

Table 1. Number of nest boxes erected each year in Anchorage, Eagle River, and the Mat-Su Valley for study of Black-capped Chickadees, Boreal Chickadees, and Red-breasted Nuthatches in south-central Alaska.

Year	Anchorage	Eagle River/Mat-Su Valley	Total
<2000	9	0	9
2000	248	45	293
2001	11	162	173
2002	3	0	3
2003	16	0	16
2004	2	0	2
Total	289	207	496

Table 2. Source of sunflower seeds submitted for contaminants screening. The most commonly used retail outlets supplying bird seed were selected from various areas in Anchorage and the Mat-Su Valley. All six residences sampled had large numbers of chickadees coming to feeders regularly during winter. The first four had each reported several chickadees with deformed beaks; the latter two had not observed any deformities before testing began.

Source	Location	Supplier	Year purchased
Retail			
Alaska Mill & Feed	Anchorage	Bulk supply, unknown	2000
Walmart	Anchorage	Penn Pak, Inc., GA	2000
Walmart	Wasilla	Penn Pak, Inc., GA	2000
Fred Meyer	Anchorage	F. M., Inc., OR	2000
Fred Meyer	Wasilla	F. M., Inc., OR	2000
Valley Feed & Seed	Eagle River	Animal Supply Co., WA	2000
Valley Feed & Seed	Wasilla	Animal Supply Co., WA	2000
Animal Food Warehouse	Wasilla	Animal Supply Co., WA	2000
Eagle Hardware	Anchorage	Kaytee Products, Inc., WI	2000
H&C Farm & Garden	Palmer	Bemis Co., WA	2000
Budget Feed & Farm	Palmer	Seawest	2000
Budget Feed & Farm	Palmer	Bulk supply, unknown	2000
Residential			
Animal Food Warehouse	Trapper Creek	Unknown	1999
Alaska Mill & Feed	Anchorage	Unknown	1997–98
Alaska Mill & Feed	Wasilla	Unknown	1999
Alaska Mill & Feed	Anchorage	Unknown	1999
Valley Feed & Seed	Eagle River	Unknown	1997
Alaska Mill & Feed	Anchorage	Unknown	1997

Table 3. List of organochlorine (OC) pesticides, polychlorinated biphenyls (PCBs), organophosphate (OP) pesticides, carbamates, and elements for which 18 samples of sunflower seeds were screened.

OC pesticides	PCBs	OP pesticides	Carbamates	Elements
<i>o,p'</i> -DDD	Aroclor 1242	acephate	aldicarb	aluminum
<i>o,p'</i> -DDE	Aroclor 1248	azinphos-methyl	carbaryl	arsenic
<i>o,p'</i> -DDT	Aroclor 1254	chlorpyrifos	carbofuran	barium
<i>p,p'</i> -DDD	Aroclor 1260	coumaphos	methiocarb	beryllium
<i>p,p'</i> -DDE	Total PCBs	demeton	methonol	boron
<i>p,p'</i> -DDT		diazinon	oxamyl	cadmium
HCB		dichlorvos		chromium
α -HCH		dichrotophos		copper
γ -HCH (Lindane)		dimethoate		iron
dieldrin		disulfoton		lead
endrin		EPN		magnesium
heptachlor epoxide		ethoprop		manganese
α -chlordane		famphur		mercury
γ -chlordane		fensulfothion		molybdenum
oxychlordane		fenthion		nickel
<i>trans</i> -nonachlor		malathion		selenium
toxaphene		methamidophos		strontium
mirex		methyl parathion		vanadium
		mevinphos		zinc
		monocrotophos		
		parathion		
		phorate		
		terbufos		
		trichlorfon		

Table 4. Number of reports received of Black-capped Chickadees with beak deformities observed at different locations in North America between November 1991 and May 2005. The minimum number of individuals excludes known or probable replicate sightings of individual birds during multiple years at the same locations.

Location	Number of reports	Minimum number of individuals
Alaska	2,153	1,441
Other states	17	13
Canada	4	4
Total	2,174	1,458

Table 5. Estimated minimum number of individual birds by species reported with beak deformities from Alaska between 1979 and 2005. These exclude probable resightings of the same individual birds, based on locations of the birds and descriptions of the deformities.

Species	Scientific name	Years reported	Number of individuals
Cackling Goose	<i>Branta hutchinsii</i>	1991	2
Pelagic Cormorant	<i>Phalacrocorax pelagicus</i>	2001–2003	3
Bald Eagle	<i>Haliaeetus leucocephalus</i>	2000	1
Peregrine Falcon	<i>Falco peregrinus</i>	2000	1
Downy Woodpecker	<i>Picoides pubescens</i>	1979–2005	24
Hairy Woodpecker	<i>Picoides villosus</i>	1999–2003	9
Gray Jay	<i>Perisoreus canadensis</i>	2000–2001	2
Steller's Jay	<i>Cyanocitta stelleri</i>	1997–2004	24
Black-billed Magpie	<i>Pica hudsonia</i>	1997–2005	35
Northwestern Crow	<i>Corvus caurinus</i>	1979–2005	44
Common Raven	<i>Corvus corax</i>	1992–2004	3
Black-capped Chickadee	<i>Poecile atricapillus</i>	1991–2005	1,441
Chestnut-backed Chickadee	<i>Poecile rufescens</i>	Unknown	1
Boreal Chickadee	<i>Poecile hudsonica</i>	1994–2002	5
Red-breasted Nuthatch	<i>Sitta canadensis</i>	1998–2005	29
Ruby-crowned Kinglet	<i>Regulus calendula</i>	1999	2
American Robin	<i>Turdus migratorius</i>	1999–2000	2
Varied Thrush	<i>Ixoreus naevius</i>	2001	1
Orange-crowned Warbler	<i>Vermivora celata</i>	2002–2004	2
Yellow-rumped Warbler	<i>Dendroica coronata</i>	1998–2004	2
American Tree Sparrow	<i>Spizella arborea</i>	2002	1
Savannah Sparrow	<i>Passerculus sandwichensis</i>	1999	1
Lincoln's Sparrow	<i>Melospiza lincolni</i>	2002	1
Dark-eyed Junco	<i>Junco hyemalis</i>	2002	1
Pine Grosbeak	<i>Pinicola enucleator</i>	1999–2002	4
White-winged Crossbill	<i>Loxia leucoptera</i>	2002	1
Common Redpoll	<i>Carduelis flammea</i>	1999–2002	5
Pine Siskin	<i>Carduelis pinus</i>	1999–2002	3

Table 6. Beak measurements of normal and deformed Black-capped and Boreal chickadees and Red-breasted Nuthatches captured in the Anchorage and Mat-Su Valley region, Alaska, 1998–2005. For individuals recaptured multiple times during study, only those from first capture were included in calculations. Birds captured as both normal and deformed were included once each time.

