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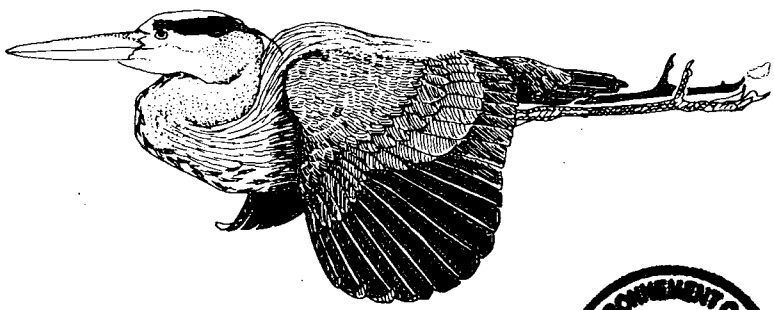

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RÉSUMÉ

Ce rapport regroupe les données concernant les teneurs en résidus chimiques du gibier à plumes canadien. On traitera ici des études réalisées, ainsi que des risques que présentent les produits toxiques pour la santé de ces oiseaux et de leurs consommateurs. La plupart des études canadiennes concernent la contamination par le mercure, le DDT et le BPC. Bien qu'un grand nombre de contaminants soient documentés, les données concernant les produits autres que ceux mentionnés plus haut sont souvent limitées. La plupart des données présentées ici ayant été recueillies avant 1975 dans les zones contaminées ou suspectes de l'être, ce bilan demeure très incomplet.

Les premières études ont révélé de très fortes concentrations résiduelles dans les tissus d'oiseaux de quelques régions (ex. Alberta, Nouveau-Brunswick). Les oiseaux étudiés plus récemment contenaient de faibles concentrations. Néanmoins la pollution chimique semble élevée dans certaines régions (ex: Port Hamilton, Ontario, Baie des chaleurs, Nouveau Brunswick). Les oiseaux considérés comme gibier peuvent aussi accumuler des produits toxiques à l'étranger lors de séjours sur les aires d'hivernage. Bien que les taux de produits organochlorés aient baissé depuis le milieu des années 60, aux États-Unis, on retrouve encore des taux étonnamment élevés chez les oiseaux hivernant dans certaines aires (ex. Alabama).

Le gibier à plumes peut accumuler des résidus chimiques à des concentrations inquiétantes pour leur santé et celle des consommateurs. Bien que l'on dispose d'estimations des récoltes contrôlées, on a très peu de données quant à l'utilisation des oiseaux comme ressource alimentaire par les autochtones. On a donc besoin de plus d'informations afin d'évaluer les risques dus à la consommation d'oiseaux par ces populations.

SOMMAIRE

Le gibier à plumes peut accumuler des résidus toxiques persistants. La gestion de cette resource économique devrait considérer les risques que présentent ces résidus chimiques pour la santé. Si des recherches ont été faites sur les résidus toxiques dans le gibier à plumes canadien, on ne trouve ni résumé, ni revue des renseignements obtenus. C'est ici le but de cette communication. On s'est efforcé, dans ce rapport, d'évaluer l'étendue de la contamination chimique, ainsi que les risques qui en découlent pour la santé des populations aviaines et de leurs consommateurs.

Les espèces visées dans ce rapport comprennent le gibier à plume typique tel que les Anatidés (canards et oies), les Phasianidés (faisans, perdrix et lagopèdes), les Rallidés (foulques, gallinules et râles), les Scolopacidés (bécasse et bécassine), et les Columbidés (pigeons et tourterelles). D'autres espèces qui ne sont pas considérées habituellement comme gibier (Anon., 1980; anon., 1982) mais qui sont chassées à l'occasion (Wendt and Cooch, 1984; Wong, 1987), sont incluses. Ces dernières font parties des Alcidés (marmettes, alques et macareux).

Les études memées au Canada portent principalement sur les contaminations au mercure, DDT (et principaux produits de dégradation) et au BPC. De nombreux autres produits ont été analysés, mais on ne dispose souvent que de données limitées à leur sujet. Pour la plupart, les études on été faites avant 1975, dans des zones contaminées ou suspectes de l'être. Il est par conséquent difficile de cerner le problème des résidus chimiques dans le gibier à plumes canadien.

La recherche a surtout porté sur le mercure, à la fin des années 60 et au début des années 70. Dans quelques cas, le taux de mercure retrouvé dans les tissus de volaille dépassait la limite permise (ex. Alberta & Ontario).Au cours des dernières années, une seule étude à grande échelle a été poursuivie à ce sujet. Les oiseaux échantillonnés dans la baie de Fundy présentaient une concentration de mercure inférieure à la dose considérée toxique. Quelques études récentes ont inclu le mercure parmi les nombreux contaminants chimiques analysés. On a mis en evidence un taux de mercure élevé dans les foies et les reins de Grands Becs-scies capturés, en 1982, sur la rivière Restigouche au Nouveau-Brunswick. Cependant les taux des autres produits étaient faibles dans cet échantillon.

Avant 1977, les plus hauts taux de DDT et de BPC ont été détectés chez les oiseaux de la péninsule du Niagara (Ontario), de Fort Churchill (Manitoba) et de certaines régions du Nouveau-Brunswick. Les oiseaux du Québec et de la Colombie-Britannique présentaient eux aussi des taux éléves. Les taux de dieldrine, d'hexachlorure de benzène et d'heptachlorure d'époxide excédaient rarement 0,1 ppm (poids net). Des études récentes portant sur les contaminations aux produits organochlorés ont été menées sur l'île de Broughton (Territoires du Nord-Ouest), au lac St-Pierre (Québec) et dans la région de la rivière Ste-Claire/Port Hamilton (Ontario). De nombreux produits chimiques furent analysés. Les résidus organochlorés étaient négligeables dans les échantillons de l'île de Broughton et du lac St-Pierre. Les taux de BPC des oiseaux de Port Hamilton étaient, par contre, de plusieurs fois supérieurs

à ceux des oiseaux de la rivière Ste-Claire. Les autres taux de produits organochlorés étaient généralement inférieurs à 0,5 ppm dans cette region.

Le gibier à plumes canadien peut accumuler des résidus chimiques pendant les séjours à l'extérieur du pays. Plusieurs oiseaux migrateurs echantillonnés aux Etats-Unis se reproduisent au Canada; l'information sur les taux résiduels, chez ces oiseaux, est donc à prendre en considération. Quelque études ont été menées aux États-Unis, à la grandeur du territoire. Le produits les plus communs étaient des résidus du BPC et de DDE (sous-produit du DDT). Les taux de BPC des oiseaux du couloir migratoire de l'Atlantique étaient plus élevés que ceux d'autres oiseaux migrateurs. Les concentrations de DDE étaient généralement plus élevées chez les migrateurs côtiers et dans les États du Sud. Certaines régions, ou l'on a détecté de fortes concentrations de DDT, représentent d'importantes aires d'hivernage pour le gibier à plumes. D'autre produits chimiques ont été détectés dans quelques échantillons, mais les concentrations étaient généralement faibles.

On connaît peu de cas d'empoisonnement grave ou mortel d'oiseaux canadiens considérés comme gibier. Cependant les accidents passent souvent inaperçus. D'après certains faits rapportés aux États-Unis, les pertes dues à l'exposition aux produits chimiques seraient un phenomène plus répandu qu'on ne le pense.

Les oiseaux contaminés peuvent représenter un risque pour le consommateur. Dans quelques cas, les taux présents, dans les tissus d'oiseaux, dépassaient la norme établie, et les autorités publiques de la santé ont dû intervenir afin de minimiser les risques à la consommation. Afin d'évaluer les risques pour la santé publique que ce genre de consommation présente, il est nécessaire d'étudier la dépendance de la population canadienne par rapport au gibier à plumes. Malgré les estimations de chasse dont on dispose, les données relatives à l'utilisation des ressources par les autochtones sont insuffisantes.

ABSTRACT

This report reviews data on chemical residues in Canadian game birds. Past efforts on surveying residues in game birds and the health hazards posed by toxic chemicals to game birds and their consumers are discussed. The majority of residue surveys conducted in Canada focused on mercury, DDT, and PCB contamination. Although information is available for a large spectrum of contaminants, data are often limited for compounds other than those mentioned above. Most of the information was collected prior to 1975 in areas of known or suspected contamination. Important data gaps, thus, exist.

Earlier studies reported high residue concentrations in tissues of game birds from a few areas (e.g., Alberta, New Brunswick). Chemical residues were generally found at low concentrations in birds from recent surveys. Nonetheless, there is evidence of important toxic chemical pollution in some areas (e.g., Hamilton Harbour, Ontario; Baie des Chaleurs, New Brunswick). Canadian game birds can also accumulate chemical residues along their migration routes or on their wintering grounds. Although levels of most organochlorines have declined since the mid-1960s in the United States, unexpectedly high levels of contaminants are still found in game birds from a few wintering locations (e.g., Alabama).

Game birds can concentrate chemical residues to levels of concern for their health and that of their consumers. Although estimates of the controlled harvests are available, there is little information on the native use of wildlife as food resources. More information is needed to assess the health hazard from consumption of contaminated game by native populations.

SUMMARY

Game birds can accumulate persistent toxic residues. Effective management of this valuable resource should take into account health hazards posed by chemical residues. Although research on chemical residues in Canadian game birds exists, there is no compendium or review of this information. The purpose of this communication is to review the data on chemical residues in Canadian game birds. The work concentrates on the extent of chemical contamination and health hazards of toxic chemicals to their populations and the consumer.

Species included in this report consist of typical game birds such as Anatidae (ducks and geese), Phasianidae (pheasants, grouse, and ptarmigans), Rallidae (coots, gallinules, and rails), Scolopacidae (woodcock and snipe), and Columbidae (pigeons and doves). Also included are some species which are not usually considered as game birds (Anon., 1980; Anon., 1982), but are occasionally harvested (Wendt and Cooch, 1984; Wong, 1987). The latter are species of Alcidae (murres, auklets, and puffins).

The majority of surveys conducted in Canada focused on mercury, DDT (and metabolites), and PCB contamination. Many other compounds were analyzed but information is often limited. Most studies were conducted previous to 1975 in areas of known or suspected contamination. It is, therefore, difficult to evaluate the problem of chemical residues in Canadian game birds.

Much research focused on mercury in the late 1960s and early 1970s. In some instances, reported levels of mercury in bird tissues exceeded the limit established for this chemical in foodstuffs (e.g., Alberta, Ontario). Few recent studies, however, have included mercury as one of the chemical contaminants analyzed. One large-scale survey of mercury concentrations in the tissues of game birds collected in the Bay of Fundy found levels below those considered toxic. Mercury levels in livers and kidneys of Common Mergansers, collected in 1982, from the Restigouche River, New Brunswick, were high.

Before 1977, the highest DDT and PCB levels were detected in game birds from the Niagara Peninsula, Ontario, Fort Churchill, Manitoba, and some areas of New Brunswick. High levels were also found in birds from Quebec and British Columbia. Dieldrin, benzene hexachloride, and heptachlor epoxide rarely exceeded levels of 0.1 ppm (wet weight). Contemporary surveys centering on organochlorine contaminants were conducted on Broughton Island, in the Northwest Territories, at Lac St. Pierre, Quebec, and in the St. Clair River-Hamilton Harbour areas in Ontario. A large spectrum of chemicals were analyzed in those surveys. Organochlorine residues were low in samples from Broughton Island and Lac St. Pierre. PCB levels were several times higher in birds from Hamilton Harbour than in birds from the St. Clair River. Other organochlorine compounds were generally below 0.5 ppm in birds from those areas.

Canadian game birds can accumulate chemical residues during their stay outside of the country. The information on persistent residue levels in migratory game birds sampled in the United States is, thus, relevant since most of these birds breed in Canada. A few nationwide surveys were conducted in the United States. PCB and DDE (a breakdown product of DDT) residues were the most common compounds detected. PCB burdens in birds from the Atlantic Flyway were higher than those from other flyways. DDE loads were generally higher in coastal flyways and in southern states. Some areas where high DDE concentrations were detected are important wintering grounds for waterfowl.

Other chemicals were detected in a few samples but generally at low concentrations.

Little information on acute poisoning or die-offs of Canadian game birds have been documented, likely because these events often pass unnoticed. Reported events in the United States following similar chemical exposure suggest that losses due to toxic chemical exposure occur more extensively than recorded.

Game birds that are contaminated with toxic chemicals may pose a risk to the consumer. In a few instances, levels in game bird tissues exceeded the established guideline levels and action was taken by public health authorities to minimize risks to consumers. To assess public health risks from consumption of contaminated game birds, information on the dependence of the Canadian population on wildlife harvest is needed. Estimates of the migratory bird harvest are available. There are, however, insufficient data on the use of wildlife by native groups.

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We would like to thank Tim Power for his help in retrieving information from the literature, and John Elliott for discussion on the report. We would also like to extend our appreciation to John Paul Campbell and Peter Chinneck for their endless hours of editing and infinite patience during the production of this report.

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1.0. INTRODUCTION

The socio-economic benefits of game birds in Canada have been largely documented (Boyd and Finney, 1978; Langford and Cocheba, 1978; Bellrose and Low, 1978) and management of this valuable resource is a complex and challenging endeavour. In addition to the regulated harvest, game bird populations are affected by such factors as habitat quality, disease, and chemical contamination. The frequent occurrence of toxic chemicals in tissues of these birds demonstrates how fully some chemicals have contaminated their habitat. Effective management of this resource should take into account health hazards posed by contaminants.

The monitoring of chemical residues in birds can help explain some of the changes occurring in their populations. The decline of certain raptors in North America, for example, has been linked to the use of persistent pesticides (Peakall, 1976). Similarly, population crashes of seed-eating birds in Sweden during the 1950s were associated with the use of alkyl mercury compounds (Jensen et al., 1972). When these products were removed from the market in 1966, the affected populations recovered (Westermark et al., 1975; Wallin, 1984). Bird loss in Korea, to cite a final example, was linked to environmental pollution by organochlorine compounds and heavy metals (Min et al., 1984; cited in Honda et al., 1986).

