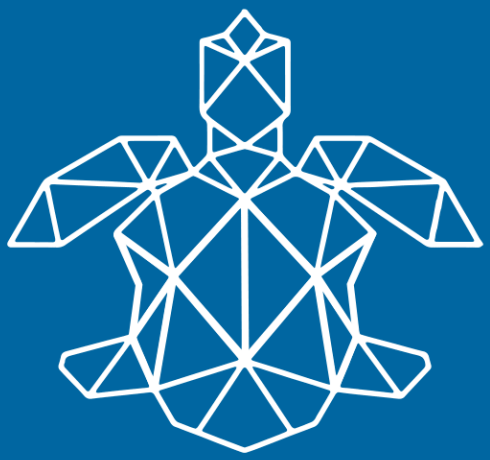

BAMAR

POSTER COMMUNICATIONS

MPS IN THE MARINE SYSTEMS: FROM BEACHES TO OFFSHORE

ULPGC Universidad de Las Palmas de Gran Canaria
Universitat de Barcelona
Universidad Católica de Valencia San Vicente Mártir
UCA Universidad de Cádiz
Universitat d'Alacant Universidad de Alicante
Universidade Vigo

MICROPLASTICS IN SUBLITTORAL COASTAL SEDIMENTS OF THE CANARY ISLANDS (SPAIN)

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Abstract: Microplastics are globally emerging environmental pollutants which have received increasing attention over recent years, especially in the marine environment, which is one of the most affected environmental compartments. In the particular case of the Canary Islands archipelago, marine pollution by microplastics is particularly relevant, due to its geographical location, highly influenced by the North Atlantic gyre which brings to the islands important amounts of marine debris. This investigation aimed to study, for the first time, the presence of microplastics in sublittoral coastal sediments of the Canary Islands. Sediment samples were collected by scuba divers at 30 locations of the archipelago, at a depth down to 10 m on a uniform sandy seabed using stainless-steel corers. Once at the laboratory, each sample was digested with H_2O_2 to remove the organic matter, followed by a flotation process with a NaCl saturated solution. The filtrates (50 μm stainless-steel filters were used) were visualized under a binocular stereomicroscope and the composition confirmed by Fourier Transformed Infrared microscopy. Results revealed the presence of microfibers, fragments, films and microbeads, mainly transparent (74%) and blue (15%) microfibres, with an average size between 1 and 2 mm. The mean concentration found ranged between 141 ± 136 and 4155 ± 1404 items/ kg dry weight (Villanova-Solano et al., 2022).

Key words: Microplastics, fibres, sediments, Canary Islands, Fourier Transform Infrared microscopy

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COVID-19 PERSONAL PROTECTIVE EQUIPMENT (PPE) CONTAMINATION IN COASTAL AREAS OF GRANADA, SPAIN

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Abstract: The use of disposable personal protective equipment (PPE) as a control measure to avoid transmission against COVID-19 has generated a challenge to the waste management and enhances plastic pollution in the environment. The research aims to monitor the presence of PPE waste and plastic debris on the coastal areas of Granada, Spain which belongs to the Mediterranean Sea. Four beaches called Salobreña, Calahonda, La Rijana, La Rábita were analyzed during different periods. The criteria for choosing the beaches were based on their activity (touristic/recreational and fishing) and location (remote and accessible). The abundance, characteristics and distribution of PPE and plastic debris were determined. Results showed that PPE densities were in the range of $1.035 \cdot 10^{-4}$ - $1.362 \cdot 10^{-3}$ PPE/m^2, where face masks represented the 90.67% of the total PPE found, being these results comparable to previous studies in other coastal areas in the world. On the other hand, plastic debris densities were in the range of $2.457 \cdot 10^{-2}$ - $9.201 \cdot 10^{-1}$ g/m^2. On average, PPE represented 0.75% of total plastic debris. During holiday periods, plastic debris increased by 41% to 119% compared to plastic debris found during holydays periods. Cigarettes filters, food containers and Styrofoam were the most abundant items. Regarding type of beaches, the presence of PPE waste and plastic debris was higher on touristic/recreational beaches. Finally, although interesting results were provided in this study, further research is required to better understand the consequences of this type of pollution and to provide viable solutions to this problem.

Key words: Plastic pollution, Beaches, COVID-19, Personal protective equipment (PPE), Face mask, Granada.

