



# SEAFLOOR LITTER POLLUTION IN JAPAN AND SOUTH KOREA DETECTED BY A CITIZEN SCIENCE INITIATIVE

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**THE GLOBAL GOALS**  
For Sustainable Development



TARGET 14-1



14  
LIFE BELOW  
WATER

REDUCE MARINE POLLUTION

# DIRECT IMPACTS

# INDIRECT IMPACTS



loss of ecosystem services and goods



human  
health

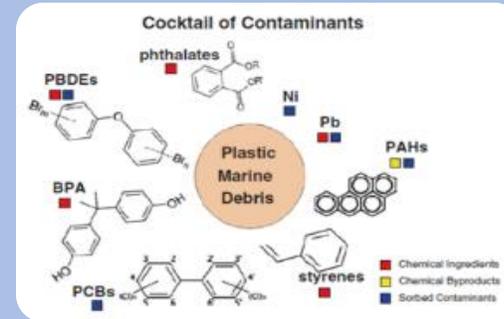


economy



# DIRECT IMPACTS

- Entanglement
- Vector of alien species
- Ingestion by organisms
- Transfer of toxic compounds
- Habitat degradation



# The seafloor represents the ultimate site of litter accumulation



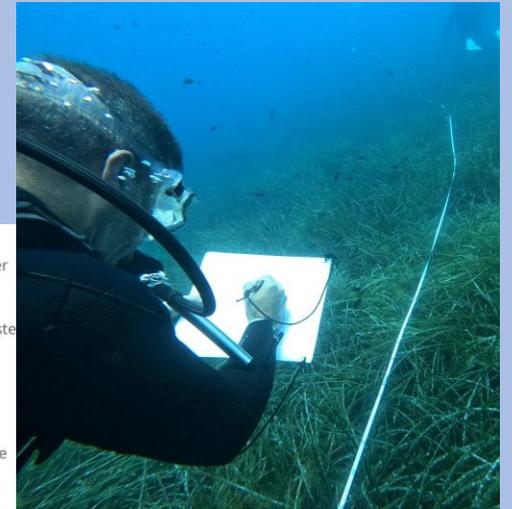
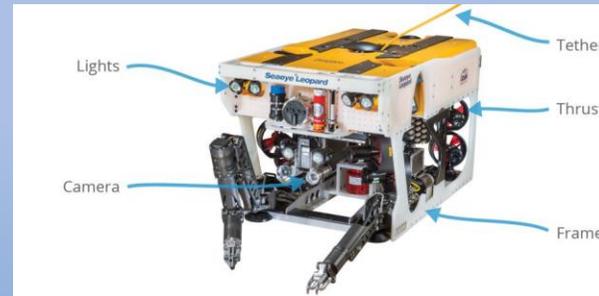
## Sampling methods



Trawl net



## UVC techniques



# CITIZEN SCIENCE INITIATIVES

## **DIVE** **AGAINST** **DEBRIS**



Use your diving  
to help keep our ocean free of rubbish  
and stop plastics from harming marine animals.