The survey of pollutants in birds can also function as an indicator of environmental quality. The systematic search for new and existing toxic chemicals in game birds can act as an early warning signal of environmental contamination. In Japan, for example, the loss of fish-eating birds in Minimata and Niigata Bays was observed long before the mercury-related deaths and illnesses of humans (Matida and Kumada, 1969; cited in Jenkins, 1980).

Information generated from surveys of toxic chemical contamination of the avifauna is useful for identifying sources and dispersion patterns of pollutants. Furthermore, these measurements must be acquired before definitive statements on the biological availability and potential effects of environmental contaminants can be made.

Despite considerable research on residue levels in game birds in Canada, there is no review or compendium of this information on a national basis. This document compiles the available data and assesses the extent of chemical contamination and health hazards of these chemicals to avian populations and their consumers. The first chapters review the information on chemical residues in game birds sampled in Canada and in the United States. The reliability of residue analyses and usefulness of the summarized data are also discussed. The effects of chemical residues on game birds are then examined in Chapter 6. In Chapter 7, the human health implications are discussed.

Species included in this report consist of typical game birds such as Anatidae (ducks and geese), Phasianidae (pheasants, grouse, and ptarmigans), Rallidae (coots, gallinules, and rails), Scolopacidae (woodcock and snipe), and Columbidae (pigeons and doves). Also included are some species which are not usually considered as game birds (Anon., 1980; Anon., 1982), but are occasionally harvested (Wendt and Cooch, 1984; Wong, 1987). The latter are species of Alcidae (murres, auklets, and puffins). Common and scientific names are those given in the AOU check list of North American Birds (AOU, 1983). Scientific names not listed in Appendix 3 are included with the common name in the text.

1.1. Disclaimer

Most information found in this report was derived from the published literature. The remaining data are from technical reports which were made available to us by federal and provincial agencies. We assumed that all published residue data are valid. No attempt was made to reject results on the basis of dubious sampling methodology and/or inadequate quality assurance.

Although this report has been reviewed, there may still be errors in the appendices due to the sheer volume of data presented. Persons wishing to use the data for a specific purpose should check the references where provided. For verification of data in Appendix 2 (data contained in the National Registry of Toxic Chemical Residues), contact the Data Base Manager at (819) 997-6122 or at the address from which copies of the report may be obtained.

2.0. REVIEW OF CHEMICAL RESIDUES IN CANADIAN GAME BIRDS

This chapter reviews data on chemical residues in game birds sampled in Canada. The majority of residue surveys of game birds in Canada focused on mercury, DDT, and PCB contamination. Studies focusing on heavy metals are covered first. Surveys that concentrated on organochlorines are then discussed. Finally, studies on single game bird species are presented. Organochlorines and mercury levels were the contaminants most often measured in the latter surveys.

The published information on residue levels in Canadian game birds is summarized in Appendix 1. In addition, data on contaminant levels in game birds stored in the National Registry of Toxic Chemical Residues (NRTCR Elliott et al, 1987), at the National Wildlife Research Center (NWRC) in Hull, Quebec, are presented in Appendix 2. Only specimens collected after 1963 are included in this appendix. To our knowledge, the coverage of available Canadian data is complete up to August 1988.

In the tables, Canadian information is summarized by species and province going westward from Newfoundland to British Columbia, followed by the territories. A list of species for which published data are available is given in Appendix 3. Appendices 4, 5, and 6 give information on residues, tissues, and locations for which data are available.

2.1. Mercury

Surveys of mercury in Canadian wildlife include those reported by: Keith, (1969); Fimreite, (1970); Fimreite et al., (1970); Vermeer, (1971); Vermeer and Armstrong, (1972a); and Fimreite, (1972; 1973; 1974). Mercury residues were generally analyzed in tissues of birds collected from areas suspected of mercury pollution. Some major sources of mercury contamination included chlor-alkali plants with mercury cells, pulp mills using mercury slimicides, and mercury-fungicide use (e.g., Fimreite, 1970; Fimreite et al., 1970). Most of these major sources are now subject to regulatory control.

In 1968, mercury residues in seed-eating birds from southern Alberta and Saskatchewan were surveyed (Fimreite et al., 1970). Total mercury levels in livers of Ring-necked Pheasant were above 2.5 ppm. Levels in Gray Partridge and Rock Dove exceeded 0.4 ppm but were lower in Sharp-tailed Grouse. Mercury levels were generally higher in birds from Alberta than Saskatchewan. This trend was related to the use pattern of alkylmercury compounds. Mercury was employed extensively in Alberta as a fungicide but its use was less common in Saskatchewan.

Keith (1969) estimated that mercury loads in edible tissues of birds from the above survey were beyond the 0.05 ppm (ww) limit set for human food by FAO/WHO at that time. This prompted a survey of mercury in tissues of pheasant and partridge in major hunting areas of Alberta, just before the

1969 harvest season. The survey revealed that mercury levels were far above

the tolerance limit established for foodstuff at that time (Keith, 1969; Weigand, 1971). This resulted in the closure of the 1969 pheasant and partridge hunting season in Alberta. Similar scenarios, where consumers were warned of risks from contaminated birds, are described in Section 7.0.

Fimreite (1970) and Fimreite et al. (1971) reported levels of mercury in tissues of birds from areas suspected of mercury contamination across Canada. Pinchi Lake, British Columbia, and the Lake St. Clair region in Ontario were reported to be heavily contaminated with mercury. Other sites showing high mercury contamination included some coastal waters; high residue levels in livers of Marbled Murrelets from Port Alberni and Horseshoe Bay, British Columbia, and eggs of Red-breasted Mergansers from Baie des Chaleurs, New Brunswick. Evidence of mercury contamination in inland waterways was also reported. Mercury in livers of Common Goldeneye, Black and Wood Ducks from a section of the Ottawa River was traced to discharges from a pulp mill in the area.

In 1968 and 1969, eggs of several species were collected in Manitoba, Saskatchewan, and Alberta and analyzed for mercury content (Vermeer, 1971). Dramatic species differences were found. Vermeer (1971) postulated that variation in diet and time of egg-laying relative to the sowing of mercury-treated grains could account for those differences.

Adult ducks from those three provinces were also collected in 1969 and 1970. Breast muscles and livers were analyzed for total mercury content (Vermeer and Armstrong, 1972a). Levels of 0.80 and 1.98 ppm in muscles and livers, respectively, of two Common Mergansers were reported. Concentrations were below 0.45 ppm in all other samples. Vermeer and Armstrong (1972a) also analyzed mercury levels in primary feathers and breast muscles of 10 adult and 10 immature Northern Pintails collected in Alberta. The analyses were done to examine whether feathers could be used for estimating residue levels in breast muscles. The correlation reported between mercury levels in feathers and muscles was weak in adults and nonexistent in young birds. The use of the wing structure for chemical residue measurements has been reviewed and is discussed in detail elsewhere (Wong et al., 1989).

Mercury discharges from a chlor-alkali plant in Dryden, Ontario, into the Wabigoon River raised concern about metal contamination in surrounding waters. Several surveys of mercury levels in ducks from the English-Wabigoon River system were conducted (Fimreite, 1972; 1973; Vermeer et al., 1973; Fimreite, 1974; Pearce et al., 1976). All studies reported mercury residue levels exceeding the 0.50 ppm (ww) limit established for mercury in foodstuffs. Total mercury concentrations in livers were highest for fish-eating birds and lowest for herbivores and omnivores (Fimreite, 1972; 1973; 1974).

Vermeer and Armstrong (1972b) attempted to correlate the mercury levels in wing muscles to those in breast muscles of waterfowl from Clay Lake (English-Wabigoon River system). They reported strong correlations for all five species examined (Mallard, r = 0.96; Common Goldeneye, r = 0.98; Common Merganser, r = 0.88; Hooded Merganser, r = 0.86; Blue-winged Teal, r = 0.73). The wing muscle:breast muscle ratios for mercury residues ranged from 0.70:1.00 to 0.75:1.00. This suggests that wings may be used in those species to assess residue levels in edible parts.

In addition to the data from the English-Wabigoon system, Pearce et al. (1976) presented data for 16 other sites in eastern Canada. Breast muscles of ducks were collected in the fall of 1970 from areas of high hunting pressure and suspected mercury contamination. While mercury concentrations were generally low, some samples exceeded 0.50 ppm total mercury (ww).

In a survey of mercury residues in ducks from eastern Canada, Pearce at al. (1976) also reported data from a fall 1971 federal-provincial study of mercury contamination in northwestern Quebec (Anon., 1972). This survey was initiated following the detection of high mercury levels in the blood of native people living in the area. Samples of 87 waterfowl from the drainage basins of the Bell-Nottaway, Broadback, and Rupert Rivers were analyzed for mercury residues. Immature specimens were collected since their residue loads would presumably represent contamination in those locations. Residue levels in breast muscles were higher in specimens taken from Lac Parent, Lac Waswanipi, and Lac Pusticamica than those from Lac Matagami. Mercury levels in birds obtained from Bell River, downstream from a chlor-alkali plant, were greater than those sampled upstream from this source. High residues were also reported in birds taken from Lac Quevillon, a lake adjacent to the chlor-alkali plant.

In the spring and fall of 1971 and 1972, 356 ducks representing 16 species were collected from Lake Winnipeg and the Saskatchewan River Delta in Manitoba (Driver and Derksen, 1980). Some waterfowl habitats in Manitoba were believed to be receiving mercury from other regions, such as the Saskatchewan River (Saskatchewan), the English-Wabigoon River (Ontario), and the Red River (U.S.). Mean levels in breast muscles were below 0.25 ppm for both adult and immature ducks, with adults containing slightly higher levels. In all, only 20 samples had mercury levels in muscles exceeding 0.50 ppm. Mercury residues in livers of adults were higher than in livers of immatures. Spring migrant dabblers collected in the Saskatchewan River Delta had slightly higher mercury residues (0.18 ppm) relative to fall migrants (0.13). Driver and Derksen (1980) postulated that those ducks accumulated mercury on their wintering ground.

Over the last 15 years there have been no large scale studies of mercury in game birds. However, Braune (1987) analyzed tissues of nine species of marine birds from the Quoddy region in the Bay of Fundy for total

mercury concentrations. Adult Black Guillemots and Common Eiders were included in the sample. All birds were collected between July 1978 and December 1984. Eiders and Guillemots, which feed on benthic organisms, had higher mercury levels in their tissues than Red-necked Phalaropes (Phalaropus lobatus) and Black-legged Kittiwakes (Rissa tridactyla), which feed on pelagic invertebrates. Concentrations in tissues of the nine species were, however, below levels considered toxic.

2.2. Metal contamination from point sources

No large-scale baseline data exist for heavy metals other than mercury. Most of the available information on other metals is provided by point sources studies. Metal residues most often analyzed in those surveys include: copper, nickel, iron, zinc, lead, silver, and mercury (e.g., Ranta et al., 1978; Vermeer and Peakall, 1979; Rose and Parker, 1982). A complete list of metal residues for which data are available is found in Appendix 4.

In 1976, livers of Surf Scoters and Greater Scaup from Iona Island and Roberts Bank, British Columbia, were collected and analyzed for metal residues (Vermeer and Peakall, 1979). Analyzed chemicals included silver, copper, lead, zinc, and mercury. Iona Island receives residential and industrial wastes and urban run-offs from Vancouver. Metal concentrations varied between species. It was suggested that ducks feeding from different intertidal zones exhibit differential accumulation of metal residues.

Studies were also performed in areas surrounding Sudbury, Ontario, where metal contamination from mining and smelting is a major environmental problem. In early May and late September of 1980, Ruffed Grouse were collected from Falconbridge and Blewett Townships. The former site is located near two smelters. Blewett Township is situated 100 km north of Sudbury. Rose and Parker (1982) reported the copper, nickel, and iron contents of primary feathers of grouse. Levels of the three metals in post-moult primaries did not differ between birds from the contaminated site and those removed from Sudbury. Feathers in pre-moult condition, however, had metal levels which were 7 to 20 times greater in birds from the contaminated site than in those from the control area.

In their second investigation, Rose and Parker (1983) analyzed levels of copper, nickel, and iron in body tissues of the same birds. Concentrations of copper and iron did not differ between birds from Blewett and Falconbridge Townships. Elevated nickel levels were recorded in kidneys and livers of birds from the contaminated area. Nickel concentrations in breast muscles of birds from the two townships were, however, similar. An earlier study by Ranta et al. (1978) also demonstrated that copper and nickel levels in Mallard and Black Duck wings increased with proximity to Sudbury. No such trend was observed for zinc.

Muir and Grift (1986) reported analyses of organochlorines in traditional food of the Broughton Island community in the Northwest Territories. The survey was undertaken to support a pilot study by the Department of National Health and Welfare. Livers and muscles of Common Eiders were taken in September and October of 1985. Tissue samples of seal, caribou, and char were also collected. Organochlorine residue levels were below 0.001 ppm in all dietary samples.

At the request of the Walpole Island Indian Band, a study of contaminant levels in ducks from the St. Clair River, Ontario, was initiated (Weseloh and Struger, 1986). Mallard, American Goldeneye, and Common Merganser were collected in December-January 1985-86 and February 1986 and analyzed for a wide spectrum of organochlorine contaminants. Chemical residues were generally low in muscles and livers. Only PCBs were above the poultry guideline level of 0.5 ppm established by the Department of National Health and Welfare. The highest mean value of 2.85 ppm (ww) was found in muscles of Common Mergansers.

For comparative purposes, domestic ducks were released in early June, 1986, at three sites in southern Ontario and collected at the end of the summer. PCB levels were elevated in birds from Hamilton Harbour. This site is known for its chemical contamination and large population of wintering waterfowl. PCB levels were 14 to 20 times higher (16.3 ppm, ww) in ducks from Hamilton Harbour than in birds from Walpole Island (St. Clair River) and Ancaster. Other compounds were most often found at concentrations below 0.5 ppm in ducks from these sites (Weseloh and Struger, 1986).