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PLASTITAR: A NEW THREAT FOR COASTAL ENVIRONMENTS

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Oil residues have been frequently found on the coasts all over the world, generally as a result of different accidental releases. Their partial evaporation and solidification onto the coastal rocks can result in the formation of a solid agglomerates of tar with other materials, including microplastics. This new class of plastic formation, which has been named herein for the first time as "plastitar", has been found in different coastal areas of the Canary Islands.
In order to characterize such new formation, plastitar found at Playa Grande beach (Tenerife, Canary Islands), which is one of the hotspots of the archipelago due to the high amount of plastic residues it receives every year, was studied. During January 2022, the coverage degree was evaluated using 20 x 20 cm quadrants; microplastics of different shapes were also collected at each quadrant, classified according to their shapes and colors, and their composition determined by Fourier-transform infrared (FTIR) spectroscopy.
This study has shown that these new formations can be permanently attached to the rocks and that they are composed mainly of tar and microplastics (mainly fragments, pellets and lines) of polyethylene and polypropylene (Álvarez-Hernández et.al., 2019).

Key words: microplastics, sea environment, tar, plastitar, Fourier-transform infrared spectroscopy.

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COASTAL PLASTIC FRAGMENTS AS RESERVOIRS OF ANTIBIOTIC-RESISTANT BACTERIA IN GRAN CANARIA (CANARY ISLANDS, SPAIN)

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Abstract:

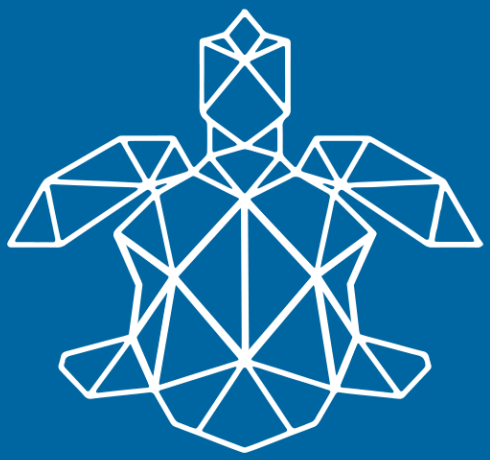
Plastics have become ubiquitous pollutants in the marine environment. Direct effects on marine wildlife such as physical damage caused by ingestion and entanglement are well known across the scientific community. However, there are also other barely explored mechanisms by which plastics could be potentially harmful to ecosystems and human health. In recent years, the ability of plastics to act as reservoirs of potentially pathogenic bacteria, including antibiotic-resistant bacteria, has been proven.

In this work, a preliminary study was carried out with the purpose of evaluating the presence of antibiotic resistant bacteria in Gran Canaria Island's coasts (Canary Islands, Spain), with a focus on coliform bacteria due to their role as faecal contamination indicators. For this reason, samples of mesoplastics (5 - 25 mm) and microplastics (< 5 mm), sand and seawater were collected from three different beaches in Las Palmas de Gran Canaria. Samples were cultivated on MacConkey agar and antimicrobial resistance was determined by disk diffusion test using nine different antibiotics (amoxicillin-clavulanic acid, clarithromycin, cephalexin, doxycycline, enrofloxacin, lincomycin, nitrofurantoin, nalidixic acid and tetracycline).

Growth was observed in 4/4 plastic samples, 2/3 sand samples and 1/3 seawater samples, however, plastic samples showed a higher concentration of strains. All isolated strains were identified as coliforms and were resistant to four antibiotics (amoxicillin-clavulanic acid, cephalexin, clarithromycin and lincomycin). In contrast, the compounds that showed the highest susceptibility were doxycycline, enrofloxacin and tetracycline.

These preliminary results highlight the need for further research on the impacts of plastic waste, with particular attention to its potential role as a vehicle and reservoir for antibiotic-resistant bacteria.

