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## PCB and PBDE levels in southern and northern resident killer whales: update on contaminant levels and related health effects

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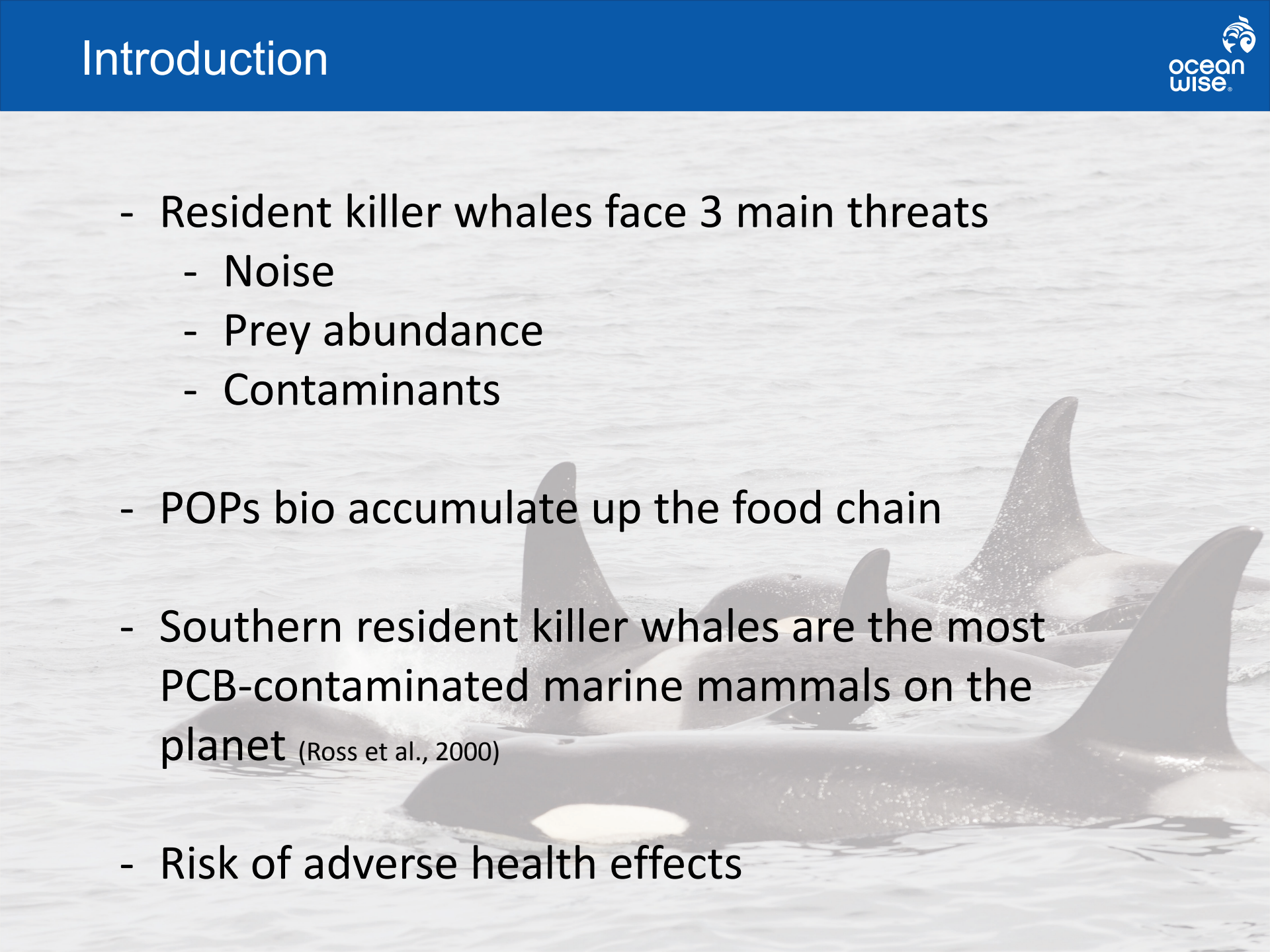
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# PCBs and PBDEs in resident killer whales: update on contaminant levels and related health effects