A companion study by the Great Lakes Institute, University of Windsor, was conducted on Walpole Island in 1986 (Great Lakes Institute, 1987). Female Mallards and Redheads and their broods were analyzed for octachlorostyrene (OCS), hexachlorobenzene (HCB), pentachlorobenzene (QCB), and total PCB. All compounds were found at concentrations below 0.1 ppm. These results are consistent with those reported by Weseloh and Struger (1986).

2.4. Individual game bird species

Single game bird species have been the focus of several residue surveys. A large variety of organochlorines were examined, but PCBs, DDE, and dieldrin were most commonly measured (e.g., Reichel and Addy, 1968; Zitko and Choi, 1972; Longcore and Mulhern, 1973). Heavy metals were also occasionally surveyed (Renewable Resources Consulting, 1977; Stendell et al., 1977; Longcore et al., 1983). These studies are described below.

2.4.1. Snow Goose

Environmental contaminants in eggs of Greater Snow Geese from Baffin and Bylot Islands, in the Northwest Territories, and tissues of adult and juvenile geese from Cap Tourmente, Quebec, were analyzed (Longcore et al.,

1983). Levels of total DDT, dieldrin, PCBs, BHC, and total mercury, in eggs collected in 1971 and in tissues collected in 1977, were low. They concluded that geese were unaffected by these chemicals.

2.4.2. Black Duck

Chemical contaminants in eggs of Black Ducks were investigated by the U.S. Fish and Wildlife Service because of concern with respect to their continued population decline over the 20 years before 1980 (Reichel and Addy, 1968; Longcore and Mulhern, 1973; Haseltine et al., 1980).

In the spring of 1964, eggs from New Brunswick and Quebec were analyzed for DDD, DDE, DDT, and dieldrin (Reichel and Addy, 1968). Only DDE (1.6 ppm, ww) and DDT (1.3 ppm, ww) were detected. In the 1971 survey, eggs from Nova Scotia, New Brunswick, Quebec, and Ontario were examined for DDE, DDD, DDT, dieldrin, heptachlor epoxide, and PCBs (Longcore and Mulhern, 1973). DDE was detected in eggs from all provinces, with the highest mean levels in Ontario (0.82 ppm, ww) and Quebec (0.79 ppm, ww). PCBs were detected in eggs from Ontario and Quebec. Other residues were found at concentrations less than 0.5 ppm. In 1978, eggs from New Brunswick, Nova Scotia, and Quebec were analyzed for DDE, PCB (Aroclor 1260), and total mercury (Haseltine et al., 1980). DDE and PCB levels were highest in eggs from Quebec (0.64 ppm, ww) and New Brunswick (0.60 ppm, ww), respectively. Mean mercury levels in eggs from the three provinces ranged from 0.12 to 0.14 ppm.

Eggs of Black Ducks collected from Fatpot Island in the Bay of Fundy, New Brunswick, in 1971, were analyzed for PCBs and DDE (Zitko and Choi, 1972). Although relatively high, the mean residue levels (9.10 ppm for PCB and 1.50 ppm for DDE) were lower than those detected in eggs of Herring Gulls (*Larus argentatus*) and Double-crested Cormorants (*Phalacrocorax auritus*) in the area.

In August and September of 1985, 17 Black Ducks were collected at Lac St. Pierre, Quebec. Liver and breast muscle levels were reported for HCB, mirex, PCB, OCS, oxychlordane, cis-chlordane, trans-nonachlor, BHC, heptachlor epoxide, dieldrin, and total DDT (Laporte, 1987). All organochlorines were found at low concentrations. Only DDE and PCB were above 0.01 ppm (ww).

2.4.3. Canvasback

Eggs of canvasbacks were collected in 1972 and 1973 from several nesting areas in Manitoba, Saskatchewan, and Alberta. These were analysed for DDE, DDT, dieldrin, HCB, PCBs, and total mercury (Stendell et al., 1977). This species was studied because populations have experienced marked annual fluctuations. Organochlorine and mercury levels were low and did not seem harmful to this bird.

2.4.4. Oldsquaw

The Oldsquaw was chosen for residue surveys because it breeds in the Arctic and winters in southern locations, such as the Great Lakes. Peterson and Ellarson (1976) postulated that residue loads in these birds would come from their wintering grounds and, therefore, could be used as an indicator of environmental residues in these areas. In 1969 and 1972, livers and eggs of Oldsquaw from northwest Hudson Bay, near Eskimo Point, and Rankin Inlet, Northwest Territories, were collected for mercury determinations. Mercury in livers of adult and immature birds averaged 1.30 and 0.29 ppm (ww), respectively. Ninety-four percent of adult Oldsquaw livers contained mercury residues of more than 0.50 ppm (ww). Lower mercury levels were detected in eggs.

In addition to the arctic collections, Peterson and Ellarson (1978) obtained data in 1971 for Newfoundland and Lakes Huron, Michigan, and Ontario. Levels of DDE, PCBs, and endrin were determined in eggs and carcasses. Levels of dieldrin, DDT, DDD, BHC, and heptachlor epoxide were also measured but were not reported because residue identities could not be confirmed by mass spectrometry. Furthermore, PCBs were high enough to interfere with DDD and DDT. This point is discussed in Section 4.0. DDE and PCB concentrations were low in birds from the Arctic. Endrin levels were below 0.1 ppm or were undetectable in these samples. Organochlorine residues were even lower in birds from Newfoundland. In contrast, Oldsquaw from Lake Huron had high levels of DDE (ranging from 5.7 to 31.3 ppm) and PCBs (ranging from 20 to 77 ppm), while birds from Lake Ontario had slightly lower levels. Similar residue profiles were obtained from Lake Michigan.

2.4.5. American Woodcock

Chemical contamination of American Woodcock in New Brunswick was recognized in the late 1950s, several years after DDT and heptachlor applications started in New Brunswick and the U.S.. From 1959 to 1963, an effort to survey these residues in Woodcock tissues was made. Wright (1965) showed that spring migrants collected in New Brunswick carried both pesticides. Upon hatching, some Woodcock were already contaminated. Reproductive success of these birds was also related to DDT exposure. Woodcock from Nova Scotia, where no DDT applications had occurred, averaged higher breeding success than birds from New Brunswick (Wright, 1965). DDT and metabolites, however, did not seem to reduce the thickness of egg shells in this species (Dilworth et al., 1972).

From 1969 to 1971, a few studies reported total DDT levels in Woodcock tissues collected in New Brunswick (Pearce, 1971; Pearce and Baird, 1971; Dilworth et al., 1972; 1974). Total DDT residues were detectable in all samples but were found at lower concentrations in Woodcock from areas with no or limited DDT spraying (Pearce, 1971). Levels in some samples exceeded the tolerance limit of 7.0 ppm in fat of meat established by the Department of National Health and Welfare (Pearce, 1971; Pearce and Baird, 1971;

Dilworth et al., 1974). The DDT content in some samples was considered by the Food and Drug Directorate to represent an unacceptable health hazard to consumers (Pearce, 1971). The New Brunswick Woodcock hunting season was closed in 1970 but was later re-opened in areas of limited DDT application.

2.4.6. Seabirds

Surveys of chemical residues in seabirds have been carried out in selected coastal areas of Canada. Between 1971 and 1976, 252 eggs of Common Eiders, Razorbills, Common Murres, Black Guillemots, and Atlantic Puffins were collected from Newfoundland, Nova Scotia, New Brunswick, Prince Edward Island, and Quebec (Pearce et al., 1979). These eggs were analyzed for DDE, PCBs, and mercury content. Other organochlorines were also surveyed but usually occurred at low levels. Eggs of Common Eiders from Quebec and New Brunswick had low DDE and PCB residues despite the fact these birds feed on molluscs, which are good accumulators of some toxic chemicals. DDE and PCB levels were higher in eggs from New Brunswick than in eggs from Quebec. Temporal and geographical differences in residue levels were reported for eggs of Atlantic Puffins collected in 1972 and 1976 from Machias Seal Island in New Brunswick and Great Island in Newfoundland. Eggs from the two puffin colonies showed decreases in DDE levels between 1972 and 1976. PCB concentrations in eggs from Newfoundland, however, increased significantly during this period. Overall, in both years, DDE and PCB levels from New Brunswick were considerably higher than those from open-ocean colonies in Newfoundland.

In a more recent report, residue levels of DDE in eggs of Atlantic Puffins decreased from 1968 to 1984 at sites in the Bay of Fundy and Newfoundland, and PCB levels decreased in puffin eggs from the Bay of Fundy (Pearce et al., 1989). During this time period, mean PCB and DDE levels did not exceed 10 ppm and 4 ppm (ww), respectively. However, levels at the Newfoundland site were consistently lower than in the Bay of Fundy. Residues of other compounds (dieldrin, HCB, oxychlordane, heptachlor epoxide, BHC, mirex) were generally found at levels below 0.3 ppm. Similarly, residue levels (except heptachlor epoxide and possibly BHC) in Gannet (*Sula bassanus*) eggs from Quebec also declined from 1968 to 1984 (Elliott et al., 1988a).

Metal and chlorinated hydrocarbon levels in adult and immature Black Guillemots and Thick-billed Murres from Lancaster Sound, Northwest Territories, were surveyed in July-August 1976 (Renewable Resources Consulting, 1977). The purpose of the study was to gather baseline information on chemical residue levels in these birds. Of all metals, zinc had the highest levels in livers and breast muscles of both species. Arsenic and copper were often the second highest in concentration. Vanadium was not detected. DDE was the only detectable chlorinated hydrocarbon in immature specimens. DDE was also the highest organic residue in adult Black Guillemots and Thick-billed Murres. HCB and PCBs were also detected but levels were low.

A study by Nettleship and Peakall (1987) on organochlorine residue levels in seabirds, including Thick-billed Murres, from Prince Leopold Island in Lancaster Sound during 1975-1977 showed that levels were highest in all species in 1976 (the year in which the study by Renewable Resources Consulting was conducted), a year when lipid levels in all tissue examined were highest. Overall, data indicate that DDE levels were low and PCB levels were high.

In 1978, a residue survey reported the presence of environmental contaminants in Razorbill eggs from the Gulf and Estuary of St. Lawrence (Chapdelaine and Laporte, 1982). Concentrations of total DDT, chlordane, oxychlordane, and PCBs (Aroclor 1260) were higher in eggs from the estuary than from the gulf. These authors concluded that contaminants were not responsible for the decline in Razorbill populations since reproductive success was comparable to that reported in Europe, where concentrations of organochlorine residues were much higher. Furthermore, they found no evidence that DDE affects the thickness of egg shells in this species. Alternatively, Elliott et al. (1988a) found that the low reproductive success of Gannets on Bonaventure Island in the Gulf of St. Lawrence in the late 1960s and early 1970s coincided with the period of greatest shell thinning and highest DDE levels. A more comprehensive review of residues in Canadian seabirds is available (Noble and Elliott, 1986).

3.0. RESIDUE SURVEYS OF GAME BIRDS CONDUCTED IN THE UNITED STATES

The acquisition of toxic chemical residues during migration is a phenomenon which has received little attention. Yet, there is evidence showing that birds accumulate residues while on their wintering grounds. For example, evidence from the field and from experimental reproductive studies with waterfowl (Haegele and Hudson, 1974; Peakall et al., 1975; Lingcore and Stendell, 1977) suggests that DDE residues are lost very slowly. Regardless of when or where a bird encounters DDE, it may still have a substantial portion left at the breeding season, a time when small amounts in the body impair reproduction in birds of several species (Stickel et al., 1984). Johnston (1975) reported that passerines wintering in Latin America, where organochlorine pesticides are still in use (Maltby, 1980), contained higher concentrations of organochlorine residues when collected in the spring than in the fall. Similarly, high DDE levels (12.47 ppm, ww) were found in livers of Blue-winged Teal collected in Louisiana during their northward migration (White, 1976). Henny et al. (1982) also provided evidence that Peregrine Falcons (Falco peregrinus) accumulate DDE residues in their Latin American wintering ground. Finally, Anderson et al. (1984) showed that the changes in total body burden in Canada Geese followed reported patterns of pesticide usages. It was demonstrated that migrational stopovers and wintering areas of geese coincided with areas in California of heavy use of organochlorines. Cases of migrating Canadian game birds carrying residues from polluted sites in the United States were also reported (Wright, 1965; Pearce, 1971). These are discussed in Section 5.0.

Numerous studies of toxic chemical residues in game birds have been carried out in the United States. Information on persistent residues in migratory game birds sampled in the United States is relevant since most of these birds breed in Canada. The residue data from the United States have not been tabulated in this report but a summary is given in Appendix 7. Documents from state wildlife agencies are summarized but the coverage is not complete. The U.S. summary provides information on the species collected, the type of tissue used for chemical analysis, the chemical residue monitored, the location and date of specimen collection, and the reference source. This summary can be used as a basis for comparison of the same species in Canadian situations.

3.1 Nation-wide residue surveys of waterfowl conducted by the U.S. Fish and Wildlife Service

The largest information base of residue levels in North American waterfowl has come from nation-wide surveys conducted by the U.S. Fish and Wildlife Service. These surveys are summarized in Appendix 8.

As part of the National Contaminant Biomonitoring Program, (Jacknow et al., 1986), the U.S. Fish and Wildlife Service has systematically been measuring organochlorine residues in wings of Mallards and Black Ducks shot by hunters throughout the continental United States. These surveys have been conducted every two to three years since the mid-1960s.

