

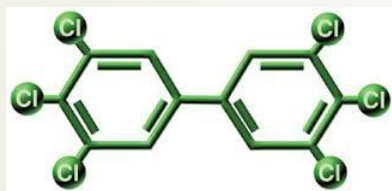
Comparison of long term temporal trends of PCBs and PBDE in UK gannet (*Morus bassanus*) eggs

M. Glória Pereira, John Crosse, Lee walker , Elaine Potter and Richard Shore ^a

Background

PCBs

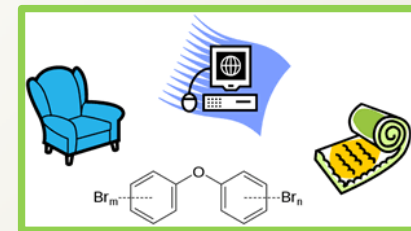
- 209 congeners
- Used in electrical equipment (capacitors and transformers), hydraulic fluids, heat transfer fluids, lubricants, and plasticizers.
- Produced in '30s to '70's
- Banned in the 1970s



Release to environment from product manufacture, use, disposal

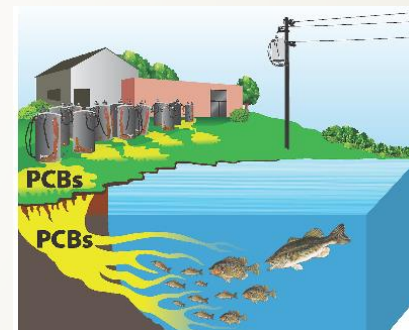
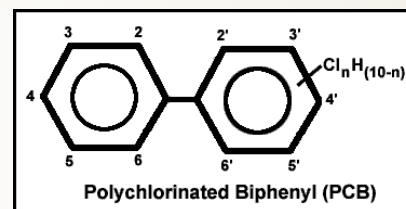
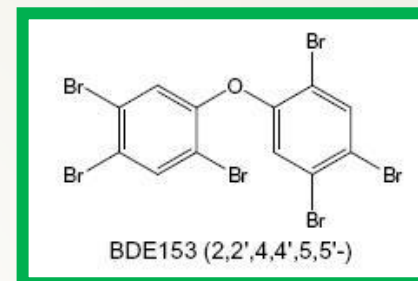
PBDEs

- Similar chemical structure to PCBs- 209 congeners
- Used in plastics, textiles, furniture foam
- Used since the 1970s
- Penta and Octa BDE mixtures in Europa and US banned in 2004



Why should we care?

- Widely used
- Highly persistent
- Lipophilic
- Bioavailable
- Toxic
- Bio-accumulate in high trophic levels
- Long range transport
- Evidence of toxicity in wildlife



Strategy



Gannet (*Morus bassanus*)

- Seabirds
- Live in colonies
- Non-migratory
- Prey- herring, mackerel and sandeels

Eggs

- Consistent media
- Easy to collect
- Reflect the breeding females exposure
- Changes in eggs will reflect changes in environmental concentrations

Aim: To examine how PCBs and PBDEs vary in eggs over time

- in gannet from two colonies and between colonies
- how the two POPs compare

Gannets- Colony Location

➤ PCBs

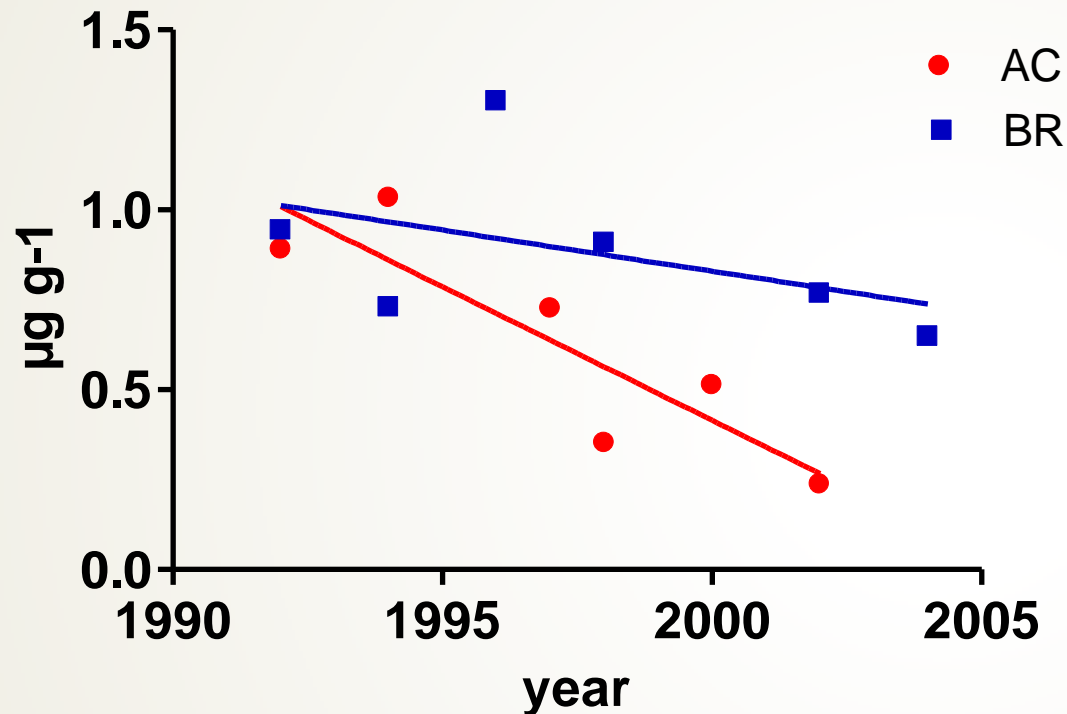
- 25 (PCB8 to 209)
- 1990-2004
- 10 fresh eggs/year

