

# **DDE and PCB in Canadian birds, 1969 to 1972**

**by Michael Gilbertson  
and Lincoln Reynolds**



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**A summary  
of DDE and PCB  
determinations  
in Canadian birds,  
1969 to 1972**

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### Abstract

Geometric mean values for DDE and PCB are presented for different tissues of bird species from different provinces of Canada.

### Résumé

On présente les valeurs des moyennes géométriques pour le DDE et le PCB trouvés dans différents tissus d'espèces d'oiseaux de diverses provinces du Canada.

## Introduction

Since 1966, the Toxic Chemicals Section of the Canadian Wildlife Service has undertaken, and supported, a number of different field projects to investigate the effects of toxic substances on birds. During the course of these various studies, a large number of samples of birds and eggs have been collected for analysis of organochlorine residues. In 1973, the Toxic Chemicals Section was requested by the Environmental Secretariat of the National Research Council of Canada to make some of these analyses available as a contribution to a monograph they were preparing on PCB. This present publication was prepared in response to the NRCC request and is a selection from those determinations in which both DDE<sup>1</sup> and PCB<sup>2</sup> were analysed, under contract to the Service, by the Ontario Research Foundation, and includes results of determinations made between October 1969 and March 1973.

The method of analysis has been described previously by Reynolds (1969).

There are several limitations in summarizing the chemical residue data from a great variety of different projects. There are inevitably biases in sampling, since the collections were made in association with particular biological projects and thus do not in any way represent a random sample from a given geographic region such as a province. Secondly, most of the species examined are migratory and thus eggs collected from them may more closely reflect contamination in the wintering grounds or in migration than contamination in the areas where the eggs were found. The data, however, do show which of the selected areas and species have been adequately sampled and which species have particularly high DDE and PCB residues, whatever the source.

The statistical distribution of residues in the samples summarized here appears to be markedly skewed. A log normal distribution is therefore assumed and the data have been analysed to give geometric means, and their 95% confidence intervals, rather than arithmetic means. The moisture content of samples varied from project to project, and so for comparability the results were expressed here on a dry-matter basis, which means that the listed concentrations of DDE and PCB are approximately five times higher than the actual concentrations in the original fresh tissue. The units of the residue analyses are parts per million, and the results are presented in Tables 1-9. The names of birds are those of the fifth edition of the A.O.U. Check-List of North American Birds (1957).

<sup>1</sup>Dichlorodiphenyl dichloroethylene.

<sup>2</sup>Polychlorobiphenyls.

## Results and discussion

The tables show that the birds which have been analysed over the last four years for both PCB and DDE are predominantly of those species feeding on fish, mammals or other birds. This reflects the present concern for the security of populations of these carnivorous birds.

The tables further show that there are various carnivorous species in certain locations which have been quite well sampled for DDE and PCB residues, but that there are species in other locations which have not been sampled extensively. Among the former group are the Loons, Grebes and Herons in Alberta, Petrels in the Maritimes, Gannets in Quebec, Double-crested Cormorants in Ontario, Quebec and New Brunswick, the Falcons in Alberta and Saskatchewan, Gulls from the Great Lakes, Quebec and New Brunswick, Common Terns from the Great Lakes and New Brunswick, and Alcids from Quebec, New Brunswick and Newfoundland.

Among the groups which have not been sampled for DDE and PCB extensively are Loons and Grebes outside the prairies and particularly in the Great Lakes Region, Petrels in British Columbia, White Pelicans in Alberta, Saskatchewan, Manitoba and Ontario, Double-crested Cormorants throughout their breeding range except for Ontario, Quebec and New Brunswick, Herons and Bitterns throughout their ranges, and Accipiters, Buteos, Eagles, Marsh Hawks, Ospreys and Falcons, except those Falcons intensively studied in the prairies. The Gulls, Terns, Alcids and Owls have been sampled in only a few locations.

Comparison of the results of determinations on eggs from species which have been sampled from a wide geographic distribution shows that the Great Lakes region has birds with the highest concentrations of the two pollutants. This can be seen most readily in the mean values for the eggs

of Double-crested Cormorants, Herring Gulls and Ring-billed Gulls.