PCBs and DDE have been the most common compounds found in the duck samples (Appendix 10). Hexachlorobenzene, mirex, dieldrin, chlordane, and heptachlor epoxide have been detected in a few samples, but at low concentrations. DDT and DDD levels have declined drastically since the first survey. DDE and PCBs, however, have continued to occur in nearly all samples. DDE levels are generally higher in coastal flyways and in southern states, where DDT application was greatest prior to 1972. Since the first survey, high DDE levels have been found in pools from Alabama and Arizona. White and Krynitsky (1986) found high DDE concentrations in two species of lizards (Cnemidoohorus inornatus, C. gularis) collected in the Pecos River drainages. The non-migratory nature of the lizards indicate that a local polluted site was probably responsible for the elevated levels found in the lizards and suggests the possibility of local sources of contamination to the Mallards (Prouty and Bunck, 1986). Mallard wings from the Atlantic Flyway continue to have higher PCB levels than those from the other flyways. A large proportion of Mallards sampled in this flyway are probably migrating south (band recovery data base, C.W.S. Banding Office, Martin and Carney, 1977). Some birds, therefore, may have accumulated PCB residues in Canada. Levels and percentage of occurrence of organochlorine residues in duck wing pools are given in Appendices 9 and 10.

Two other nation-wide surveys were carried out in the early 1970s. During 1972-73, a study was conducted by the U.S. Fish and Wildlife Service to determine lead residues in wing bones of seven species of waterfowl (Stendell et al., 1979). Lead levels ranged from trace amounts to 361 ppm (dry weight). Mottled Ducks (Anas fulvigula) contained the greatest lead burden, followed by Redheads, Black Ducks, Mallards, Canvasbacks, Northern Pintails, and Lesser Scaup. Comparison of lead residues, on a flyway basis, was performed using immature Mallards. The highest lead values were recorded in the Atlantic and Central Flyways.

During 1970-71, breast muscles of 327 ducks collected nation-wide were analyzed for mercury content (Baskett, 1975). Ducks were sampled from areas of known or suspected industrial mercury contamination, areas where mercurial fungicides were used, and areas with no known mercury contamination. Overall, 7.6 percent of the specimens had concentrations equal to or exceeding the 0.5 ppm action level set by the U.S. Food and Drug Administration (FDA). Diving ducks generally had higher mercury levels than dabbling ducks. This trend was attributed to the greater quantities of animal matter in the diet of divers.

Comparisons of ducks from areas of suspected or known mercury contamination and ducks from non-contaminated sites indicate that levels of

mercury reflect the environmental state (Baskett, 1975). Both dabbling and diving ducks from polluted areas had higher mercury levels than those from unpolluted regions. Surprisingly, 9.2% of divers from unpolluted regions had levels above 0.5 ppm.

4.0. RELIABILITY OF RESIDUE ANALYSES

It is difficult to compare residue data from different laboratories because of differences in analytical protocol. Furthermore, the level and sensitivity of detection vary between laboratories and tissues. Results from the following studies illustrate this problem.

Pearce et al. (1976) noted that total mercury residue levels in their 1971 samples of Mallards and Green-winged Teal were lower than levels reported by Vermeer et al. (1973), even though the samples were from the same birds. In the former study, mercury analyses were performed at the Ontario Research Foundation (ORF). The Freshwater Institute (Winnipeg) carried out the mercury analyses in the second study. Similarly, Pearce et al. (1976) found that mercury levels in breast muscles of Common Goldeneye and Common Mergansers were lower than levels obtained by others at the University of Michigan (Annett et al., 1975), although samples were from the same birds.

The presence of PCBs in biological samples can result in inaccuracies in residue analyses, especially for organochlorines. In earlier studies, it was shown that DDE values may include some contribution from PCBs (Reynolds, 1971). PCBs can also interfere with the detection of DDT and DDD. No direct PCB interference, however, was reported in heptachlor epoxide analyses. Measurements of dieldrin were also found to be unaffected except in the presence of high DDE residue levels, where dieldrin peaks would be masked. These findings would lead one to question the value of some of the analytical results obtained for organochlorine residues before 1970 (analyses which were performed without PCB Florisil separation) or studies which do not confirm the identity of the residue being measured.

An essential part of any residue survey program is the accuracy and reproducibility of measurements. At present, chemical analyses of Canadian Wildlife Service (CWS) wildlife specimens are contracted out or are performed in-house at the National Wildlife Research Centre (Hull, Quebec). Checks of quality assurance are performed on a routine basis using primary and secondary analytical reference material for metal analyses and secondary reference samples for analyses of organic compounds (Won and Norstrom, 1980). This standardization of protocols and the maintenance of quality control allows for comparisons of results from these chemical analyses. Guidelines for quality assurance in contracted chemical analysis have been published by Turle and Norstrom (1987).

It should also be pointed out that some of the tissue samples collected for residue analyses by CWS are preserved in freezers in the National Specimen Bank (NSB) of the NWRC (Elliott, 1984; 1988b). In all, over 200 species of birds, including game birds, are represented. Some specimens were collected as early as 1963. The archiving of wildlife specimens is invaluable for filling in information gaps. In addition, specimen banking can be used for detection of new compounds and to verify

previous results by re-analyzing samples with the more sensitive technology. It is, therefore, possible to retrieve tissue samples for retrospective chemical examination and gain a better understanding of the dynamics of pollutant exposure in these birds.

5.0. USEFULNESS OF THE SUMMARIZED DATA

As with any report which compiles information from a variety of studies, this document has its limitations. Caution must be exercised when comparing data sets. It is obvious that biases in sampling exist since surveys were initiated with particular objectives in mind. For example, many of the residue surveys were carried out in areas with known or suspected sources of contamination. These are not representative of random samples.

Many species included in this report are migratory. The measured contaminant loads in tissues, therefore, do not necessarily represent the residue profile of the area of collection. They may reflect the contamination on wintering grounds and migratory stopovers. As mentioned earlier, there is evidence that Canadian game birds can accumulate residues during their stay outside the country. Wright (1965) notes that American Woodcock migrating to New Brunswick during 1960-63 carried heptachlor epoxide, the metabolic product of heptachlor. Heptachlor was extensively used in Woodcock wintering grounds in the United States, but was not applied in New Brunswick. In a similar scenario, the presence of mirex, the pesticide employed as a replacement for heptachlor, was found in six Woodcock sampled in New Brunswick in 1971. This factor, therefore, must be taken into account when interpreting background levels of chemical residues in birds sampled in Canada.

In the literature, there is no uniform mode of expressing the quantities of chemical residues in tissues. Most authors calculate residue values on a wet weight basis, while others express them on a dry weight or on a lipid weight basis. The most acceptable procedure is to present the residue data together with the percent water and percent fat of the analyzed tissue. This allows interested readers to convert residue results from wet to dry weights or wet to lipid weights.

Greater standardization of sampling methods and analytical techniques is required. Furthermore, the age, sex and tissue of the animals, as well as the timing of collection, must be thoroughly considered.

Despite the biases and the lack of uniformity in the presentation of data, the summarized residue information is valuable in several regards. First, it provides integrated information on the species, locations, and residues surveyed. Second, it is useful for detecting areas and game species with information gaps.

Most of the early Canadian residue surveys were designed to examine specific environmental problems. In some studies, residues were measured in single species at one geographical and temporal point. While data derived from these "spot checks" are useful for detecting the presence of toxic chemical residues, they are of limited value for trend monitoring. The following data sets may, however, provide valuable background information for monitoring studies.

A. METALS

1) Mercury residues in waterfowl across Canada (Vermeer, 1971; Vermeer and Armstrong, 1972a; Pearce et al., 1976; Driver and Derksen, 1980).
2) Mercury in aquatic birds collected from the English-Wabigoon River system (Fimreite, 1972, 1973, 1975; Pearce et al., 1973).
3) Mercury in aquatic birds collected in known or suspected areas of contamination other than northwestern Ontario (Fimreite, 1970; Fimreite et al., 1971; Anon, 1972).

B. ORGANOCHLORINES

1) DDT in New Brunswick Woodcock (Pearce, 1971; Dilworth et al., 1972, 1974).
2) Organochlorines in aquatic birds from western Canada (Vermeer and Reynolds, 1970).

C. INDIVIDUAL SPECIES

1) Black Duck eggs from the Atlantic Flyway collected in 1964 (Reichel and Addy, 1968), 1971 (Longcore and Mulhern, 1973), 1978 (Haseltine et al., 1980), and 1985 (Laporte, 1987).
2) Seabirds from sites in the Atlantic coast surveyed between 1970 and 1976 (Pearce et al., 1979; Noble and Elliott, 1986; Pearce et al., 1989).

The residue information from the above surveys, as well as smaller data sets summarized in this report, could form the basis of future game bird monitoring programs.

6.0. EFFECTS OF ENVIRONMENTAL RESIDUES ON GAME BIRDS

Direct toxic effects to wildlife, as revealed by incidents of die-offs, are sometimes obvious results of chemical exposure. Other toxic effects may be subtle and often go undetected. The sublethal effects of pesticides to birds in general (Grue et al., 1983; Peakall, 1984) and to waterfowl in particular (White and Stickel, 1975; Grue et al., 1986) have been reviewed.

Game birds are generally considered at low risk to direct chemical poisoning. Yet several episodes of acute poisoning or die-offs involving North American species have been documented (Appendix 11). The largest known outbreak occurred in Arkansas, where about 16,000 Mallards died of lead poisoning between December of 1953 and February of 1954 (Shealy, 1982). More recent incidents include the death of about 200 Canada Geese due to lead poisoning on Plum Island, Massachusetts, between December 1983 and early January 1984 (Windingstad and Hinds, 1987). Bellrose (1976) has stated that significant day-to-day losses of North American waterfowl due to lead poisoning by spent gun shot generally pass unnoticed. The U.S. Fish and Wildlife Service (1976) estimated that 1.6 to 2.4 million ducks die in North America each year from environmental lead exposure. These studies indicate that extensive mortality can occur by direct or indirect contamination.

Birds rely on fat reserves during migration (King and Farner, 1965). This mobilization results in increasing concentrations of lipid-soluble residues in the remaining fat (Anderson and Hickey, 1976; Anderson et al., 1984). These levels of accumulated contaminants can cause lethal poisoning long after exposure. For example, Babcock and Flickinger (1977) reported widespread casualties of northward migrating Snow Geese in western Missouri in 1974. Analysis of brain tissue showed high levels of dieldrin residues in some geese. This evidence, along with knowledge of migration routes and pesticide use patterns, suggests that death was a consequence of the delayed effects following exposure to aldrin-treated grains in their wintering areas in southeast Texas. No mortality was recorded after the suspension of aldrin use (Flickinger, 1979). Other studies have suggested that factors such as cold temperature, reproduction, disease, injury, and food shortage may also result in mobilization of body fat reserves (Stickel, 1965; Ecobichon and Saschenbrecker, 1969; Findlay and de Freitas, 1971; Van Velzen et al., 1972; Stickel, 1973), which would produce death among animals with normally sublethal residue levels.

Relatively few instances of acute poisoning in game birds in Canada have been reported. This is likely due to the fact that such mortality is difficult to detect (Rosene and Lay, 1963; Schladweiler and Weigand, 1983). The documented die-offs in other North American locations following similar chemical exposure, coupled with the occurrence of residues in these birds, suggest that such losses occur more extensively than recorded.

7.0. PUBLIC HEALTH IMPLICATIONS

Game birds that are contaminated with toxic chemical residues may pose a risk to consumers. The Canadian Wildlife Service has, from time to time, conducted surveys of toxic chemical residues in selected game bird species to support assessments of potential health hazards to humans. In a few cases, recorded levels in tissues of birds exceeded the established guideline levels and consumers were duly warned by public health authorities of the risks involved in eating contaminated birds. For example, in a 1969 survey of total mercury levels in breast muscle of pheasants and partridges from southern Alberta, levels were found to be nine times above the 0.05 ppm (ww) guideline level for human food set by FAO/WHO at that time (Keith, 1969). Consequently, the 1969 pheasant and partridge hunting seasons were closed by provincial authorities. In a similar scenario, high DDT concentrations (45.8 to 771 ppm, lipid weight) were found in American Woodcock sampled in New Brunswick before the 1970 hunting season (Pearce, 1971). On the advice of the Department of National Health and Welfare, the Woodcock hunting season was closed that year. But the 1971 and 1972 seasons were eventually re-opened in areas of limited DDT applications because concentrations were lower in tissues of birds from those areas.

Similar actions have been taken by U.S. wildlife and health agencies. During 1963-65, following applications of DDT in western Montana forests, levels of this chemical in Blue Grouse were measured (Mussehl and Finley, 1967). DDT and metabolites ranged from 1.5 to 280 ppm (ww) in tissues. These results prompted the U.S. FDA to propose that provisions be made for the curtailment of hunting and game consumption in this area.

Mercury was detected in tissues of Gray Partridges collected in northcentral Montana during October, 1969. Mercury loads in breast muscles of most birds (78%) exceeded the then-recognized FAO/WHO guideline level of 0.05 ppm in human food (Weigand, 1971). All residue levels, however, were below the 0.50 ppm tolerance limit established by the U.S. FDA in 1970.

Two residue monitoring studies were conducted in New York State in 1979-80 (Kim et al., 1984) and 1981-82 (Kim et al., 1985), on mixed species of waterfowl. PCB, DDE, and mirex concentrations in different tissues were measured. PCB levels (7.5 ppm) in the fat of birds exceeded the FDA tolerance level of 3.0 ppm (lipid weight) for domestic poultry. Based on this information, the states of New York and New Jersey issued warnings to hunters concerning the edibility of waterfowl and suggested that fat be removed when cooking. The states of Wisconsin and Michigan have since also initiated surveys of contaminant residues in waterfowl with the intent of issuing consumption advisories.