➤ PBDE Congeners

- 25 (BDE17 to 197)
- 1977-2007
- 5 fresh eggs/year



Temporal trends of Sum PCB congeners



➤ 0.65- 1.30 ug/g wwt in BR

➤ 0.35-1.03 ug/gww in AC

Ailsa Craig

➤ Significant decline
($R^2 = 0.78$; $P < 0.05$)

Bass Rock

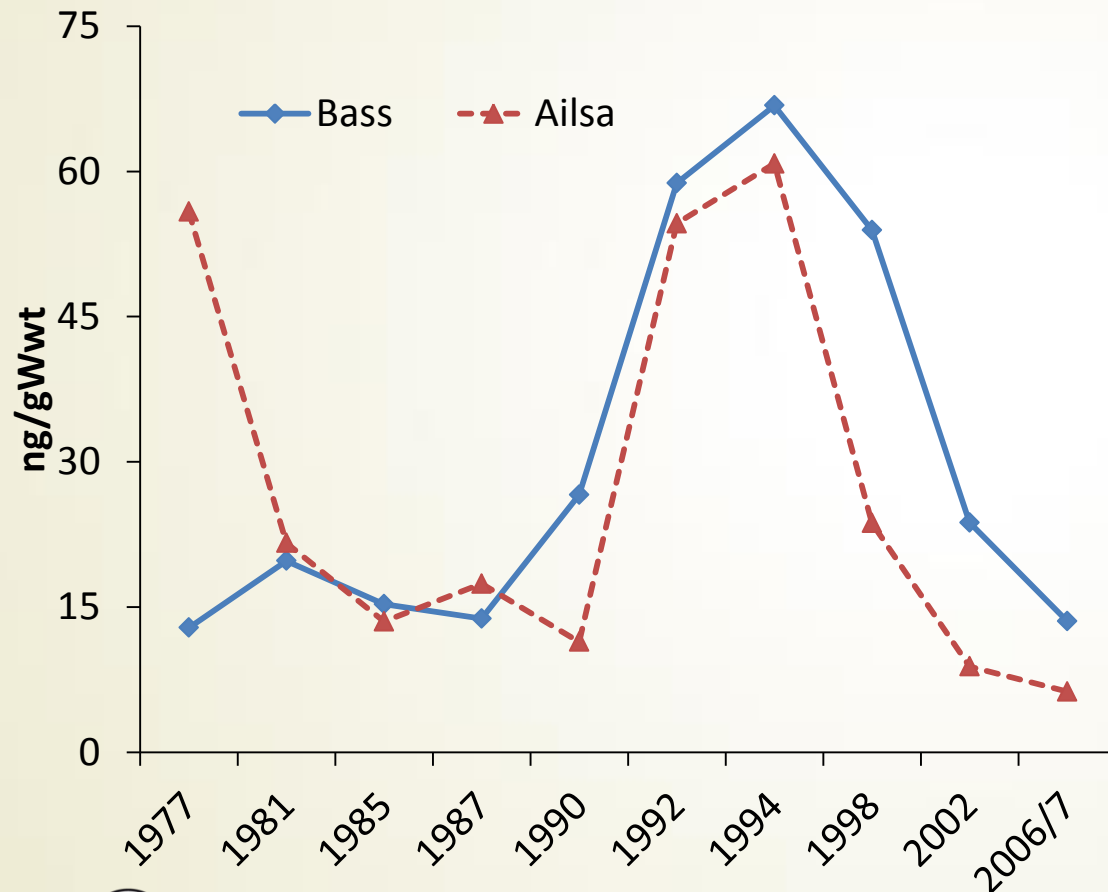
➤ Decline but not significant

➤ No significant differences
between both colonies