Great caution should be used in interpreting the results since the effects of DDE and probably also of PCB vary considerably from one bird species to another.

Mean values which were substantially higher than the majority of values in the tables were found in raptor eggs. Among those raptor species adequately sampled, high values of DDE and PCB were found in the eggs of Bald Eagles in Saskatchewan and Ontario, of Ospreys in Ontario, of Prairie Falcons in Alberta, of Peregrines in the Northwest Territories and of Merlins in Alberta.

Among the fish-eating birds adequately sampled, the following species had similar higher mean values in their eggs; Common Loons in Alberta and Saskatchewan, Arctic Loons in the Northwest Territories, Horned and Western Grebes in Alberta, Gannets in Quebec, Double-crested Cormorants in Ontario, Quebec and New Brunswick, Great Blue Herons in Alberta, Black-crowned Night Herons in the Great Lakes, Herring Gulls throughout the sampled range, California Gulls in Alberta, Ring-billed Gulls in Ontario, Common Terns in Alberta and the Great Lakes and Caspian Terns in the Great Lakes. Eggs of Leach's Petrels from Quebec and New Brunswick contained high residues.

Among the eggs of Owls from Saskatchewan which have been adequately sampled, high values were found in the Great Horned and Short-eared Owls for DDE but low values of PCB were detected.

The analyses of the eggs indicated that different areas of the country exhibit different values for the ratio of DDE to PCB. Among the aquatic birds the ratio is near unity in the Northwest Territories. Similarly, in British Columbia, the ratio appeared to be near unity but was more

variable. In the prairies, DDE is the more important contaminant, in sharp contrast to the predominance of PCB found in the Great Lakes, Quebec (mostly samples from the Gulf of St. Lawrence), and the Atlantic Maritime Provinces. Among the raptors and owls the same general pattern is found except that DDE is relatively more abundant than PCB in the samples from British Columbia, Quebec and New Brunswick.

These generalizations are all that can be drawn from the data as summarized here. No further generalizations should be made without communicating directly with the collector and referring to the original data.

**Table 1**  
Caviiformes

	No. analysed	Ppm, dry-matter basis geometric mean and (95% confidence interval)		DDE/ PCB	Collector
Common Loon - <i>Gavia immer</i>					
Alberta					
Egg	17	7.53 (5.21-10.9)	5.43 (3.39-8.69)	1.39	K.V.*
Brain	14	1.54 (0.85-2.80)	1.38 (0.49-3.87)	1.12	K.V.
Liver	14	2.28 (1.02-4.70)	2.34 (1.08-5.06)	0.97	K.V.
Fat	14	23.0 (8.73-60.5)	16.8 (5.32-53.0)	1.37	K.V.
Saskatchewan					
Egg	5	54.4 (35.1-84.3)	87.9 (43.6-177)	0.62	K.V.
Yellow-billed Loon - <i>Gavia adamsii</i>					
Northwest Territories					
Egg	1	0.75	0.98	0.76	R.W.F.
Arctic Loon - <i>Gavia arctica</i>					
Northwest Territories					
Egg	5	4.80 (2.09-11.0)	6.49 (2.65-15.9)	0.74	R.W.F.
Brain	9	1.99 (0.79-5.02)	1.44 (0.45-4.64)	1.38	R.W.F.
Fat	9	19.8 (4.09-95.5)	23.3 (8.32-65.3)	0.85	R.W.F.
Gonad	2	8.85	2.08	4.26	R.W.F.
British Columbia					
Liver	2	2.22	5.64	0.39	W.A.M.
Red-throated Loon - <i>Gavia stellata</i>					
Northwest Territories					
Egg	5	2.76 (0.69-15.9)	3.14 (0.83-11.8)	0.88	R.W.F.
Brain	8	2.95 (0.82-10.6)	4.16 (1.25-13.9)	0.71	R.W.F.
Fat	8	25.1 (5.84-108)	35.6 (11.9-107)	0.70	R.W.F.

Table 1 cont.

	No. analysed	Ppm, dry-matter basis geometric mean and (95% confidence interval)		DDE/ PCB	Collector
		DDE	PCB		
Gonad	1	60.5	64.6	0.94	R.W.F.*
Quebec					
Egg	1	20.3	50.0	0.41	P.A.P.