Key words: microplastic, mesoplastic, antimicrobial resistance, coliforms



3AMAR

POSTER COMMUNICATIONS

INITIATIVES TO REDUCE MARINE LITTER POLLUTION AND CITIZEN SCIENCE

ULPGC Universidad de Las Palmas de Gran Canaria

Universitat de Barcelona

Universidad Católica de Valencia San Vicente Mártir

UCA Universidad de Cádiz

Universitat d'Alacant Universidad de Alicante

Universidade Vigo

DISTRIBUTION OF PRODUCTS ON CATALYTIC PYROLYSIS OF DISCARDED COVID-19 MASKS OVER SEPIOLITE

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Abstract: The disposable masks generated in the battle against COVID-19 have attracted wide attention in the world. Unfortunately, some of these masks are currently contaminating the coast of Spain. This research aims to develop a new strategy to valorise wasted COVID-19 masks based on pyrolysis to convert them into useful products. In a first stage, surgical and FFP2 masks were thermally pyrolyzed at temperatures of 450–550 ºC with the purpose of obtaining valuable solid (char), liquid (oil) and gas products. At low temperatures, char formation was favored over oil and gas production, while at high temperatures the non-condensable hydrocarbon yields (gas product) was enhanced. The highest yield of oil was found at an operating temperature of 500 ºC in both surgical and FPP2 masks reaching oil yields of 59.08% and 58.86%, respectively. In a second stage of research, the volatiles generated during thermal pyrolysis were cracked with sepiolite as catalyst at 500 ºC. The cracking with catalyst was more effective obtaining by-products with low molecular mass increasing the final yield of gas product (43.89% against 39.52% for surgical masks and 50.53% against 39.41% for FFP2 masks) and reducing the viscosity of the oil product. Also, the effect of sepiolite regeneration for its use in consecutive pyrolysis tests was examined to evaluate its recyclability. Results showed that, with the higher use-regeneration of sepiolite, the catalyst was degraded obtaining by-products with higher molecular mass. This effect was hardly noticeable in the case of FFP2 masks, although, in both cases, gave better results (oil and gas product with better properties) than non-catalyst pyrolysis.

Key words: Pyrolysis; Catalyst; COVID-19 masks; Plastic waste; Sepiolite.

Acknowledgments: Project "RECOMAR", reference PYC20 RE 041 UGR, co-financed 80% by the ERDF, ERDF Operational Program 2014-2020 and the Ministry of Economic Transformation, Industry, Knowledge and Universities, Junta de Andalucía. European Union – European Regional Development Fund (ERDF) - “Andalusia moves with Europe”.

MONITORING OF MARINE PLASTIC DEBRIS IN A MARINA IN GRAN CANARIA. A PILOT STUDY

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Abstract: The aim of this work was to study the characterisation of floating debris on the water surface inside a marina, Pasito Blanco (Gran Canaria). The separation and sampling of different inorganic debris present in this area was carried out by using two active filtering devices called Seabin (seabinproject.com), specially designed for use in harbours and marinas, which removed floating debris up to 2 mm. The study was carried out by sampling the retained material on a weekly basis between September 2020 and January 2021. The anthropogenic marine litter fractions were quantified following the guidelines proposed by the NOAA MDP for Marine Debris Monitoring and Assessment (MDMAP) into 44 items, grouped into 7 categories (plastics, metal, glass, rubber, processed wood, fabric/fabric and other/unclassified) (Lippiatt, S., Opfer, S., & Arthur, C. (2013). The identification of the filtered material was done by a manual separation process of the different types of fragments. A significant amount of seagrass wrack in the marina containing trapped litter fragments was observed. In general, a dominance of plastic fragments (more than 60%) compared to the other litter was established during the pilot study. The variability in the composition of the collected marine litter appeared to be a consequence of both hydrodynamic and environmental factors such as the current and wave intensity, winds, boat traffic and other port facility maintenance activities in the marina. The results of the sampling and the characterisation of the different fragments provide a first approach to the evaluation and quantification of the different types of marine litter in these port environments, where activities related to nautical sports and coastal transport cause floating debris to converge. The results can contribute to raising awareness of marine litter management policies at sea and in port areas with nautical activity.

Key words: Floating Litter, Plastic Fragments, Marine Debris, Ports and Marinas

Acknowledgments: This study was funded by the European Regional Development Fund through the Madeira-Açores-Canarias Territorial Cooperation Operational Program (POMAC) 2014-2020 through the NAUTICOM (MAC/2.3D/158) and MAWADIPOL
(MAC2/3.5B/334) projects.

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MARINE LITTER OBSERVATORY OF FUERTEVENTURA BIOSPHERE RESERVE

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Abstract: The Marine Litter Observatory is a project to generate scientific knowledge developed by the Fuerteventura Biosphere Reserve in collaboration with the MITECO Biodiversity Foundation, co-financed by the PLEAMAR program of the European Maritime Fishing Fund (FEMP), whose objective is to monitor the amount of marine waste that reaches both the coast and the surrounding waters of the island of Fuerteventura through synergies with different groups, where the collection of "floating garbage" stands out through the participation of professionals from the fishing sector for its subsequent classification. and revaluation.

The Project began in November 2020 and following the methodology of guideline 10 of the MITECO Spanish Marine Strategies, in a single year 28 tons of marine waste have been collected from the coast of Fuerteventura and a total of 450,000 items have been classified, of which 70% are from the category of plastics, highlighting above all those for single use. According to the Tudor&Williams methodology, the sources of origin are "beach tourism" and "leisure and hospitality", unlike other Spanish communities where the main source of origin is "fishing", although if you had the option " oceanic dynamics" given the degradation and the real origin of the marine debris found would be this one with the highest percentage.