Temporal trends – Congeners sum

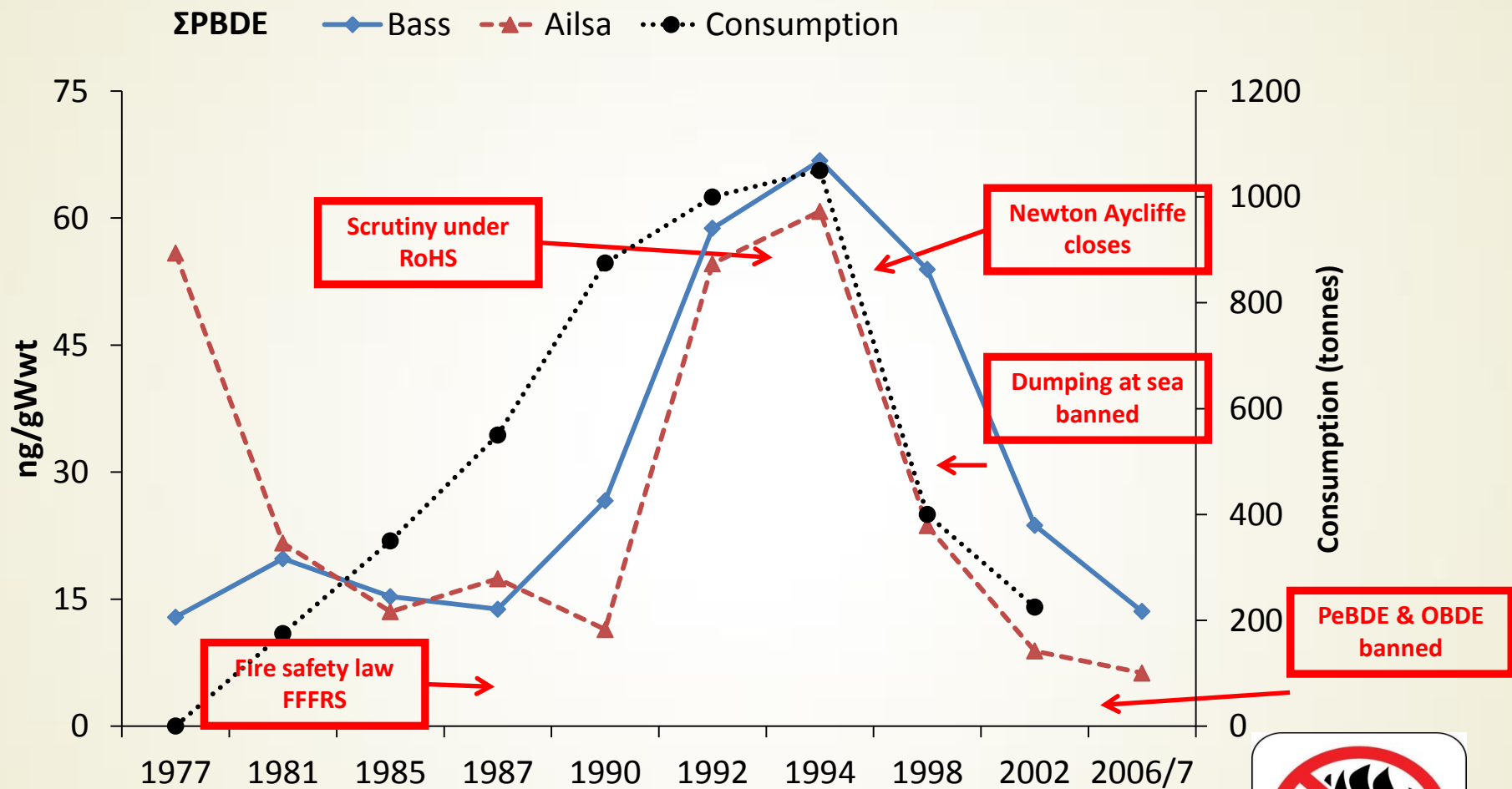


➤ No SD between colonies



- 12.9-66.8 ng/g wwt in BR
- 6.3-60.8 ng/gww in AC
- Small increase in the 80s
- Rapid increase in 90s
- Peaked in 1994
- Significant and rapid decline after

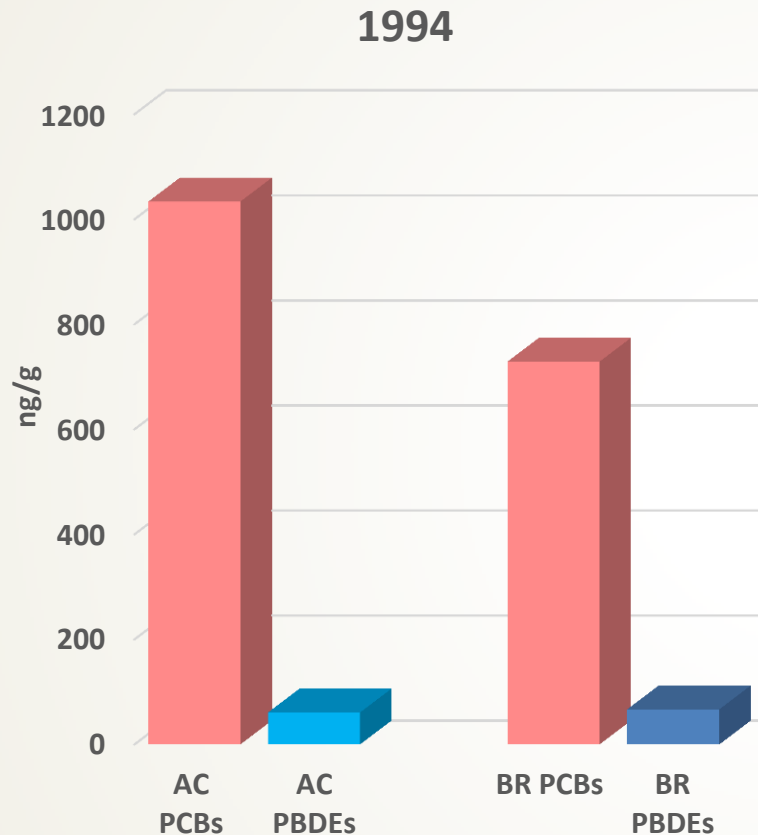
Temporal trends



PBDE Consumption estimates (Prevedorous et al., 2004)