\*Initials refer to the names of collectors listed in the acknowledgements.

Table 2  
Podicipediformes

	No. analysed	Ppm, dry-matter basis geometric mean and (95% confidence interval)		DDE/ PCB	Collector
Red-necked Grebe - <i>Podiceps grisegena</i>					
Alberta					
Egg	20	2.96 (1.83-4.78)	2.47 (1.20-5.09)	1.20	R.W.F.* M.E.R.
Liver	1	1.57	0.95	1.65	K.V.
Whole body	1	7.17	5.86	0.86	R.W.F. M.E.R.
Horned Grebe - <i>Podiceps auritus</i>					
Alberta					
Egg	13	8.83 (4.38-17.8)	4.82 (2.09-11.1)	1.83	R.W.F. M.E.R.
Eared Grebe - <i>Podiceps caspius</i>					
Alberta					
Egg	3	8.58	2.92	2.94	R.W.F. M.E.R.
Brain	1	3.96	0.54	7.32	R.W.F. M.E.R.
Whole body	1	0.26	0.45	0.58	R.W.F. M.E.R.
Western Grebe - <i>Aechmophorus occidentalis</i>					
British Columbia					
Brain	1	4.11	6.45	0.64	R.W.F.
Fat	1	103	64.6	1.59	R.W.F.
Breast muscle	1	16.9	6.59	2.56	R.W.F.
Alberta					
Egg	9	23.9 (13.5-42.0)	13.3 (4.92-35.7)	1.80	R.W.F. M.E.R.
Liver	2	2.96	7.88	0.38	K.V.
Whole body	3	30.1	40.2	0.75	R.W.F. M.E.R.

\*Initials refer to the names of collectors listed in the acknowledgements.

Table 3  
Procellariiformes

	No. analysed	Ppm, dry-matter basis geometric mean and (95% confidence interval)		DDE/ PCB	Collector
		DDE	PCB		
<b>Sooty Shearwater - <i>Puffinus griseus</i></b>					
British Columbia					
Whole body	1	0.28	0.81	0.34	R.W.F.*
<b>Fork-tailed Petrel - <i>Oceanodroma furcata</i></b>					
British Columbia					
Egg	1	7.79	29.0	0.27	R.H.D.
<b>Leach's Petrel - <i>Oceanodroma leucorhoa</i></b>					
British Columbia					
Egg	1	8.12	4.10	1.98	R.H.D.
Quebec					
Egg	5	8.22 (3.16-21.4)	9.65 (5.59-16.7)	0.85	P.A.P.
New Brunswick					
Egg	5	22.3 (15.6-31.9)	36.3 (24.5-53.8)	0.61	P.A.P.
Newfoundland					
Whole body (immature)	5	3.13 (1.60-6.14)	1.77 (0.97-3.21)	1.77	D.N.N.

\*Initials refer to the names of collectors listed in the acknowledgements.

Table 4  
Pelecaniformes

	No. analysed	Ppm, dry-matter basis geometric mean and (95% confidence interval) DDE	PCB	DDE/ PCB	Collector
<b>White Pelican - <i>Pelecanus erythrorhynchos</i></b>					
Manitoba					
Egg	3	7.44	2.45	3.03	K.V.*
Ontario					
Brain	3	21.2	11.2	1.90	A.F.
Liver	3	38.7	45.7	0.85	A.F.
<b>Gannet - <i>Morus bassanus</i></b>					
Quebec					
Egg	21	111 (92.8-133)	49.9 (38.1-65.4)	2.23	J.A.K.
New Brunswick					
Brain	3	59.7	121	0.49	P.A.P. J.A.K.
<b>Double-crested Cormorant - <i>Phalacrocorax auritus</i></b>					
British Columbia					
Egg	1	21.9	75.3	0.29	
Alberta					
Egg	2	20.9	13.2	1.58	K.V.
Liver	1	0.12	0.004	30.0	
Saskatchewan					
Egg	1	22.2	4.29	5.19	K.V.
Manitoba					
Egg	2	46.9	8.34	5.62	K.V.
Ontario					
Lake Nipigon					
Egg	52	56.8 (47.8-67.5)	77.5 (59.4-101)	0.73	S.P.

