

Supplemental figures and tables for:

Life history and social structure as drivers of persistent organic pollutant levels and stable isotopes in Hawaiian false killer whales (*Pseudorca crassidens*)

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Figure S1. Persistent organic pollutant (POP) concentrations (ng g^{-1} lipid wt.) sum DDTs and sum PCBs (A), sum CHLDs, mirex, and sum PBDEs (B), and dieldrin, HCB, and sum HCHs (C) measured in main Hawaiian Islands false killer whale mother offspring pairs (from left to right, pairs: HIPc120 (mother) / HIPc312 (offspring); HIPc212 (mother) / HIPc282 (offspring); second biopsy for latter pair; HIPc382 (mother) / HIPc230 (offspring)).

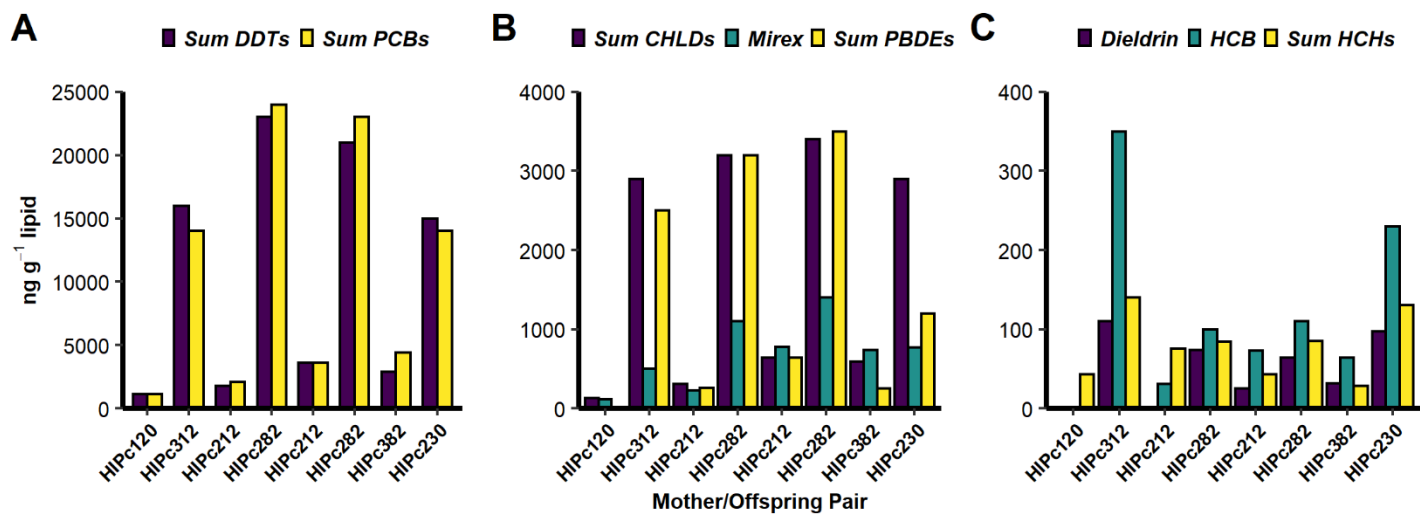


Figure S2. Composition of PCB (A, C) and PBDE (B,D) congeners by homolog group for false killer whale populations (A, B) and among age/sex/reproductive class groups within the main Hawaiian Islands (MHI) population (C, D). Deca-, nona-, and trichlorinated PCBs and tri- and heptabrominated PBDEs contributed less than 2% to total sums and therefore are not shown. For plots A, B: NWHI = Northwestern Hawaiian Islands; PEL = pelagic. For plots C, D: Ad. = Adult; Null. = Nulliparous; UK = Unknown reproductive status.