Species	Measurement ^a	Sex	Normal					Deformed				
			N	Mean	SE	Min	Max	N	Mean	SE	Min	Max
Black-capped Chickadee	Nares to tip	M	827	7.29	0.01	6.0	8.4	81	11.56	0.55	5.9	31.6
		F	897	7.15	0.01	6.1	8.4	97	12.46	0.61	7.3	40.3
	Culmen	M	420	9.75	0.03	7.2	11.4	61	14.69	0.68	7.6	34.0
		F	419	9.57	0.02	8.0	11.1	66	14.90	0.66	9.8	34.4
	Gonys	M	10	6.62	0.15	6.1	7.3	60	9.60	0.53	6.1	28.3
		F	14	6.52	0.13	5.8	7.4	76	9.64	0.50	5.7	28.4
Boreal Chickadee	Nares to tip	M	84	7.48	0.03	6.9	8.2					
		F	60	7.40	0.04	6.8	8.2					
	Culmen	M	44	9.93	0.08	8.5	10.9					
		F	27	10.09	0.07	9.5	10.7					
Red-breasted Nuthatch	Nares to tip	M	90	10.74	0.06	9.5	12.4					
		F	79	10.51	0.06	9.2	12.0	2	15.21	3.10	12.1	18.3
	Culmen	M	46	14.46	0.12	13.2	16.2					
		F	34	13.96	0.15	11.7	15.4					
	Gonys	M										
		F						2	15.24	2.96	12.3	18.2

^a Nares to tip = chord measurement from distal end of nare to tip of maxilla; exposed culmen = chord measurement from base of foremost feathers on forehead to tip of maxilla; gonys = chord measurement between distal end of notch along centerline of lower mandible to tip of mandible.

Table 7. Number of occupied nest boxes monitored each year by species and location^a in south-central Alaska from 2000–2004.

Year	Black-capped Chickadee			Boreal Chickadee			Unidentified chickadee			Red-breasted Nuthatch		
	NW	S	ER/MS	NW	S	ER/MS	NW	S	ER/MS	NW	S	ER/MS
2000	30	19	0	4	12	0	0	0	0	7	8	1
2001	28	24	33	4	10	1	0	0	1	5	5	0
2002	35	29	7	1	9	0	1	0	0	5	6	0
2003	26	33	6	2	5	0	0	4	3	6	3	0
2004	10	26	0	2	6	0	0	1	0	2	1	0
Total	128	131	46	13	42	1	1	5	4	25	23	1

^aNW=North and West Anchorage; S=South Anchorage; ER/MS=Eagle River and Mat-Su Valley.

Table 8. Number of nest boxes in south-central Alaska that were occupied by chickadees with deformed beaks, 2000–2004. No deformed Red-breasted Nuthatches nested in any of the boxes.

Extent of deformity	Black-capped Chickadee		Boreal Chickadee
	Male	Female	Female
Severe	4	9 ^a	0
Moderate	8 ^a	13	0
Possible incipient	5	16	2
Total	17	38	2

^aIn one pair the male had a moderate beak deformity and the female was severely deformed.

Table 9. Comparison of clutch and brood sizes of Black-capped Chickadees relative to presence or absence of beak deformity in parents in south-central Alaska, 2000–2004.

Parameter/Parental status	<i>n</i>	Mean \pm SE	Minimum	Maximum
Clutch size				
Normal parents	216	7.83 \pm 0.08	2	11
Deformed female	30	8.13 \pm 0.18	6	10
Deformed male	15	8.47 \pm 0.27	7	11
Brood size at hatch				
Normal parents	220	7.15 \pm 0.12	1	10
Deformed female	14	6.14 \pm 0.51	2	10
Deformed male	10	7.00 \pm 0.42	5	9
Brood size at 12 days old				
Normal parents	207	6.74 \pm 0.13	2	10
Deformed female	13	5.85 \pm 0.58	2	10
Deformed male	8	6.13 \pm 0.35	5	8

Table 10. Model selection for clutch size ($n = 260$) of Black-capped Chickadee nests from 2000–2004 in south-central Alaska. Models with the lowest ΔAIC and the greatest Akaike weights (w_i) have the most support. K is the number of parameters in each model, including the intercept and explanatory variables. Areas include NW and S Anchorage and Eagle River/Mat-Su Valley. Deformity indicates adult male (M) or female (F) with beak deformity. Date is clutch initiation date.

Model	K	ΔAIC	w_i
Deformity_M+date+year	5	0.00	0.709
Deformity_M+deformity_F+date+year	8	4.37	0.080
Deformity_M+date	3	5.19	0.053
Deformity_M+deformity_F+date	4	5.56	0.044
Date+year	6	7.24	0.019
Deformity_M+date+year+area	9	7.58	0.016
Date	2	7.76	0.015
Deformity_F+ date+ year	7	7.98	0.013
Deformity_M+deformity_F+date+year+area	10	8.02	0.013
Deformity_M+date+area	5	8.43	0.010
Deformity_F+date	3	8.51	0.010
Deformity_M+deformity_F+date+area	6	8.94	0.008
Date+year+area	8	10.71	0.003
Date+area	4	11.06	0.003
Deformity_F+date+year+area	9	11.53	0.002
Deformity_F+date+area	5	11.91	0.002

Table 11. Model selection for hatching and fledging success of Black-capped Chickadee nests from 2000–2004 in south-central Alaska. Models with the lowest ΔAIC and the greatest Akaike weights (w_i) have the most support. K is the number of parameters in each model, including the intercept and explanatory variables; n = total number of nests monitored. Areas include NW and S Anchorage and Eagle River/Mat-Su Valley. Deformity indicates adult female (F) or male (M) with beak deformity. Date is nest initiation date.