Peak of PBDEs



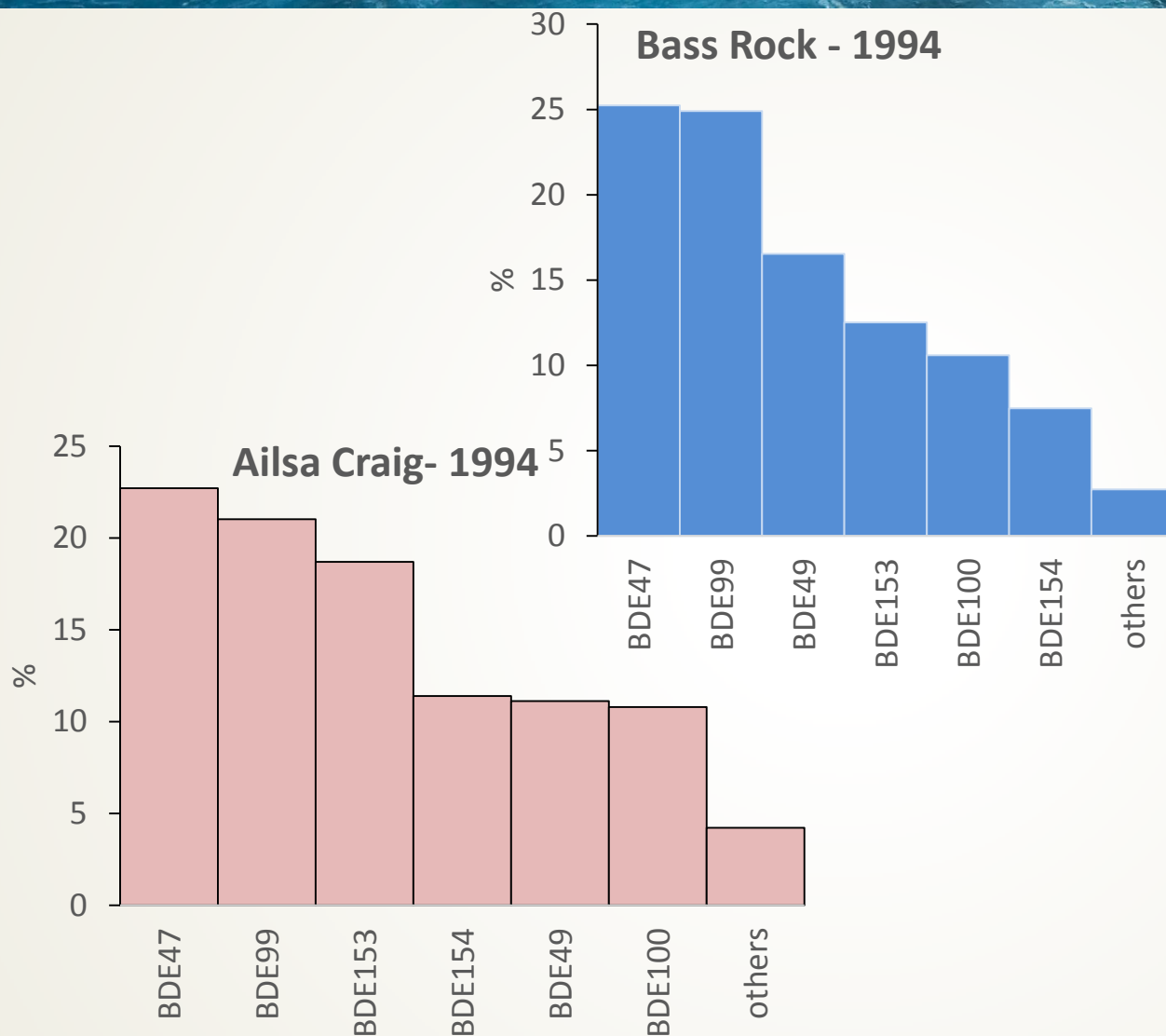
Bass Rock:

- PCBs were 11x higher than PBDEs

Ailsa Craig:

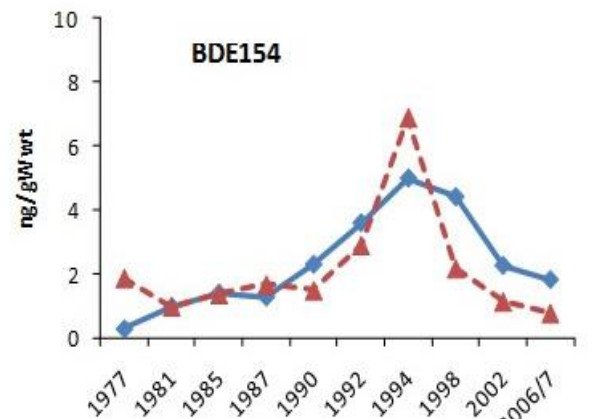
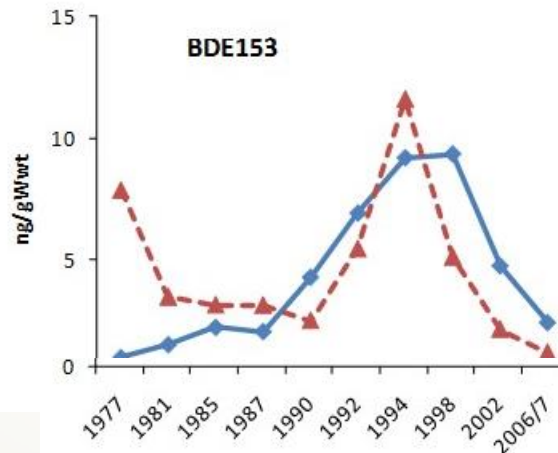
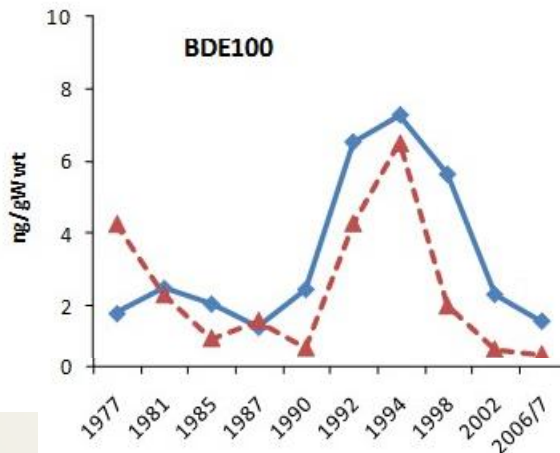
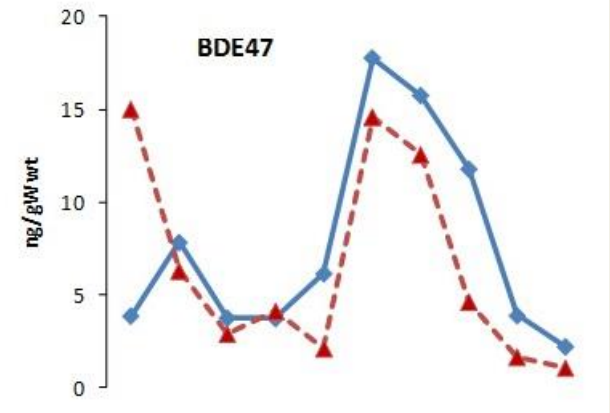
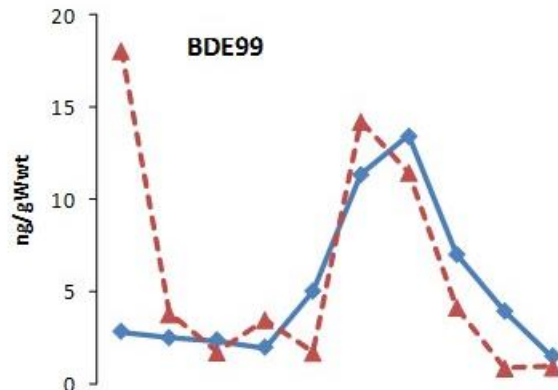
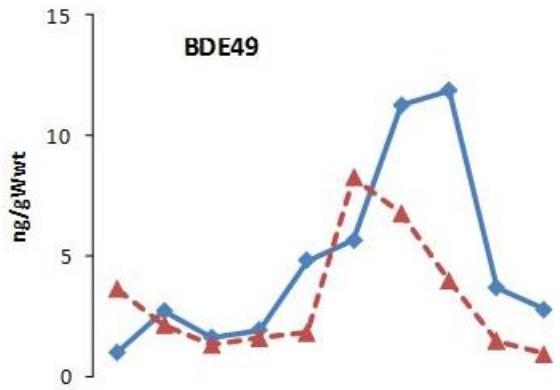
- PCBs were 17x higher than PBDEs