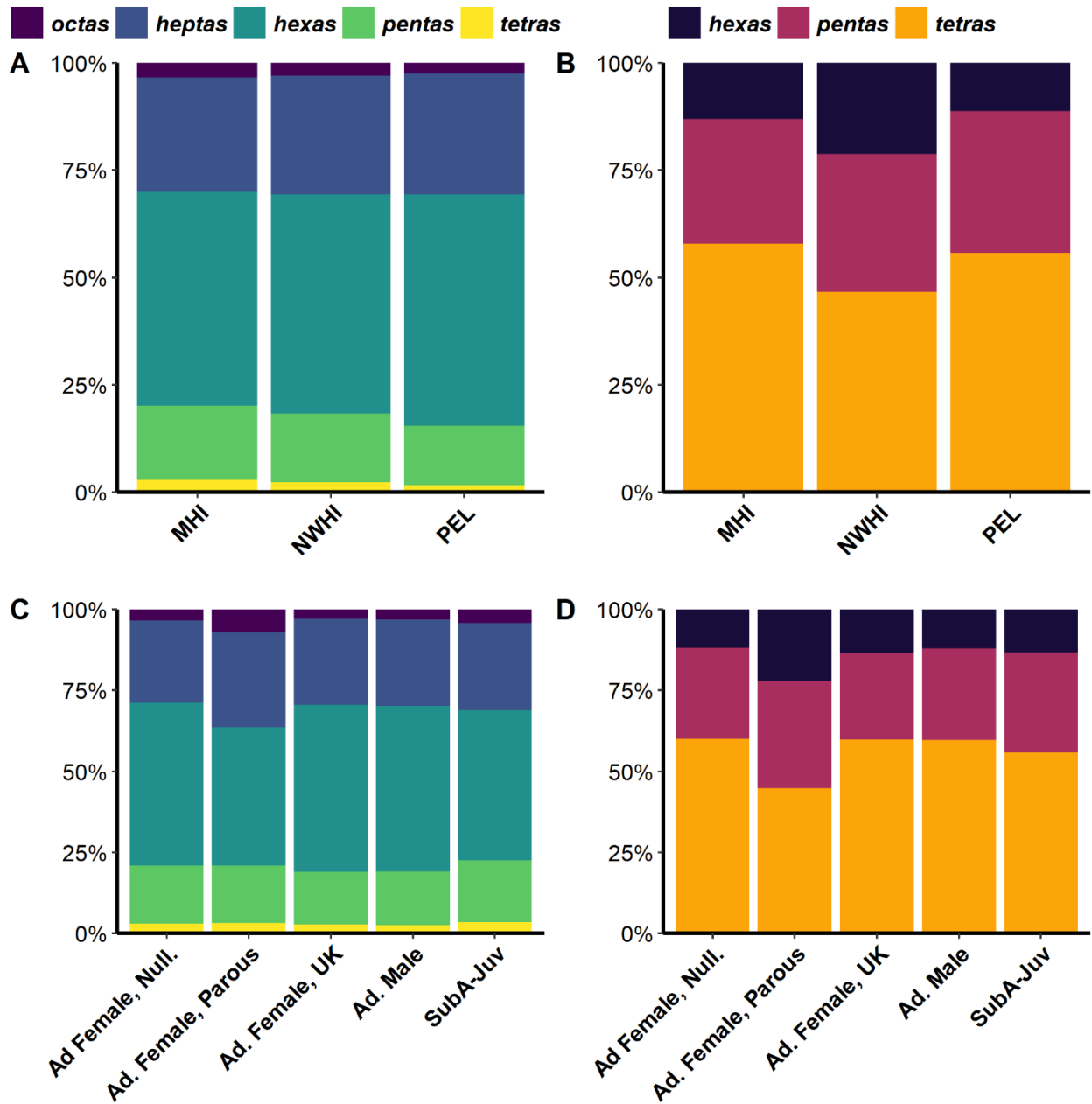


Figure S3. Mean relative contribution (%) of PCB congeners to the total sum of PCBs measured in false killer whale populations from Hawaiian waters. MHI = main Hawaiian Islands; NWHI = Northwestern Hawaiian Islands; PEL = pelagic population.

