

# Total mercury concentrations in fur of three ice-associated seal species in the Bering Sea

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## INTRODUCTION

- ▶ Low fur total mercury concentrations ([THg]) have been reported for legally-harvested ice-associated seals in Alaska.
- ▶ A significant proportion of newborn Steller sea lions in the western Aleutian Islands have [THg] > 20 µg/g, a threshold of potential adverse effects for pinnipeds.
- ▶ We investigated fur [THg] in three species of free-ranging, ice-associated seals occupying the adjacent Bering Sea.

## STUDY SPECIES COMPARISON

	BEARDED SEAL (EB) <i>Erignathus barbatus</i>	RIBBON SEAL (HF) <i>Histiophoca fasciata</i>	SPOTTED SEAL (PL) <i>Phoca largha</i>
STATUS IN BERING SEA	Depleted stock (MMPA) & Threatened (ESA)	All three species protected throughout range under Marine Mammal Protection Act (MMPA)	
FEMALE AGE AT MATURITY	3-4 years	3-4 years; though as early as 1 year	3-4 years
LIFESPAN	25 years	20-30 years	35 years
PARTURIATION PERIOD	Mid-March to Mid-May	April to Early-May	Early to Mid-April
LACTATION DURATION	3-4 weeks	3-4 weeks	3-4 weeks
MOLTING PERIOD	Pups → by weaning Others → June	March-July; Timing age/sex class dependent	Pups → by weaning Others → May-June
DIET	Benthic Invertebrates & Fishes shrimp, crabs, mollusks, amphipods, echiurids, octopus saffron cod, Arctic cod, sculpins, flatfishes	Pelagic Schooling Fishes & Invertebrates saffron cod, Arctic cod, walleye pollock, Pacific cod, capelin, flatfishes shrimp, squid	Demersal Fishes & Cephalopods herring, smelt, sandlance, flatfishes, Pacific cod, saffron cod, Arctic cod shrimp, amphipods

\*young seals eat more crustaceans; trophic position ↑ with age

## METHODS

**FIELD CAPTURES**  
Seals were captured and fur was collected over the right hip (~5x5cm<sup>2</sup>) during April-June of the years: 2009, 2010, 2014, 2016, 2018 & 2022.

**LABORATORY TESTS**  
Fur samples were washed with a mild detergent (1% Triton-X) and freeze-dried prior to [THg] analyses (Direct Mercury Analyzer-80; Milestone, Inc.). These measurements represent [THg] at time of fur growth.

**STATISTICAL ANALYSES**  
Comparisons among age classes were conducted using the non-parametric Kruskal-Wallis test, followed by post-hoc comparisons via Dunn test with Bonferroni corrections (Program R).

Further division of age classes by capture year and/or sex yielded small and unbalanced sample sizes, insufficient for post-hoc comparisons.

## RESULTS

All [THg] were <20µg/g\*  
→ maximal [THg] = 17.87µg/g for all species  
\*threshold of potential adverse effects for pinnipeds

No difference between median [THg] for HF and PL (p=0.1736)

Small sample size of EB (n=4) did not allow for further statistical analyses  
→ All EB <2µg/g

Five pups were captured while undergoing their first molt, allowing for collection of both:  
▶ lanugo (natal fur grown *in utero*)  
▶ newly-grown fur

Species	Capture Year	[THg] µg/g		% change [THg]
		Lanugo	1st Molt	
HF	2014	1.84	1.20	-35%
PL	2014	1.54	0.98	-36%
PL	2014	3.76	2.69	-28%
PL	2014	0.66	0.41	-38%
PL	2016	1.25	0.96	-23%
<b>Mean</b>		<b>1.81</b>	<b>1.25</b>	<b>-32%</b>