Hatching success ($n = 262$) ^a				Fledging success ($n = 249$) ^b			
Model	K	ΔAIC	w_i	Model	K	ΔAIC	w_i
Deformity_F	2	0.00	0.199	Constant	1	0.00	0.286
Deformity_F+area	4	0.51	0.154	Deformity_F	2	0.97	0.176
Deformity_F+date	3	1.02	0.119	Date	2	1.52	0.134
Deformity_F+date+year	7	1.53	0.092	Deformity_M	2	1.85	0.113
Deformity_F+date+area	5	1.94	0.075	Deformity_F+date	3	2.62	0.077
Constant	1	2.03	0.072	Deformity_F+deformity_M	3	2.77	0.072
Date	2	2.46	0.058	Deformity_M+date	3	3.38	0.053
Area	3	2.87	0.047	Deformity_F+deformity_M+date	4	4.43	0.031
Deformity_F+ date+area+year	9	3.23	0.040	Year	5	5.87	0.015
Deformity_F+year	6	3.58	0.033	Date+year	6	6.64	0.010
Date+year	6	3.65	0.032	Deformity_F+year	6	6.79	0.010
Date+area	4	3.70	0.031	Deformity_F+date+year	7	7.68	0.006
Deformity_F+area+year	8	4.83	0.018	Deformity_M+year	6	7.77	0.006
Date+area+year	8	5.17	0.015	Deformity_M+date+year	7	8.51	0.004
Year	5	6.16	0.009	Deformity_F+deformity_M+year	7	8.64	0.004
Area+year	7	7.39	0.005	Deformity_F+deformity_M+date+year	8	9.50	0.002

^aUnable to model effects of male deformity because no failures occurred during incubation for deformed males.

^bUnable to model effects of area because no failures occurred in the Mat-Su/Eagle River area during nestling period.

Table 12. Model selection for brood size at hatch and brood size at 12 days old for Black-capped Chickadee nests from 2000–2004 in south-central Alaska. All models for brood size at hatch also include clutch size as a controlling variable; models for brood size at 12 days old control for brood size at hatch. Models with the lowest ΔAIC and the greatest Akaike weights (w_i) have the most support. K is the number of parameters in each model, including the intercept and explanatory variables; n = total number of nests monitored. Area could not be modeled because no broods were lost in Mat-Su Valley/Eagle River. Deformity indicates adult male (M) or female (F) with beak deformity. Date is clutch initiation date.

Brood size at hatch ($n = 244$)				Brood size at 12 days old ($n = 227$)			
Model	K	ΔAIC	w_i	Model	K	ΔAIC	w_i
Deformity_F	3	0.00	0.408	Deformity_M+year	7	0.00	0.327
Deformity_F+deformity_M	4	1.43	0.200	Year	6	1.14	0.185
Deformity_F+date	4	1.53	0.190	Deformity_M+deformity_F+year	8	1.87	0.129
Deformity_F+deformity_M+date	5	2.92	0.095	Deformity_M+date+year	8	2.00	0.120
Deformity_F+year	7	4.86	0.036	Deformity_F+year	7	2.95	0.075
Deformity_F+deformity_M+year	8	6.15	0.019	Date+year	7	3.13	0.068
Constant	2	6.59	0.015	Deformity_M+deformity_F+date+year	9	3.86	0.048
Deformity_F+ date+ year	8	6.82	0.013	Deformity_F+date+year	8	4.95	0.028
Deformity_F+deformity_M+date+year	9	8.11	0.007	Deformity_M+date	4	7.71	0.007
Deformity_M	3	8.24	0.007	Deformity_M	3	8.96	0.004
Date	3	8.45	0.006	Date	3	9.20	0.003
Deformity_M+date	4	10.09	0.003	Deformity_M+deformity_F+date	5	9.65	0.003
Year	6	12.25	0.001	Constant	2	10.70	0.002
Deformity_M+year	7	13.80	0.000	Deformity_M+deformity_F	4	10.81	0.001
Date+year	7	14.01	0.000	Deformity_F+date	4	11.09	0.001
Deformity_M+date+year	8	15.56	0.000	Deformity_F	3	12.47	0.001

Table 13. Levels of enzyme activity and concentrations of nutrients, metabolites, and electrolytes in blood serum from adult Black-capped Chickadees with deformed and normal beaks during winter 1999.

Parameter ^a	Units	Deformed beaks					Normal beaks				
		Median	IQR ^b	Minimum	Maximum	<i>n</i>	Median	IQR ^b	Minimum	Maximum	<i>n</i>
ALT	U/L	95.00	98.75	40.00	315.00	6	59.50	302.75	4.00	555.00	6
AP	U/L	55.00	34.00	3.00	100.00	7	75.00	110.75	3.00	245.00	6
AST	U/L	563.00	510.00	285.00	1235.00	7	624.00	460.00	435.00	2295.00	7
ALT	U/L	95.00	98.75	40.00	315.00	6	59.50	302.75	4.00	555.00	6
CK	U/L	3030.00	2665.00	840.00	5385.00	7	2635.00	2675.00	1290.00	20490.00	7
GGT	U/L	4.00	13.25	3.00	20.00	6	3.00	1.00	3.00	5.00	5
LDH	U/L	1957.50	576.25	940.00	2690.00	6	1752.50	890.00	800.00	2320.00	6
Calcium	mg/dL	5.90	3.00	2.70	7.60	7	6.90	2.00	4.70	7.70	5
Cholesterol	mg/dL	201.00	150.00	1.50	295.00	7	214.00	70.00	75.00	2085.00	7
Glucose	mg/dL	490.00	370.00	45.00	630.00	7	425.00	95.00	295.00	775.00	7
Phosphorus	mg/dL	4.25	—	3.60	4.90	2	4.85	8.28	4.10	15.10	4
Total protein	g/dL	3.20	1.60	2.00	3.90	7	2.60	1.48	1.00	5.00	10
Uric Acid	mg/dL	8.00	6.60	4.50	13.80	7	17.75	24.78	11.90	42.60	6
Chloride	mmol/L	118.50	—	116.00	121.00	2	122.00	—	122.00	122.00	2
Potassium	mmol/L	11.05	—	10.50	11.60	2	9.55	—	8.80	10.30	2
Sodium	mmol/L	155.50	—	153.00	158.00	2	158.50	—	157.00	160.00	2
Bicarbonate	mmol/L	43.00	—	42.00	44.00	2	37.00	—	37.00	37.00	1
Anion Gap	mmol/L	5.50	—	5.00	6.00	2	10.00	—	10.00	10.00	1