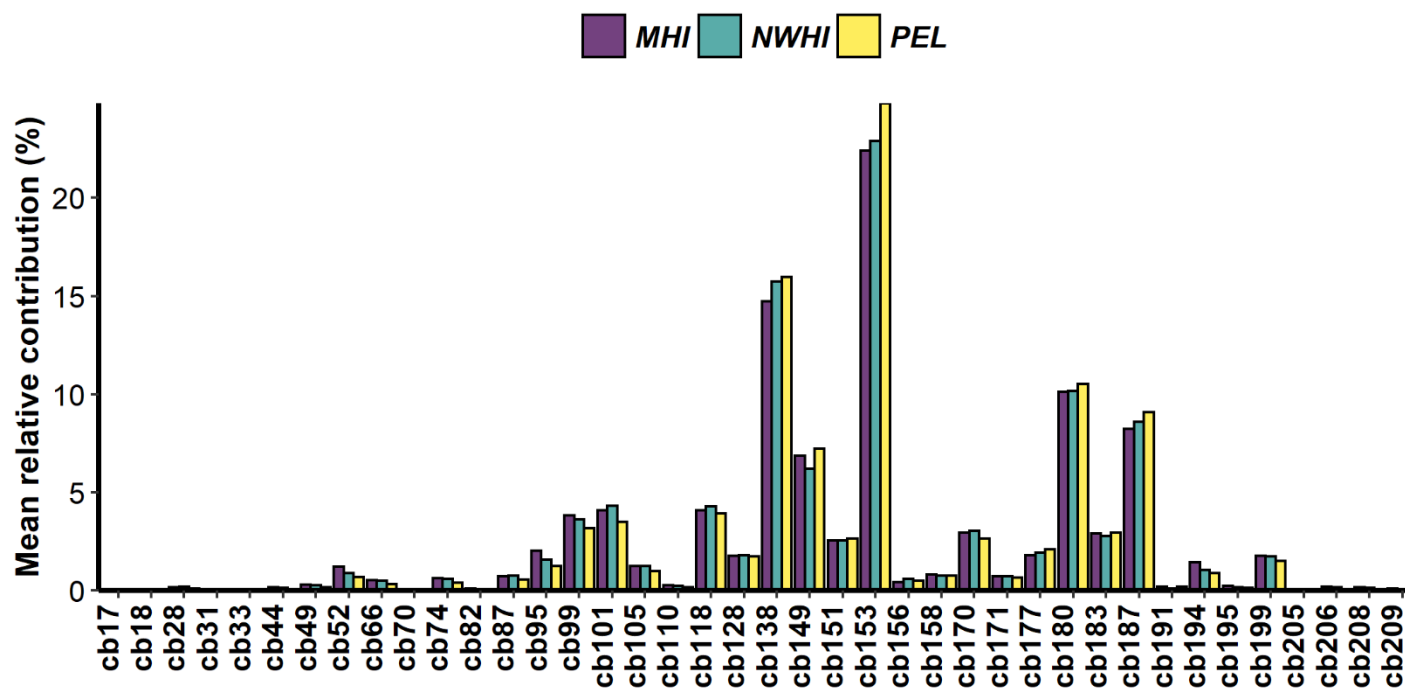


Figure S4. Mean relative contribution (%) of PBDE congeners to the total sum of PBDE measured in false killer whale populations from Hawaiian waters. MHI = main Hawaiian Islands; NWHI = Northwestern Hawaiian Islands; PEL = pelagic population.