**PROJECTAWARE.ORG**



# 100 debris items

Plastic Materials	SUP/Fishing gear	Metal Materials	SUP/Fishing gear
01. bags: grocery/retail (plastic)	SUP	52. aerosol/spray cans	
02. bags: trash (plastic)	SUP	53. appliances: household	
03. bait containers/packaging	FG	54. batteries: AA, AAA, C & D, 6V, 9V, etc	
04. balloons		55. batteries: car or boat	
05. balls		56. beverage cans (aluminium)	
06. baskets, crates		57. cans: food, juice, other (tin)	
07. beverage bottles: less than 2 litres (plastic)	SUP	58. caps & lids (metal)	
08. beverage bottles: 2 litres or more (plastic)	SUP	59. cars & car parts	
09. bottles: bleach, cleaner		60. cups, plates, tableware, dishes (metal)	
10. bottles: oil/lube		61. drums: 55 gallon	
11. buckets, drums & jerry cans: 2 litres or more		62. fishing: sinkers, lures, hooks	FG
12. buoys & floats (plastic & foamed)		63. fishing: traps & pots	FG
13. caps & lids (plastic)	SUP	64. forks, knives, spoons (cutlery)	
14. carpet (synthetic)		65. gas bottles/cylinder, drums: more than 4 litres	
15. cigarette filters	SUP	66. pipes & rebar	
16. cigarette lighters		67. pull tabs: beverages	
17. cigar tips	SUP	68. scuba weights	
18. containers: fast food, lunch boxes & similar	SUP	69. strapping bands (metal)	
19. cotton bud sticks	SUP	70. wire, wire mesh, barbed wire	
20. cups, plates, forks, knives, spoons (plastic)	SUP	71. wrappers (foil/metal)	
21. diapers/nappies	SUP	72. metal fragments	
22. fishing: line	FG	<b>Rubber Materials</b>	
23. fishing: lures, rods/poles	FG	73. condoms	
24. fishing: nets & pieces of nets	FG	74. gloves (rubber)	
25. fishing: traps & pots	FG	75. inner-tubes & rubber sheets	
26. foam insulation & packaging		76. rubber bands	
27. food wrappers (plastic)	SUP	77. tires/tyres	
28. furnishings (plastic)		78. rubber fragments	
29. gloves (latex)		<b>Wood Materials</b>	
30. light sticks/cyalumes	FG	79. fishing: traps & pots	FG
31. mesh bags: fruit, vegetable, shellfish	FG	80. furnishings (wood)	
32. pipes (plastic/PVC)		81. lumber (processed or cut/milled wood)	
33. rope (plastic/nylon)		82. pallets	
34. scuba & snorkel gear, masks, snorkels, fins		83. wood fragments	
35. sheeting: tarpaulin, plastic sheets, palette wrap		<b>Cloth Materials</b>	
36. six-pack rings, ring carriers	SUP	84. bags (burlap/hessian)	
37. strapping bands (plastic)		85. bags (cloth)	
38. straws, stirrers	SUP	86. gloves (cloth)	
39. syringes (plastic)	SUP	87. rope & string (cloth)	
40. tampon applicators	SUP	88. towels, rags	
41. tobacco packaging & wrappers		89. cloth fragments	
42. toothbrushes		<b>Paper/Cardboard Materials</b>	
43. plastic fragments		90. bags (paper)	
<b>Glass &amp; Ceramic Materials</b>		91. cardboard: packaging & cartons	
44. beverage bottles (glass)		92. paper: books, newspapers, magazines, etc	
45. buoys (glass)	FG	93. paper/cardboard fragments	
46. cups, plates, tableware, dishes (glass & ceramic)		<b>Mixed Materials</b>	
47. fluorescent light tubes		94. bricks, cinderblocks, chunks of cement	
48. jars: food (glass)		95. clothing	
49. light globes: bulbs, etc		96. computer equipment & other electronic devices	
50. syringes (glass)		97. fireworks	
51. glass & ceramic fragments		98. shoes, flip flops, sandals, tennis, etc	
		99. tampons	
		100. toys	



1. Weigh



2. Sort



3. Record



4. Dispose



5. Report

## Create Debris Data

Home

Please confirm the Dive Against Debris Surveyor Statement \*

I have read the Dive Against Debris Survey Guide and the data I am reporting was collected underwater, during one dive and completed by single or multiple buddy teams. I understand I should only include data on trash collected from underwater environments here. Repeat dives should be reported through separate submissions. Marine debris collected on land can be shared with the My Ocean community and with our partner, The Ocean Conservancy.

Survey Site Name \*

Enter the dive site name for where your survey took place e.g. House Reef. If you have submitted data for this survey site previously, please ensure you enter the same survey site name

**YOUR SURVEY TEAM \***

Team Leader Name

Enter the name of your survey team leader.

Team Leader Email \*

Enter the email address of your survey team leader.

Number of Participants \*

Enter the number of individual scuba divers that were underwater collecting debris only (land support should not be included here - you can acknowledge their support in the comments section).

