Plastic Busters MPAs Final Conference
Athens, 12-13 April 2022

Brijuni National Park, Croatia

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Ruđer Bošković Institute, Center for Marine Research
Brijuni National Park

- West coast of Istria, Croatia (northern Adriatic sea)
- 14 islands and islets
- total area 33.9 km²
- island and sea area (80 % sea)
- management structure (National, no private owners)

- Beach litter (macro and micro litter)
- Floating litter (macro and micro litter)
- Seafloor litter
- Litter in biota
Beach litter

- 4 locations, 2 seasons
- Semi-rural, remote/natural
- 12,648 items analyzed
- Total weight of litter: 382 kg

**PLASTIC:** 88 ± 9 %

25% G67 Sheets, industrial packaging, plastic

**SOURCE:** 19 ± 5.81 % COSTAL ACTIVITIES
18% ± 9.50 % FISHERY

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### AVG: 3.02 ± 2.17 items/m²

<table>
<thead>
<tr>
<th>Season</th>
<th>Location</th>
<th>items/m²</th>
<th>CCI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Season I</td>
<td>Javorika (VB)</td>
<td>5.10</td>
<td>102</td>
</tr>
<tr>
<td>Season I</td>
<td>Peneda (VB)</td>
<td>0.67</td>
<td>13</td>
</tr>
<tr>
<td>Season I</td>
<td>Pisak (MB)</td>
<td>5.42</td>
<td>108</td>
</tr>
<tr>
<td>Season I</td>
<td>Zenadija (MB)</td>
<td>4.90</td>
<td>98</td>
</tr>
<tr>
<td>Season II</td>
<td>Javorika (VB)</td>
<td>0.48</td>
<td>10</td>
</tr>
<tr>
<td>Season II</td>
<td>Peneda (VB)</td>
<td>0.70</td>
<td>14</td>
</tr>
<tr>
<td>Season II</td>
<td>Pisak (MB)</td>
<td>2.62</td>
<td>52</td>
</tr>
<tr>
<td>Season II</td>
<td>Zenadija (MB)</td>
<td>4.32</td>
<td>86</td>
</tr>
</tbody>
</table>

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### AVG: 3919 ± 1097 particles/kg

<table>
<thead>
<tr>
<th>Location</th>
<th>particles/kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>Javorika (VB)</td>
<td>3236 ± 664</td>
</tr>
<tr>
<td>Peneda (VB)</td>
<td>3592 ± 15</td>
</tr>
<tr>
<td>Pisak (MB)</td>
<td>4851 ± 2146</td>
</tr>
<tr>
<td>Zenadija (MB)</td>
<td>3997 ± 695</td>
</tr>
</tbody>
</table>

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Floating litter

MACROLITTER:

<table>
<thead>
<tr>
<th>Transect</th>
<th>items/km²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transek 1</td>
<td>23.50</td>
</tr>
<tr>
<td>Transek 2</td>
<td>70.51</td>
</tr>
<tr>
<td>Transek 3</td>
<td>376.03</td>
</tr>
<tr>
<td>Transek 4</td>
<td>399.53</td>
</tr>
<tr>
<td>Transek 5</td>
<td>47.00</td>
</tr>
<tr>
<td>Transek 6</td>
<td>0</td>
</tr>
<tr>
<td>Transek 7</td>
<td>0</td>
</tr>
<tr>
<td>Transek 8</td>
<td>0</td>
</tr>
<tr>
<td>Transek 9</td>
<td>47.00</td>
</tr>
<tr>
<td>Transek 10</td>
<td>0</td>
</tr>
<tr>
<td>Transek 11</td>
<td>0</td>
</tr>
<tr>
<td>Transek 12</td>
<td>0</td>
</tr>
</tbody>
</table>

AVG 80.30 ± 145.72 items/km²
78% G79 Plastic pieces 2.5 cm > < 50cm

MICROLITTER:

AREA 51 060 m² (transects - 12 km)

AVG 77.6E+03 ± 45.3E+03 particles/km²
Seafloor litter

8 items/100 m²
Source: 18% Costal activities, 5% Fishery

51% G208 Glass or ceramic fragments >2.5 cm
17% G198 Other metal pieces < 50 cm
Litter in biota

European anchovy (*Engraulis encrasicolus*)

European pilchard (*Sardina pilchardus*)

Red mullet (*Mullus barbatus*)

Striped red mullet (*Mullus surmuletus*)

Mediterranean mussel (*Mytilus galloprovincialis*)

Frequency + MP: 1-2
≤ 40% +MP
### Overall

<table>
<thead>
<tr>
<th>Category</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beach Macrolitter</td>
<td>$3.02 \pm 2.17$ items/m²</td>
</tr>
<tr>
<td>Beach Microlitter</td>
<td>$3919 \pm 1097$ particles/kg</td>
</tr>
<tr>
<td>Floating Macrolitter</td>
<td>$80.30 \pm 145.72$ items/km²</td>
</tr>
<tr>
<td>Floating Microlitter</td>
<td>$77.6E+03 \pm 45.3E+03$ particles/km²</td>
</tr>
<tr>
<td>Bottom Litter</td>
<td>8 items/100 m²</td>
</tr>
<tr>
<td>Litter in biota</td>
<td>40% + MP individua</td>
</tr>
</tbody>
</table>

**Red:** above Croatian AVG *(IPA DeFishGear 2017)*  
**Blue:** under Croatian AVG *(IPA DeFishGear 2017)*
Prevention & mitigation

1. Adopt-a-beach
2. Banning SUP
3. Developing a network of collection points
Implementation of the mitigation measures

- **“Adopt-a-beach”**
  - team building – beach cleaning
  - special certificate that will be issued to concessionaires that include such activities.

- **Launched the project “For an island without plastic”**
  - 0 plastic for the hotel guests
  - promo material to incentivize the reduction of waste

- **Additional points with recycling bins –**
  - Applied for funds (20 000 €)
  - 3 additional points at the main island (Veliki Brijun) and several in hotels and at the congress hall (smaller volume that would serve guests but also maids)
  - for the island of Jerolim a flyer will be made and a disposable biodegradable bag will be donated when buying tickets (to carry waste and not dispose of it in the environment)

- **Education for employees (maids and receptionists)**
Lessons learned

- The majority of the litter source: coastal activities and fishery
- Composition of the litter: the litter is not produced in the MPA
- Indication that the major input is from the cities near the MPA
- Specificity of the coastal morphology, high CCI ("funnel bay effect")
- Beach microlitter "concentration" – very high due to the lack of sand beaches
- Good example – cooperation with the MPA management

Acknowledgement:
- Faculty of Civil Engineering, Architecture and Geodesy, Split, Croatia
- NP Brijuni
- Croatian Army
- MINGOR
- CIM Team
Thank you!

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