POPs in the preen gland oil of Streaked Shearwaters breeding on the islands in Japan reflect marine pollution in western North Pacific

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Background

• Seabirds bio-magnify marine pollutants and so can be a useful indicator (Furness and Camphuysen 1977)
• Inter-colony (regional) differences in POPs in seabird tissue reflect the ocean scale pattern of marine pollution level (Roscales et al. 2010).
• New techniques (tracking and non-invasive tissue sampling) enable us to know more about spatial pattern.
Streaked Shearwaters breeds on many islands around Japan and Korea, can be indicator of POPs spatial pattern in Western North Pacific

Preen gland oil from GPS tracked birds
Geolocator tracking
Foraging range of the shearwaters from four islands during breeding season

a) GPS track (Sep to Oct)

b) GL track (Apr to Oct)
Inter-colony differences in POPs

**PCBs**

- Pacific: N=8
- Japan Sea: N=7
- Seto-Inland: N=6
- East China: N=12

**DDT**

- Pacific: N=8
- Japan Sea: N=7
- Seto-Inland: N=12
- East China: N=12

**HCHs**

- Pacific: N=8
- Japan Sea: N=7
- Seto-Inland: N=12
- East China: N=12
Proportion of metabolite of DDT (DDE) to DDT was high in FNA where POPs levels were lowest and low in NKA where DDT was highest.
PCB Congeners

Pacific Sea

N Japan Sea

Seto-inland Sea

East China Sea
Summary

• Total PCBs was highest in birds foraging in Seto-inland Sea
• DDT was highest and DDE/DDT ratio was low in birds foraging in East China Sea
• Total HCHs was highest in birds foraging in Japan Sea off northern Japan.
• All POPs were lowest and %lower-Chl PCB congeners was high in birds foraging in Pacific Ocean off northern Japan
This pattern resembles those reported in marine organisms collected in the Western North Pacific.

<table>
<thead>
<tr>
<th>POPs</th>
<th>Material</th>
<th>High</th>
<th>Low</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>PCBs</td>
<td>Mussel</td>
<td><strong>Seto-inland Sea</strong>, Tokyo Bay, South China Sea</td>
<td>N Pacific coast, Japan Sea coast</td>
<td>Raum et al. 2007, Department of Environment 2010</td>
</tr>
<tr>
<td>PCBs</td>
<td>Coastal fish</td>
<td>Tokyo Bay, <strong>Seto-inland Sea</strong>,</td>
<td>N Pacific coast</td>
<td>Department of Environment 2010</td>
</tr>
<tr>
<td>PCBs</td>
<td>Dolphins</td>
<td><strong>Seto-inland-Sea</strong></td>
<td>N Pacific Ocean</td>
<td>Minh et al. 2000</td>
</tr>
<tr>
<td>DDTs</td>
<td>Mussels</td>
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</tbody>
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Emission and transportation might explain this spatial pattern.
For AWA birds, the oil was sampled at capture and recapture. Increase of POPs (ng/glipid) was greater for 4 birds foraging in Japan Sea/Tsugaru Strait/Pacific coast than 6 birds foraging in Japan Sea only.
Conclusion

• Range data and POPs in the preen gland oil of seabirds give us useful information of spatial pattern of marine pollution, especially in the off shore area, but measurement of the range of individuals is essential.

• Data from tracked birds from multiple species and colonies complements ongoing marine pollutant monitoring program in western North Pacific.