**ABOUT YOUR SURVEY \***

Survey Date \*



# Dive Against Debris® Survey Guide



**A Survey of Underwater Marine Debris  
For Scuba Divers**



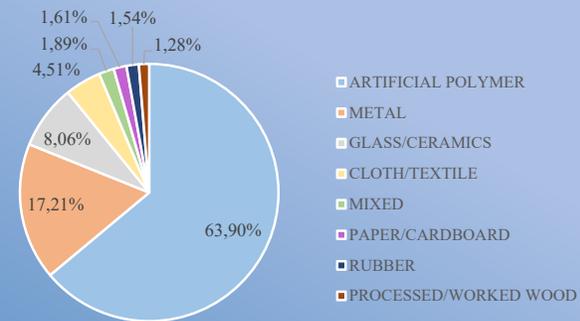
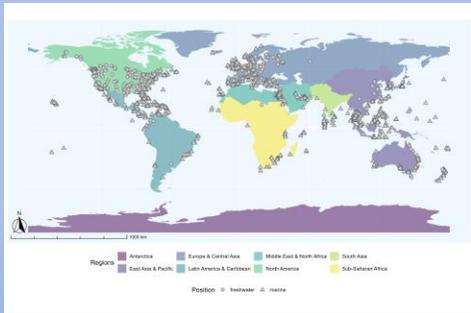
# Dive Against Debris® Marine Debris Identification Guide



**A Resource for Scuba Divers Completing  
Dive Against Debris® Surveys**

**Synthetic polymers: A global threat to aquatic benthic environments**

Pierpaolo Consoli<sup>a,\*,1</sup>, Valentina Costa<sup>b,1</sup>, Valentina Scutтери<sup>c</sup>, Danilo Malara<sup>b</sup>, Cristina Pedà<sup>b</sup>, Fabio Figurella<sup>a</sup>, Ian Campbell<sup>d</sup>, Emily Deery<sup>d</sup>, Teresa Romeo<sup>e</sup>, Franco Andaloro<sup>e</sup>



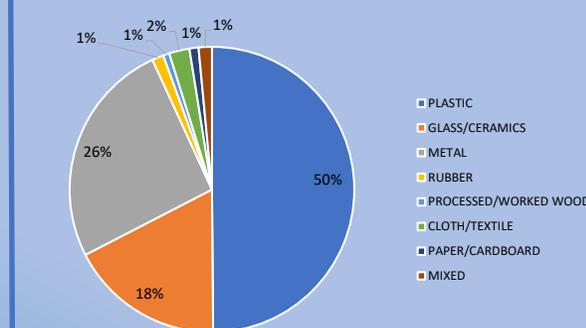
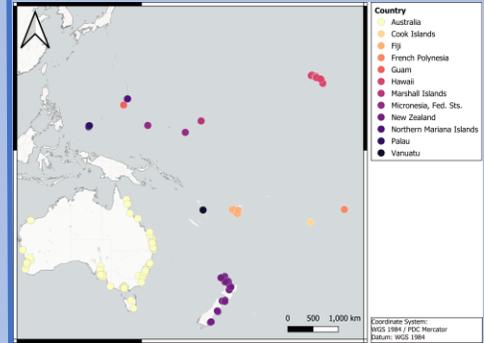
**DATASET**

- World
- 12,373 dives
- 2011-2021

Mean litter density (n. items/100m<sup>2</sup>)  
 = **53.23 ± 1.94**  
 SUP = 30.70%  
 FG = 20.89%

**Citizen science through a recreational underwater diving project supports the collection of large-scale marine litter data: The Oceania case study**

V. Scutтери<sup>a,1</sup>, V. Costa<sup>b</sup>, D. Malara<sup>b</sup>, F. Figurella<sup>a</sup>, I. Campbell<sup>d</sup>, E. Deery<sup>d</sup>, T. Romeo<sup>e</sup>, F. Andaloro<sup>e</sup>, P. Consoli<sup>a,\*,1</sup>



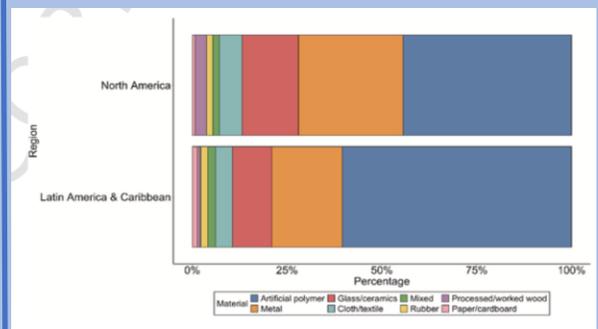
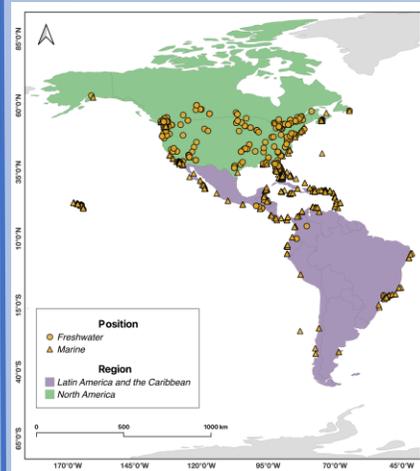
**DATASET**

