Environmental quality of sandy beaches: bioindicators as proxies for revealing chronic marine pollution

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**MAIN QUESTIONS**

1. How are pollutants spatially distributed on the northern coast of São Paulo State?
2. Do physiological condition and populational structure reveal long-term stress related to environmental contamination levels?

**WHY?**

<table>
<thead>
<tr>
<th>Pollutants</th>
<th>Macrobenthos</th>
<th>Sandy beaches</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rapidly dispersed</td>
<td>Potential indicators to assess variations in habitat quality</td>
<td>Good and services</td>
</tr>
<tr>
<td>Toxicity and persistence</td>
<td></td>
<td>Highly impacted</td>
</tr>
<tr>
<td>Biotransference</td>
<td></td>
<td>Poorly studied</td>
</tr>
<tr>
<td>Bioaccumulation</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**HOW?**

**1. Environmental conditions**

- **TBT**
- **Heavy Metals**
- **Hydrocarbons**
- **Microplastics**

**2. Stress conditions (biomarkers)**

- **Organism level**
  - DNA damage
  - Energetic status (energy reserves)

- **Population level**
  - Density/Abundance
  - Body size
  - Number of eggs
  - Gonado-somatic index

**Credits:**
1. Consigilhotas do Brasil
2. Cláudio Dias Timm
3. Diogo Luiz