An extensive monitoring survey of aquatic and terrestrial wildlife species was conducted in Montana between April of 1981 and November of 1982 (Schladweiler and Weigand, 1983). The initial objectives were to evaluate the edibility of game species following endrin applications on agricultural

crops. Initial samples in treated areas showed endrin residues in fat of some game birds to exceed the U.S. Department of Agriculture (USDA) action level of 0.3 ppm for domestic meats (22.9 ppm, ww, in Sharp-tailed Grouse; 2.56 ppm in Ruddy Ducks; 0.64 ppm in American Coots) indicating rapid accumulation of endrin. Fat residues remained high (2.56 ppm in Ruddy Ducks; 2.02 in Sharp-tailed Grouse; 0.63 ppm in Mallards; 0.58 ppm in American Wigeon; and 0.32 ppm in Northern Pintails) 15 months after spraying. Subsequent sampling revealed the presence of 17 other chlorinated hydrocarbon compounds (i.e., heptachlor, heptachlor epoxide, PCBs, DDT, DDE, DDD, dieldrin, lindane, alpha-BHC, beta-BHC, HCB, mirex, and five chlordane isomers). Maximum residues of these chemicals in fat were 53.0 ppm (ww) heptachlor epoxide in a Mourning Dove, 50.1 ppm PCBs in a Blue-winged Teal, 0.82 ppm alpha-chlordane in a Northern Shoveler, 0.68 ppm gamma-chlordane in a Mallard, 0.60 ppm trans-nonachlor in a Mourning Dove, 8.27 ppm DDT in a Northern Pintail, and 6.01 ppm mirex in a Mallard. Twenty percent of upland game birds and 7% of waterfowl had heptachlor epoxide residues higher than the 0.3 ppm USDA action level.

This information prompted state health authorities to warn hunters of health hazards from consuming pesticide-contaminated wildlife. The Montana Fish and Game Commission delayed the goose harvest season in eight counties, for six weeks, because of the contamination. In addition, the state agency issued advisories to consumers on removal of fat, cooking methods, and limitations on consumption of Sharp-tailed Grouse, partridges, and waterfowl in 1981, 1982, and 1983 (Schladweiler and Weigand, 1983). This concern for public health threatened the waterfowl hunting season in 17 states, although they were eventually opened (Fleming et al., 1983).

In addition to human health aspects, Schladweiler and Weigand (1983) discussed the impacts of the 1981 endrin issue to wildlife management and local economy. The cost of the study to wildlife agencies was estimated to be $262,000 (U.S.). About one-third and two-thirds of the upland game bird and waterfowl hunters, respectively, did not hunt in 1982. A licence refund policy was established by the State of Montana. Loss of revenue from reduced hunting licence sales totaled $116,595 (U.S.) in 1981 and 1982. The total loss of hunting-related income to private enterprise was estimated to exceed $8 million (U.S.).

In 1986, the Arkansas Game and Fish Commission initiated a pilot study to determine chemical residue levels in waterfowl as a result of contaminant releases from a hazardous waste site in Jacksonville (Perkins and Yaich, 1986). From June to July, 22 Wood Ducks were collected at two sites near Jacksonville. High levels of polychlorinated dibenzodioxins (PCDDs) and dibenzofurans (PCDFs) were found in birds collected approximately 10 miles from the contaminated site. The latter levels exceeded the level considered safe for human consumption by the U.S. Food and Drug Administration. The public was advised that Wood Ducks from this area should not be consumed.

Other studies have also reported unexpectedly high levels of contamination in game bird tissues. Baskett (1975) found that about 9% of diving ducks from "uncontaminated" sites contained levels of mercury in breast muscles exceeding the FDA action level. Similarly, Baker et al. (1976) reported that 27% of the Greater Scaup collected in New York State contained PCB concentrations higher than the 5.0 ppm FDA legal limit. In the survey of wintering Snow Geese in Louisiana, West (1977) found that 36% of birds had dieldrin residues above the USDA tolerance limit. Likewise, 24% and 2.5% of Snow Geese contained mirex and DDT residues above the established levels.

Although DDT was banned as an insecticide in the U.S. in 1972, there is evidence of new DDT contamination in large areas of New Mexico and Arizona (Clark and Krynitsky, 1983). Seven of the eight breast muscle samples from Northern Pintails, Green-winged Teal and Cinnamon Teal (Anas cyanoptera) collected in Arizona between December of 1981 and January of 1982 contained DDE residues above the U.S. FDA tolerance level for total DDT (5.0 ppm) in fat of domestic meats. In New Mexico, one of fifteen muscle samples exceeded this limit. The exact source(s) of DDT has not yet been established (White and Krynitsky, 1986). Contributions of residues from DDT treatments prior to the ban and input from accidental or intentional dumping since the ban cannot be excluded.

Schladweiler and Weigand (1983) stated that the lack of established tolerance or action levels for residues in wild game meats and the paucity of recent residue information on wildlife hindered the ability of the Montana Fish and Game Commission to quickly evaluate and respond to the endrin situation described earlier. Game species are not included in typical market basket surveys which monitor levels of residues in dietary products. Tolerance levels of contaminants in these products are established by the U.S. FDA. The action levels for poultry are enforced by the federal Department of Agriculture. Chemical residues above these levels result in the embargo of the food until further testing can be performed. These agencies, however, do not have jurisdiction over wild game. Tolerance levels are, therefore, not determined for wild meat. A similar situation exists in Canada. Maximum allowable limits for food items are set by the Food Directorate of the Department of National Health and Welfare. A list of some established residue limits for domestic poultry is found in Appendix 12. For comparison, the residue guidelines used by FAO/WHO are also included.

In order to assess public health hazard from consumption of contaminated game, the dependence of populations on wildlife harvest must be determined. Estimates of the controlled migratory bird harvests are readily available (Boyd and Finney, 1978). There is, however, little information on native use of wildlife as a food resource since native hunters are not included in the annual licence buyer surveys. Some estimates of waterfowl kill were determined for native groups of northern Quebec and James Bay from 1973 to 1975 (Boyd, 1977) and native hunters of the Hudson Bay Lowland from

1974 to 1976 (Prevett et al, 1983). Previous to this, Hanson and Currie (1957) published estimates of wild geese harvested by the natives of Hudson Bay from 1945 to 1956. Finney (1979) estimated that natives harvest approximately 10.8% of the 6.5 million ducks taken in Canada annually. Native dependence on geese is much higher, accounting for approximately 31.1% of the total Canadian kill. That author concluded that insufficient information is available on the harvest of wildlife species by native groups. It was only recently that quantitative data were acquired for native groups in the Canadian Arctic (Gamble, 1988). Although this preliminary harvest information was limited to seven communities in the Northwest Territories, it established a basic framework from which future and more extensive surveys could be conducted. Some unpublished data from northern native harvest surveys covering the Keewatin, Kitikmeot, and Baffin regions are summarized in Wong (1987). Detailed information on per capita consumption of game should be procured since one would expect some large regional differences. Once determined, it would seem desirable to monitor residues in "edible tissues" of game species representing a substantial portion of a population's diet.

8.0. CONCLUSIONS

This report reviews information on chemical residue levels in Canadian game birds. Most surveys on chemical residue levels in game birds were conducted in southern latitudes. Mercury, DDT (and metabolites), PCBs, and dieldrin were the compounds most often surveyed. Hexachlorobenzene and heptaclor epoxide were also measured in several studies. Other chemical residues were rarely analyzed. The majority of surveys were conducted during short periods in areas of suspected contamination. While useful for detecting the presence of toxic chemicals, these studies are of limited value for trend monitoring.

Despite the fact that regulations limiting PCB discharges into the environment were instituted in the U.S. and Canada, there is evidence suggesting that organochlorine contamination continues to be a problem in the Great Lakes and the St. Lawrence estuary. For instance, domestic ducks released at Hamilton Harbour accumulated high PCB concentrations (Weseloh and Struger, 1986). Buffleheads collected near Hamilton Harbour in March 1986 also had a high mean concentration of PCBs in their livers (395 ppm, ww; Appendix 2) and muscles (44 ppm, ww; Appendix 2). Furthermore, waterfowl collected in New York in 1981-82 contained high levels of PCBs and increasing levels of mirex. Significant concentrations of PCB residues were also found in eggs of Razorbills collected during the late 1970s in the estuary of the St. Lawrence. Monitoring PCB residues in waterfowl from these areas seems advisable.

During the 1970s, strict regulations were placed on industrial and agricultural sources of mercury (Sherbin, 1979). Recent evidence of elevated mercury levels in waterfowl from New Brunswick (Pearce, unpublished data) indicates, however, that some areas may still be contaminated by mercury. This may also warrant investigation.

Lead toxicosis has been recognized as an important source of waterfowl mortality for several years (e.g., Bellrose, 1976). Several episodes of die-offs due to lead poisoning from spent gun shot were reported in the United States. Although similar cases of acute lead poisoning in Canada were not reported, the reports from the United States suggest that it may also be an important source of waterfowl mortality in Canada. Yet, lead residue levels in Canadian game birds have very rarely been investigated. The U.S. information also indicates that species feeding in grain stubble fields, such as Mallards, Pintails, and geese, are more susceptible to lead toxicosis due to spent gun shot. Special attention should be given to monitoring lead levels in those birds.

The largest data base of residue levels in North American game birds came from surveys conducted by the U.S. Fish and Wildlife Service. Information from the U.S. National Contaminant Biomonitoring Program indicates a marked decline of most organochlorine residue levels in the continental U.S. (Jacknow et al., 1986). Compounds such as PCBs and DDE,

however, are still detected at high levels in wildlife from some areas. PCB concentrations are high in wildlife from some industrialized areas (Jacknow et al., 1986). Elevated DDE levels were also detected in ducks from areas important to wintering waterfowl (e.g., Alabama). A certain proportion of birds collected at these U.S. locations are harvested in Canada.

It is difficult to interpret how the information from the monitoring program conducted in the United States relates to game birds sampled in Canada as no comparable Canadian data set exists. The Canadian Wildlife Service, therefore, implemented a national survey of contaminants in waterfowl in 1988. Thousands of harvested waterfowl wings are received annually from selected hunters in the Species Composition Survey. It may, eventually, be possible to utilize these wings in the contaminants monitoring program for waterfowl. The information generated would serve as a basis for comparison with the U.S. biomonitoring program.

Several studies have demonstrated that game birds are vulnerable to toxic chemicals and that they can accumulate chemical residues to levels considered unsafe for human consumption. The maximum residue limits in meat established by the Department of National Health and Welfare are based on an average consumption of meat. These limits may not be relevant to Canadian populations which consume a larger quantity of wild meat (Wong, 1987). Some estimates of native use of wild game are available for a few communities but better information is required since large regional differences may exist. Once this information has been gathered, residue levels in edible tissues of game species harvested by native populations should be monitored.

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APPENDIX 1:

Summary tables of residue levels in game birds sampled in Canada. All chemical residues are expressed on a wet-weight basis, unless otherwise indicated. Abbreviations used for describing tissues correspond to those given in Appendix 5. The age of the birds is described as adult (AD) or immature (IM).

Table 1. Residue levels in Anatidae sampled in Canada.

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Anatidae Canada Goose (Branta canadensis)	Quebec												
	Lac au Goeland 49°47′ 76°48′	Sept.7-Oct.26 1971	3	Bm			-	-	Hg	< 0.01	-	12	
	Lac Matagami 49°53′ 77°30′	1971	1	Bm			-	-	Hg	< 0.01	-	12	
	Lac Mistassini 50°30′ 74°00′	1975-76	2*	Wm	-	-	-	-	Hg	0.01	-	57	*Pool of 2 to 5 geese
	Lac Matagami 49°50′ 77°30′	1975-76	1	Wm	-	-	-	-	Hg	0.01	-	57	
	Ontario												
	Lake St. Clair	1970	1	Bm			-	F	Hg	< 0.10	-	60	
				L			-	F	Hg	0.18	-	60	
				K			-	F	Hg	< 0.10	-	60	

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Canada Goose (cont'd)	Ontario (cont'd)												
	Niagara Peninsula	1971	15	E		14.0 (3.4-22.0)	-	-	Total DDT	0.33	(TRACE-1.84)	88	ND - below the limit of 0.005 ppm for total DDT and Dieldrin and 0.05 ppm for PCB ** Aroclor 1254:1260 1:2 to 1:5
							-	-	Dieldrin	0.015	(ND-0.07)		
							-	-	PCB**	0.14	(ND-1.0)		
							-	-	Hg	0.12	(0.03-0.46)		
	Saskatchewan												
	Cypress Lake	1969	10	E			-	-	Hg	0.052	-	223	
	Cypress Lake	1969	10	E	66.4	15.7	-	-	DDE	0.02	-	229	
									Dieldrin	0.012	-		
	Alberta												
	Dowling Lake	1968	10	E			-	-	Hg	0.037	-	223	
	Lake Newell		10	E			-	-	Hg	0.031	-	223	
	Dowling Lake	1968	10	E	68.6	15.6	-	-	DDE	0.04	-	229	
									Dieldrin	0.012	-		
	Lake Newell		10	E	69.1	15.8	-	-	DDE	0.03	-	229	
									Dieldrin	0.022	-		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Anatidae	Quebec												
Snow Goose													
(Chen	Cap Tourmente	1977	1	C	-	2.9	AD	-	Total DDT	0.122	-	150	*Greater Snow
caerulescens)*									Dieldrin	0.051	-		Goose
									PCB(Aroclor 1254)	0.308	-		
			1	C	-	6.2	AD	-	Total DDT	ND	-		
									Dieldrin	ND	-		
									PCB(Aroclor 1254)	0.036	-		
			1	C	-	6.6	AD	-	Total DDT	0.032	-		
									Dieldrin	ND	-		
									PCB(Aroclor 1254)	0.117	-		
			1	C	-	4.7	IM	-	Total DDT	0.042	-		
									Dieldrin	ND	-		
									PCB(Aroclor 1254)	0.141	-		
			1	C	-	13.1	IM	-	Total DDT	0.017	-		
									Dieldrin	0.007	-		
									PCB(Aroclor 1254)	0.088	-		
	Cap Tourmente	1977	1**	Br	-	3.8	AD	-	Total DDT	ND	-	150	**Pool of 3
									Dieldrin	ND	-		
									PCB(Aroclor 1254)	0.167	-		
			1**	Br	-	3.9	IM	-	Total DDT	0.074	-		**Pool of 2
									Dieldrin	0.008	-		
									PCB(Aroclor 1254)	0.088	-		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Snow Goose (cont'd)	Quebec (cont'd)												
		1977	1**	L	-	1.7	AD	-	Total DDT	0.006	-		**Pool of 3
									Dieldrin	ND	-		
									PCB (Aroclor 1254)	0.225	-		
			1**	L	-	3.8	IM	-	Total DDT	0.015	-		**Pool of 2
									Dieldrin	ND	-		
									PCB (Aroclor 1254)	0.029	-		
		1977	3**	L	-	-	AD	-	Hg	0.03 ± 0.006***	-	150	***$\bar{x}$ ± SE **3 pooled analyses
			2**	L	-	-	IM	-	Hg	0.04 ± 0.015***	-	150	**2 pooled analyses
	Cap Tourmente	1977	14**	Wm	-	-	AD	-	Hg	0.02 ± 0.002	-	150	**4 pooled analyses
			34**	Wm	-	-	IM	-	Hg	0.02 ± 0.008	-	150	**8 pooled analyses
	Ontario												
	Hudson Bay Drainage James Bay 51°10' 79°52'	1970	4	Bm			-	-	Hg	0.02	(0.01-0.03)	51	