PBDE Congener Profile

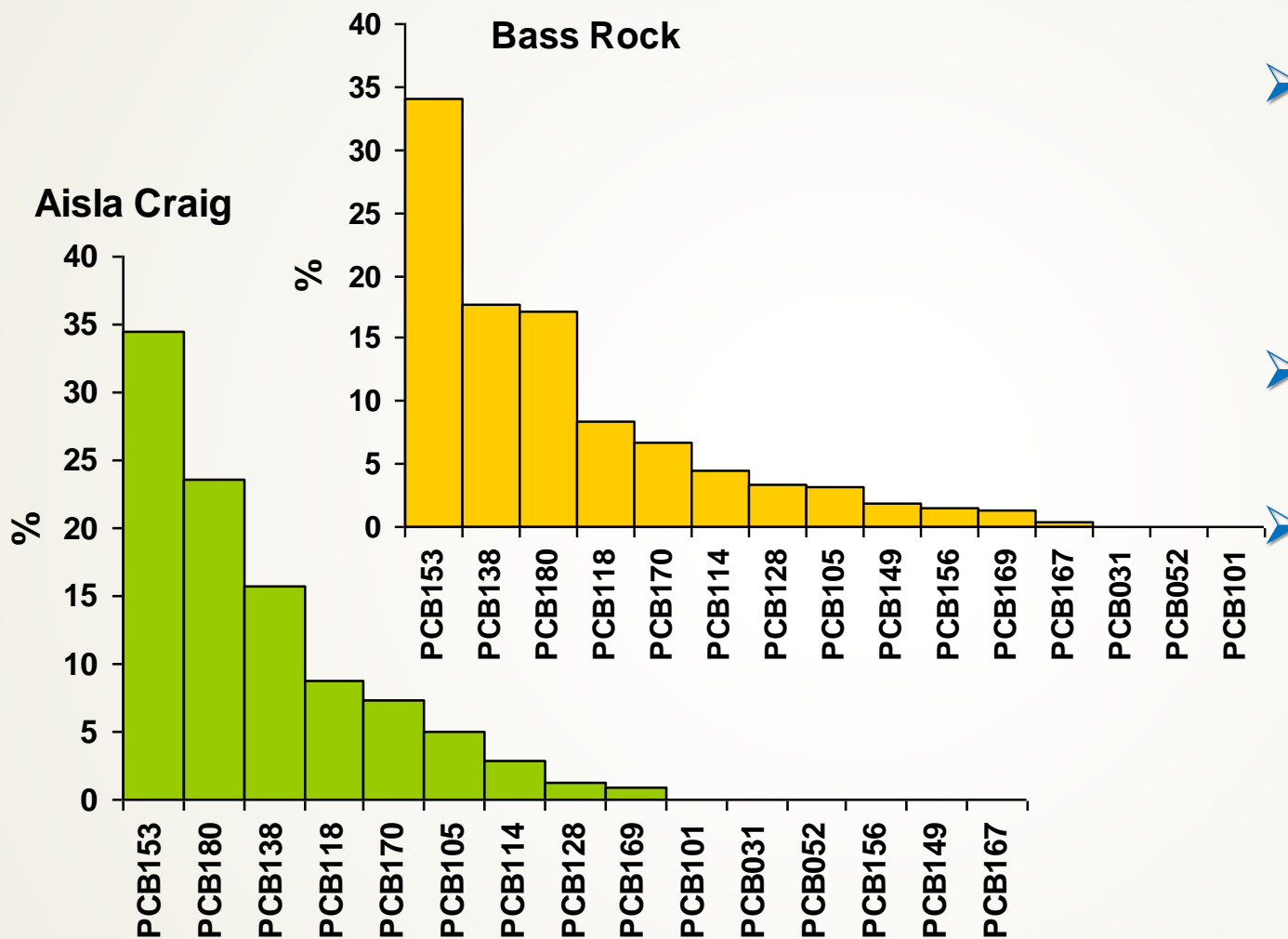
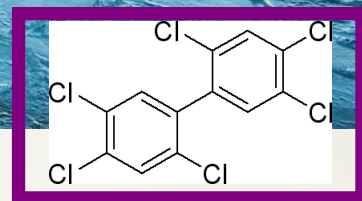