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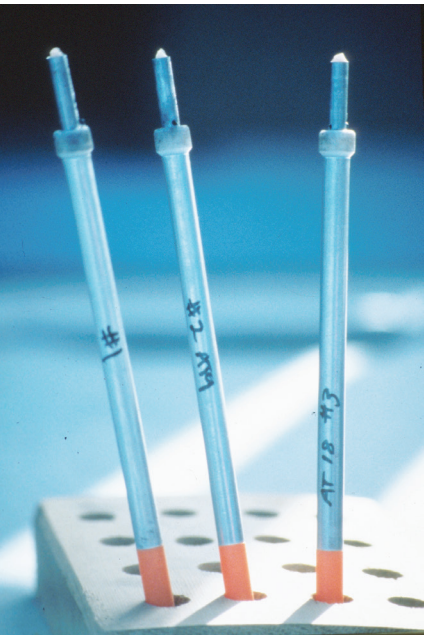


- Resident killer whales face 3 main threats
    - Noise
    - Prey abundance
    - Contaminants
  - POPs bio accumulate up the food chain
  - Southern resident killer whales are the most PCB-contaminated marine mammals on the planet (Ross et al., 2000)
  - Risk of adverse health effects
- 
- A background image showing several killer whales (Orcinus orca) swimming in the ocean. Their dark, sleek bodies and prominent dorsal fins are visible above the water's surface. The water is a light, slightly rippled blue-grey color.