The results serve to improve governance towards a sustainability model based on the circular economy and greater innovation for the revaluation of the waste that arrives. In addition, it has made it possible to expand the campaigns on cigarette butts (which are in the TOP 10 of the 120 items collected) or the close relationship between the concentration of waste from water treatment and the increase in occupation on the island.

Key words: citizen science, citizen participation, governance, marine debris, floating garbage, fishermen

Acknowledgments: This project belongs to Fuerteventura Biosphere Reserve in collaboration with the Biodiversity Foundation of the Ministry of Ecological Transition and Demographic Challenge co- financed by the PLEAMAR program of the European Maritime Fishing Fund. Thank the Island Council of Fuerteventura for all the support received and its human resources.

ANNUAL STUDY OF MICRO AND MESOPLASTICS IN 5 BEACHES ON FUERTEVENTURA, CANARY ISLANDS

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Abstract: Islands are presented as model laboratories in the oceans for marine pollution studies. Several studies detail areas of accumulation of macro and microplastic in the Canary archipelago, however, information on the island of Fuerteventura is scarce (Álvarez-Hernández, C. *et al*., 2019; Baztan, J. *et al*., 2014; Edo, C. *et al*., 2019; Herrera, A. *et al*., 2018; Reinold, S. *et al*., 2020). Here we present data from a meso and microplastic abundance, number of items and morphology composition study in 5 beaches in Fuerteventura (Canary Islands) during one year (December 2020 to December 2021).

Quantification analysis (CEDEX, 2016) showed, in the specific case of Caletillas beach (Puerto del Rosario), the highest microplastic abundance data in the study were recorded, with average abundances of 121.08 g/m2 and 6741.33 items/m2.

Morphology analysis showed in general, the FRA morphology (hard plastic fragments) predominated in all the beaches and seasons of the year, reaching, in some cases, for up to 93% of the composition of the sample (Caletillas, winter 2021), and representing more than 50% of the composition of most of the analyzed samples.

Morphology analysis showed differences at local level. In Viejo Rey (La Pared), the FOA morphology (corks, foams and polystyrene) predominated in part of the year (winter, spring, autumn), which represented between the 34% and 77% of the composition of the samples. Differences were also observed on Caleta del Marrajo (El Cotillo). Although hard plastic fragments (FRA) representation varied between 41% and 87% of the composition of the samples depending on the time of year, the morphology LINES (lines, ropes and fishing nets) was especially relevant in the summer season, representing the 41%. In a preliminary way we can establish the beach of Caletillas, in the municipality of Puerto del Rosario, as a point of special attention in the accumulation of marine debris, especially meso and microplastics.

Key words: Microplastics, Marine debris, Abundance, Plastic pollution, Fuerteventura, Canary islands.

Acknowledgments: We greatly want to thank our colleagues on AVANFUER, the NGO which this project gave birth, for all the continuous support through the years, to Yanira Cáceres, Ana Martín and María Jimenez. To the Insular Government - Cabildo de Fuerteventura and the Biosphere Reserve of Fuerteventura, specially to Tony Gallardo for all the disinterest help, and finally to all the volunteers who came to the beach with us to participate and help the activities and workshops since 2018.

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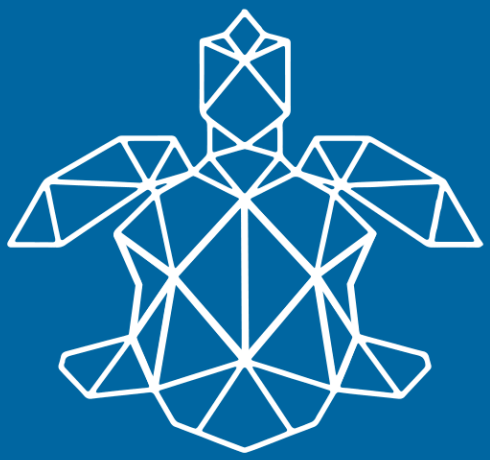

3AMAR

POSTER COMMUNICATIONS

PLASTIC LITTER AND MICROPLASTICS: SOURCES, TRANSPORT AND DISTRIBUTION

ULPGC Universidad de Las Palmas de Gran Canaria

Universitat de Barcelona

Universidad Católica de Valencia San Vicente Mártir

UCA Universidad de Cádiz

Universitat d'Alacant Universidad de Alicante

Universidade Vigo

MARINE MICRODEBRIS IN THE SURFACE WATERS AND SEDIMENTS OF LIVINGSTON AND DECEPTION ISLANDS (SOUTH SHETLAND ISLANDS, ANTARCTICA)

