

Organohalogen contaminants and vitamins in Northern Fur Seals (*Callorhinus ursinus*) collected during subsistent hunts in Alaska

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Statistical Methods

The software package Stata/SE 11.2 was used for analysis. Parametric quantile regression models based on the generalized gamma distribution are versatile tools for analyzing right-skewed continuous data. For this study, we used generalized gamma regression models without any predictors to determine an appropriate and more parsimonious distribution for each biomarker outcome: all biomarkers except tocopherols were consistent with a lognormal distribution, while tocopherols were consistent with a Weibull distribution. We then switched to parametric quantile regression models assuming lognormal or Weibull distributions, as appropriate, to estimate the relative medians of the biomarkers as a flexible function of years elapsed since 1987. We ran models with polynomial terms for year ranging from 0-order polynomials (e.g. constant relationship with respect to time), up to 5th-order polynomials, and selected the best model by likelihood ratio tests for nested models, using $\alpha=0.05$ as the decision-rule for significantly improved model fit. To examine potential over-fitting of the data, the candidate “best” model of the relationship of biomarker medians with time was contrasted with a model with only a linear term for time by comparing the mean root mean squared error for each model across a 5-fold cross-validation; this led to a selection of model with a linear term for time for chlordanes rather than the cubic model suggested by likelihood ratio tests; all other exposures’ model selections were unchanged. We accounted for the clustering of seals within rookeries by robust clustered sandwich standard errors that were applied after the models were fit by maximum likelihood estimation.

Table S1. Sample information, collection date, rookery, and total extractable organic content.

Fur Seal Sample #	Blubber Storage #	Liver Storage #	Collection Date	Rookery	Total Extractable Organics (%)
1	MM1B004	MM1L001	7/28/1987	Polavina	51.2
2	MM1B008	MM1L005	7/28/1987	Polavina	73.0
3	MM1B012	MM1L009	7/28/1987	Polavina	70.8
4	MM1B016	MM1L013	7/29/1987	Northeast	69.6
5	MM1B020	MM1L017 ^a	7/29/1987	Northeast	80.7
6	MM4B097	MM4L095	7/23/1990	Zapadni	62.5
7	MM4B100	MM4L098	7/23/1990	Zapadni	69.5
8	MM4B103	MM4L101	7/23/1990	Zapadni	63.2
9	MM4B106	MM4L104	7/23/1990	Zapadni	72.4
10	MM4B109	MM4L107	7/24/1990	Reef	50.6
11	MM4B112	MM4L110	7/24/1990	Reef	45.1
12	MM4B115	MM4L113	7/24/1990	Reef	57.8
13	MM4B118	MM4L116	7/27/1990	Reef	76.4
14	MM4B121	MM4L119	7/24/1990	Reef	66.2
15	MM4B124	MM4L122	7/24/1990	Reef	42.9
16	MM12B648	MM12L646	8/6/1997	Zapadni	67.0
17	MM12B652	MM12L650	8/6/1997	Zapadni	57.0
18	MM12B656	MM12L654	8/6/1997	Zapadni	65.5
19	MM12B660	MM12L658	8/6/1997	Zapadni	57.0
20	MM12B664	MM12L662	8/6/1997	Zapadni	65.0
22	MM16B169C	MM16L167C	7/10/2000	Polavina	62.5
23	MM16B172C	MM16L170C	7/10/2000	Polavina	78.6
24	MM16B175C	MM16L173C	7/10/2000	Polavina	71.0
25	MM16B178C	MM16L176C	7/10/2000	Polavina	60.4
26	MM16B181C	MM16L179C	7/10/2000	Polavina	79.9
27	MM16B184C	MM16L182C	7/10/2000	Polavina	68.5
28	MM16B187C	MM16L185C	7/10/2000	Polavina	76.8
29	MM16B190C	MM16L188C	7/10/2000	Polavina	69.7
30	MM16B193C	MM16L191C	7/10/2000	Polavina	68.8
31	MM16B196C	MM16L194C	7/10/2000	Polavina	74.8
38	MM22B819C	MM22L818C	7/22/2006	Reef	75.8
39	MM22B822C	MM22L820C	7/22/2006	Reef	75.4
40	MM22B825C	MM22L823C	7/22/2006	Reef	65.3
41	MM22B828C	MM22L826C	7/22/2006	Reef	81.9
42	MM22B831C	MM22L829C	7/22/2006	Reef	70.4
44	MM22B796C	MM22L794C	7/22/2006	Reef	82.2
45	MM22B799C	MM22L797C	7/22/2006	Reef	84.3
46	MM22B808C	MM22L806C	7/22/2006	Reef	70.7
47	MM22B802C	MM22L800C	7/22/2006	Reef	77.5
48	MM22B836C	MM22L834C	7/22/2006	Reef	83.6
52	MM22B899C	MM22L897C	7/8/2007	Polavina	74.2
53	MM22B902C	MM22L900C	7/8/2007	Polavina	77.9
54	MM22B905C	MM22L903C	7/8/2007	Polavina	63.7
55	MM22B908C	MM22L906C	7/8/2007	Polavina	56.1
56	MM22B911C	MM22L909C	7/8/2007	Polavina	68.1
57	MM22B914C	MM22L912C	7/8/2007	Polavina	76.5
58	MM22B917C	MM22L915C	7/8/2007	Polavina	68.3
59	MM22B920C	MM22L918C	7/8/2007	Polavina	64.1
60	MM22B923C	MM22L921C	7/8/2007	Polavina	70.3
61	MM22B926C	MM22L924C	7/8/2007	Polavina	65.4