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Snow Goose (cont'd)	Northwest Territories												
	Baffin Island (72°57'N, 80°45'W)	1971	5**	E	-	12.3	-		Total DDT	< 0.041	-	150	**1 pooled analysis
									Dieldrin	< 0.005	-		
									PCB(Aroclor 1254)	0.13	-		
									BHC	0.025	-		
									Hg	< 0.05	-		
	Bylot Island (72°52'N, 79°55'W)	1971	5**	E	-	13.4	-	-	Total DDT	< 0.049	-	150	**1 pooled analysis
									Dieldrin	< 0.005	-		
									PCB(Aroclor 1254)	0.13	-		
									BHC	0.024	-		
									Hg	< 0.05	-		
		1971	5**	E	-	13.4	-	-	Total DDT	< 0.047	-	150	**1 pooled analysis
									Dieldrin	< 0.005	-		
									PCB(Aroclor1254)	0.13	-		
									BHC	0.026	-		
									Hg	< 0.05	-		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Anatidae	Quebec												
Mallard (Anas platyrhyhchos)	near Thurso Ottawa River 45°36′ 75°15′	Fall 1970	3	Bm	-	-	-	-	Hg	0.23	(0.01-0.61)	178	3 analyses
	Lake St. Francis 45°10′ 74°22′	Sept. 1970	3	Bm	-	-	-	-	Hg	0.05	(0.01-0.10)	178	3 analyses
	Lake St. Louis 45°26′ 73°48′	Sept. 1970	3	Bm	-	-	-	-	Hg	0.09	(0.04-0.15)	178	3 analyses
			3	Bm	-	-	-	-	Hg	0.31	(0.24-0.43)	178	3 analyses
	Lacs Matagami, Waswanipi au Goeland, Pustamic	1970	5	Bm	-	-	-	-	Hg	0.22	(0.06-0.62)	178	5 analyses
	N of Ottawa	Fall 1970	15	Wm	-	-	-	-	Hg	0.16	-	178	3 pooled analyses
	Lac Mistassini	1975-76	1	Wm	-	-	-	-	Hg	0.18	-	57	
	Ontario												
	Sudbury	Sept. 13 1975	10	Fe	-	-	IM	F	Zn	113 ± 3 *	-	185	* $\bar{x}$ ± SD
									Cu	17 ± 2 *	-		
									Ni	5.1 ± 0.8*	-		20 - 30 km from smelter

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Mallard (cont'd)	Ontario (cont'd)												
							IM	F	Zn	132 ± 2*	-		
									Cu	23 ± 3*	-		
									Ni	7.2 ± 0.8*	-		
							IM	F	Zn	105 ± 3*	-		
									Cu	23 ± 3*	-		
									Ni	7.6 ± 0.8*	-		
							IM	M	Zn	122 ± 3*	-		
									Cu	13 ± 2*	-		
									Ni	2.0 ± 0.7*	-		
							IM	M	Zn	130 ± 3*	-	185	* $\bar{x}$ ± SD
									Cu	13 ± 3*	-		
									Ni	4.4 ± 0.8*	-		
							IM	M	Zn	115 ± 3*	-		
									Cu	17 ± 2*	-		
									Ni	5.9 ± 0.8*	-		
							IM	M	Zn	99 ± 3*	-		
									Cu	17 ± 2*	-		
									Ni	3.6 ± 0.8*	-		
		Sept. 17 1975		Fe	-	-	IM	F	Zn	126 ± 3*	-		
									Cu	19 ± 2*	-		
									Ni	5.7 ± 0.08*	-		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Mallard (cont'd)	Ontario (cont'd)												
	French River	Sept. 27 1975	10	Fe			AD	M	Zn	103 ± 3*	-	185	60 km from smelter
									Cu	14 ± 3*	-		
									Ni	0.6 ± 0.07*	-		
							AD	F	Zn	129 ± 3*	-		
									Cu	14 ± 3*	-		
									Ni	0.2 ± 0.8*	-		
	Manitoulin Is.	Sept. 27 1975	10	Fe			IM	F	Zn	128 ± 3*	-	185	95-140 km from smelter
									Cu	17 ± 2*	-		
									Ni	2.5 ± 0.8*	-		
							IM	F	Zn	129 ± 3*	-		
									Cu	13 ± 2*	-		
									Ni	4.3 ± 0.8*	-		
							IM	F	Zn	121 ± 3*	-		
									Cu	5 ± 2*	-		
									Ni	0.2 ± 0.8*	-		
							IM	F	Zn	135 ± 3*	-		
									Cu	11 ± 2*	-		
									Ni	0.7 ± 0.8*	-		
							IM	F	Zn	113 ± 3*	-		
									Cu	10 ± 2*	-		
									Ni	2.5 ± 0.8*	-		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Mallard (cont'd)	Ontario (cont'd)												
							IM	F	Zn	108 ± 3*	-		* $\bar{x}$ ± SD
									Cu	8 ± 3*	-		95-140 km from
									Ni	1.4 ± 0.8*	-		smelter
							IM	M	Zn	117 ± 3*	-		
									Cu	7 ± 3*	-		
									Ni	0.0 ± 0.8*	-		
							IM	M	Zn	113 ± 3*	-		
									Cu	13 ± 3*	-		
									Ni	1.4 ± 0.8*	-		
							IM	M	Zn	108 ± 3*	-		
									Cu	11 ± 3*	-		
									Ni	2.2 ± 0.8*	-		
							IM	M	Zn	123 ± 3*	-		
									Cu	10 ± 3*	-		
									Ni	1.9 ± 0.8*	-		
	Lake St. Clair	1970	5	Bm			-	F	Hg	0.58	(<0.10-1.15)	60	
			5	L			-	F	Hg	2.04	(0.23-4.8)		
			5	K			-	F	Hg	1.38	(<0.10-3.5)		
			3	Bm			-	M	Hg	0.33	(0.16-0.62)	60	
			3	L			-	M	Hg	0.94	(0.58-1.40)		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Mallard (cont'd)	Ontario (cont'd)												
	Lake St. Clair (cont'd)		3	K			-	M	Hg	0.74	(0.49-1.20)		
			9	E			-	-	Hg	0.82	(0.22-2.70)	60	
	Niagara Peninsula	1971	2	E		11.0	-	-	Total DDT	2.34	(2.03-2.65)	88	ND - below the
						(10.0-	-	-	Dieldrin	0.13	(trace-0.25)		limit of 0.005 ppm
						12.0)	-	-	PCB**	4.0	(ND-8.0)		for total DDT and
							-	-	Hg	0.15	(0.08-0.23)		0.05 ppm for PCBs.
	Niagara Peninsula	1971	2	extract-able fat in eggs			-	-	Total DDT*	20.70		88	* 100 % DDE
									Dieldrin	1.15			** Aroclor 1254:1260
									PCB**	35.0			1:2 to 1:5
	Clay Lake	July 20-Aug. 5 1970	4	L			AD	-	Hg	8.08	(3.24-12.20)	69,70,71	
		June 20-July 28 1971	1	L			IM	-	Hg	5.93	-		
	Ball Lake	June 20-July 28 1971	4	L			AD	-	Hg	6.94	(3.85-12.50)	69,70,71	
			5	L			IM	-	Hg	0.57	(0.21-2.56)		
	Maynard Lake	June 20-July 28 1971	2	L			AD	-	Hg	1.60	(0.35-2.86)	69,70,71	
			4	L			IM	-	Hg	0.23	(0.14-0.36)		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Mallard (cont'd)	Ontario (cont'd)												
	Sydney Lake	June 20-July 28 1971	2	L			IM	-	Hg	0.34	(0.32-0.36)	69,70,71	
	Northwestern Ontario (Wabigoon, Clay, Ball, Maynard, Sydney Lakes)	June 20-July 28 1971	10	L			AD	-	Hg	6.30 ± 1.25*	-	69,70,71	* $\bar{x}$ ± SE
			10	Bm			AD	-	Hg	2.39 ± 0.93*	-		
		June 20-July 28 1971	5	L			IM**	-	Hg	2.19 ± 1.12*	(0.14-9.17)	69,70,71	** Ducklings
			5	Bm			IM**	-	Hg	1.33 ± 0.73*	(0.13-5.93)		
	Wabigoon-English River System	Fall 1970	55	Wm			-	-	Hg	0.08	-	178	3 pooled analyses
	Lake Superior	Fall 1970	25	Wm			-	-	Hg	0.22	-	178	1 pooled analysis
	Lake Erie	Fall 1970	75	Wm			-	-	Hg	0.07	-	178	3 pooled analyses
	Upper Ottawa River	Fall 1970	5	Wm			-	-	Hg	0.29	-	178	1 pooled analysis
	N. of Lake Ontario	Fall 1970	105	Wm			-	-	Hg	0.15	-	178	5 pooled analyses
	Clay Lake 50°03' 93°30'	Aug.3-14 1971	16	Bm			-	-	Hg	4.78	(1.67-9.43)	178	

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Mallard (cont'd)	Ontario (cont'd)												
	Wabigoon River - Clay Lake	Sept. 27 Oct. 4 1971	3	Bm			-	-	Hg	0.44	(0.30-0.71)	178	
	English River System	Sept. 27 Oct. 4 1971	10	Bm			-	-	Hg	0.34	(0.06-0.96)	178	
	Winnipeg River	1971	4	Bm			-	-	Hg	0.12	(0.09-0.13)	51	
	Tetu Lake 50°11' 95°02'	1971	3	Bm			-	-	Hg	0.15	(0.06-0.21)	51	
	Indian Lake 50°15' 94°04'	1971	3	Bm			-	-	Hg	0.50	(0.22-0.90)	51	
	Kapuskasing 49°25' 82°26'	1970	5	Bm			-	-	Hg	0.22	(0.06-0.62)	51	
	Lake St. Clair 42°33' 82°29'	Fall 1970	11	Bm			-	-	Hg	0.10	(<0.10-0.65)	178	8 analyses

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Mallard (cont'd)	Ontario (cont'd)												
	Northwestern Ontario	July 20-Aug. 5 1970	7	L			AD	-	Hg	5.46 ± 0.82*	-	69,70,71	* $\bar{x}$ ± SE
									CH_3Hg	2.10 ± 0.47*	-		
		June 20-July 28 1971	7	Bm			AD	-	Hg	1.59 ± 0.32*	-	69,70,71	
									CH_3Hg	1.05 ± 0.31*	-		
			7	L			IM**	-	Hg	2.18 ± 1.12*	-	69,70,71	** Ducklings
									CH_3Hg	0.92 ± 0.44*	-		
			7	Bm			IM**	-	Hg	1.33 ± 0.73*	-	69,70,71	
									CH_3Hg	0.47 ± 0.20*	-		
	Clay Lake 50°03'N 93°30'W	August 1971	16	Bm			IM***	-	Hg	6.13 ± 1.28****	(0.9-10.4)	226,227	*** all immatures except one adult ****$\bar{x}$ ± 95% confidence intervals
			16	Wm			IM***	-	Hg	4.76 ± 1.24*	-	226	
	Clay Lake	May 1971	1	Bm			AD	-	Hg	0.16	-	227	
									CH_3Hg	0.11	-		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Mallard (cont'd)	Ontario (cont'd)												
	St. Clair River	Dec.1985	6	L		4.27		-	QCB	0.097	-	234	ND = not detectable
									HCB	0.311	-		
									DDE	0.042	-		
									Photomirex	ND	-		
									Mirex	ND	-		
									PCB	0.776	-		
									OCS	0.493	-		
									BHC	ND	-		
									Oxychlordane	0.010	-		
									Cis-chlordane	0.004	-		
									Trans-nonachlor	0.012	-		
									Cis-nonachlor	0.004	-		
									DDD	0.007	-		
									DDT	ND	-		
									HE	0.013	-		
									Heptachlor Epoxide				
									Dieldrin	0.042	-		
									TeCB	0.021	-		
			6	M		3.55			QCB	0.072	-	234	
									HCB	0.276	-		
									DDE	0.050	-		
									Photomirex	ND	-		
									Mirex	ND	-		
									PCB	0.586	-		
									OCS	0.083	-		
									BHC	ND	-		
									Oxychlordane	0.004	-		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Mallard (cont'd)	Ontario (cont'd)												
	St. Clair River (cont'd)								Trans-nonachlor	0.002	-		
									Cis-nonachlor	0.002	-		
									DDD	0.008	-		
									DDT	0.002	-		
									HE	0.002	-		
									Dieldrin	0.007	-		
									TeCB	0.014	-		
	St. Clair River	Feb.1986	6	L		4.15			QCB	0.003	-	234	
									HCB	0.011	-		
									DDE	0.018	-		
									Photomirex	ND	-		
									Mirex	ND	-		
									PCB	0.227	-		
									OCS	0.041	-		
									BHC	ND	-		
									Oxychlordane	0.005	-		
									Cis-chlordane	ND	-		
									Trans-nonachlor	0.001	-		
									Cis-nonachlor	ND			
									DDD	0.001	-		
									DDT	0.001	-		
									HE	0.005	-		
									Dieldrin	0.008	-		
									TeCB	ND	-		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Mallard (cont'd)	Ontario (cont'd)												
	St. Clair River (cont'd)		6	M		3.78			QCB	0.003	-	234	
									HCB	0.010	-		
									DDE	0.021	-		
									Photomirex	ND	-		
									Mirex	ND	-		
									PCB	0.225	-		
									OCS	0.005	-		
									BHC	ND	-		
									Oxychlordane	0.002	-		
									Cis-chlordane	ND	-		
									Trans-nonachlor	0.001	-		
									Cis-nonachlor	ND	-		
									DDD	0.001	-		
									DDT	0.001	-		
									HE	0.001	-		
									Dieldrin	0.002	-		
									TeCB	ND	-		
	Walpole Island	Summer 1986	15	L	-	-	-	-	OCS	115.33 ± 93.22**		92	* IUPAC no. (Ref 21)
									HCB	29.59 ± 30.79**			** ppb
									QCB	1.53 ± 1.51**			non-migratory
									PCB # 28*	1.76 ± 1.77**			mallards
									PCB # 101*	1.16 ± 1.06**			
									PCB # 180*	3.94 ± 6.81**			