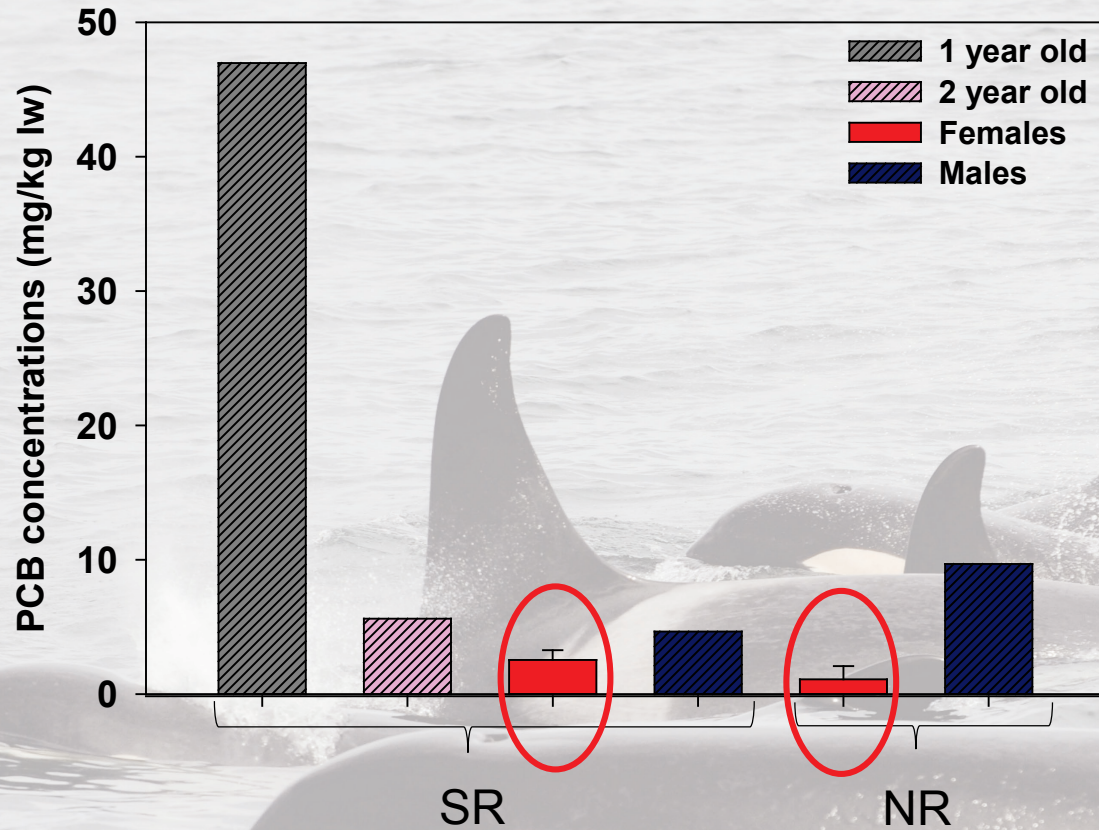


# Methods

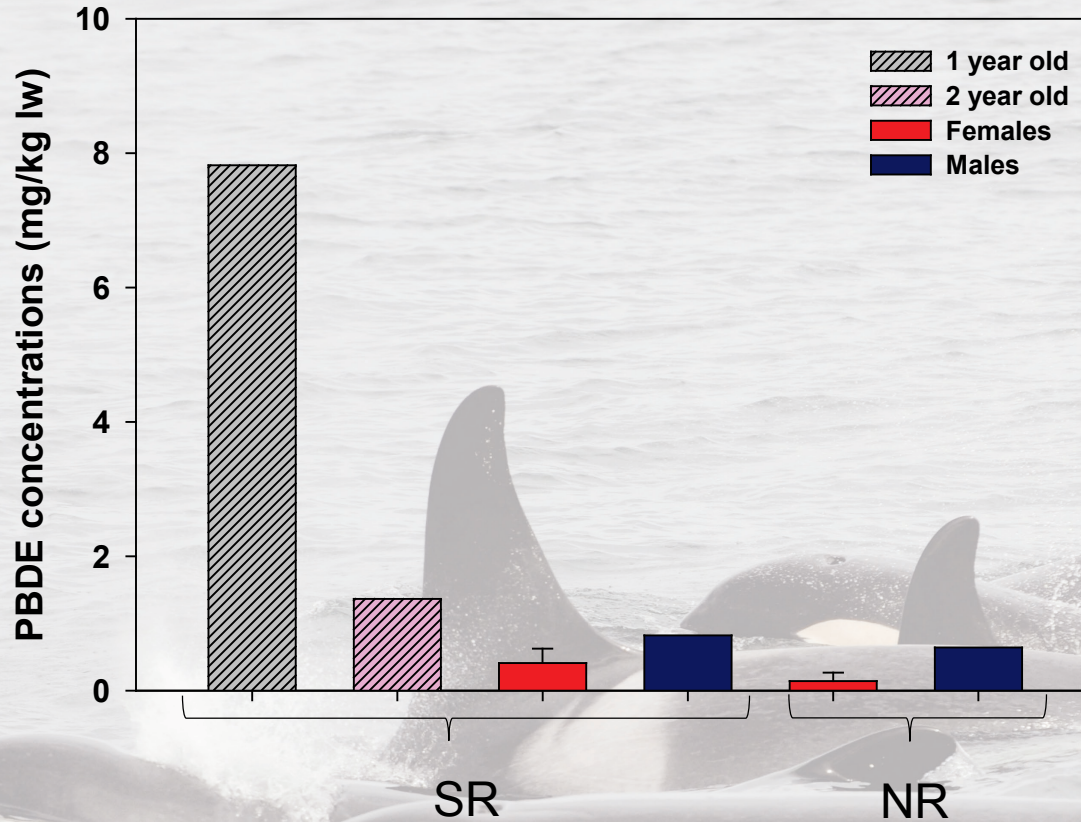
- **Blubber biopsy** were collected in 2016 and 2017
- PCB and PBDE analyses
- Stable isotopes
- Fatty acids
- Gene expression



# PCB levels in northern and southern residents

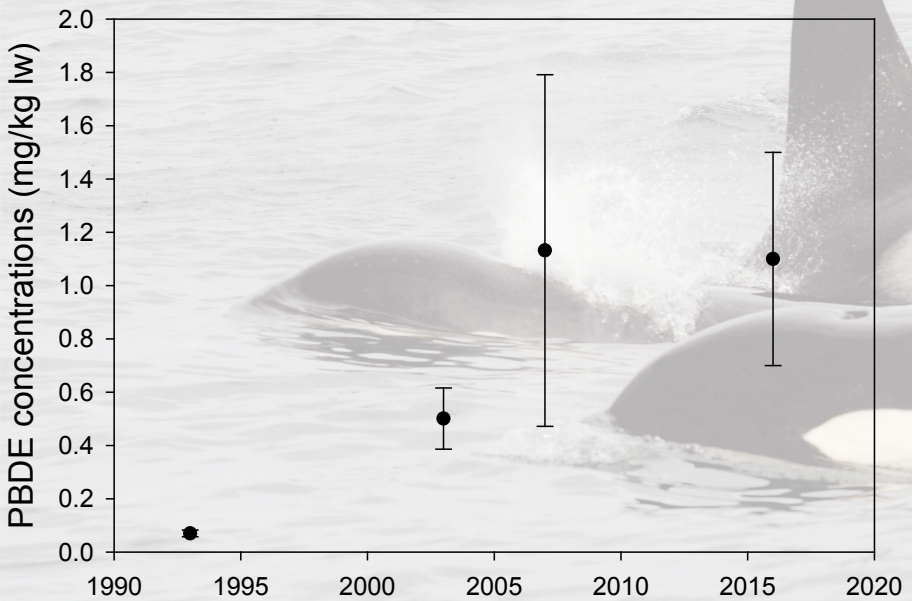
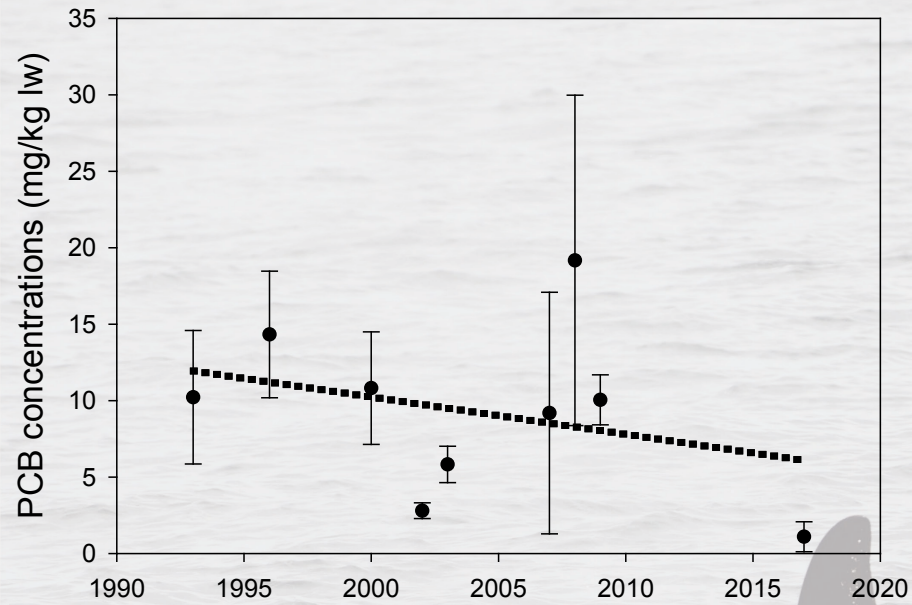