Lanugo [THg] > newly-grown fur  
→ t(4) = 2.78, p = 0.019

## CONCLUSIONS

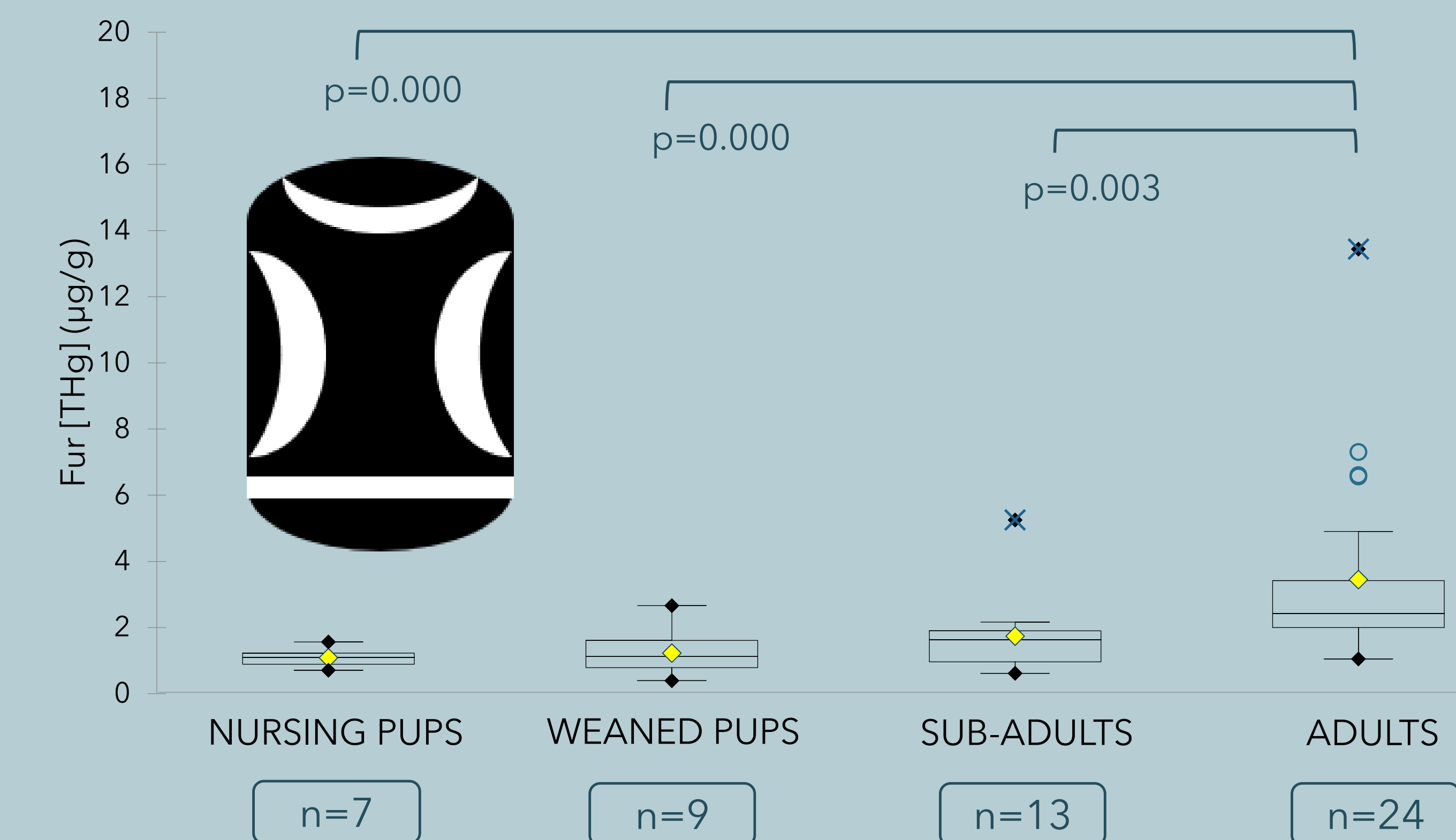
[THg] observed in all species were low & **not** expected to result in sub-lethal adverse effects to these seals from the Bering Sea.

The pattern of [THg] increasing with seal age → consistent with expectations of Hg bioaccumulation within individuals over their lifetime.

Fur of nursing pups has not yet molted, therefore → fur [THg] reflects mom's mid- to late-gestation diet  
may explain ↑ [THg] in pups compared to other non-adults.

Nearly 1/3 reduction in fur [THg] between lanugo and new fur growth  
→ Hg transfer to pups primarily occurs → during gestation (vs. lactation).