Table 4 cont.

	No. analysed	Ppm, dry-matter basis geometric mean and (95% confidence interval) DDE	PCB	DDE/ PCB	Collector
Lake Huron					
Egg	55	86.1 (72.5-102)	140 (122-162)	0.61	S.P.* M.G.
Brain	1	22.2	63.9	0.35	S.P.
Breast muscle	1	25.8	80.3	0.32	S.P.
Liver	1	32.1	95.9	0.34	S.P.
Lake Erie					
Egg	18	33.9 (24.1-47.7)	63.7 (25.1-161)	0.53	S.P.
Lake Ontario					
Egg	7	61.3 (49.1-76.4)	114 (77.9-167)	0.54	M.G.
Quebec					
Egg	15	36.5 (25.3-52.6)	68.4 (47.4-98.7)	0.53	P.A.P.
New Brunswick					
Egg	25	41.4 (31.9-53.8)	65.8 (48.3-89.5)	0.63	P.A.P.
<b>Pelagic Cormorant - <i>Phalacrocorax pelagicus</i></b>					
British Columbia					
Egg	2	4.09	23.0	0.18	R.H.D.

\*Initials refer to the names of collectors listed in the acknowledgements.

Table 5  
Ciconiiformes

		Ppm, dry-matter basis geometric mean and (95% confidence interval)		DDE/ PCB	Collector
	No. analysed	DDE	PCB		
<b>Great Blue Heron - <i>Ardea herodias</i></b>					
Alberta					
Egg	40	33.9 (23.9-48.1)	1.48 (0.99-2.20)	22.9	K.V.*
<b>Black-crowned Night Heron - <i>Nycticorax nycticorax</i></b>					
Ontario					
Lake Erie					
Egg	5	26.2 (17.1-40.2)	147 (93.3-230)	0.18	M.G.
Lake Ontario					
Egg	4	89.4 (24.9-321)	333 (197-565)	0.27	I.M.P.

\*Initials refer to the names of collectors listed in the acknowledgements.

Table 6  
Anseriformes

	No. analysed	Ppm, dry-matter basis geometric mean and (95% confidence interval)		DDE/ PCB	Collector
		DDE	PCB		
<b>Eider Duck - <i>Somateria mollissima</i></b>					
Quebec					
Egg	21	0.98 (0.80-1.20)	2.44 (1.66-3.59)	0.40	P.A.P.*
New Brunswick					
Egg	5	1.75 (1.15-2.66)	13.0 (3.37-50.1)	0.14	P.A.P.

\*Initials refer to the names of collectors listed in the acknowledgements.

Table 7  
Falconiformes

	No. analysed	Ppm, dry-matter basis geometric mean and (95% confidence interval) DDE	PCB	DDE/ PCB	Collector
<b>Goshawk - <i>Accipiter gentilis</i></b>					
New Brunswick					
Egg	1	19.5	0.26	76.5	P.A.P.*
<b>Cooper's Hawk - <i>Accipiter cooperii</i></b>					
Alberta					
Egg	4	19.1 (7.61-48.0)	3.80 (2.79-5.16)	5.04	R.W.F.
Saskatchewan					
Egg	5	20.5 (12.8-32.8)	1.16 (0.22-6.24)	17.7	R.W.F.
<b>Red-tailed Hawk - <i>Buteo jamaicensis</i></b>					
British Columbia					
Egg	1	29.0	2.29	12.6	R.W.F.
Brain	1	0.61	0.20	3.13	R.W.F.
Saskatchewan					
Egg	5	5.40 (1.16-25.2)	0.90 (0.15-5.33)	6.03	R.W.F.
Ontario					
Egg	2	2.32	4.24	0.55	
<b>Swainson's Hawk - <i>Buteo swainsoni</i></b>					
Alberta					
Egg	1	1.52	0.004	348	R.W.F.
Whole body (immature)	1	6.86	2.40	2.86	R.W.F.
Saskatchewan					
Egg	2	6.43	0.03	215	R.W.F.