# PBDE levels in northern and southern residents



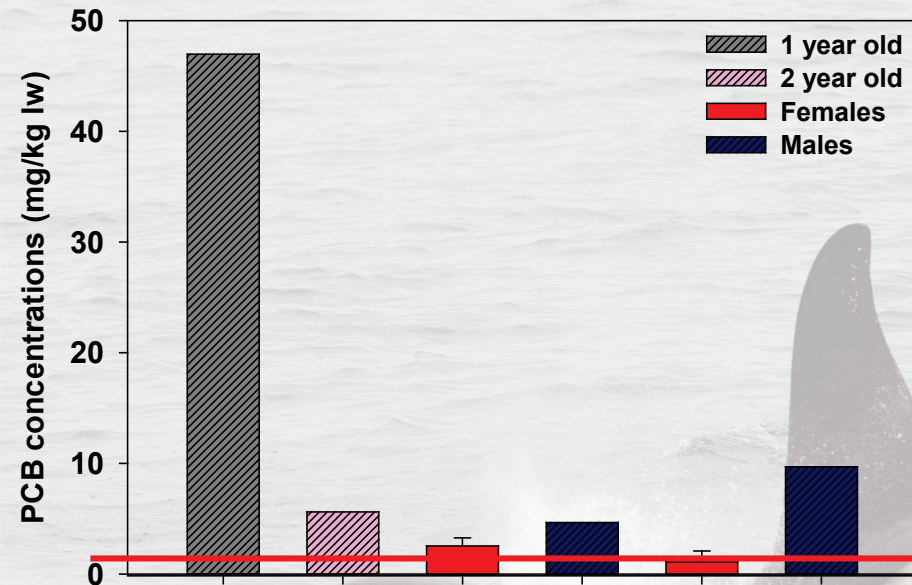
PBDE levels are an order of magnitude lower compared to PCBs

