Plastic in the marine and lacustrine ecosystem: from the problema to the new recycling frontier
RIMINI – ITALY - november 2016

Floating litter: the survey of Goletta Verde

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Goletta Verde, the famous Italian campaign of Legambiente for the protection of the sea and coastline, has pursued for three years a survey on the presence of floating waste in the sea, promoting scientific insights and actions for mitigation and prevention of marine litter phenomenon. A problem, nowadays, well known by the international scientific community, for which it is imperative to adopt a decisive policy to avoid the huge repercussions on the environment, on wildlife and unbalance effects for the entire food chain.

In **RED**, we specified the 2016 survey segments, **YELLOW** for 2015 and **WHITE** for 2014.
In summer of 2016, from June to August, Goletta Verde has monitored the presence of floating garbage in the Italian seas.

These are the survey’s numbers:

- 950,9 km monitored / 513 nautical mile
- 25 km² of sea monitored
- 80 hours of observation
- 49 monitored segments

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The protocol

Legambiente based the survey on the scientific protocol by Ispra, used to monitor macro litter, on sea surface, but adapting some of its parameters

- All floating litter >2.5 cm are considered
- The litter recording is done by Ospar categories, modified following the JRC and Defishgear program instructions
- The observation is carried out with “naked eye” and binoculars are only used to verify the type of the litter
- The observation area is 25 mt on a single side of the boat
- I transetti monitorati e i singoli rifiuti sono registrati mediante scheda cartacea e gps

The team conducted the observation only with excellent or good weather and sea condition, with sunlight and at an average speed of 6 knots.
The observation team spotted 1514 debris:

- 179 of organic origin (algae, floating branches etc.)
- 1336 of anthropogenic origin

The litter from human activities are, therefore, 88% of the total. Within the anthropogenic waste, the 45% has a size of less than 20 cm.
Material of waste

95.7% of the 1336 waste anthropogenic detected consists of plastics.

After the plastics, the main type of waste observed are from:

- paper (1.6%)
- rubber (1%)
- wood (0.7%)
- metals (0.6%)
- glass (0.2%)
- textile (0.1%)
Most common waste

The “top ten” most spotted waste belongs entirely to the synthetic polymers category. Almost half consists of plastic debris not related to identifiable objects.

Among the objects are identified
- plastic bags (16.2%)
- towels (9.6%)
- nets and lines (3.6%)
- polystyrene fragments (3.1%)
- bottles (2.5%),
- caps/lids (2.5%)
- dishes (2.2%)
- sanitary towels (1.8%)
- polystyrene boxes whole or fragmented (1.6%).

<table>
<thead>
<tr>
<th>Most common waste</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bags</td>
<td>16.2</td>
</tr>
<tr>
<td>Sheets</td>
<td>9.6</td>
</tr>
<tr>
<td>Net/Lines</td>
<td>3.6</td>
</tr>
<tr>
<td>Polystyrene other</td>
<td>3.1</td>
</tr>
<tr>
<td>Bottles</td>
<td>2.5</td>
</tr>
<tr>
<td>Caps/Lids</td>
<td>2.5</td>
</tr>
<tr>
<td>Tableware</td>
<td>2.2</td>
</tr>
<tr>
<td>Sanitary towels</td>
<td>1.8</td>
</tr>
<tr>
<td>Polystyrene box</td>
<td>1.6</td>
</tr>
<tr>
<td>Other Plastic</td>
<td>49.2</td>
</tr>
</tbody>
</table>
The concentration of the waste in the investigated area is 57.6 waste unit/ km² of the sea. The **highest concentration** of litter is along the segment done in the **Tyrrenian Sea** (61.8 Waste / sq km).

The concentrations recorded in the Ionian Sea (50.4) and in the Adriatic (45.99) are lower than the national average rate.

<table>
<thead>
<tr>
<th></th>
<th>Tyrrhenian</th>
<th>Ionian</th>
<th>Adriatic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Survey area (km²)</td>
<td>14.5</td>
<td>2</td>
<td>7</td>
</tr>
<tr>
<td>Syntetic polymers (%)</td>
<td>96%</td>
<td>98%</td>
<td>95%</td>
</tr>
<tr>
<td>Average concentration (n. waste/km²)</td>
<td><strong>61.89</strong></td>
<td>50.41</td>
<td>45.92</td>
</tr>
<tr>
<td>Standard Error</td>
<td>8.55</td>
<td>9.53</td>
<td>13.78</td>
</tr>
</tbody>
</table>

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Waste concentration in macro-areas

Compared to the national average density of waste by sea of 57.6 per km² and medium density for each sea, there are more geographical differences.

The **Southern Adriatic** record a higher concentration of waste with 88.8 per km², followed by the **central Tyrrhenian** (69.1), from the **Ligurian and North Tyrrhenian Sea** (67.2).