- Oceania
- 862 dives
- 2011 - 2021

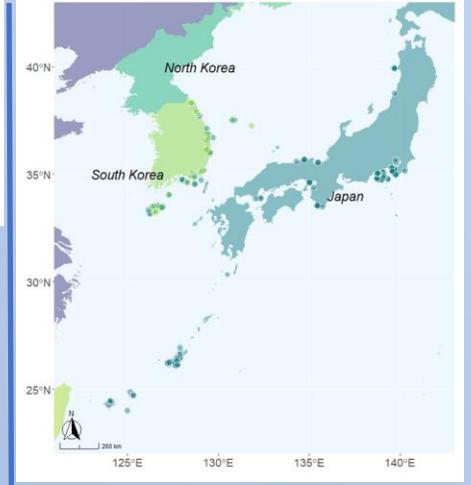
Mean litter density (n. items/100m<sup>2</sup>)  
 = **58.22 ± 7.55**  
 SUP = 15.77%  
 FG = 35.66%

**A continental-scale analysis of benthic litter in marine and freshwater habitats of the Americas using standardized citizen science data**

Pierpaolo Consoli<sup>a,\*,1</sup>, Gaia Grasso<sup>b,1</sup>, Danilo Malara<sup>c</sup>, Valentina Costa<sup>a,b,c,1</sup>, Valentina Scutтери<sup>a</sup>, Cristina Pedà<sup>a</sup>, Fabio Figurella<sup>b</sup>, Ian Campbell<sup>d</sup>, Emily Deery<sup>d</sup>, Franco Andaloro<sup>e</sup>

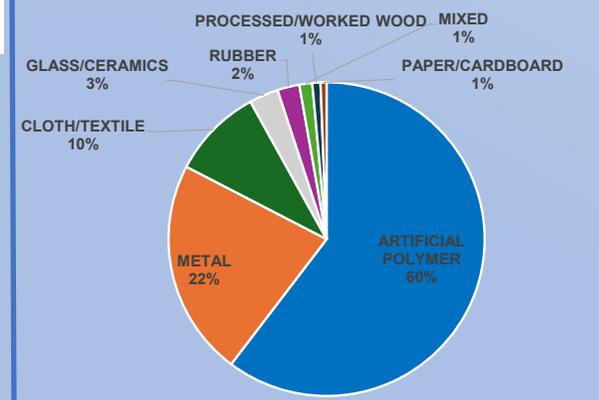


Mean litter density (n. items/100m<sup>2</sup>)  
 NA = 22.48 ± 2.13  
 LAC = 36.45 ± 3.44  
 SUP = 8.86% (NA); 26.53% (LAC)  
 FG = 40.56% (NA); 21.84% (LAC)