# Temporal trends in northern residents PCBs and PBDEs

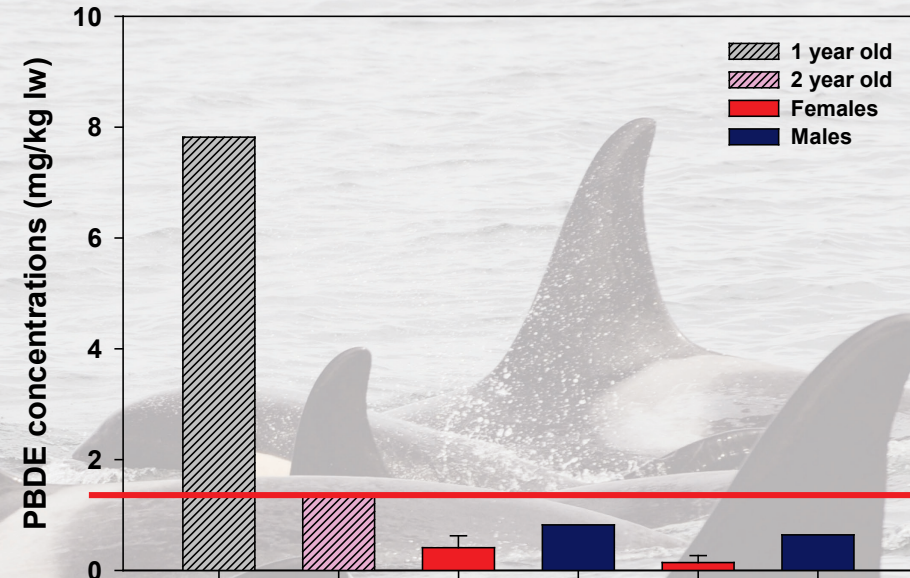


# What does it mean for their health?

Toxicity Reference Values (TRV) have been derived for marine mammals and provide benchmarks for conservation, mitigation and/or risk management



- Only 3 NR females had levels below the PCB threshold of 1.5 mg/kg lw

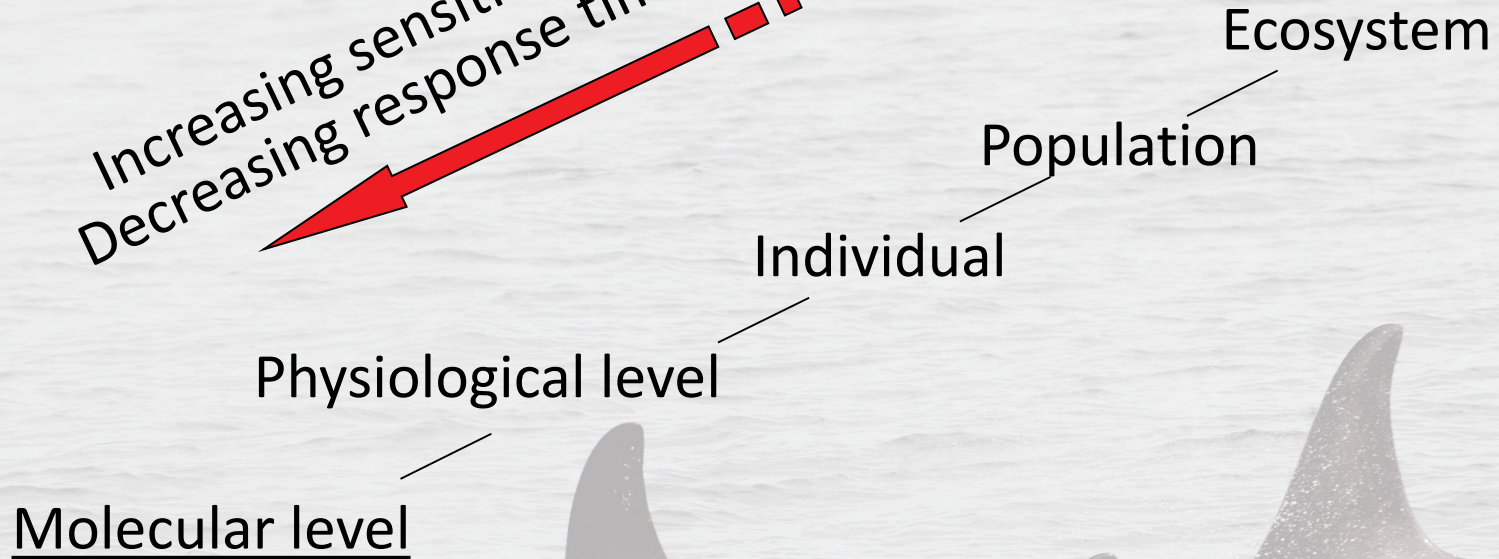


- PBDE levels were above the threshold of 1.3 mg/kg only in the one year old SR

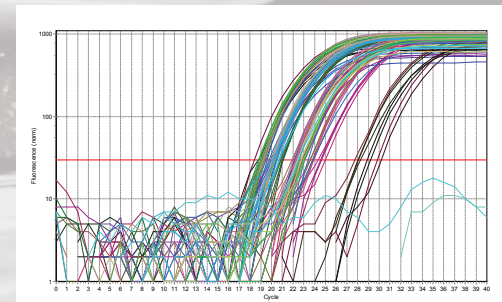
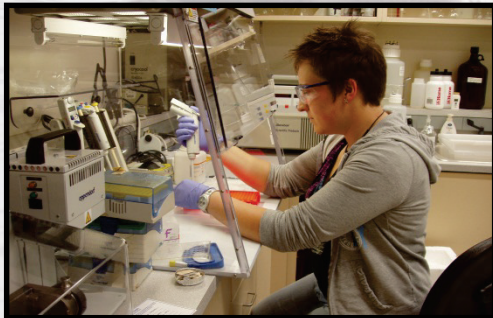