^aMM1L017 sample was never located and excluded from the analysis

Table S2. Range of PFAAs concentrations (ng/g wet mass) in northern fur seal liver samples.

	Polavina (n=23)	Northeast (n=1)	Zapadni (n=9)	Reef (n=16)
	Range	Range	Range	Range
PFNA	<0.682-19.8	2.39	1.17-8.55	0.555-13.1
PFDA	<0.884-1.70	<0.400	<0.592-1.42	<0.374
PFUnA	1.50-122	17.8	1.69-12.2	0.545-138
PFDoA	<0.370-2.21	<0.201	<0.248-2.78	<0.229
PFTriA	<0.222-13.8	1.84	0.823-4.69	<0.222-25.9
PFTA	<0.174-0.973	<0.342	<0.174-1.32	<0.314
PFHxS	<0.122-1.63	0.135	0.111-0.358	<0.122-0.460
PFOS	0.927-15.8	4.92	3.09-13.6	1.09-17.5
PFOSA	<0.162-3.99	<0.162	<0.259-3.19	<0.151-1.39

Values shown as “<” a specified number describe the actual reporting limit (RL)

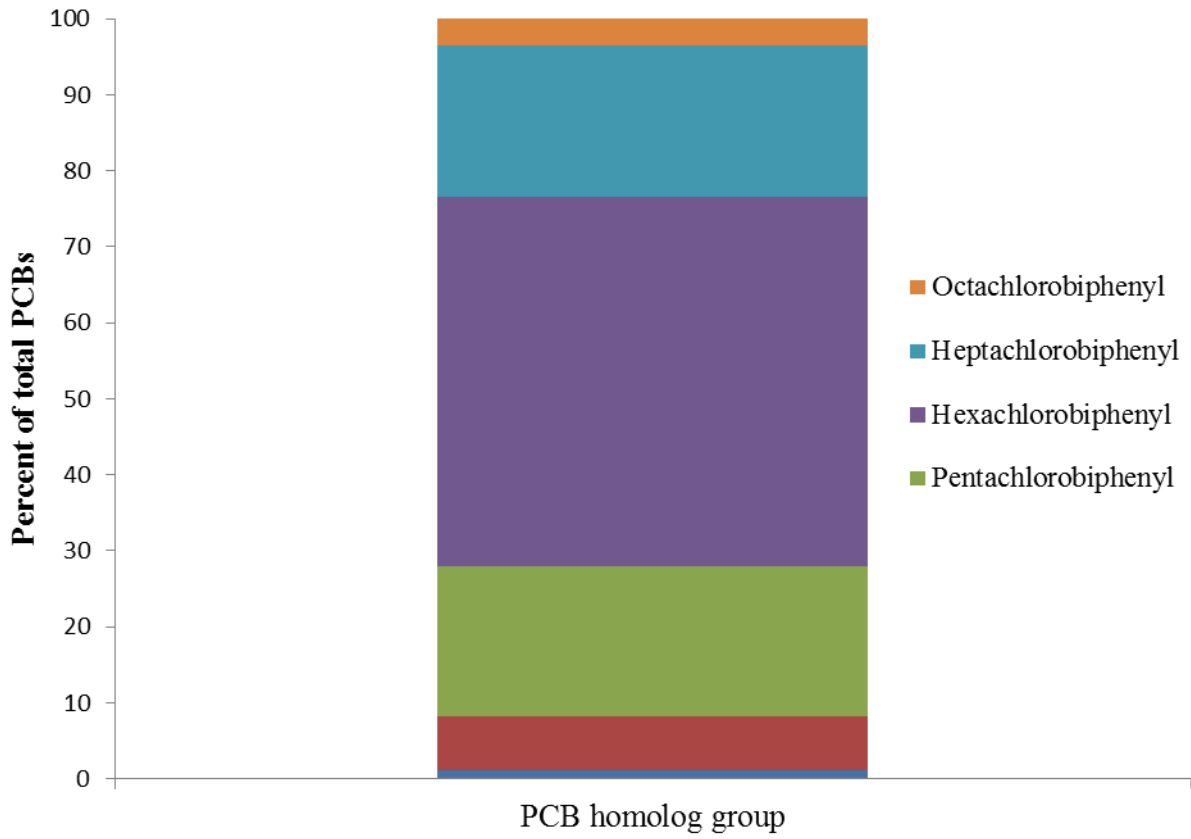


Figure S1. Percent makeup of PCB homolog group in northern fur seal samples.

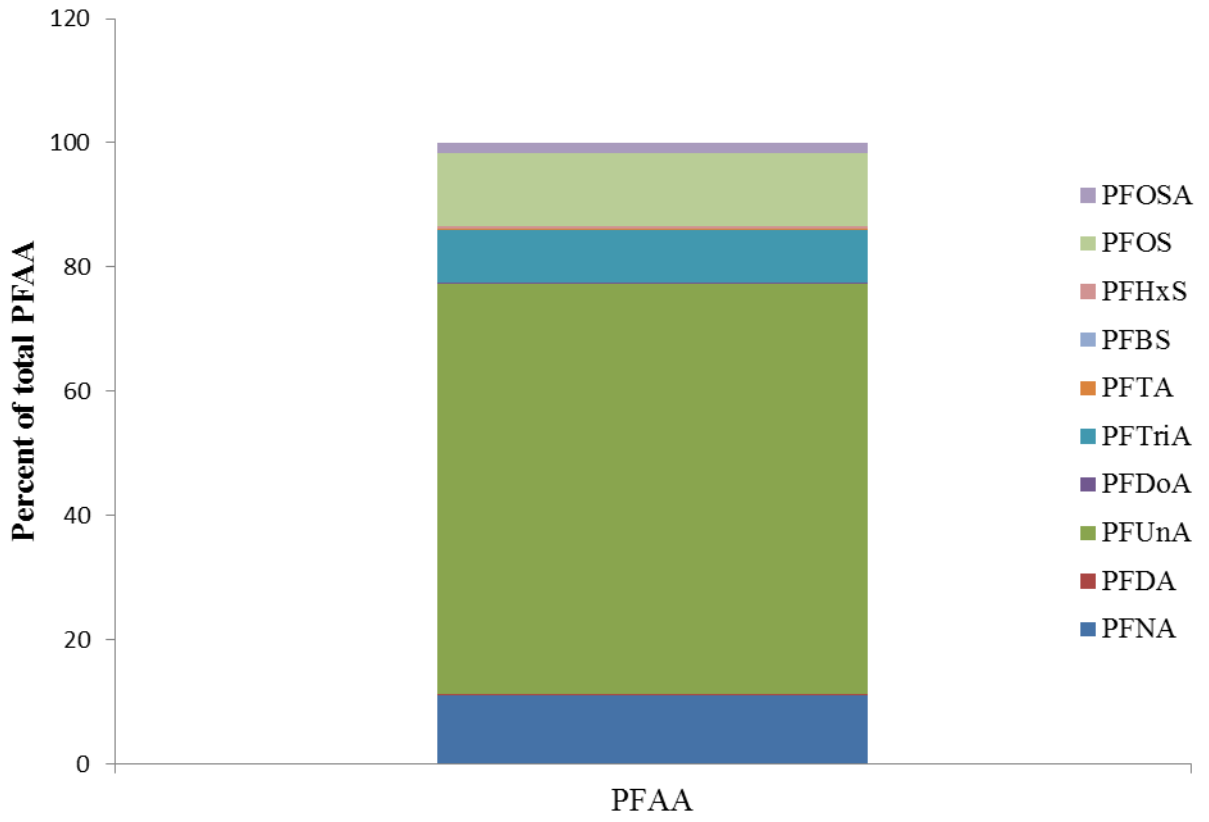


Figure S2. Percent makeup of PFAAs in northern fur seal samples.