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Abstract: Antarctica and the Southern Ocean, previously considered as pristine regions, are not exempt of marine debris, mainly plastics, which are of special concern due to their huge environmental impact. Although there have been a few studies assessing this issue[1-5], there is still a strong need of information. Here we investigated the abundance, characteristics and distribution of marine microdebris in Livingston Island (South Shetland Islands, Antarctica) surface waters and also in Deception Island (South Shetland Islands, Antarctica) marine intertidal beach sediments. In both cases, we found microdebris items, represented primarily by fibres and followed by fragments. No clear distribution patterns were found for either surface waters or beach sediments. A redundant majority of those items had a dominant short length of <0,1 mm – 0,99 mm. Their most common colours were black and blue. Regarding the polymer types, in surface waters we found mainly polyester fibres and polyethylene fragments. In beach sediments cellulose was the dominant polymer. Considering all these results, we propose that the main sources of pollution are probably local: tourism, fisheries and scientific research stations. We urge for proper management policies to protect the Antarctic environment and its organisms. Further research is needed to keep filling the gaps that escape our knowledge yet.

Key words: Southern Ocean, Pollution, Microplastics, Environmental risk, Waste management

Acknowledgments: We thank all members of the DISTANTCOM-2 (2017-2018) and BLUEBIO-1 (2018-2019) Antarctic campaigns for their help during the fieldwork. This work was supported by the CHALLENGE project (PID2019-107979RB-100).

CHARACTERIZATION AND EVALUATION OF WASTE ASSOCIATED WITH THE COVID-19 PANDEMIC AND ITS ENVIRONMENTAL IMPACT ON THE MARINE ENVIRONMENT (RECOMAR PROJECT)

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Abstract: In the last years, due to coronavirus disease (COVID-19), a novel type of plastic pollution driven by the use of personal protective equipment (PPE), such as face masks or gloves, has entered in the environment in large amounts (Alfonso et al., 2021; Ammendolia et al., 2021).
The "RECOMAR" project has been co-financed by the ERDF Andalusian Operational Program 2014-2020. Its main objective is to analyze the impact of COVID-19 on the production of plastic waste and its effects on marine pollution in Granada (Spain). The RECOMAR project has the collaboration of the Association of Municipalities of the Tropical Coast of Granada (formed by 19 municipalities), the company Waste, Water & Energy Consultores, S.L. and the "Aula del Mar CEI·MAR-UGR" and has been structured into different work packages. In the first work package, the non-selectively collected fractions from the municipal solid waste treatment plants and the solid waste separated in the pretreatment stage of the urban wastewater treatment plants will be identified and characterized, with special interest in the plastic and PPE waste. In the second work package, plastic and PPE waste will be analyzed on the coastal areas of Granada (beaches and deep marine environments). Then, the management of plastic and PPE waste will be studied to propose protocols for more efficient management options, including an environmental and socio-economic study of the different management scenarios. Finally, the option of chemical recycling by pyrolysis of PPE waste will be studied to obtain valuable liquid fuels. In addition, during all the duration of the RECOMAR project, public awareness activities will be carried out in order to promote rational use and recycle of plastic products and PPE.

Key words: Plastic pollution, Beaches, COVID-19, Personal protective equipment (PPE), Granada.

Acknowledgments: Project "RECOMAR", reference PYC20 RE 041 UGR, co-financed 80% by the ERDF, ERDF Operational Program 2014-2020 and the Ministry of Economic Transformation, Industry, Knowledge and Universities, Junta de Andalucía. European Union – European Regional Development Fund (ERDF) - "Andalusia moves with Europe".

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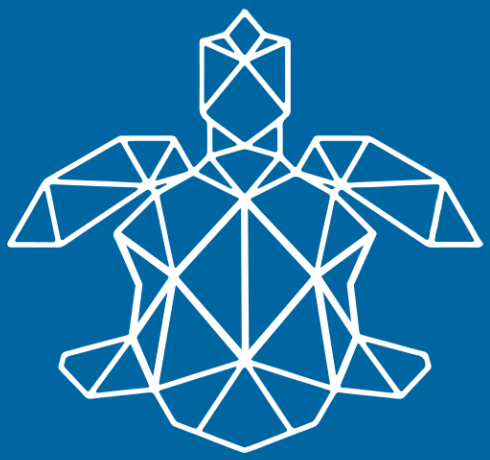