**DATASET**

- Japan & South Korea
- 663 dives
- 2011 - 2024

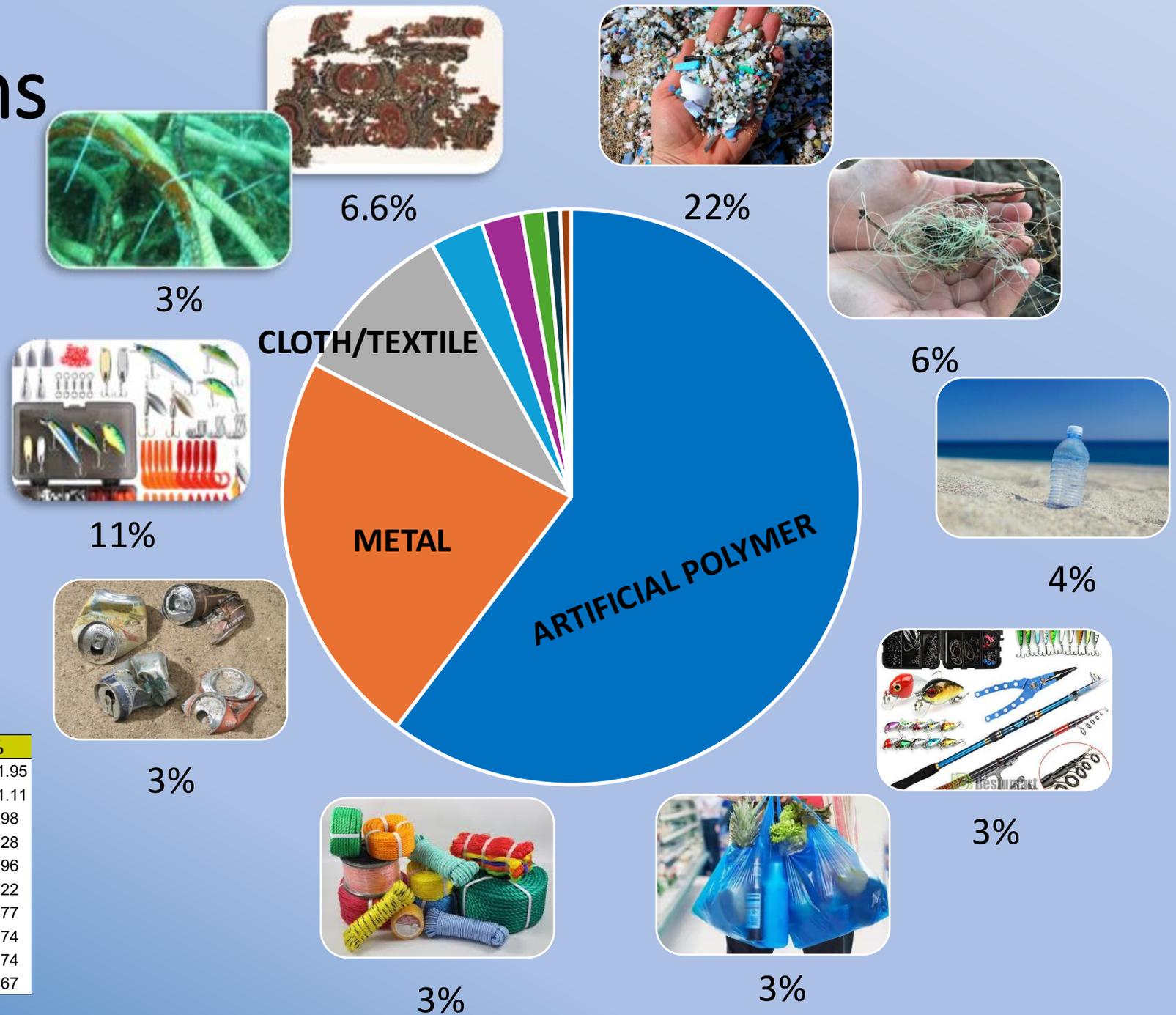


Mean litter density (n. items/100m<sup>2</sup>)  
 = **54.83 ± 5.94**  
 SUP = 16.92%  
 FG = 25.63%

# TOP-10 litter items

61% of the overall litter

ALDFG are likely lost by recreational fishermen since dives are carried out at shallow depths in popular tourist locations.



MATERIAL	USE CATEGORY	LITTER ITEMS	%
ARTIFICIAL POLYMER		plastic fragments	21.95
METAL	FISHING GEARS	fishing: sinkers, lures, hooks	11.11
ARTIFICIAL POLYMER	FISHING GEARS	fishing: line	5.98
CLOTH/TEXTILE		cloth fragments	4.28
ARTIFICIAL POLYMER	SUP	beverage bottles: less than 2 litres	3.96
METAL		beverage cans	3.22
ARTIFICIAL POLYMER	FISHING GEARS	fishing: lures, rods/poles	2.77
ARTIFICIAL POLYMER	SUP	bags-grocery/retail	2.74
CLOTH/TEXTILE		rope and string	2.74
ARTIFICIAL POLYMER		rope	2.67

# SINGLE-USE PLASTIC PRODUCTS (SUPs)

They are used once and thrown away. Their production has increased exponentially since the 1950s, and this litter is related to our modern throw-away lifestyle. The impacts of SUPs on the environment and our health can be drastic.