- 14 congeners found in >1 egg
- BDE 47 dominant (20-25%)
- BDE 49 important contribution
- Components of the PeBDE mix

Individual congeners - Temporal trends

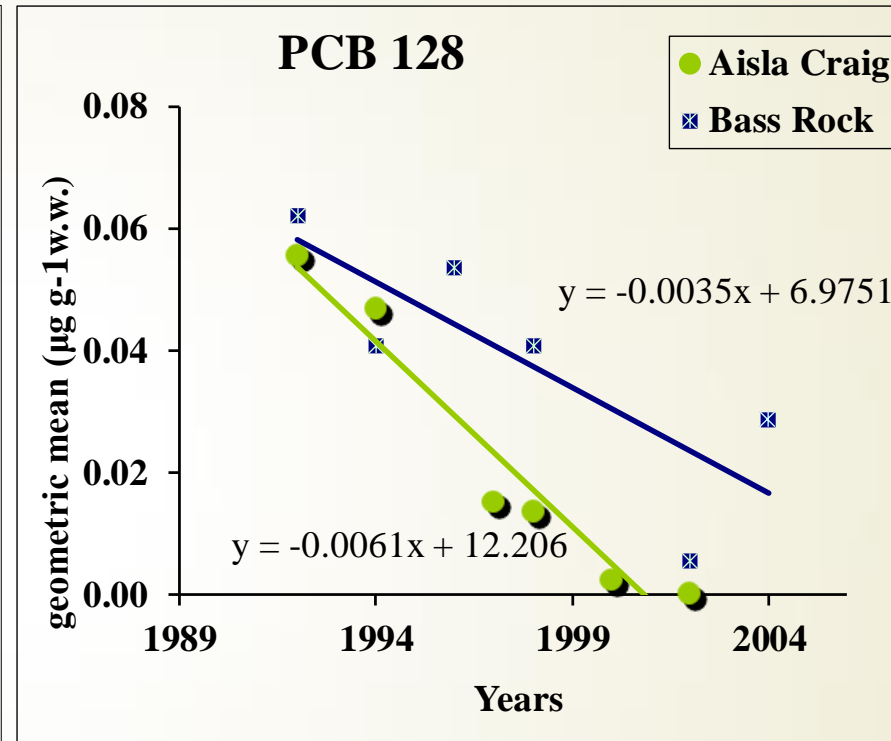
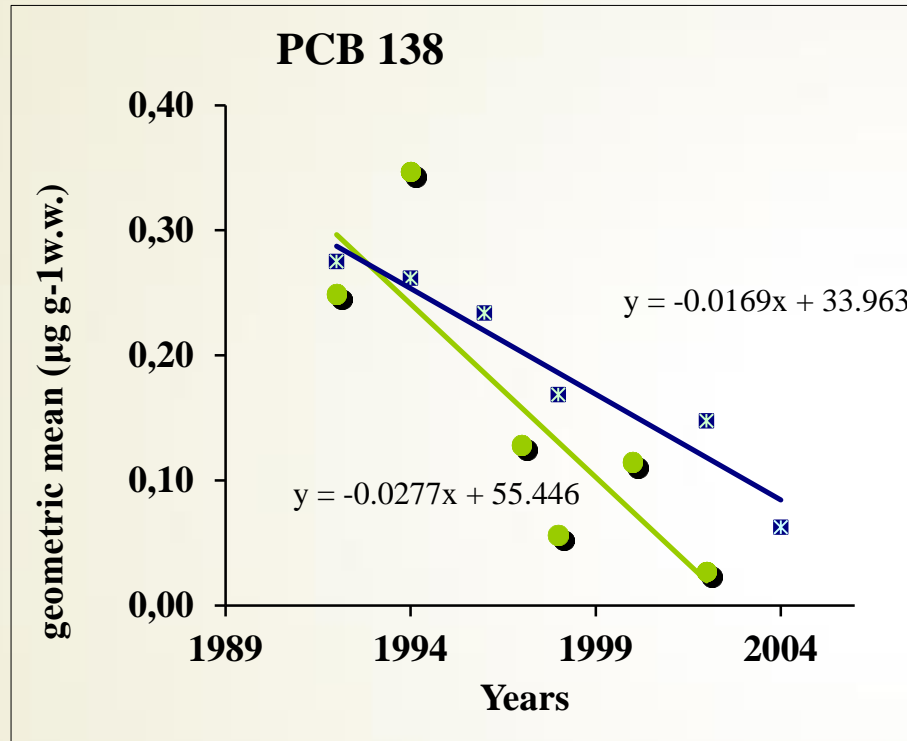