# Investigating mRNA levels in killer whales

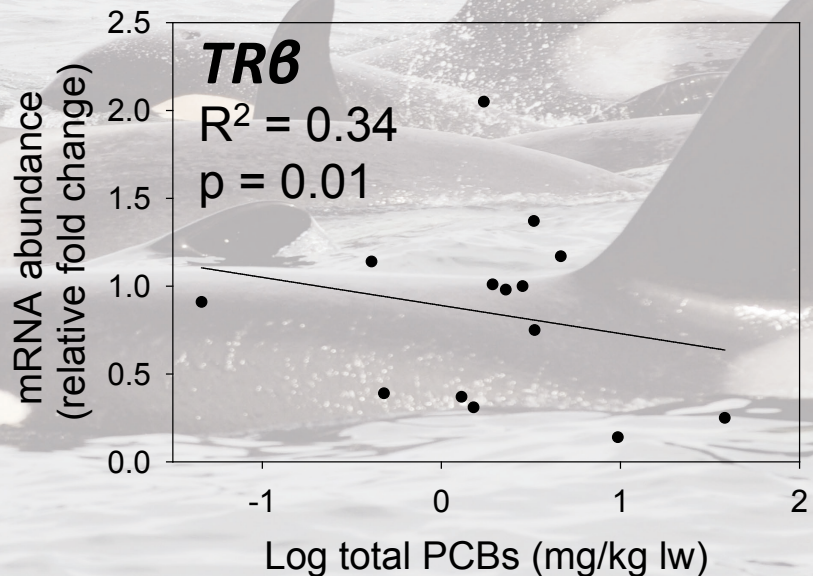
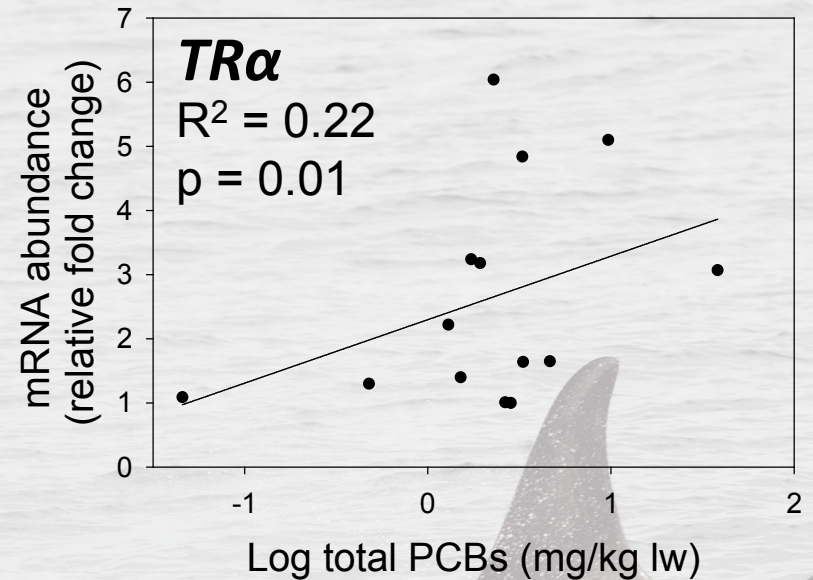
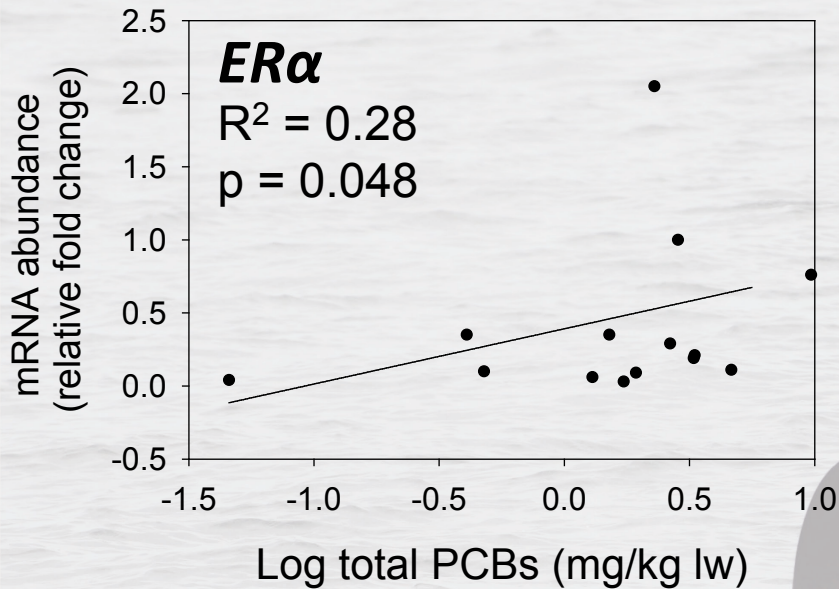
Increasing sensitivity  
Decreasing response time