^a ALT=alanine aminotransferase; AP=alkaline phosphatase; AST=aspartate aminotransferase; CK=creatinine kinase; GGT=gamma glutamyl transferase; LDH=lactate dehydrogenase.

^b Interquartile range.

Table 14. Percentages of different protein fractions, determined from electrophoresis, in blood serum of adult Black-capped Chickadees with deformed and normal beaks during winter 1999.

Protein fraction	Deformed beaks				Normal beaks			
	Median	Minimum	Maximum	<i>n</i>	Median	Minimum	Maximum	<i>n</i>
Prealbumin	28.98	27.23	34.13	4	33.94	19.81	34.37	3
Albumin	36.20	30.34	38.54	4	36.06	23.06	41.87	3
α 1-globulin	5.65	4.84	7.75	4	5.14	4.64	5.54	3
α 2-globulin	4.73	3.07	6.21	4	4.02	3.96	4.10	3
β -globulin	10.91	5.15	13.95	4	6.32	4.10	19.35	3
γ -globulin	13.70	10.26	18.23	4	13.62	11.05	28.53	3

Table 15. Maximum concentrations ($\mu\text{g/g}$ wet weight) of organochlorine (OC) pesticides and polychlorinated biphenyls (PCBs) found in samples of sunflower seeds ($n=18$) collected from different sources in the Anchorage and Mat-Su Valley region, Alaska, 1997–2000. The minimum detection limit (DL) for a given analyte varied among samples, so the highest DL is listed, along with the number of samples with any detectable concentrations.

Compound	# above sample DL	Highest sample DL	Maximum concentration
OC pesticides			
<i>o,p'</i> -DDD	0	0.000103	
<i>o,p'</i> -DDE	0	0.000312	
<i>o,p'</i> -DDT	1	0.000200	0.000268
<i>p,p'</i> -DDD	0	0.000108	
<i>p,p'</i> -DDE	1	0.000291	0.000106
<i>p,p'</i> -DDT	2	0.000238	0.000296
HCB	7	0.000202	0.000129
α -HCH	1	0.000852	0.002360
γ -HCH (Lindane)	3	0.000923	0.006840
Dieldrin	0	0.000161	
Endrin	0	0.000242	
Heptachlor epoxide	0	0.000115	
α -Chlordane	0	0.000150	
γ -Chlordane	0	0.000134	
Oxychlordane	0	0.002020	
<i>Trans</i> -Nonachlor	0	0.000129	
Toxaphene	0	0.024700	
Mirex	0	0.000126	
PCBs			
Aroclor 1242	3	0.002790	0.004330
Aroclor 1248	0	0.002790	
Aroclor 1254	0	0.003590	
Aroclor 1260	0	0.002030	
Total PCBs	3	0.000129	0.004330

Table 16. Concentrations ($\mu\text{g/g}$ dry weight) of metals and trace elements in samples of sunflower seeds ($n = 18$) collected from different sources in the Anchorage and Mat-Su Valley region, Alaska, 1997–2000. Frequency of detection is indicated by the number of samples above the detection limit (DL), which varied among samples.

Analyte	# above DL	Median concentration	IQR ^a	Minimum concentration	Maximum concentration
Aluminum	16	7.975	4.220	<4.970 ^b	67.400
Arsenic	18	0.059	0.005	0.053	0.098
Barium	18	3.290	2.780	1.880	10.300
Beryllium	18	0.101	0.003	0.095	0.106
Boron	18	14.950	3.000	12.100	18.800
Cadmium	18	0.433	0.127	0.308	0.878
Chromium	18	7.280	3.300	4.160	16.800
Copper	18	16.050	1.500	12.000	20.600
Iron	18	76.850	23.000	62.200	118.000
Lead	4	<0.021 ^b	—	<0.021 ^b	0.084
Magnesium	18	3274.000	474.000	2869.000	3626.000
Manganese	18	20.400	5.000	15.200	27.300
Mercury	0	<0.021 ^b	—	<0.021 ^b	<0.021 ^b
Molybdenum	18	0.741	0.184	0.578	1.090
Nickel	18	5.740	1.980	3.830	8.880
Selenium	18	1.135	0.360	0.708	3.910
Strontium	18	7.370	9.270	3.610	29.100
Vanadium	18	1.130	0.130	0.946	1.270
Zinc	18	48.550	8.300	35.800	58.200

^aInterquartile range.

^bMaximum DL among samples in which analyte was not detected.

Table 17. Concentrations ($\mu\text{g/g}$ dry weight) of metals, trace elements, and methyl mercury in livers of adult Black-capped Chickadees from the Anchorage and Mat-Su Valley region, Alaska, in 1999. Frequency of detection is indicated by the number of samples above the detection limit (DL), which varied among samples for a given compound.