Table 7 cont.

	No. analysed	Ppm, dry-matter basis geometric mean and (95% confidence interval)		DDE/ PCB	Collector
Golden Eagle – <i>Aquila chrysaetos</i>					
Alberta					
Egg	2	14.3	4.06	3.51	R.W.F.*
Bald Eagle – <i>Haliaeetus leucocephalus</i>					
Saskatchewan					
Egg	9	22.4 (14.0–36.1)	14.2 (8.82–23.0)	1.58	R.W.F.
Ontario					
Egg	18	164 (126–215)	140 (92.1–213)	1.17	S.P. J.G.
Brain (nestling)	1	5.32	1.82	2.92	J.G.
Liver (nestling)	1	8.72	5.97	1.46	J.G.
Breast muscle (nestling)	1	1.59	1.12	1.42	J.G.
Marsh Hawk – <i>Circus cyaneus</i>					
Alberta					
Egg	1	9.39	1.87	5.02	R.W.F.
Saskatchewan					
Egg	7	3.68 (0.70–19.3)	0.37 (0.16–0.86)	9.96	R.W.F.
Quebec					
Egg	1	65.0	13.5	4.80	R.W.F.
Osprey – <i>Pandion haliaetus</i>					
Ontario					
Egg	9	22.0 (15.0–32.3)	19.4 (6.73–56.0)	1.13	S.P. J.G.
Liver	2	1.33	3.79	0.35	A.F.
Brain	2	0.87	2.40	0.36	A.F.
Breast muscle	1	1.92	10.9	0.18	J.G.

Table 7 cont.

	No. analysed	Ppm, dry-matter basis geometric mean and (95% confidence interval)		DDE/ PCB	Collector
Whole body (immature)	1	23.7	70.7	0.34	J.G.*
<b>Gyr Falcon – <i>Falco rusticolus</i></b>					
Northwest Territories					
Egg	2	14.5	24.4	0.59	R.W.F.
<b>Prairie Falcon – <i>Falco mexicanus</i></b>					
Alberta					
Egg	141	9.24 (7.95–10.7)	3.03 (2.40–3.82)	3.05	R.W.F.
Fat	1	19.8	35.0	0.57	R.W.F.
Saskatchewan					
Egg	26	15.7 (10.2–24.4)	3.25 (2.38–4.44)	4.84	R.W.F.
<b>Peregrine Falcon – <i>Falco peregrinus</i></b>					
Northwest Territories					
Egg	19	22.0 (8.55–56.8)	36.1 (19.1–68.1)	0.61	R.W.F.
Leg muscle	3	2.36	0.29	8.14	R.W.F.
Brain	3	5.42	1.96	2.77	R.W.F.
Fat	1	27.1	4.74	5.71	R.W.F.
Yukon					
Egg	3	173	34.9	4.97	R.W.F.
British Columbia					
Egg	4	84.8 (58.8–122)	25.6 (23.0–28.4)	3.32	R.W.N.
Brain (nestling)	2	16.7	3.82	4.38	R.W.N.
Breast muscle (nestling)	1	12.7	1.57	8.06	R.W.N.
Liver (nestling)	2	20.5	1.32	15.6	R.W.N.
Whole body (nestling)	1	90.5	15.4	5.90	R.W.N.

Table 7 cont.

	No. analysed	Ppm, dry-matter basis geometric mean and (95% confidence interval)		DDE/ PCB	Collector
Alberta					
Egg	1	99.5	37.8	2.63	R.W.F.*
New Brunswick					
Brain	1	0.84	0.63	1.34	P.A.P.
Liver	1	0.61	0.65	0.94	P.A.P.
Fat	1	5.35	2.45	2.19	P.A.P.
Newfoundland					
Egg	1	169	276	0.61	R.W.F.
<b>Merlin – <i>Falco columbarius</i></b>					
British Columbia					
Egg	1	42.1	8.64	4.87	R.W.F.
Brain	1	45.5	0.003	15,800	R.W.F.
Alberta					
Egg	90	42.9 (34.3–53.7)	4.83 (4.07–5.73)	8.89	R.W.F.
Whole body (immature)	1	20.6	8.35	2.47	R.W.F.
Quebec					
Egg	1	163	38.4	4.24	R.W.F.