 ***Early warning signal of health effects in killer whales***

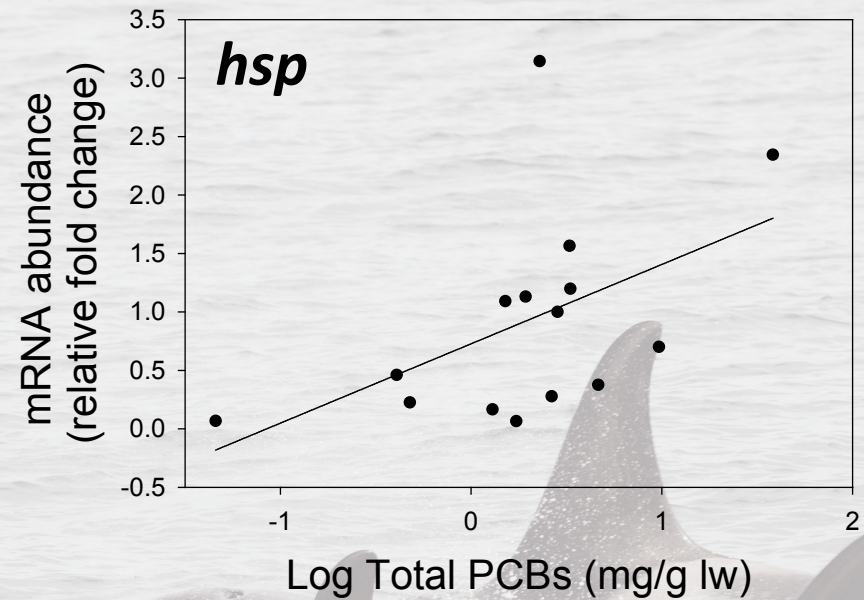
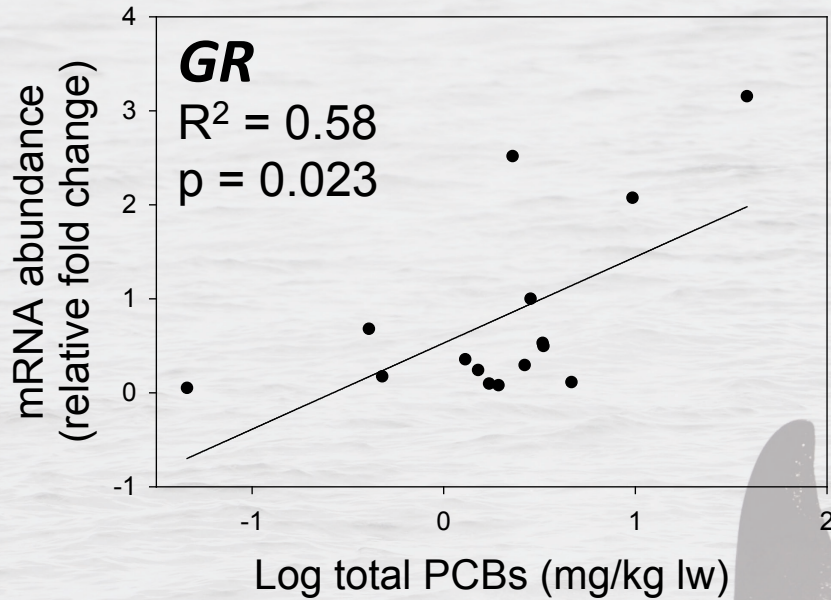


# Hormone receptors



- Estrogens important for cellular differentiation, organ development and reproduction
- Thyroid hormones important for growth, development and metabolism