Analyte	<i>n</i>	# above DL	Concentration		
			Median	Minimum ^a	Maximum
Aluminum	20	0	–	<4.9800–19.8413	
Arsenic	20	13	0.0218	<0.0180–0.0397	0.0496
Barium	20	0	–	<0.4980–1.9841	
Beryllium	20	0	–	<0.0996–0.3968	
Boron	20	0	–	<0.4980–1.9841	
Cadmium	20	20	0.8290	0.1160	1.6300
Chromium	20	0	–	<1.3944–5.5556	
Copper	20	20	21.9500	18.9000	34.3000
Iron	20	20	1696.5000	488.0000	3007.0000
Lead	20	18	0.2445	<0.0116–0.4255	0.6110
Magnesium	20	20	815.5000	661.0000	909.0000
Manganese	20	20	5.7500	4.0500	9.3700
Mercury	20	17	0.0411	<0.0100–0.0314	0.1500
Molybdenum	20	15	3.2748	<2.5180–5.5556	5.5556
Nickel	20	1	–	<1.3944–5.5556	
Selenium	20	20	4.2350	2.3600	6.6600
Strontium	20	0	–	<0.5858–2.2222	
Vanadium	20	0	–	<0.4980–1.9841	
Zinc	20	20	80.0000	67.1000	108.0000
Methyl mercury	9	3	–	<0.0200–0.0444	0.0652

^aMinimum concentration for analytes that were detected in all samples; range of DLs for analytes that were not detected in some or any of the samples.

Table 18. Concentrations ($\mu\text{g/g}$ dry weight) of metals and trace elements in livers of nestling Black-capped Chickadees from the Anchorage and Mat-Su Valley region, Alaska, from 1999–2001. Frequency of detection is indicated by the number of samples above the detection limit (DL), which varied among samples for a given compound.

Analyte	<i>n</i>	# above DL	Concentration		
			Median	Minimum ^a	Maximum
Aluminum	30	0	–	<20.8000–46.6000	
Arsenic	49	32	0.1320	<0.1030–0.2220	1.2300
Barium	49	15	0.3678 ^b	<0.1030–4.6600	1.8400
Beryllium	49	0	–	<0.0261–0.9310	
Boron	30	3	–	<8.3100–14.7000	219.0000
Cadmium	49	45	0.0986	<0.0469–0.1090	0.3180
Chromium	49	15	0.4029 ^b	<0.2060–4.6600	0.6930
Copper	30	30	21.7000	12.0000	59.8000
Iron	30	30	1456.0000	673.0000	2574.0000
Lead	49	16	0.0199 ^b	<0.0415–0.1110	1.1300
Magnesium	30	30	899.5000	700.0000	1136.0000
Manganese	49	49	6.2800	3.7600	11.2000
Mercury	49	7	0.0338 ^b	<0.0435–0.1860	0.4830
Molybdenum	49	20	1.4422 ^b	<2.0800–4.6600	3.1600
Nickel	49	7	0.1551 ^b	<0.2060–4.6600	3.2400
Selenium	49	48	1.1100	<0.2670	6.4900
Strontium	30	4	–	<0.8310–1.8600	1.6700
Vanadium	49	0	–	<0.0435–4.6600	
Zinc	30	30	95.4500	69.7000	119.0000

^aMinimum concentration for analytes that were detected in all samples; range of DLs for analytes that were not detected in some or any of the samples.

^bMedian estimated through robust regression on order statistics (Helsel 2005:68ff).

Table 19. Concentrations ($\mu\text{g/g}$ wet weight) of organochlorine (OC) pesticides in samples of adult Black-capped Chickadees from the Anchorage and Mat-Su Valley region, Alaska, from 1999–2002. Frequency of detection is indicated by the number of samples above the detection limit (DL), which varied among samples for a given compound.

Compound	<i>n</i>	# above DL	Concentration		
			Median	Minimum ^a	Maximum
OC pesticides					
<i>o,p'</i> -DDD	35	0	–	<0.00007–0.00057	
<i>o,p'</i> -DDE	35	0	–	<0.00017–0.00057	
<i>o,p'</i> -DDT	35	0	–	<0.00028–0.00057	
<i>p,p'</i> -DDD	35	8	0.00020 ^b	<0.00014–0.00057	0.00048
<i>p,p'</i> -DDE	35	35	0.00542	0.00121	0.04700
<i>p,p'</i> -DDT	35	10	0.00023 ^b	<0.00018–0.00057	0.00070
HCB	35	35	0.00198	0.00063	0.00720
1,2,3,4-TeCB	16	6	0.00320 ^b	<0.00049–0.00057	0.00125
1,2,4,5-TeCB	16	16	0.00538	0.00121	0.02241
α -HCH	35	0	–	<0.00046–0.00230	
β -HCH	16	1	–	<0.00046–0.00057	0.00091
γ -HCH (Lindane)	35	2	–	<0.00046–0.00210	0.00600
δ -HCH	16	0	–	<0.00046–0.00057	
Aldrin	16	0	–	<0.00046–0.00057	
Dieldrin	35	20	0.00028 ^b	<0.00046–0.00057	0.01800
Endrin	35	1	–	<0.00007–0.00057	0.00065
Endosulfan-II	16	0	–	<0.00046–0.00057	
Heptachlor epoxide	35	24	0.00040 ^b	<0.00051–0.00056	0.01100
Heptachlor	16	0	–	<0.00046–0.00057	
Pentachlor	16	1	–	<0.00046–0.00056	0.00328
α -Chlordane	35	0	–	<0.00026–0.00057	
γ -Chlordane	35	0	–	<0.00016–0.00057	
Oxychlordane	35	1	–	<0.00046–0.00360	0.00430
<i>Cis</i> -nonachlor	16	0	–	<0.00046–0.00057	
<i>Trans</i> -nonachlor	35	24	0.00061 ^b	<0.00051–0.00057	0.00350
Toxaphene	35	0	–	<0.00455–0.03400	
Mirex	35	16	0.00026 ^b	<0.00015–0.00057	0.00052

^aMinimum concentration for compounds that were detected in all samples; range of DLs for compounds that were not detected in some of the samples.

^bMedian estimated through robust regression on order statistics (Helsel 2005:68ff).

Table 20. Concentrations ($\mu\text{g/g}$ wet weight) of organochlorine (OC) pesticides and polychlorinated biphenyl (PCB) mixtures in samples of Black-capped Chickadee nestlings from the Anchorage and Mat-Su Valley region, Alaska, from 2000–2001. Frequency of detection is indicated by the number of samples above the detection limit (DL), which varied among samples for a given compound.