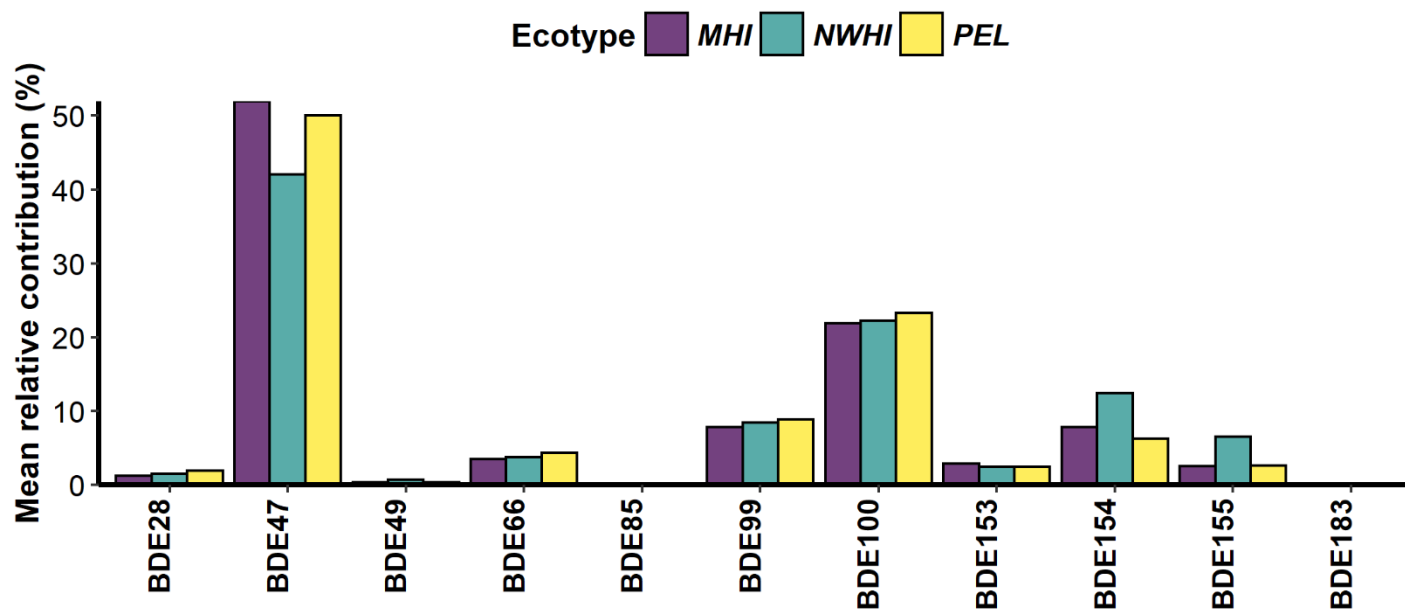


Table S1.

Percent lipid and persistent organic pollutant concentrations measured in blubber biopsies from all three Hawaiian false killer whale populations.

False killer whale population	ng g ⁻¹ (parts per billion)								
	% lipid	Sum HCHs ¹	Sum CHLDs ²	Sum PCBs ³	Sum DDTs ⁴	Sum PBDEs ⁵	dieldrin	HCB ⁶	mirex
MHI⁷ (n = 45)									
Mean ± SD (wet wt.)	21 ± 11	18 ± 15	900 ± 960	6,100 ± 7,900	8,900 ± 14,000	410 ± 440	18 ± 17	39 ± 37	240 ± 240
Concentration range	5.2 - 58	1.7 - 66	16 - 4,200	140 - 35,000	140 - 55,000	< LOQ - 1,900	< 1.8 - 56	< 3.3 - 150	13 - 1,000
Mean ± SD (lipid wt.)	—	90 ± 51	4,100 ± 3,000	27,000 ± 23,000	38,000 ± 41,000	1,800 ± 1,400	83 ± 57	180 ± 140	1,100 ± 700
Concentration range	—	18 - 230	130 - 13,000	1,000 - 110,000	1,100 - 180,000	< LOQ - 6,600	< LOQ - 220	< LOQ - 660	87 - 3,000
NWHI⁷ (n = 8)									
Mean ± SD (wet wt.)	19 ± 7.0	11 ± 3.5	460 ± 240	3,500 ± 2,300	3,200 ± 2,700	200 ± 74	8.1 ± 2.8	19 ± 6.5	200 ± 100
Concentration range	9.2 - 27	6.3 - 16	180 - 910	1,300 - 7,800	910 - 8,900	130 - 310	4.3 - 13	8.0 - 30	95 - 400
Mean ± SD (lipid wt.)	—	69 ± 44	2,900 ± 2,200	22,000 ± 19,000	20,000 ± 18,000	1,300 ± 900	52 ± 38	120 ± 88	1,200 ± 760
Concentration range	—	36 - 170	790 - 7,600	5,700 - 62,000	4,000 - 55,000	570 - 3,400	25 - 140	62 - 330	440 - 2,800
PEL⁷ (n = 3)									
Mean ± SD (wet wt.)	20 ± 6.2	17 ± 11	680 ± 630	5,900 ± 6,200	6,900 ± 7,900	350 ± 280	9.4 ± 7.5	21 ± 17	280 ± 210
Concentration range	13 - 25	7.8 - 30	250 - 1,400	1,600 - 13,000	1,800 - 16,000	92 - 650	3.8 - 18	10 - 41	83 - 500
Mean ± SD (lipid wt.)	—	85 ± 47	3,300 ± 2,700	28,000 ± 28,000	33,000 ± 36,000	1,600 ± 1,200	46 ± 32	110 ± 75	1,300 ± 860
Concentration range	—	55 - 140	1,600 - 6,500	12,000 - 60,000	11,000 - 74,000	710 - 3,000	26 - 83	47 - 190	640 - 2,300