SUP = 16.92% of total litter

SUP = 28.05% of Plastics

Mainly composed of take out food items linked to our modern fast life society

MATERIAL	USE CATEGORY	LITTER ITEMS	%
ARTIFICIAL POLYMER SUP		beverage bottles: less than 2 litres	6.56
ARTIFICIAL POLYMER SUP		bags-grocery/retail	4.54
ARTIFICIAL POLYMER SUP		food wrappers	4.25
ARTIFICIAL POLYMER SUP		caps & lids	3.56
ARTIFICIAL POLYMER SUP		bags: trash	2.64
ARTIFICIAL POLYMER SUP		cups, plates, forks, knives, spoons	1.50
ARTIFICIAL POLYMER SUP		beverage bottles: 2 litres or more	1.50
ARTIFICIAL POLYMER SUP		containers: fast food, lunch boxes & similar	1.34
ARTIFICIAL POLYMER SUP		cigarette filters	1.01
ARTIFICIAL POLYMER SUP		straws, stirrers	0.98
ARTIFICIAL POLYMER SUP		cigar tips	0.09
ARTIFICIAL POLYMER SUP		diapers/nappies	0.04
ARTIFICIAL POLYMER SUP		syringes	0.02
ARTIFICIAL POLYMER SUP		cotton bud sticks	0.02
ARTIFICIAL POLYMER SUP		tampon applicators	0.01
ARTIFICIAL POLYMER SUP		six-pack rings, ring carriers	0.00
<b>TOTAL over PLASTICS</b>			<b>28.05</b>

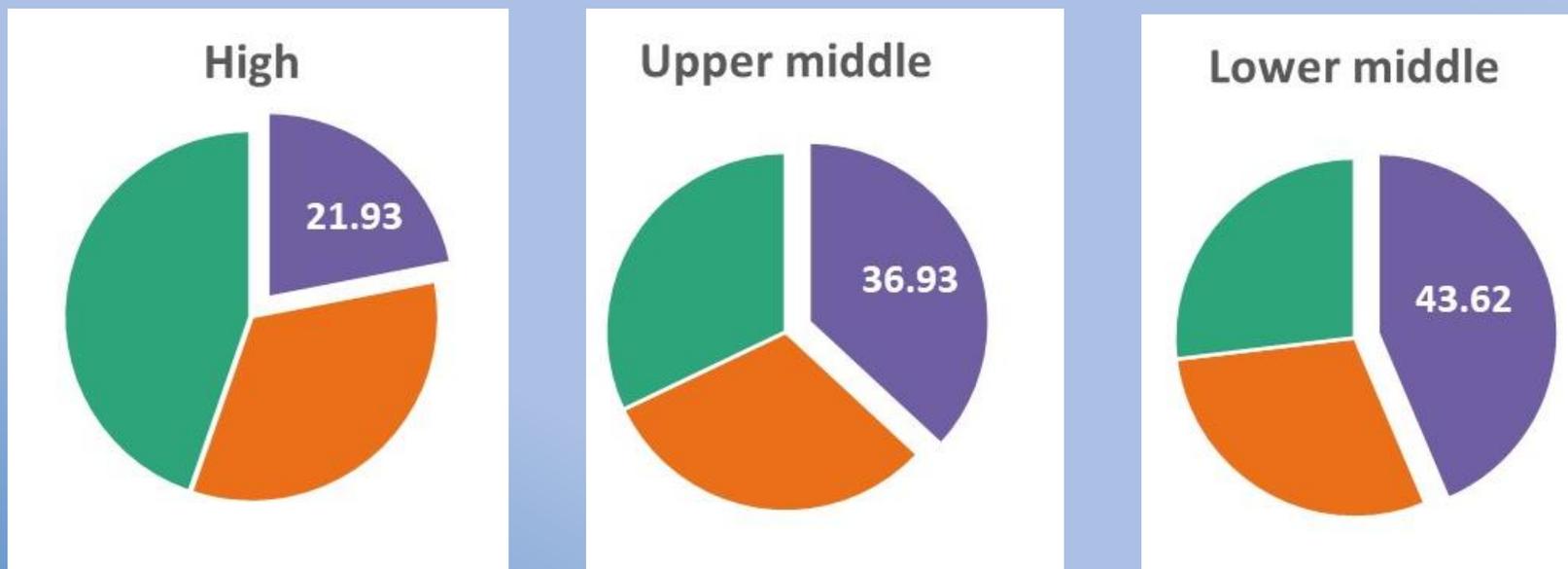




## Synthetic polymers: A global threat to aquatic benthic environments

Pierpaolo Consoli <sup>a,\*</sup>, Valentina Costa <sup>b,1</sup>, Valentina Scutteri <sup>a</sup>, Danilo Malara <sup>a</sup>, Cristina Pedà <sup>b</sup>, Fabio Figurella <sup>c</sup>, Ian Campbell <sup>d</sup>, Emily Deery <sup>d</sup>, Teresa Romeo <sup>a</sup>, Franco Andaloro <sup>e</sup>

# Single Use Plastic per Income level



# Policy Instruments to Address Plastic Pollution



## Regulatory instruments

- bans & restrictions (e.g., single-use plastics, microbeads);
- the application of the extended producer responsibility (EPR);
- developing new or improve existing processes or products.