### RIBBON SEAL FUR [THg] BY AGE CLASS (n=53)



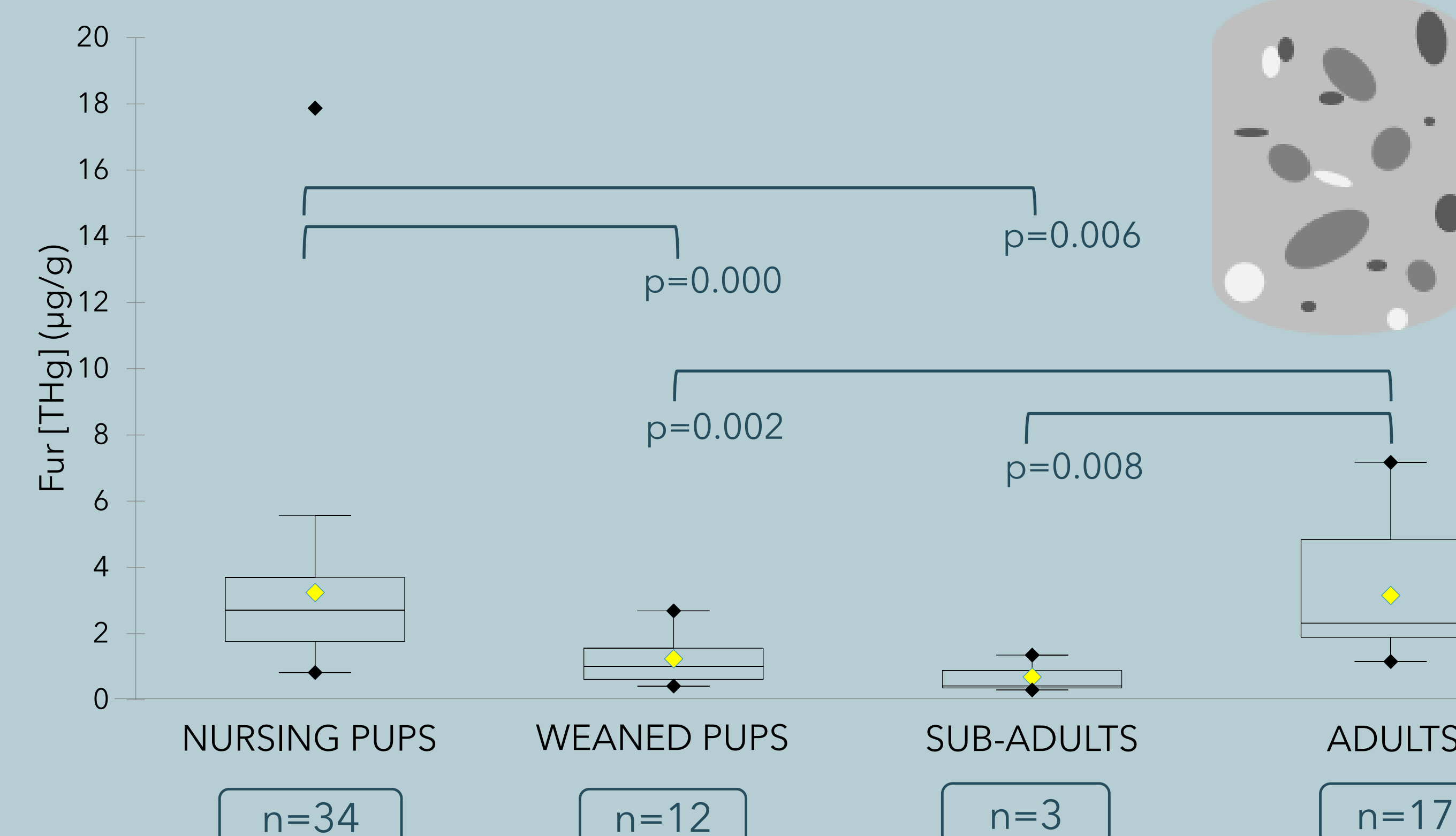
Median [THg] = 1.84µg/g for all HF

Age class & interaction (age\*sex) were statistically significant.

Adult median [THg] significantly > than each other age class.

Observed pattern of fur [THg] ↑ with age class of the seal.

### SPOTTED SEAL FUR [THg] BY AGE CLASS (n=66)



Median [THg] = 2.28µg/g for all PL

Age class & interaction (age\*year) were statistically significant.

Fur [THg] of nursing (1.17µg/g) & adult (2.31µg/g) PL significantly > than both weaned pups (1.01µg/g) & subadults (0.42µg/g).

**FUTURE RECOMMENDATIONS** → Continue monitoring [THg] in these species. Median [THg] in Steller sea lions in the adjacent western Aleutian Islands has more than doubled in ~10 years to a median [THg] exceeding the threshold of potential adverse effects.