Compound	<i>n</i>	# above DL	Concentration		
			Median	Minimum ^a	Maximum
OC pesticides					
<i>o,p'</i> -DDD	49	0	–	<0.00008–0.00053	
<i>o,p'</i> -DDE	49	0	–	<0.00005–0.00040	
<i>o,p'</i> -DDT	49	1	–	<0.00011–0.00073	0.00096
<i>p,p'</i> -DDD	49	15	0.00010 ^b	<0.00010–0.00053	0.00092
<i>p,p'</i> -DDE	49	49	0.00308	0.00039	0.07640
<i>p,p'</i> -DDT	49	21	0.00019 ^b	<0.00013–0.00088	0.00188
HCB	49	49	0.00071	0.00052	0.00117
α -HCH	49	0	–	<0.00028–0.00310	
γ -HCH (Lindane)	49	7	0.00032 ^b	<0.00034–0.00294	0.00307
Dieldrin	49	20	0.00012 ^b	<0.00002–0.00041	0.00264
Endrin	49	0	–	<0.00008–0.00065	
Heptachlor epoxide	49	22	0.00010 ^b	<0.00003–0.00067	0.00086
α -Chlordane	49	1	–	<0.00008–0.00060	0.00014
γ -Chlordane	49	7	0.00014 ^b	<0.00016–0.00051	0.00023
Oxychlordane	49	1	–	<0.00113–0.06070	0.00613
<i>Trans</i> -nonachlor	49	29	0.00013 ^b	<0.00008–0.00035	0.00193
Toxaphene	49	1	–	<0.00816–0.04730	0.04400
Mirex	49	0	–	<0.00014–0.00085	
PCB mixtures					
Aroclor 1242	30	0	–	<0.00175–0.00472	
Aroclor 1248	30	0	–	<0.00175–0.00472	
Aroclor 1254	30	17	0.00321 ^b	<0.00208–0.00787	0.03990
Aroclor 1260	30	29	0.01033	<0.00340	0.08470
Total PCBs	49	47	0.00707	<0.00405–0.00714	0.12300

^aMinimum concentration for compounds that were detected in all samples; range of DLs for compounds that were not detected in some of the samples.

^bMedian estimated through robust regression on order statistics (Helsel 2005:68ff).

Table 21. Concentrations ($\mu\text{g/g}$ wet weight) of organochlorine (OC) pesticides and polychlorinated biphenyl (PCB) mixtures in samples of Black-capped Chickadee eggs from the Anchorage and Mat-Su Valley region, Alaska, from 2000–2001. Frequency of detection is indicated by the number of samples above the detection limit (DL), which varied among samples for a given compound.

Compound	<i>n</i>	# above DL	Concentration		
			Median	Minimum ^a	Maximum
OC pesticides					
<i>o,p'</i> -DDD	39	0	–	<0.00027–0.00148	
<i>o,p'</i> -DDE	39	2	–	<0.00019–0.00370	0.00119
<i>o,p'</i> -DDT	39	0	–	<0.00040–0.00593	
<i>p,p'</i> -DDD	39	5	0.00016 ^b	<0.00048–0.00296	0.00265
<i>p,p'</i> -DDE	39	39	0.01980	0.00389	0.07690
<i>p,p'</i> -DDT	39	11	0.00022 ^b	<0.00015–0.00333	0.00556
HCB	39	39	0.00405	0.00163	0.01320
α -HCH	39	0	–	<0.00044–0.02890	
γ -HCH (Lindane)	39	4	0.00076 ^b	<0.00075–0.02740	0.00215
Dieldrin	39	15	0.00024 ^b	<0.00013–0.00142	0.14000
Endrin	39	0	–	<0.00043–0.00133	
Heptachlor epoxide	39	10	0.00025 ^b	<0.00015–0.00234	0.08600
α -Chlordane	39	0	–	<0.00037–0.00556	
γ -Chlordane	39	21	0.00047 ^b	<0.00038–0.00333	0.00117
Oxychlordane	39	0	–	<0.00087–0.04670	
<i>Trans</i> -nonachlor	39	30	0.00067 ^b	<0.00040–0.00148	0.00891
Toxaphene	39	1	–	<0.02750–0.47100	0.11100
Mirex	39	7	0.00034 ^b	<0.00026–0.00259	0.00073
PCB mixtures					
Aroclor 1242	10	0	–	<0.01050–0.03300	
Aroclor 1248	10	0	–	<0.01050–0.03300	
Aroclor 1254	10	5	0.01846 ^b	<0.03070	0.03940
Aroclor 1260	10	10	0.08460	0.01830	0.19100
Total PCBs	39	39	0.03930	0.00477	0.23400

^aMinimum concentration for compounds that were detected in all samples; range of DLs for compounds that were not detected in some of the samples.

^bMedian estimated through robust regression on order statistics (Helsel 2005:68ff).

Table 22. Concentrations ($\mu\text{g/g}$ wet weight) of polychlorinated biphenyl (PCB) mixtures and one organophosphate (OP) pesticide in samples of adult Black-capped Chickadees from the Anchorage and Mat-Su Valley region, Alaska, from 1999–2002. Frequency of detection is indicated by the number of samples above the detection limit (DL), which varied among samples for a given compound.

Compound	<i>n</i>	# above DL	Concentration		
			Median	Minimum ^a	Maximum
PCB mixture					
Aroclor 1242	19	3	–	<0.00150–0.00320	0.00780
Aroclor 1248	19	0	–	<0.00150–0.00320	
Aroclor 1254	19	19	0.00770	0.00470	0.11000
Aroclor 1260	19	18	0.01200	<0.00430	0.02400
Total PCBs	35	35	0.02100	0.00740	0.15000
OP pesticide					
Chlorpyrifos	16	2	–	<0.00046–0.00057	0.00064

^aMinimum concentration for compounds that were detected in all samples; range of DLs for compounds that were not detected in some of the samples.

Table 23. Concentrations (ng/g wet weight) of dioxin-like polychlorinated biphenyl (PCB) congeners in tissues of adult Black-capped Chickadees from the Anchorage and Mat-Su Valley region, Alaska, from 2001–2002. Frequency of detection is indicated by the number of samples above the detection limit (DL), which varied among samples for a given compound.