BAMAR

POSTER COMMUNICATIONS

PLASTIC ADDITIVES AND LEACHATES: THE HIDDEN THREAT OF MARINE PLASTIC POLLUTION

ULPGC Universidad de Las Palmas de Gran Canaria

Universitat de Barcelona

Universidad Católica de Valencia San Vicente Mártir

UCA Universidad de Cádiz

Universitat d'Alacant Universidad de Alicante

Universidade Vigo

MICROPLASTICS AND ORGANIC PERSISTENT CONTAMINANTS IN ODONTOCETE SPECIES: EVIDENT EXPOSURE, BUT NOT CORRELATED.

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Abstract:
Plastics materials incorporate a number of chemical compounds added to improve their performance such as plasticizers, antioxidants, flame-retardants, light and heat stabilizers, that, in some cases, make up a large proportion of the plastic product itself (Hahladakis et al., 2018; Rochman, 2015). These additives may interact biochemically and cause toxic effects, and therefore may have an impact on marine organisms and habitats (Hammer et al., 2012). Taking advantage of the opportunity provided by cetacean stranding nets to study the interaction of marine litter with cetaceans, and the previous multidisciplinary experience of the teams involved in this work, this study investigates (1) the level of plastic ingestion in stranded cetaceans (with a especial focus on microplastics, sieving the gastrointestinal contents down to 200 μm) (Montoto-Martínez et al., 2021), (2) the concentrations of organic persistent contaminants (OPCs) in the skeletal muscle of the same cetaceans. All animals (n=12) contained microplastics of diverse sizes, most of them being fibres (98.06%, n=708). The predominant pollutants bisphenols (BPS, BPF and BPA) and DEHP were detected in 94.44% and 88% of the tissue samples, with concentrations ranging 4-984 ng/g and 102-1533 ng/g respectively. Also, except for two individuals, all animals had pesticide levels in their tissues. Findings show evidence of exposure of cetaceans to both plastic fibres and OPCs. Microplastic fibres were present in numbers too low to block or compromise the functioning of the digestive tract. On the other hand, the highest OPCs concentrations were found in three dolphins that exceeded the value of 1 ppm for DDD, a toxic threshold for organohalogenated compounds in marine mammals' tissues (Letcher et al., 2010). Two of these individuals also exceeded this concentration for DEHP. Finally, no correlation was observed between the presence of microplastics and OPCs levels.

Key words: microplastics, organic persistent contaminants (OPCs), odontocete, Macaronesia.

Acknowledgments:

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FIRST DETECTION OF MICROPLASTICS AND PTHALATES IN SEA URICHIN FROM SARDINIA (ITALY)

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Abstract: Microplastics and phthalates were researched in specimens of wild sea urchins *Paracentrotus lividus* sampled across five distinct sampling stations placed in the west coast of Sardinia (Italy, Western Mediterranean). Digestive tracts from 23 samples were submitted to chemical digestion procedure, filtered onto stainless steel filter (25 um pore size) and analyzed by μFTIR; gonads were analyzed by SPME-LC-MS/MS. A total of 23 plastic particles were detected, of which 78% were particles and 22% fibers, with an average of 1,0 ± 0,3 items/individual. The most prevalent polymers were polyalkenes (PE/PP). Phthalates were found to vary from values under the detection limit to maximum value of 72.7 ng/g registered in a sample of the northern sampling station. Overall, the average contamination was 19,2 ng/g, σ = 5,3. The most abundant phthalates were DBP (7,8 ng/g, σ = 1,2) e DEHP (5,0 ng/g, σ = 1,5). A slight correlation between the presence of DEHP and microplastic was also highlighted (Spearman's ρ= 0.4, p =0,027) . Due to local use of sea urchin gonads as delicacy, this study suggests to consider the potential human exposition to microplastics and plastic associated contaminants caused by direct consumption.