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Mallard (cont'd)	Ontario (cont'd)												
	Walpole Island (cont'd)	Summer 1986	15	M	-	-	-	-	OCS	11.71 ± 36.20**		92	* IUPAC no. (Ref 21)
									HCB	7.14 ± 5.29**			** ppb
									QCB	0.55 ± 0.38**			non-migratory
									PCB # 28*	0.44 ± 0.51**			mallards
									PCB # 101*	0.23 ± 0.29**			
									PCB # 180*	1.52 ± 1.84**			
		Fall 1986	10	L	-	-	-	-	OCS	56.08 ± 93.66**		92	* IUPAC no. (Ref 21)
									HCB	8.70 ± 16.47 **			** ppb
									QCB	0.41 ± 0.46 **			non-migratory
									PCB # 28*	0.20 ± 0.29 **			mallards
									PCB # 101*	0.07 ± 0.15 **			
									PCB # 180*	1.10 ± 1.55 **			
	Walpole Island	Fall 1986	10	M	-	-	-	-	OCS	1.67 ± 2.13 **		92	* IUPAC no. (Ref 21)
									HCB	4.82 ± 10.75**			** ppb
									QCB	0.47 ± 0.23**			migratory mallards
									PCB 28*	0.11 ± 0.12 **			
									PCB 101*	0.02 ± 0.06 **			
									PCB 180*	0.42 ± 0.44 **			
	Upper Canada Village	Sept. 1983	1*	L	-	-	-	-	Me_3Pb^+	0.6	-	86'	* Pool of 5
									Me_2Pb^+	ND	-		(females)
									$MeEt_2Pb^{2+}$	ND	-		
									Me_2Pb^{2+}	ND	-		
									Et_3Pb^+	ND	-		
									Et_2Pb^+	ND	-		
									$MeEtPb^{2+}$	ND	-		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Mallard (cont'd)	Ontario (cont'd)												
	Upper Canada Village (cont'd)			K	-	-	-	-	Me_3Pb^+	1.4	-	86	
									Me_2Pb^+	0.4	-		
									$MeEt_2Pb^{2+}$	0.3	-		
									Me_2Pb^{2+}	ND	-		
									Et_3Pb^+	0.6	-		
									Et_2Pb^+	0.4	-		
									$MeEtPb^{2+}$	ND	-		
				Br	-	-	-	-	Me_3Pb^+	0.6	-		
									Me_2Pb^+	ND	-		
									$MeEt_2Pb^{2+}$	ND	-		
									Me_2Pb^{2+}	ND	-		
									Et_3Pb^+	0.3	-		
									Et_2Pb^+	0.7	-		
									$MeEtPb^{2+}$	ND	-		
				Bm	-	-	-	-	Me_3Pb^+	0.4	-		
									Me_2Pb^+	ND	-		
									$MeEt_2Pb^{2+}$	0.4	-		
									Me_2Pb^{2+}	ND	-		
									Et_3Pb^+	ND	-		
									Et_2Pb^+	0.5	-		
									$MeEtPb^{2+}$	ND	-		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Mallard (cont'd)	Ontario (cont'd)												
	Upper Canada Village	Sept. 1983	1*	L	-	-	-	-	Me_3Pb^+	1.4	-	86	* Pool of 5 (males)
									Me_2Pb^+	0.5	-		
									$MeEt_2Pb^{2+}$	0.7	-		
									Me_2Pb^{2+}	ND	-		
									Et_3Pb^+	1.3	-		
									Et_2Pb^+	1.0	-		
									$MeEtPb^{2+}$	ND	-		
				K	-	-	-	-	Me_3Pb^+	4.0	-		
									Me_2Pb^+	1.7	-		
									$MeEt_2Pb^{2+}$	1.7	-		
									Me_2Pb^{2+}	1.9	-		
									Et_3Pb^+	3.5	-		
									Et_2Pb^+	3.0	-		
									$MeEtPb^{2+}$	0.7	-		
				Br	-	-	-	-	Me_3Pb^+	1.1	-		
									Me_2Pb^+	0.5	-		
									$MeEt_2Pb^{2+}$	0.8	-		
									Me_2Pb^{2+}	1.4	-		
									Et_3Pb^+	1.2	-		
									Et_2Pb^+	0.5	-		
									$MeEtPb^{2+}$	ND	-		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Mallard (cont'd)	Ontario (cont'd)												
	Upper Canada Village (cont'd)			Bm	-	-	-	-	Me_3Pb^+	1.6	-	86	
									Me_2Pb^+	0.6	-		
									$MeEt_2Pb^{2+}$	0.9	-		
									Me_2Pb^{2+}	1.7	-		
									Et_3Pb^+	1.4	-		
									Et_2Pb^+	0.8	-		
									$MeEtPb^{2+}$	ND	-		
	Manitoba												
	Saskatchewan River Delta	Spring 1971	12	Bm			-	-	Hg	0.17	(0.05-0.45)	56	
			3	L			-	-		0.32	(0.24-0.43)		
		Spring 1972	19	Bm			-	-	Hg	0.12	(0.02-0.42)	56	
			5	L			-	-		0.27	(0.17-0.42)		
			5	Fe			-	-		1.58	(1.04-2.51)		
		Fall 1971	11	Bm			IM	-	Hg	0.12	(0.04-0.48)	56	
			3	L			IM	-		0.13	(0.05-0.19)		
			3	Bm			AD	-	Hg	0.06	(0.03-0.09)	56	
			1	L			AD	-		0.10	-		
		Fall 1972	10	Bm			IM	-	Hg	0.19	(0.07-0.30)	56	
			5	L			IM	-		0.46	(0.06-0.98)		
			5	Fe			IM	-		1.20	(0.74-1.83)		
			7	Bm			AD	-	Hg	0.12	(0.05-0.22)	56	

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Mallard (cont'd)	Manitoba (cont'd)												
	Lake Winnipeg	Spring	2	Bm			-	-	Hg	0.11	(0.03-0.18)	56	
		1971	2	L			-	-		0.35	(0.10-0.60)		
		Fall	6	Bm			IM	-	Hg	0.12	(0.06-0.19)	56	
		1971	2	L			IM	-		0.19	(0.15-0.21)		
			1	L			AD	-		1.03	-		
	Saskatchewan												
	Jackfish Lake	1968	10	E	68.6	14.3	-	-	DDE	0.24	-	229	
									Dieldrin	0.063	-		
	Old Wives Lake	1969	10	E	68.3	12.7	-	-	DDE	0.24	-	229	
									Dieldrin	0.080	-		
									HE	0.009	-		
									Hep	-	-		
									BHC	ND	-		
	Cypress Lake		10	E	68.6	14.7	-	-	DDE	1.07	-	229	
									Dieldrin	0.050	-		
									HE	0.902	-		
									Hep	0.067	-		
									BHC	ND	-		
	Jackfish Lake	1968	10	E			-	-	Hg	0.066	-	223	
	Old Wives Lake	1969	10	E			-	-	Hg	0.029	-	223	

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Mallard (cont'd)	Saskatchewan (cont'd)												
	Cypress Lake		10	E			-	-	Hg	0.064	-	223	
	(Province-wide)	August 1969	9*	Bm			AD	-	Hg	0.04	-	225	* pooled samples
			9*	L			AD	-		0.11	-		
	(Province-wide)	August 1969	9*	Bm			IM	-	Hg	0.04	-	225	* pooled samples
			9*	L			IM	-		0.09	-		
	Northern Saskatchewan (near Prince Albert)	Sept. 27 Oct. 12 1975	10	Fe			IM	F	Zn	121 ± 3**	-	185	** $\bar{x}$ ± SD
									Cu	12 ± 3**	-		
									Ni	0.1 ± 0.7**	-		
				Fe			IM	F	Zn	125 ± 3**	-		
									Cu	7 ± 3**	-		
									Ni	0.0 ± 0.7**	-		
				Fe			IM	F	Zn	124 ± 3**	-		
									Cu	0.7 ± 3**	-		
									Ni	0.4 ± 0.7**	-		
				Fe			AD	F	Zn	116 ± 3**	-		
									Cu	6 ± 3**	-		
									Ni	0.3 ± 0.7**	-		
				Fe			AD	F	Zn	124 ± 3**	-		
									Cu	14 ± 3**	-		
									Ni	0.0 ± 0.7**	-		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Mallard (cont'd)	Saskatchewan (cont'd)												
				Fe			AD	F	Zn	122 ± 3**	-		
									Cu	6 ± 3**	-		
									Ni	0.5 ± 0.7**			
				Fe			AD	F	Zn	130 ± 3**	-		
									Cu	8 ± 3**	-		
									Ni	0.3 ± 0.7**	-		
				Fe			AD	M	Zn	111 ± 3**	-	185	** $\bar{x}$ ± SD
									Cu	7 ± 3**	-		
									Ni	0.0 ± 0.8**	-		
				Fe			AD	M	Zn	101 ± 3**	-		
									Cu	7 ± 3**	-		
									Ni	0.3 ± 0.8**	-		
				Fe			IM	M	Zn	109 ± 3**	-		
									Cu	12 ± 3**	-		
									Ni	0.1 ± 0.8**	-		
							IM	M	Zn	144 ± 3**	-		
									Cu	11 ± 3**	-		
									Ni	0.2 ± 0.7**	-		
	Saskatchewan - Alberta	1970	12	Bm			IM	-	Hg	0.02	-	225	4 pooled samples
										0.04	-		
										0.04	-		
										0.06	-		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Mallard (cont'd)	Saskatchewan (cont'd)												
	Saskatchewan - Alberta	1970	15	Bm			AD	-	Hg	< 0.01	-	225	5 pooled samples
										< 0.01	-		
										0.03	-		
										0.03	-		
										0.05	-		
	Alberta												
	(Province-wide)	August 1969	16*	Bm			AD	-	Hg	0.04	-	225	* pooled samples
			16*	L			AD	-	Hg	0.16	-		
	(Province-wide)	August 1969	21*	Bm			IM	-	Hg	0.04	-	225	* pooled samples
			21*	L			IM	-	Hg	0.10	-		
		1968	2	L			-	-	Hg	0.316 ± 0.053**	(0.215-0.417)	72	** $\bar{x}$ ± SE
	Miquelon Lake	1968	10	E	68.1	14.8	-	-	DDE	0.14	-	229	
									Dieldrin	0.038			
	Lake Newell	1968	10	E	68.0	15.9	-	-	DDE	0.37	-	229	
									Dieldrin	0.020	-		
	Miquelon Lake	1968	10	E			-	-	Hg	0.065	-	223	
	Lake Newell	1968	10	E			-	-	Hg	0.055	-	223	

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Mallard (cont'd)	Alberta (cont'd)												
	Chip Lake	1968	10	E			-	-	p,p'-DDE	0.2	-	188	pooled samples
									p,p'-DDD	0.01	-		
									p,p'-DDT	0.15	-		
									Dieldrin	0.08	-		
									HE	0.01	-		
									PCB (Aroclor1254)	0.09	-		
	British Columbia												
	Westham Island 49° 05' 123°10'	1969-70 Dec.'69-Jan. '70	5	Bm			-	-	Hg	0.07	(0.03-0.11)	51	
	Northwest Territories												
	Mills Lake 61°30' 118°15'	1970	1	Bm			-	-	Hg	0.01	-	51	
	Yellowknife	1961-62	9	Wb(?)			-	-	Total DDT	0.5	(0.1-0.8)	202	