PCB Congener Profile



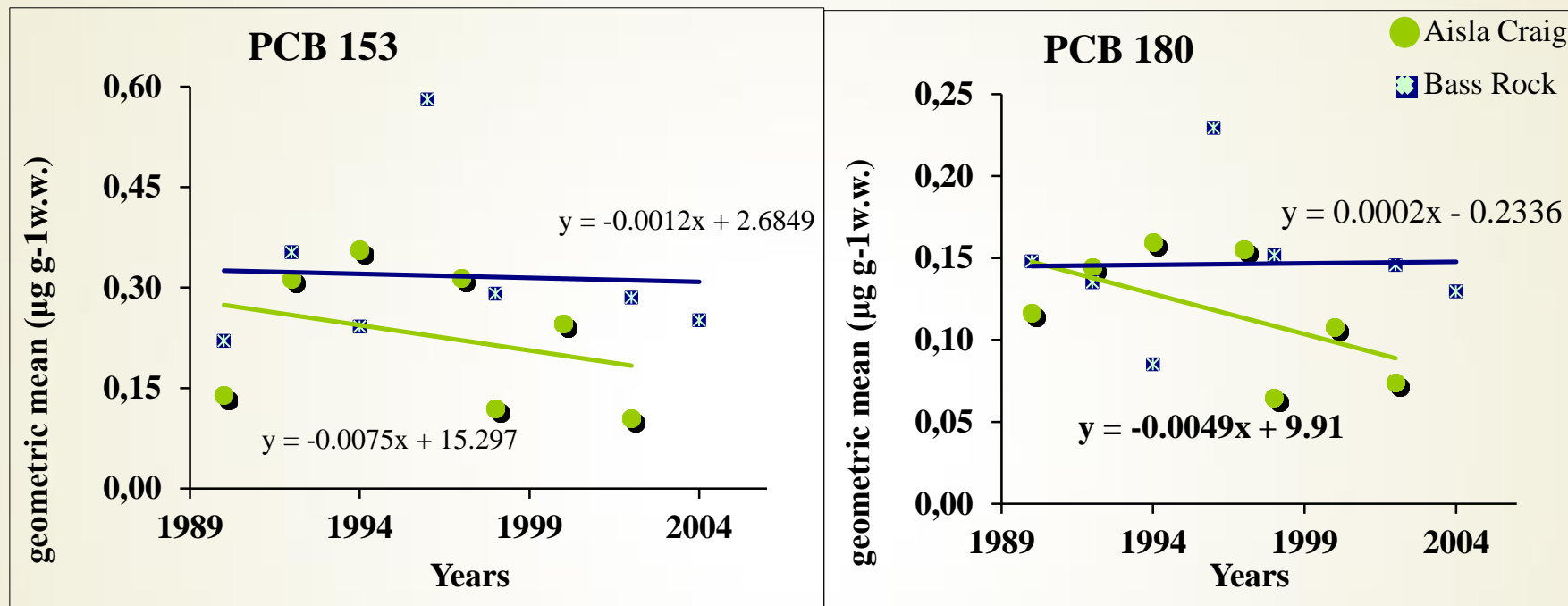
- 15 congeners detected in 15 to 100% samples
- Dominated by 5 congeners
- PCB153 – 30 to 40%