¹ Sum HCHs = summed concentrations of alpha-, beta-, and gamma-hexachlorocyclohexane (HCH) isomers² Sum CHLDs = summed concentrations of *cis*-chlordane, *trans*-chlordane, heptachlor, heptachlor epoxide, *cis*-nonachlor, *trans*-nonachlor, nona-III-chlordane and oxychlordane³ Sum PCBs = summed concentrations of congeners 17, 18, 28, 31, 33, 44, 49, 52, 66, 70, 74, 82, 87, 95, 99, 101/90, 105, 110, 118, 128, 138/163/164, 149, 151, 153/132, 156, 158, 170, 171, 177, 180, 183, 187/159/182, 191, 194, 195, 199, 205, 206, 208 and 209⁴ Sum DDTs = summed concentrations of *o,p'*-DDD, *p,p'*-DDD, *o,p'*-DDE, *p,p'*-DDE, *o,p'*-DDT and *p,p'*-DDT⁵ Sum PBDEs = summed concentrations of congeners 28, 47, 49, 66, 85, 99, 100, 153, 154, 155 and 183⁶ HCB = hexachlorobenzene⁷ Population abbreviations: MHI = main Hawaiian Islands; NWHI = Northwest Hawaiian Islands; PEL = pelagic

< LOQ = less than the lower limit of quantitation

Table S2.

Linear mixed-effects model results for retained PCA factors 1-3 for persistent organic pollutant classes in main Hawaiian Islands (MHI) false killer whales ($n = 36$, restricted dataset). Covariates included age/sex class (adult male/female, sub-adult/juvenile) paired with reproductive status (nulliparous/parous) and social cluster assignment (1-4). Statistically significant covariates ($p < 0.05$) are bolded.

<i>Model</i>	<i>Factor 1</i>			<i>Factor 2</i>			<i>Factor 3</i>		
	Estimate	SE	<i>p</i>-value	Estimate	SE	<i>p</i>-value	Estimate	SE	<i>p</i>-value
Intercept	-0.17	0.31	0.601	-0.38	0.40	0.348	0.75	0.39	0.065
<i>Age/sex class, relative to nulliparous adult females</i>									
Adult female, parous	-0.83	0.40	0.048	-0.56	0.51	0.283	-1.25	0.50	0.019
Adult male	0.92	0.32	0.008	0.20	0.41	0.627	-1.02	0.40	0.018
Sub-adult/juvenile	-0.44	0.36	0.236	0.74	0.46	0.122	0.18	0.45	0.686
<i>Social cluster, relative to cluster 1</i>									
Cluster 2	-0.01	0.31	0.973	0.24	0.40	0.553	-0.87	0.39	0.033
Cluster 3	0.94	0.41	0.030	0.65	0.53	0.228	-0.05	0.51	0.923
Cluster 4	0.13	0.35	0.711	0.91	0.45	0.052	-0.27	0.44	0.540

Table S3.

Summary of stable isotope $\delta^{13}\text{C}$ and $\delta^{15}\text{N}$ values from main Hawaiian Islands (MHI) Cluster 1 false killer whales by age/sex class.

Adult female (n = 11)

Mean \pm SD	-16.0 \pm 0.08	12.3 \pm 0.21
Range of ratios	-16.4 – -15.5	11.1 – 13.1

Adult male (n = 7)

Mean \pm SD	-15.9 \pm 0.10	12.1 \pm 0.18
Range of ratios	-16.5 – -15.6	11.6 – 12.7

Subadult female (n = 2)

Mean \pm SD	-15.7 \pm 0.05	12.3 \pm 0.30
Range of ratios	-15.8 – -15.6	12.0 – 12.6

Subadult male (n = 1)

Mean	-15.7	11.8
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All Cluster 1 individuals (n = 21)

Mean \pm SD	-15.9 \pm 0.27	12.2 \pm 0.59
Range of ratios	-16.5 – -15.5	11.1 – 13.1

All MHI individuals (n = 52)

Mean \pm SD	-16.0 \pm 0.28	12.2 \pm 0.48
Range of ratios	-16.6 – -15.4	11.1 – 13.1