Analyte	<i>n</i>	# above DL	Concentration		
			Median	Minimum ^a	Maximum
<i>Non-ortho</i> PCBs					
Congener 77	16	1	–	<0.0182–0.0229	0.0340
Congener 81	16	0	–	<0.0182–0.0229	–
Congener 126	16	0	–	<0.0182–0.0229	–
Congener 169	16	0	–	<0.0182–0.0229	–
<i>Mono-ortho</i> PCBs					
Congener 105	16	16	0.2415	0.1190	0.4780
Congener 114	16	0	–	<0.0182–0.0229	–
Congener 118	16	16	0.8585	0.3450	2.9170
Congener 123 ^b	16	16	0.1470	0.0290	0.8640
Congener 156	16	15	0.1200	<0.0220	0.3870
Congener 157 ^c	16	16	0.1140	0.0770	0.1800
Congener 167	16	16	0.1235	0.0550	0.3090
Congener 189	16	1	–	<0.0182–0.0229	0.0220

^aRange of DLs for compounds that were not detected in some or any of the samples.

^bCoeluted with congener 149.

^cCoeluted with congeners 173 and 201.

Table 24. Concentrations (ng/g wet weight) of dioxin-like polychlorinated biphenyl (PCB) congeners in tissues of nestling Black-capped Chickadees from the Anchorage and Mat-Su Valley region, Alaska, from 2000–2001. Frequency of detection is indicated by the number of samples above the detection limit (DL), which varied among samples for a given compound.

Analyte	<i>n</i>	# above DL	Concentration		
			Median	Minimum ^a	Maximum
<i>Non-ortho</i> PCBs					
Congener 77	49	4	–	<0.0030–0.0190	0.0330
Congener 81	49	9	–	<0.0012–0.0057	0.0056
Congener 126	49	3	–	<0.0020–0.0200	0.0510
Congener 169	49	9	–	<0.0011–0.0067	0.0077
<i>Mono-ortho</i> PCBs					
Congener 105	49	49	0.0970	0.0175	3.6000
Congener 114	49	45	0.0120	<0.0019–0.0035	0.2100
Congener 118	49	49	0.4600	0.0644	13.0000
Congener 123	49	36	0.0154	<0.0044–0.0108	0.1900
Congener 156/157 ^b	49	48	0.0676	<0.0032	2.3000
Congener 167	49	49	0.0404	0.0064	0.9700
Congener 189	49	44	0.0122	<0.0018–0.0041	0.1200

^aRange of DLs for compounds that were not detected in some of the samples.

^bCongeners coeluted.

Table 25. Concentrations (ng/g wet weight) of dioxin-like polychlorinated biphenyl (PCB) congeners in Black-capped Chickadee eggs from the Anchorage and Mat-Su Valley region, Alaska, from 2000–2001. Frequency of detection is indicated by the number of samples above the detection limit (DL), which varied among samples for a given compound.

Analyte	<i>n</i>	# above DL	Concentration		
			Median	Minimum ^a	Maximum
<i>Non-ortho</i> PCBs					
Congener 77	39	2	–	<0.0092–0.1800	0.0240
Congener 81	39	1	–	<0.0074–0.0250	0.0251
Congener 126	39	4	–	<0.0062–0.1900	0.0316
Congener 169	39	8	–	<0.0052–0.0275	0.0480
<i>Mono-ortho</i> PCBs					
Congener 105	39	39	0.4630	0.0721	4.3900
Congener 114	39	39	0.0525	0.0080	0.7150
Congener 118	39	39	2.7000	0.3040	34.8000
Congener 123	39	33	0.0526	0.0140	0.4840
Congener 156/157 ^b	39	39	0.4870	0.0434	4.0000
Congener 167	39	39	0.2920	0.0306	1.7000
Congener 189	39	39	0.0718	0.0088	0.3300

^aRange of DLs for compounds that were not detected in some of the samples.

^bCongeners coeluted.

Table 26. Concentrations (ng/g wet weight) of polychlorinated dibenzo-*p*-dioxin (PCDD) and polychlorinated dibenzofuran (PCDF) congeners in tissues of adult Black-capped Chickadees from Anchorage and Mat-Su Valley, Alaska, in 2001–2002. Frequency of detection is indicated by the number of samples above the detection limit (DL), which varied among samples for a given compound.

Analyte	<i>n</i>	# above DL	Concentration	
			Minimum ^a	Maximum
2,3,7,8-TCDD	16	0	<0.00182–0.00229	
1,2,3,7,8-PeCDD	16	0	<0.00911–0.01144	
1,2,3,4,7,8-HxCDD	16	0	<0.00911–0.01144	
1,2,3,6,7,8-HxCDD	16	2	<0.00911–0.01111	0.01590
1,2,3,7,8,9-HxCDD	16	1	<0.00911–0.01111	0.01360
1,2,3,4,6,7,8-HpCDD	16	3	<0.00911–0.01111	0.15620
OCDD	16	6	<0.01820–0.02160	0.69310
2,3,7,8-TCDF	16	0	<0.00182–0.00229	
1,2,3,7,8-PeCDF	16	0	<0.00911–0.01144	
2,3,4,7,8-PeCDF	16	0	<0.00911–0.01144	
1,2,3,4,7,8-HxCDF	16	1	<0.00911–0.01144	0.01080
1,2,3,6,7,8-HxCDF	16	0	<0.00911–0.01144	
1,2,3,7,8,9-HxCDF	16	0	<0.00911–0.01144	
2,3,4,6,7,8-HxCDF	16	0	<0.00911–0.01144	
1,2,3,4,6,7,8-HpCDF	16	1	<0.00911–0.01111	0.02710
1,2,3,4,7,8,9-HpCDF	16	0	<0.00911–0.01144	
OCDF	16	0	<0.01820–0.02288	

^aRange of DLs for compounds that were not detected in some or any of the samples.