## Economic instruments

- include incentives (subsidies, cash for return, and tax breaks);
- disincentives (fees, taxes, levies, and duties).



## Information instruments

- Research, monitoring and plastic-flow data collection;
- Public education and outreach campaigns;
- Eco-labels, product disclosure and placards.

# HOW TO REDUCE ADLFG?

According to FAO, the specific actions to reduce ALDFG can be classified into three categories:

- measures to cure (removing ALDFG from the environment).
- measures to prevent: laws to regulate fishing effort (technical and spatial management measures) and the retrieval of ALDFG (incentive; extended producer responsibility)
- measures to mitigate (use of biodegradable fishing gear);

Albeit the cost of removing lost FG may be prohibitive, clean-up initiatives by scuba divers may be cheap and useful for reducing the problem

education programs for fishermen (awareness-raising activities) should go closely together with government incentive mechanisms and policies to contain the problem

There is still no solid evidence of the beneficial effects of bioplastics on the environment.

# MARINE LITTER, SINGLE-USE PLASTIC, AND ALDFG LAWS IN JAPAN AND SOUTH KOREA

Country	Law / Policy	Year	Main Objectives / Provisions	Provisions Related to ALDFG
Japan	Plastic Resource Circulation Act	2021 (effective 2022)	Comprehensive plastic lifecycle law; promotes '3R + Renewable'; restricts single-use plastics; promotes eco-design.	Includes protocols for lost/abandoned fishing gear; supports retrieval with GPS and buoys; encourages fishermen to bring back debris.
Japan	National Action Plan for Marine Plastic Litter	2019	Framework to prevent plastic leakage to oceans; promotes cooperation and waste management.	Promotes collection of derelict fishing gear in cleanup campaigns.
Japan	Law for the Promotion of Marine Litter Disposal	2009 (rev. 2018)	Defines responsibilities for marine debris management; supports cleanup and prevention.	Covers drifting marine debris broadly, including lost fishing gear.
South Korea	Management Act on Marine Debris and Contaminated Marine Sediment	2019	Core law for marine debris management; 'polluter pays' principle; national coordination committee.	National and local governments must collect discarded fishing gear; cooperatives participate in retrieval projects.
South Korea	First Framework Plan for Marine Debris (2021–2030)	2021	Aims to reduce marine litter by 60% by 2030; reach zero discharge by 2050.	Includes ghost net retrieval, deposit/refund systems to discourage abandonment.
South Korea	Fisheries Act	2022	Regulates fishing operations and gear use; enforces waste recovery.	Authorities can collect lost/abandoned fishing gear; owners bear disposal costs; mandatory reporting of gear loss.

# CONCLUSIONS

- In Japan and South Korea, plastics represent the main source of seafloor litter.
- They are mainly composed of SUP and ALDFG, which have adverse and direct effects on benthic ecosystems. Moreover, they represent a source of secondary microplastics and may leach hazardous monomers, additives, and chemical by-products into the marine environment.
- Although policies represent a valid tool for reducing pollution, we need to remember that pollution originates further upstream among consumers. The main difficulties regarding this issue remain our modern fast life society made of fast take-out food, fast fashion, fast technologies, and fast consuming. Therefore, it is necessary to modify consumers' behaviour.
- Improving environmental awareness and education projects for fishermen and consumers remains crucial to tackling the problem of litter pollution.

Citizen science initiatives are an effective tool to collect information that can be used as scientific data to guide policies and improve citizens' environmental awareness.

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**THE POWER OF CITIZEN SCIENCE:  
SUPPORTING SCIENCE WHILE  
IMPROVING ENVIRONMENTAL  
AWARENESS**



**THANKS  
FOR  
YOUR ATTENTION**

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