Below the national average density, we find the **Ionian Sea** (50.4), the **southern Tyrrhenian Sea** (48.2), the **central Adriatic** (30.2) and the **northern Adriatic** (26.3).

<table>
<thead>
<tr>
<th>Macro-areas</th>
<th>Concentration (waste unit/km²)</th>
<th>Standard error</th>
</tr>
</thead>
<tbody>
<tr>
<td>Southern Adriatic</td>
<td>88.89</td>
<td>36.99</td>
</tr>
<tr>
<td>Central Tyrrhenian</td>
<td>69.18</td>
<td>20.75</td>
</tr>
<tr>
<td>Ligurian and North Tyrrhenian</td>
<td>67.29</td>
<td>13.39</td>
</tr>
<tr>
<td>Ionian</td>
<td>50.41</td>
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<td>6.31</td>
</tr>
<tr>
<td>Northern Adriatic</td>
<td>26.39</td>
<td>6.55</td>
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Among the 49 segments, maximum waste concentration was recorded in the navigation between the north west of Capri (approximately 5 nautical miles) in Punta Campanella, this was the segment which counted a waste concentration almost 4 times higher than the national average rate with 227 unit/ km² of sea. Following, with 211 unit/ km² the segment from Marciana Marina to Portoferraio in Elba Island. It is recorded a rate three times superior the national average concentration in Casamicciola Terme (Ischia) and the Gulf of Naples with 179 unit/ km² at sea. In the southern Adriatic, the transect with more waste is between the north of Vieste and Capoiale (Fg) with 146 unit/ km²; also the navigation between Cape d’Orlando and Tindari (Me) made record a waste concentration of 100 unit/ km².
In spite of 51% of waste spotted is unclassifiable, the survey identifies two main sources of floating waste.

The bad management of urban waste (incorrect waste management upstream, purifying failure, conscious abandon) in fact generates the 29% of total waste and the productive activities (fishing, agriculture, industry) are responsible for the 20% of the total waste.
Among waste by productive activities, the 46% belong to the fishing activities (nets, lines, polystyrene boxes both whole and fragmented)
The sources: mismanaged urban waste

This type of source is 29% of the monitored waste and concerns the mismanagement of municipal waste (dispersion, conscious neglect, purifying failure). The artificial polymers constitute the most spotted wastes.

In particular:
- Bags (57%)
- Bottles (9%)
- Caps and lids (9%)
- Tableware (8%)
- Sanitary napkins (6%)

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Excluding sanitary towels, 83% of municipal waste mismanaged belongs to the category of plastic disposable packaging.
As reported by Legambiente in “Beach Litter 2016” survey *, the packaging category represents more than half of urban mismanaged waste buried in the sand. Of this 56%, 75% is disposable plastic packaging.

*monitored area 106,000 m2
Observing the wastes categories listed above, it is clear the constant presence of mismanaged urban wastes among all the seas. Otherwise, the incidence of waste related to the fishing activities is more dominant in the Adriatic Sea, with a percentage of 18% against that of 7% in the Tyrrhenian Sea.
Conclusions

- The 45% of waste monitored has a size between 2.5 and 20 cm. Potentially, we talk about waste already partially degraded. Along with everyone else, floating, stranded, submerged, they will generate an incalculable amount of micro plastics if they are not collected. The 45% of spotted waste has a size between 2.5 and 20 cm. Potentially, these are partially degraded fragments. Therefore, if not collected, floating, stranded and submerged waste will generate an incalculable amount of micro plastics.

- The waste monitored in this survey are just the tip of the iceberg. The literature reports a percentage of 15% of floating waste, 15% of waste dispersed in the water column and 70% sank. Less optimistic data report a percentage of just 0.5% for the floating garbage. This data should be interpreted with a projection on the submerged waste.
Conclusions

Waste and sea water concentration

Source: GESAMP, Sources, fate and effects of microplastics in the marine environment: A global assessment, 2015

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Conclusions

• The so-called fishing for litter is a good tool to introduce in Italy, but not the only one to deploy in order to mitigate the problem.
• Prevention first. Mismanaged waste is reported in every sea and is mainly due to the packaging, (in particular plastic disposable). The percentage is 56% in stranded waste and 83% in floating.

Prevention FIRST
Conclusions

**PREVENTION**

- Awareness campaign
- Research and innovation
- Better implementation of present laws

**CLEAN UP**

- Economic incentives for producer and costumer
- Outlawing (ex. Plastic shopper / microplastiche)
- Improving depuration technologies
- Collection and fishing litter

**GRID**

- Arendal
- Riccardo Pravettoni

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http://www.legambiente.it/marinelitter/?lang=eng
Thanks for your attention

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