Key words: Microplastics, Plastic associated contaminants, *Paracentrotus lividus*, Mediterranean Sea

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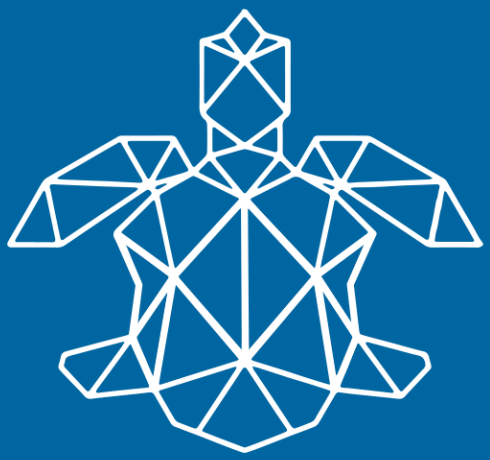

3AMAR

POSTER COMMUNICATIONS

OCEANIC ISLANDS AS HOTSPOTS OF PLASTIC POLLUTION: THE CASE OF CANARY ISLANDS

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Universidade de Vigo

ALEGRANZA, THE NORTH ATLANTIC LANDFILL

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The Canary Islands are an area particularly vulnerable to plastic pollution, as the ocean currents carries all the waste from the east coast of the United States and Canada, North Africa and Europe, and also from maritime traffic to these coasts. Alegranza is the northernmost island of the Canary Islands, therefore the first to be encountered by the Canary Current, a descending branch of the Gulf Stream that flows in a southwesterly direction. Due to its geographical location, it is a hot spot of marine litter accumulation, since all the debris carried by the current is deposited on its northeast-facing coast. Alegranza is an uninhabited island that belongs to the Chinijo Archipelago, protected by the figure of the Natural Park and has also been recognised as a special protection area for birds (ZEPA). From July to October 2020, six expeditions were led to the island to make a first inventory of marine debris and its possible source and origin. In total, 3,667 objects weighing 321 kg were removed, excluding wooden objects. Of these, 97.7% were plastics, the most abundant being drink bottles (25.4%). Most of the marine litter corresponds to objects of everyday use and plastic fragments of unknown source. However, fishing activity and maritime traffic were a significant source of marine litter (20.2%). While knowing the origin, source and pathway of debris is difficult, legible labels provided valuable information. In Alegranza, 66.7% of the legible bottle labels indicated Asian countries of manufacture, which is evidence that the source is maritime traffic in the region. The lobster trap license labels from the east coast of the United States and Canada were dated from 1999 to 2018, supporting both the exogenous origin and long lifetime in the ocean of these debris.

Key words: marine litter, plastic pollution, maritime traffic, Canary Islands, Canary Current

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MICROPLASTIC POLLUTION ON SIX BEACHES IN THE EASTERN CANARY ISLANDS.

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The spatio-temporal distribution of marine debris pollution was studied on six beaches in the Eastern Canary Islands (Lambra, Famara, Caleta del Marrajo, Caletillas, Las Canteras and Vagabundos). Marine debris sampling was carried out every 3 months (one for each season of the year) and 5 replicates were carried out on each beach. No seasonal patterns were found as they varied in each area. Lambra is the beach with the least anthropogenic pressure, however, it was the most polluted, with an average concentration of 2618 items/m^2 and 51.64 g/m^2. Vagabundos was the beach with the least marine litter accumulation with concentrations of 35.4 items/m^2 and 0.6 g/m^2. The most frequent type of marine debris was mainly plastic fragments (83.1%), tar (9.2%), and pellets (4.7%), suggesting that the pollution on the beaches is of exogenous origin. The most frequent colors were white (46.7%) black (11.5%), yellow (11.4%), and blue (8.7%). The results obtained affirm that some of the beaches studied have high levels of plastic pollution, similar or higher to other regions of the planet. This study demonstrates that the Canary Islands are a hotspot for the accumulation of plastic and tar pollution.

Key words: Canary Islands, beaches, marine debris, microplastics, mesoplastics.

Acknowledgments: This work was financed by IMPLAMAC project (MAC2/1.1a/265) Interreg MAC (European Fund to Regional Development, Macaronesian Cooperation).

EXTRACTION METHODOLOGIES TO MICROPOLLUTANS ADSORB ON MICROPLASTICS

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Microplastics are ubiquitous in the marine environment and can cause negative effects on organisms. In addition, they can also adsorb a variety of pollutants and can act as pollutant carriers.
In the IMPLAMAC project, different analytical methodologies are developed to determine different types of organic pollutant, such as UV filters and stabilisers (Montesdeoca-Esponda *et al*., 2021), hormones (Guedes-Alonso *et al*., 2021) and drugs (Santana-Viera *et al*., 2020), whose presence in the environment is booming with the increase in population. Extractions were carried out by ultrasound-assisted extraction (UAE) and the determination by ultrahigh-performance liquid chromatography with tandem mass spectrometry detection (UHPLC-MS/MS). 300 mg of pellets and microplastic fragments were used to obtain the best extraction condition for the different targeted micropollutants.
The method for UVFs and UVSs displayed values lower than 22% and 28% for intraday precision and interday precision, and limits of detection (LODs) were obtained from 0.01 to 0.69 $ng \cdot g^{-1}$ and limits of quantification (LOQs) were from 0.02 to 2.29 $ng \cdot g^{-1}$.
Regarding the analytical method for hormones, it showed intraday and interday precisions below 20% for most compounds, with LODs between 0.07 and 27.5 $ng \cdot g^{-1}$ and LOQs ranging from 0.23 to 91.7 $ng \cdot g^{-1}$.
Respecting drugs method, relative standard deviations lower than 15% were obtained for intraday and interday precisions in most cases. LODs ranged from 0.25 to 15.8 $ng \cdot g^{-1}$ and LOQs were between 0.82 and 52.7 $ng \cdot g^{-1}$.