# Stress-related genes

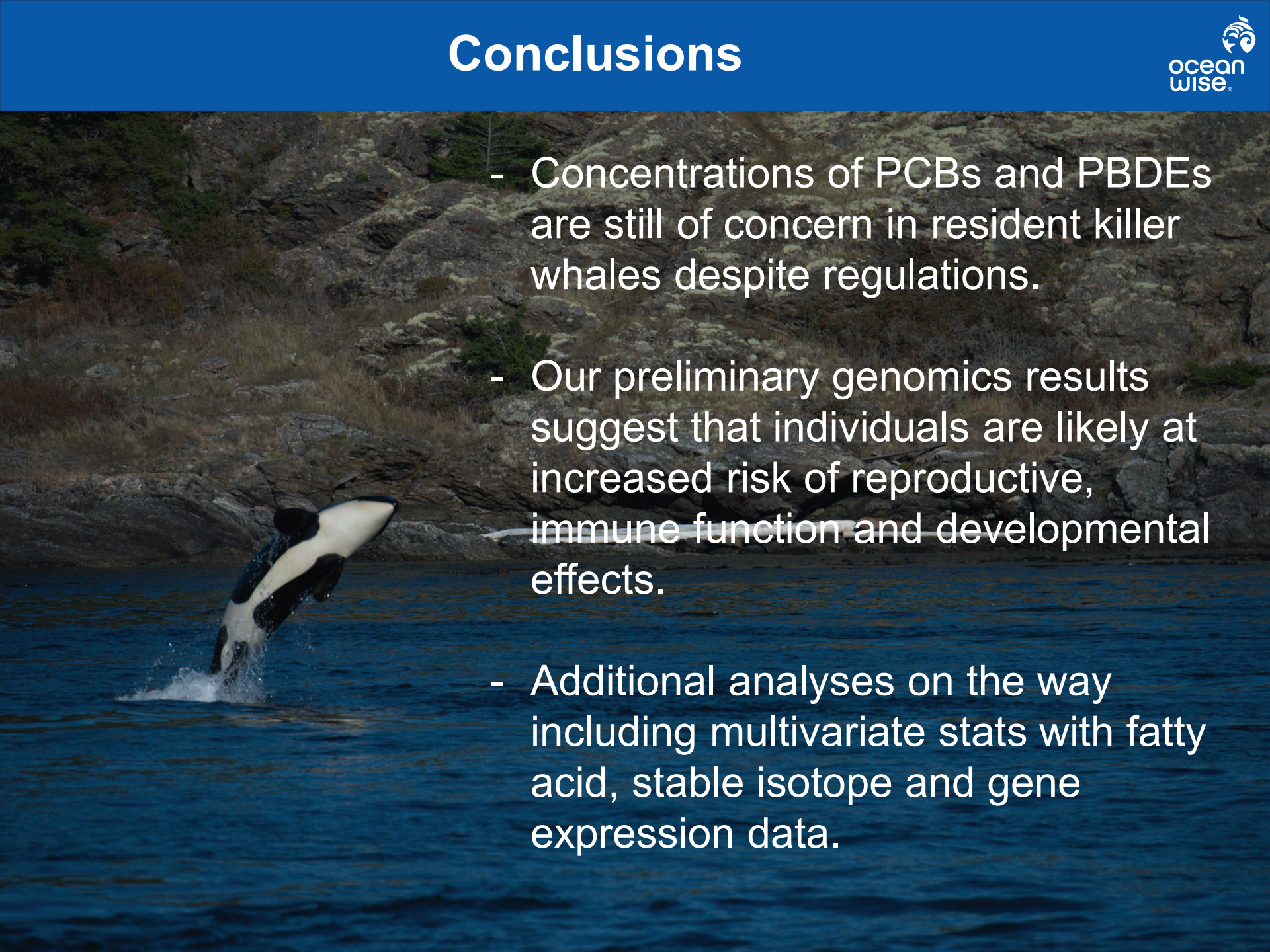


Important involvement in the hypothalamic – pituitary – adrenal (HPA) axis

Important to protect cells against stress

**Impaired ability to efficiently respond to various stresses**

# Conclusions

- 
- Concentrations of PCBs and PBDEs are still of concern in resident killer whales despite regulations.
  - Our preliminary genomics results suggest that individuals are likely at increased risk of reproductive, immune function and developmental effects.
  - Additional analyses on the way including multivariate stats with fatty acid, stable isotope and gene expression data.



# Thank you

## Acknowledgements

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Photo credits: Jared Towers and Lance Barrett-Lennard