Table 27. Concentrations (ng/g wet weight) of polychlorinated dibenzo-*p*-dioxin (PCDD) and polychlorinated dibenzofuran (PCDF) congeners in tissues of nestling Black-capped Chickadees from Anchorage and Mat-Su Valley, Alaska, from 2000–2001. Frequency of detection is indicated by the number of samples above the detection limit (DL), which varied among samples for a given compound. Cl-4 through Cl-7 are concentrations of all PCDDs or PCDFs with 4–7 chlorine atoms, respectively.

Analyte	<i>n</i>	# above DL	Concentration		
			Median	Minimum ^a	Maximum
2,3,7,8-TCDD	29	7	0.00005 ^b	<0.0002–0.0010	0.0072
1,2,3,7,8-PeCDD	29	10	0.00033 ^b	<0.0006–0.0015	0.0510
1,2,3,4,7,8-HxCDD	29	5	–	<0.0015–0.0043	0.0390
1,2,3,6,7,8-HxCDD	29	10	0.00138 ^b	<0.0018–0.0043	0.0740
1,2,3,7,8,9-HxCDD	29	3	–	<0.0015–0.0043	0.0370
1,2,3,4,6,7,8-HpCDD	29	26	0.00530	<0.0012–0.0022	0.1900
Cl-4 PCDD	29	7	0.00005 ^b	<0.0002–0.0010	0.0072
Cl-5 PCDD	29	11	0.00030 ^b	<0.0007–0.0015	0.0510
Cl-6 PCDD	29	13	0.00088 ^b	<0.0018–0.0043	0.1500
Cl-7 PCDD	29	24	0.00500	<0.0011–0.0022	0.2000
OCDD	29	13	0.00715 ^b	<0.0072–0.0170	0.2000
2,3,7,8-TCDF	29	3	–	<0.0004–0.0013	0.0040
1,2,3,7,8-PeCDF	29	3	–	<0.0004–0.0016	0.0100
2,3,4,7,8-PeCDF	29	6	0.00015 ^b	<0.0005–0.0016	0.0070
1,2,3,4,7,8-HxCDF	29	5	–	<0.0006–0.0090	0.0120
1,2,3,6,7,8-HxCDF	29	4	–	<0.0005–0.0090	0.0120
1,2,3,7,8,9-HxCDF	29	2	–	<0.0005–0.0090	0.0054
2,3,4,6,7,8-HxCDF	29	4	–	<0.0005–0.0090	0.0047
1,2,3,4,6,7,8-HpCDF	29	15	0.00120	<0.0009–0.0018	0.0280
1,2,3,4,7,8,9-HpCDF	29	2	–	<0.0005–0.0018	0.0040
Cl-4 PCDF	29	2	–	<0.0003–0.0013	0.0043
Cl-5 PCDF	29	7	0.00009 ^b	<0.0005–0.0016	0.0160
Cl-6 PCDF	29	10	0.00068 ^b	<0.0007–0.0090	0.0300
Cl-7 PCDF	29	5	–	<0.0005–0.0018	0.0340
OCDF	29	1	–	<0.0040–0.0130	0.0210

^aRange of DLs for compounds that were not detected in some or any of the samples.

^bMedian estimated through robust regression on order statistics (Helsel 2005:68ff).

Table 28. Concentrations (ng/g wet weight) of polychlorinated dibenzo-*p*-dioxin (PCDD) and polychlorinated dibenzofuran (PCDF) congeners in eggs of Black-capped Chickadees from Anchorage and Mat-Su Valley, Alaska, from 2000–2001. Frequency of detection is indicated by the number of samples above the detection limit (DL), which varied among samples for a given compound. Cl-4 through Cl-7 are concentrations of all PCDDs or PCDFs with 4–7 chlorine atoms, respectively.

Analyte	<i>n</i>	# above DL	Concentration		
			Median	Minimum ^a	Maximum
2,3,7,8-TCDD	39	12	0.00114 ^b	<0.0012–0.0037	0.0043
1,2,3,7,8-PeCDD	39	21	0.00377	<0.0030–0.0089	0.0180
1,2,3,4,7,8-HxCDD	39	3	–	<0.0080–0.0250	0.0240
1,2,3,6,7,8-HxCDD	39	16	0.00679 ^b	<0.0080–0.0250	0.0840
1,2,3,7,8,9-HxCDD	39	3	–	<0.0080–0.0250	0.0270
1,2,3,4,6,7,8-HpCDD	39	35	0.02800	<0.0044–0.0077	0.1900
Cl-4 PCDD	39	10	0.00086 ^b	<0.0012–0.0033	0.0092
Cl-5 PCDD	39	21	0.00359	<0.0030–0.0069	0.0180
Cl-6 PCDD	39	18	0.00767	<0.0080–0.0200	0.1400
Cl-7 PCDD	39	33	0.02800	<0.0044–0.0081	0.6500
OCDD	39	26	0.06200	<0.0340–0.1000	0.6500
2,3,7,8-TCDF	39	0	–	<0.0023–0.0074	
1,2,3,7,8-PeCDF	39	1	–	<0.0029–0.0093	0.0099
2,3,4,7,8-PeCDF	39	0	–	<0.0029–0.0093	
1,2,3,4,7,8-HxCDF	39	1	–	<0.0034–0.0110	0.0230
1,2,3,6,7,8-HxCDF	39	1	–	<0.0034–0.0110	0.0130
1,2,3,7,8,9-HxCDF	39	0	–	<0.0034–0.0110	
2,3,4,6,7,8-HxCDF	39	0	–	<0.0034–0.0110	
1,2,3,4,6,7,8-HpCDF	39	13	0.00139 ^b	<0.0033–0.0100	0.1000
1,2,3,4,7,8,9-HpCDF	39	0	–	<0.0033–0.0100	
Cl-4 PCDF	39	0	–	<0.0023–0.0074	
Cl-5 PCDF	39	1	–	<0.0029–0.0093	0.0099
Cl-6 PCDF	39	6	–	<0.0034–0.0110	0.0460
Cl-7 PCDF	39	11	0.00096 ^b	<0.0033–0.0100	0.1100
OCDF	39	0	–	<0.0240–0.0760	

^aRange of DLs for compounds that were not detected in some or any of the samples.

^bMedian estimated through robust regression on order statistics (Helsel 2005:68ff).