\*Initials refer to the names of collectors listed in the acknowledgements.

Table 8  
Charadriiformes

	No. analysed	Ppm, dry-matter basis geometric mean and (95% confidence interval)		DDE/ PCB	Collector
		DDE	PCB		
<b>Glaucous-winged Gull – <i>Larus glaucescens</i></b>					
British Columbia					
Egg	7	2.54 (2.13–5.40)	5.27 (2.18–12.7)	0.48	R.H.D.*
<b>Herring Gull – <i>Larus argentatus</i></b>					
Manitoba					
Egg	2	68.4	33.7	2.03	K.V.
Ontario					
Lake Huron					
Egg	5	110 (65–185)	368 (206–656)	0.30	M.G.
Detroit River					
Egg	2	158	520	0.31	M.G.
Lake Erie					
Egg	6	48.0 (33.0–70.1)	300 (244–369)	0.16	M.G.
Lake Ontario					
Egg	16	131 (104–164)	565 (436–730)	0.23	M.G.
Brain	2	22.8	91.0	0.25	
Quebec					
Egg	16	32.1 (20.4–50.6)	65.2 (47.1–90.3)	0.49	P.A.P. D.N.N.
New Brunswick					
Egg	5	14.1 (7.58–26.1)	25.4 (15.6–41.2)	0.56	P.A.P.
<b>California Gull – <i>Larus californicus</i></b>					
Alberta					
Egg	10	20.5 (11.3–37.2)	1.65 (0.34–7.93)	12.4	K.V.
Brain	10	4.76 (2.69–8.44)	0.74 (0.20–2.70)	6.43	K.V.



Table 8 cont.

	No. analysed	Ppm, dry-matter basis geometric mean and (95% confidence interval)		DDE/ PCB	Collector
		DDE	PCB		
Liver	10	12.7 (6.73-24.0)	2.06 (1.16-3.66)	6.17	K.V.*
Gonad	10	30.3 (16.3-56.4)	3.28 (1.96-5.51)	9.23	
Fat	14	103 (28.3-375)	26.5 (15.7-44.7)	3.89	K.V.
Manitoba					
Egg	3	19.2	12.9	1.49	K.V.
Ring-billed Gull - <i>Larus delawarensis</i>					
Manitoba					
Egg	2	11.7	10.8	1.07	K.V.
Ontario					
Lake Huron					
Egg	2	18.6	113	0.16	M.G.
Lake Erie					
Egg	2	18.3	140	0.13	M.G.
Lake Ontario					
Egg	4	60.5 (48.2-75.8)	379 (260-553)	0.16	M.G.
Brain	1	206	1055	0.20	
New Brunswick					
Egg	6	5.88 (4.15-8.31)	24.7 (15.8-38.9)	0.24	P.A.P.
Common Tern - <i>Sterna hirundo</i>					
Alberta					
Egg	2	59.5	5.54	10.7	K.V.
Ontario					
Lake Huron					
Egg	8	19.9 (16.9-23.4)	81.7 (70.5-94.6)	0.24	M.G.

Table 8 cont.

	No. analysed	Ppm, dry-matter basis geometric mean and (95% confidence interval)		DDE/ PCB	Collector
Lake Erie					
Egg	15	24.4 (17.0-35.3)	156 (120-202)	0.16	M.G.*
Lake Ontario					
Egg	20	46.9 (35.8-61.3)	268 (209-342)	0.18	M.G.
Hamilton Harbour					
Egg	71	49.6 (42.0-58.7)	258 (207-322)	0.19	M.G.
Quebec	3	1.96	4.31	0.45	P.A.P.
Egg					
New Brunswick					
Egg	19	3.05 (2.61-3.56)	8.61 (6.65-11.1)	0.35	P.A.P.
Caspian Tern - <i>Hydroprogne caspia</i>					
Ontario					
Lake Ontario					
Egg	4	63.9 (35.1-116)	359 (158-816)	0.18	M.G.
Lake Huron					
Egg	3	57.9	174	0.33	M.G.
Brain	1	29.2	43.8	0.67	
Razorbill - <i>Alca torda</i>					
Quebec					
Egg	10	12.4 (8.24-18.8)	50.7 (34.4-74.8)	0.25	P.A.P.
Newfoundland					
Breast muscle	2	1.23	4.66	0.26	P.A.P.