PCB congeners – Temporal trends



- Significant decline
- No significant differences between colonies

PCB congeners – Temporal trends

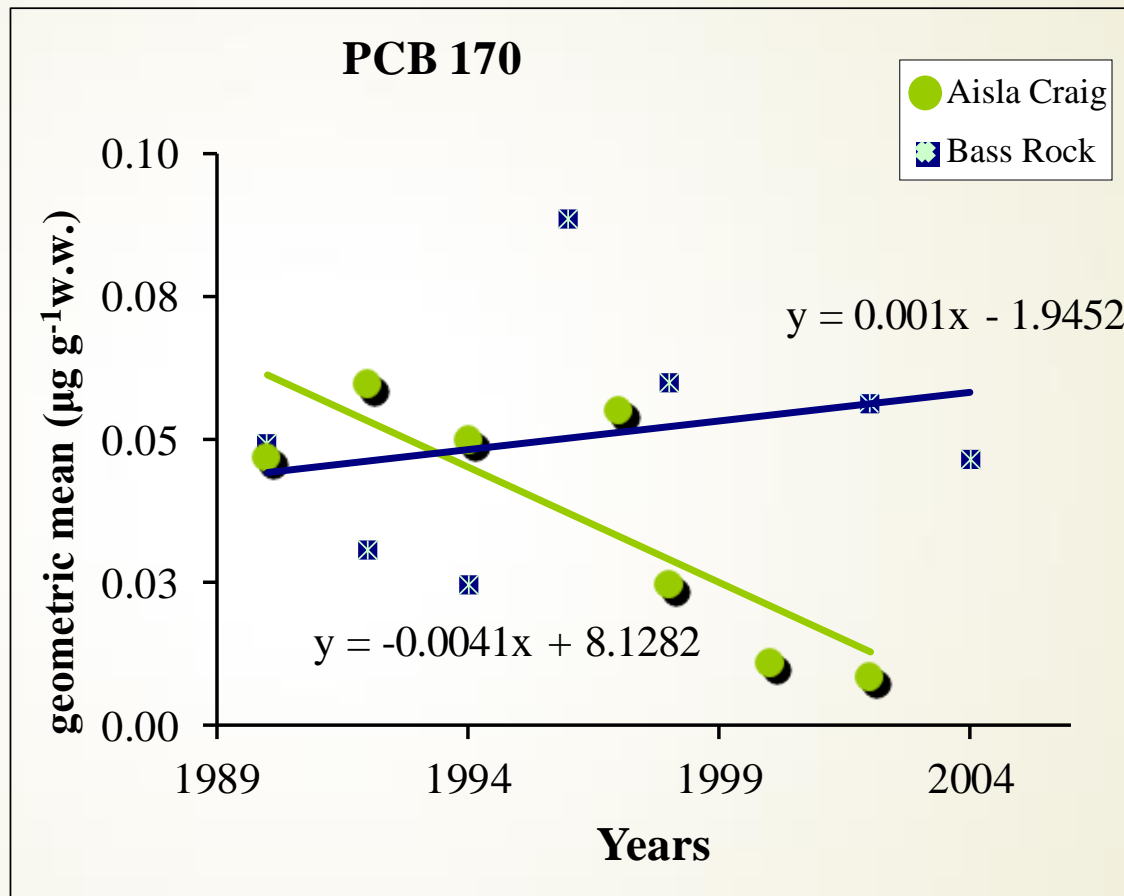


- No significant trends
- No significant differences between colonies

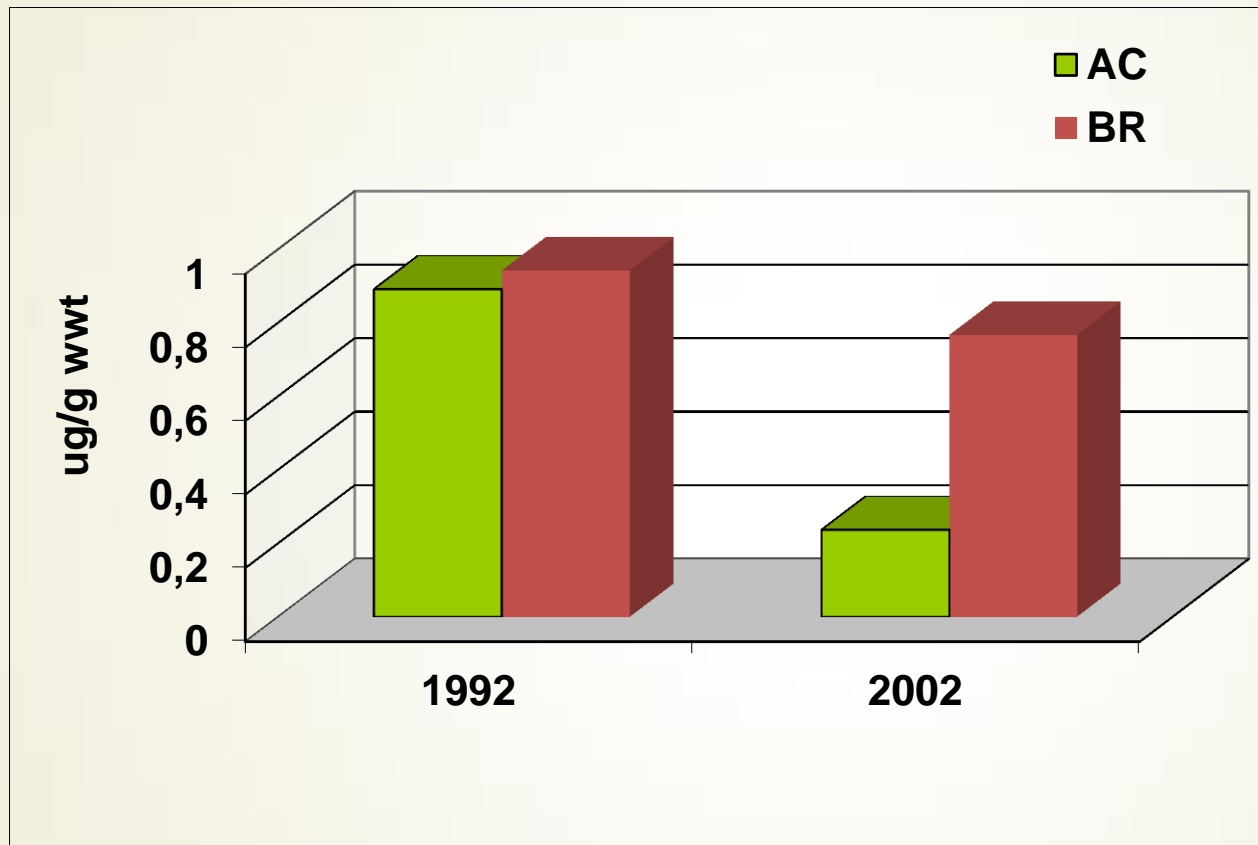
PCB congener – Temporal trends



- Significant decline in Ailsa Craig
- No significant increase in Bass Rock
- Significant differences between colonies



PCBs – colony comparison



Conclusions



PCB Congeners

- PCBs 153, 138 and 180 – dominated (70%) – followed by 118 and 170 - in both colonies
- AC - All dominant congeners decline
- BR - different congeners have different temporal trends
- In 2002 higher concentrations in BR than in Aisla Craig

PBDE Congeners

- BDE 47 dominant
- 47>99>49>153>100
- Similar temporal pattern for dominant congeners (penta mix)
- Identical in both colonies

Conclusions



PBDEs

- No SD between colonies
 - Significant temporal decline in AC Sum PCBs
 - No significant temporal decline in BR Sum PCBs
- No SD between colonies
 - Sum BDEs -Increased in the 90s- significant decline after 94
 - Temporal trend follows production/restrictions

Peak of PBDEs – PCBs 11x and 17x higher

- Significant contribution of PCBs
- PBDEs come and gone in gannets
- PCBs showed a temporal and spatial difference

1. Pereira, M.G. *et al.*, 2008. *Environmental Pollution*.**157**: 155-163.
2. Crosse, J.D., Shore R.F., Jones, KC & **Pereira, M.G.**, 2012. .
Environmental Pollution.**161**:93-100



Thank you
for listening!



Any Questions?