Key words: UV filters, hormones, drugs, ultrasound-assisted extraction

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POSTER COMMUNICATIONS

HARMONIZATION OF PROCEDURES AND CHARACTERIZATION OF MPS AND PLASTIC LEACHATES

ULPGC Universidad de Las Palmas de Gran Canaria

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Universidade Vigo

A CRITICAL REVIEW ABOUT RECOVERY MICROPLASTICS METHODS IN DIGESTIVE TRACTS

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Abstract: The ubiquity of small plastic fragments and fibres, called microplastics (MPs; < 5mm), in the marine environment has allowed their incorporation to marine organisms. Such incorporation can have an impact in the health of marine ecosystem and in human health, as MPs can be found in seafood commercial species (JPI Oceans, 2020). Overall, the main route of MPs incorporation in aquatic species is the ingestion. Therefore, the target organ of MPs is the gastrointestinal tract (Lusher et al., 2017). Although currently the isolation and identification of MPs in organic matrices and tissues can be done by alkaline digestion, as established by European protocols (Hanke et al., 2013), still some works have quantified the internalized MPs by visual inspection, enzymatic reactions, or acid digestions (Thiele et al., 2019). The use of different techniques to isolate MPs make difficult the comparison among studies. In relation to studies which used standardised protocols for isolation of MPs, there is not a standardised method on how to dissect and select the gastrointestinal part to be analysed (gastrointestinal contents or complete degradation of the digestive tract (DT); including its constituent tissues). In this work, a complete organic digestion of the DT of European anchovy (*Engraulis encrasicolus*) and Iberian sardine (*Sardina pilchardus*) was carried out using the standardised BASEMAN European protocol (Gerdts, 2019). Our results showed a high number of MPs (> 8 items·ind^{-1}) in the DT of these species compared to other authors, suggesting that complete digestion could extract a greater amount of MPs. Under the umbrella of the present results, it is necessary to use standardised methods not only for MPs isolation and digestion, but also for organs dissection.

Key words: Tissue digestion, Microplastics, Alkaline, Oxidizing, Anchovy, Sardine

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COMPARISON OF EFFECTIVE METHODS FOR QUANTIFICATION OF PLANKTON-SIZED MICROPLASTICS: THE CASE OF THE GULF OF BOTHNIA, SWEDEN.

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Abstract: In recent years, the concern about the concentration and impact of microplastics (< 5 mm) in the marine environment has increased globally. Recent studies show that more than 70% of the microplastics found in marine vertebrates are smaller than 2 mm. However, few studies have analysed the fraction of microplastics smaller than 300 microns, which overlaps in size with many planktonic prey organisms. This study aims to compare two sampling methods and devices for collection of microplastics down to 10 µm in marine waters. Water samples were collected from 5 stations along the Gulf of Bothnia off the coast of Sweden. Large volumes of surface water (1 m3) were filtered with a 10 µm steel mesh using two types of plastic-free pumps: UFO AAU (Aalborg University) and PUMP ÖRU (Örebro University) both at surface level and 3.5 m depth. These samples were processed according to a protocol developed at AAU, briefly: SDS incubation, enzymatic treatment, fenton reaction, density separation, and evaporation. In turn, microplastics larger than 300 µm were processed by microscopy and FTIR spectroscopy, while the fraction between 10-300 microns was processed by µFTIR-Imaging spectroscopy, followed by automatic PM detection. Our preliminary results show that most marine MPs are smaller than 300 µm, and can be potentially ingested by marine animals, entering in marine food webs. At the same time, it is expected that this characterization of microplastics at the water surface and the comparison between methods will allow establishing common protocols for the sampling of microplastics smaller than 300 microns in the marine environment, which is essential to better evaluate the levels of plastic pollution in the ocean.

Key words: Plankton-sized microplastics, microplastics collection; pump; Gulf of Bothnia.

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