Plastic litter in the oceans: implications for food safety & security

Peter Kershaw
peter@pjkershaw.com
Relationship between fisheries & plastics

- Direct impact of marine litter on fishing industry
- Fisheries & aquaculture as sources of marine litter
- Impact of ALDFG on environment
- Implications of ALDFG for fishing communities & food security
- Potential impact of plastics on food safety
World plastics production

World Plastics Production 1950 – 2015

(in Mio. t)

2015: ~322
2011: ~280
2009: 250
2002: 200
1989: 100
1977: 50
1950: 1.5

(image: Plastics Europe)
Marine litter comes in many sizes

- **Mega**
  - 1 m

- **Macro**
  - 25 mm

- **Meso**
  - 1–5 mm

- **Micro**
  - ~100 nm

- **Nano**
  - ~100 nm

(GESAMP, in press)
Land-based sources:
- Inadequate waste management
- Coastal tourism/recreation
- Population centres
- Poorly controlled/illegal waste sites
- Industrial sites
- Agriculture

Sea-based sources:
- Shipping
- Fisheries/aquaculture
- Recreational activities
- Offshore infrastructure

Key leakage points:
Degradation times of plastics in the ocean

(GESAMP 2015)
Plastics last a long time in the marine environment

Photograph of an old potato crisp packet from a recent shoreline survey in Studland Bay

Manufacturing date: 1958

The UK and Ireland adopted the ‘new’ decimal currency on 15 February 1971
Estimating annual direct costs to the fisheries sector due to marine litter

Example: European Union (Mouat 2010)

<table>
<thead>
<tr>
<th>Type of cost</th>
<th>Cost per vessel (Euro)</th>
<th>Cost to EU fishing fleet (million Euro)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Additional time to sort catch</td>
<td>2,340</td>
<td>29</td>
</tr>
<tr>
<td>Litter removal from fishing gear</td>
<td>960</td>
<td>12</td>
</tr>
<tr>
<td>Damaged gear and fouled propellers</td>
<td>190</td>
<td>17</td>
</tr>
<tr>
<td>Cost of rescue services</td>
<td>50</td>
<td>5</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>62</strong></td>
<td></td>
</tr>
</tbody>
</table>
Fishing for Litter: helping to reduce the problem

Coordinated by Kimo International
www.fishingforlitter.org
Plastic waste produced and mismanaged

Coastal population
Million people
- Less than 1
- 1 to 2
- 2 to 10
- 10 to 50
- 50 to 263
- Land locked country

Plastic waste production
Thousand tonnes per day, 2010

Vital Graphics Series,
GRID-Arendal

Estimated annual leakage of plastic to the ocean via rivers

Due to inadequate waste management

Lebreton et al. 2017

Baltimore Harbour
Accidental losses from shipping & fisheries

Happisburgh, Norfolk

SW England
Beach litter survey Oostende

- Sanitary waste: 19 items
- Fisheries: 12 items
- Other maritime-based: 39 items
- Shoreline activities: 29 items
- Other land-based: 1 item

(Arcadis 2014)
Impact of fishing gear: risk to wildlife

Happisburgh beach, Norfolk

Fishing net used as nesting material, southern North Sea
Estimating annual indirect costs to the crustacean fisheries sector due to derelict gear

Based on Chesapeake Bay Blue crab pot fishery: derelict gear removal programme

Scheld et al. 2016
Estimating potential increased revenue following gear retrieval

= impact on food security & income of fishing community

Global pot & trap fisheries – 9 species of crab & lobster

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<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>Total landings</td>
<td>615,560 million tonnes</td>
</tr>
<tr>
<td>Total value</td>
<td>$US 2,500 million</td>
</tr>
<tr>
<td>Average gear loss</td>
<td>20% (range 10 – 70%)</td>
</tr>
<tr>
<td>Potential increased landings</td>
<td>293,929 million tonnes</td>
</tr>
<tr>
<td>Following 10% gear recovery</td>
<td></td>
</tr>
<tr>
<td>Potential increased revenue</td>
<td>$US 831 million</td>
</tr>
<tr>
<td>Following 10% gear recovery</td>
<td></td>
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</tbody>
</table>

Scheld et al. 2016
Microplastics: do they pose a problem?

‘plastic particles < 5mm diameter’

‘primary’ microplastic particles – manufactured for a purpose

‘secondary’ microplastic particles – fragments of larger items

Microplastics - a source of chemical exposure in organisms?

PBTs & POPs

seawater

prey species

predator

human consumption

potential effects

plastic

additives

PBTs – Persistent Bio-accumulating & Toxic compounds

POPs - Persistent Organic Pollutants – Stockholm Convention

Examples: PCBs, DDT & other pesticides, flame retardants
‘...... at present there is no evidence that microplastics ingestion has negative effects on populations of wild and farmed aquatic organisms.’

‘In humans ...... after consumption of a portion of mussels ...... have a negligible effect (less than 0.1 percent of total dietary intake) on chemical exposure to certain PBTs and plastic additives.’

Lusher et al. 2017 (FAO Technical Report)
Conclusions:

- Marine litter imposes a cost on fishing industry
- Fisheries & aquaculture are sources of marine litter
- ALDFG has an impact on environment
- ALDFG has a social and financial impact on fishing communities & threatens food security
- At present there is no evidence that ingestion of microplastics threatens food safety
Thank you!

Peter Kershaw

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