Table 8 cont.

	No. analysed	Ppm, dry-matter basis geometric mean and (95% confidence interval)		DDE/ PCB	Collector
Common Murre - <i>Uria aalge</i>					
British Columbia					
Liver	2	1.89	3.69	0.51	W.A.M.*
Whole body	1	3.25	2.80	1.16	P.A.P.
Quebec					
Egg	4	6.34 (3.17-12.7)	6.90 (1.86-25.7)	0.92	P.A.P. D.N.N.
Newfoundland					
Breast muscle	2	1.09	1.07	1.02	P.A.P.
Black Guillemot - <i>Cephus grylle</i>					
Newfoundland					
Breast muscle	1	1.00	3.18	0.32	P.A.P.
Pigeon Guillemot - <i>Cephus columba</i>					
British Columbia					
Egg	3	1.90	5.93	0.32	R.H.D.
Marbled Murrelet - <i>Brachyramphus marmoratus</i>					
British Columbia					
Fat	3	2.26	1.73	1.31	R.W.N.
Ancient Murrelet - <i>Synthliboramphus antiquum</i>					
British Columbia					
Whole body (adult)	2	2.78	2.78	1.00	R.W.F.
Whole body (immature)	2	16.8	2.70	6.21	R.W.N.
Cassin's Auklet - <i>Ptychoramphus aleutica</i>					
British Columbia					
Egg	1	9.73	2.00	4.87	R.H.D.
Whole body	2	1.45	1.18	1.23	R.H.D.

Table 8 cont.

	No. analysed	Ppm, dry-matter basis geometric mean and (95% confidence interval)		DDE/ PCB	Collector
		DDE	PCB		
<b>Rhinoceros Auklet</b> - <i>Cororhinca monocerata</i>					
British Columbia					
Egg	2	8.36	6.40	1.31	R.H.D.*
Whole body	2	16.4	7.68	2.13	R.H.D.
Fat	2	14.1	3.67	3.84	R.H.D.
<b>Common Puffin</b> - <i>Fratercula arctica</i>					
Quebec					
Egg	21	3.64 (3.02-4.40)	10.6 (8.57-13.1)	0.34	P.A.P. D.N.N.
New Brunswick					
Egg	5	9.04 (6.43-12.7)	25.3 (22.1-29.1)	0.36	P.A.P.
Newfoundland					
Egg	10	2.01 (1.69-4.03)	7.35 (5.99-9.01)	0.27	D.N.N.
Breast muscle	2	1.04	1.47	0.71	D.N.N.
Whole body	5	0.73 (0.59-0.89)	1.14 (0.94-1.39)	0.64	D.N.N.
<b>Tufted Puffin</b> - <i>Lunda cirrhata</i>					
British Columbia					
Egg	1	1.58	2.46	0.64	R.H.D.
Whole body	2	0.94	2.67	0.35	R.H.D.

\*Initials refer to the names of collectors listed in the acknowledgements.

**Table 9**  
Strigiformes

	No. analysed	Ppm, dry-matter basis geometric mean and (95% confidence interval)		DDE/ PCB	Collector
		DDE	PCB		
<b>Great Horned Owl – <i>Bubo virginianus</i></b>					
Saskatchewan					
Egg	8	23.8 (11.8–48.4)	3.08 (0.93–10.3)	7.74	R.W.F.*
Brain	1	0.285	0.09	3.25	R.W.F.
<b>Long-eared Owl – <i>Asio otus</i></b>					
Saskatchewan					
Egg	4	2.73 (0.29–25.3)	0.29 (0.04–2.17)	9.54	R.W.F.
<b>Short-eared Owl – <i>Asio flammeus</i></b>					
Saskatchewan					
Egg	5	19.6 (10.5–36.8)	0.47 (0.15–1.51)	41.7	R.W.F.

\*Initials refer to the names of collectors listed in the acknowledgements.

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