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Anatidae	Newfoundland												
Black Duck													
(*Anas rubripes*)	Tinker Harbour	Fall 1970	1	Bm			-	-	Hg	0.05	-	178	
	Grand Falls	Fall 1970	1	Bm			-	-	Hg	0.09	-	178	
	-	Fall 1970	5	Wm			-	-	Hg	0.10	-	178	
	Nova Scotia												
	-	1971	2	E			-	-	DDE	0.09	(0.07-0.11)	126	
									DDD	-	-		
									DDT	0.025	-		
									Dieldrin	0.025	-		
									HE	0.0025	-		
									PCB	0.05	-		
	Sheffield Mill	Fall 1970	3	Bm			-	-	Hg	0.08	(0.07-0.09)	178	
	-	Fall 1970	30	Wm			-	-	Hg	0.08	-	178	2 analyses
	-	1978	3	E			-	-	DDE	ND	-	105	
									PCB (Aroclor 1260)	0.60	-		
									Hg	0.14	-		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Black Duck (cont'd)	Prince Edward Island												
	Murray River	Fall 1970	3	Bm			-	-	Hg	0.07	(0.05-0.08)	178	2 analyses
	New Brunswick												
	-	1971	3	E			-	-	DDE	0.173	(0.09-0.24)	151	
									DDD	-	-		
									DDT	0.060	(0.05-0.08)		
									Dieldrin	0.025	-		
									HE	0.002	-		
									PCB (Aroclor 1254)	0.333	-		
		1978	1	E			-	-	DDE	ND	-	105	
									PCB (Aroclor 1260)	0.60	-		
									Hg	0.14	-		
	Fatpot Island	May 1971	4	E			-	-	PCB (Aroclor 1260)	9.10 ± 0.53*	-	262	* $\bar{x}$ ± SD
									DDE	1.50 ± 0.20*	-		
	Milltown	Fall 1970	1	Bm			-	-	Hg	0.11	-	178	
	Sackville	Fall 1970	2	Bm			-	-	Hg	0.14	(0.09-0.20)	178	
	Sackville	Fall 1970	30	Wm			-	-	Hg	0.10	-	178	2 pooled analyses

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Black Duck (cont'd)	New Brunswick (cont'd)												
	New Brunswick	Fall 1970	75	Wm			-	-	Hg	0.13	-	178	3 pooled analyses
	Fredericton 45°58' 66°39'	1970	5	Bm			-	-	Hg	0.29	(0.27-0.30)	178	
	Tabusintac 47°20' 65°01'	1970	7	Bm			-	-	Hg	0.07	(0.01-0.09)	178	3 pooled analyses
	Bathurst Bass River 47°36' 65°39'	1970	6	Bm			-	-	Hg	0.18	(0.01-0.32)	178	3 pooled analyses
	Quebec												
	New Brunswick and Quebec	Spring 1964	5	E			-	-	DDE	1.6 ± 0.7*	(0.9-2.5)	186	* $\bar{x}$ ± SD
							-	-	DDT	1.3 ± 1.1*	(0.5-3.1)		Trace = less than 0.1 ppm
							-	-	DDD	Trace	(Trace-0.3)		
							-	-	Dieldrin	Trace	(0-0.2)		
	-	1971	5	E			-	-	DDE	0.790	(0.22-1.50)	151	
									DDD	0.010	-		
									DDT	0.254	(0.06-0.60)		
									Dieldrin	0.040	-		
									HE	0.006	-		
									PCB (Aroclor1254)	1.1	(1.0-2.0)		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Black Duck (cont'd)	Quebec (cont'd)												
	-	1978	4	E			-	-	DDE	0.64 ± 0.45*	(0.19-2.0)	105	* arithmetic means ± SE
									PCB(Aroclor1260)	0.25 ± 0.20*	(ND-0.84)		
									Hg	0.12 ± 0.04*	(ND-0.21)		
													ND = below the limit of quantification = 0.1 ppm for DDE = 0.5 ppm for PCBs and 0.02 ppm for Hg
	Southern Quebec	Fall 1970	50	Wm			-	-	Hg	0.15	-	178	6 pooled analyses
	Southern Quebec		55				-	-	Hg	0.21	-	178	3 pooled analyses
	St. Lawrence River upstream from Quebec City		75				-	-	Hg	0.17	-	178	3 pooled analyses
	Nottaway River	Fall 1971	6	Bm			-	-	Hg	0.08	(0.05-0.15)	178	
	Bell River - Lac Quevillon		1	Bm			-	-	Hg	1.05	-	178	

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Black Duck (cont'd)	Quebec (cont'd)												
	Baie Noire, Ottawa River	1968	5	L			-	-	Hg	0.38	(0.02-0.77)	68,73	
	Lac St. Louis	Fall 1970	3	Bm			-	-	Hg	0.31	(0.24-0.43)	178	
	Lac St. Pierre	Sept. 1985	1*	L	75.5	2.48	IM	-	HCB	<0.01	-	141	*pool of 9 ducks
									p,p'-DDE	<0.01	-		ND = not detectable
									Mirex	ND	-		
									PCB**	0.04	-		**Aroclor 1254:1260, 1:1
									OCS	ND	-		
									Oxychlordane	<0.01	-		
									Cis-chlordane	ND	-		
									Trans-nonachlor	<0.01	-		
									Cis-nonachlor	<0.01	-		
									p,p'-DDD	ND	-		
									p,p'-DDT	ND	-		
									HE	<0.01	-		
									Dieldrin	<0.01	-		
									BHC	ND	-		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Black Duck (cont'd)	Quebec (cont'd)												
	Lac St. Pierre	Sept. 1985	1*	Bm	70.0	2.34	IM	-	HCB	<0.01	-	141	* Pool of 9 ducks
									p,p'-DDD	0.01	-		ND = not detectable
									Mirex	ND	-		
									PCB**	0.046	-		** Aroclor 1254:1260, 1:1
									OCS	ND	-		
									Oxychlordane	<0.01	-		
									Cis-chlordane	ND	-		
									Trans-nonachlor	<0.01	-		
									Cis-nonachlor	<0.01	-		
									p,p'-DDD	ND	-		
									p,p'-DDT	ND	-		
									HE	<0.01	-		
									Dieldrin	<0.01	-		
									BHC	ND	-		
	Lac St. Pierre	Sept. 1985	1*	L	73.2	2.79	AD	-	HCB	< 0.01	-	141	* Pool of 8 ducks
									p,p'-DDE	0.051	-		ND = not detectable
									Mirex	ND	-		
									PCB**	0.063	-		**Aroclor 1254:1260, 1:1
									OCS	< 0.01	-		
									BHC	ND	-		
									Oxychlordane	< 0.01	-		
									Cis-chlordane	ND	-		
									Trans-chlordane	< 0.01	-		
									Cis-nonachlor	ND	-		
									p,p'-DDD	< 0.01	-		
									p,p'-DDT	ND	-		
									HE	< 0.01	-		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Black Duck (cont'd)	Quebec (cont'd)												
	Lac St. Pierre	Sept. 1985	1*	Bm	69.9	2.96	AD	-	HCB	< 0.01	-	141	* Pool of 8 ducks
									p,p'-DDE	0.064	-		
									Mirex	ND	-		ND = not detectable
									PCB**	0.047	-		** Aroclor 1254:1260, 1:1
									OCS	ND	-		
									BHC	ND	-		
									Oxychlordane	< 0.01	-		
									Cis-chlordane	ND	-		
									Trans-nonachlor	ND	-		
									Cis-nonachlor	ND	-		
									p,p'-DDD	< 0.01	-		
									p,p'-DDT	< 0.01	-		
									HE	< 0.01	-		
									Dieldrin	< 0.01	-		
	Lacs Matagami, Waswanipi, au Goeland, Pustamic	Fall 1970	9	Bm			-	-	Hg	0.13	(0.06-0.26)	178	
	Thurso 45°36' 75°15'	1970	3	Bm			-	-	Hg	0.15	(0.07-0.22)	178	

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Black Duck (cont'd)	Quebec (cont'd)												
	Lac Evans 50°55' 77°00'	Sept. 7-Oct. 26 1971	1	Bm			-	-	Hg	0.13	-	12	
	Lac Parent 48°38' 77°03'	1971	1	Bm			-	-	Hg	0.20	-	12	
	Bell River 49°01' 77°05' upstream	1971	1	Bm			-	-	Hg	0.05	-	12	upstream from source of mercury
	Bell River 49°01' 77°05' downstream	1971	1	Bm			-	-	Hg	1.05	-	12	downstream from source of mercury
	Lac Waswanipi 49°34' 76°29'	1971	1	Bm			-	-	Hg	0.10	-	12	
	Lac au Goeland 49°47' 76°48'	1971	2	Bm			-	-	Hg	0.11	(0.07-0.15)	12	
	Lac Matagami 49°53' 77°30'	1971	1	Bm			-	-	Hg	0.11	-	12	
	Lac St. Francis 45°10' 74°22'	Sept. 1970	3	Bm			-	-	Hg	0.14	(0.12-0.16)	178	
	Lac Matagami 49°50' 77°30'	1975-76	1	Wm			-	-	Hg	0.18	-	57	

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Black Duck (cont'd)	Quebec (cont'd)												
	Lac Matagami 50°14' 77°00'	1975-76	1	Wm			-	-	Hg	0.18	-	57	
	Ontario												
	Stewart Lake	Sept. 13 1975	10	Fe			IM	F	Zn	117 ± 3*	-	185	* $\bar{x}$ ± SD (pooled samples) 95 km from smelter
									Cu	13 ± 2*	-		
									Ni	0.9 ± 0.7*	-		
							IM	F	Zn	126 ± 3*	-		
									Cu	24 ± 2*	-		
									Ni	1.5 ± 0.7*	-		
							IM	F	Zn	130 ± 3*	-		
									Cu	14 ± 2*	-		
									Ni	0.3 ± 0.7*	-		
							IM	F	Zn	126 ± 3*	-		
									Cu	14 ± 2*	-		
									Ni	1.5 ± 0.7*	-		
							AD	F	Zn	122 ± 3*	-		
									Cu	19 ± 2*	-		
									Ni	0.5 ± 0.7*	-		
							AD	M	Zn	122 ± 3*	-		
									Cu	12 ± 2*	-		
									Ni	0.2 ± 0.7*	-		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Black Duck (cont'd)	Ontario (cont'd)												
							AD	M	Zn	125 ± 3*	-		
									Cu	11 ± 2*	-		
									Ni	0.5 ± 0.7*	-		
	Sudbury		10	Fe			IM	F	Zn	113 ± 3*	-	185	20-30 km from smelter
									Cu	11 ± 2*	-		
									Ni	3.2 ± 0.7*	-		
							IM	F	Zn	125 ± 3*	-		
									Cu	53 ± 3*	-		
									Ni	36.7 ± 0.8*	-		
							AD	F	Zn	119 ± 3*	-		
									Cu	21 ± 2*	-		
									Ni	12.5 ± 1.3*	-		
							AD	M	Zn	129 ± 3*	-		* $\bar{x}$ ± SD (pooled samples)
									Cu	11 ± 2*	-		
									Ni	2.5 ± 0.7*	-		
							AD	M	Zn	119 ± 3*	-		
									Cu	13 ± 2*	-		
									Ni	4.2 ± 0.7*	-		
	French River	Oct. 4 1975	10	Fe			AD	M	Zn	118 ± 3*	-	185	50-60 km from smelter
									Cu	9 ± 2*	-		
									Ni	0.9 ± 0.7*	-		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Black Duck (cont'd)	Ontario (cont'd)												
							IM	F	Zn	127 ± 3*	-		
									Cu	19 ± 2*	-		
									Ni	3.8 ± 0.8*	-		
		Sept. 27 1975	10	Fe			AD	F	Zn	129 ± 2*	-		
									Cu	14 ± 3*	-		
									Ni	0.2 ± 0.8*	-		
	Manitoulin Island	Sept. 27 1975	10	Fe			IM	M	Zn	149 ± 3*	-	185	95-140 km from smelter
									Cu	10 ± 2*	-		
									Ni	1.0 ± 0.8*	-		
	N. of Lake Superior	Fall 1970	10	Wm			-	-	Hg	0.14	-	178	2 pooled analyses
	Lake St. Clair		35				-	-	Hg	0.08	-	178	3 pooled analyses
	Upper Ottawa River		20				-	-	Hg	0.26	-	178	4 pooled analyses
	N. of Lake Ontario		55				-	-	Hg	0.09	-	178	3 pooled analyses
	Lake St. Clair	Fall 1970	2	Bm			-	-	Hg	0.02	(0.01-0.02)	178	
	Kapuskasing 49°25' 82°26'	1970	9	Bm			-	-	Hg	0.13	(0.06-0.26)	178	

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Black Duck (cont'd)	Ontario (cont'd)												
	-	1971	5	E			-	-	DDE	0.82	(0.28-1.49)	151	
									DDD	0.01	-		
									DDT	0.254	(0.07-0.41)		
									Dieldrin	0.03	-		
									HE	0.011	(0.01-0.02)		
									PCB (Aroclor1254)	1.50	(0.05-3.00)		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Anatidae	Manitoba												
Gadwall													
(Anas strepera)	Saskatchewan River	Spring	10	Bm				-	Hg	0.05	(0.02-0.08)	56	
	Delta	1971	2	L				-	Hg	0.14	(0.13-0.14)		
		Fall	9	Bm			IM	-	Hg	0.07	(0.04-0.11)	56	
		1971	3	L			IM	-	Hg	0.17	(0.11-0.26)		
			2	Bm			AD	-	Hg	0.08	(0.06-0.11)	56	
			1	L			AD	-	Hg	0.20	-		
		Fall	1	Bm			AD	-	Hg	0.13	-	56	
		1972	1	L			AD	-	Hg	0.40	-		
			1	Fe			AD	-	Hg	0.80	-		
	Lake Winnipeg	Spring	1	Bm			-	-	Hg	0.04	-	56	
		1971	1	L			-	-	Hg	0.18	-		
	Saskatchewan												
	Old Wives Lake	1969	10	E			-	-	Hg	0.116	-	223	
	Alberta												
	Chip Lake	1968	10	E			-	-	Hg	0.30	-	223	
	Lake Newell	1968	10	E			-	-	Hg	0.10	-	223	

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Gadwall (cont'd)	Alberta (cont'd)												
	Chip Lake	1968	10	E	66.9	16.0	-	-	DDE	0.23	-	229	
									Dieldrin	0.027	-		
	Lake Newell	1968	10	E	67.9	16.0	-	-	DDE	0.16	-	229	
									Dieldrin	0.025	-		
	Strathmore	1964	10	Fat			0-200g	-	Total DDT	7.90	-	41	** Ducklings
							**	-	Dieldrin	0.03	-		
				M*				-	Total DDT	0.08	-		* breast muscle
									Dieldrin	ND	-		and/or leg muscle
			2	Fat			201g-	-	Total DDT	0.25	-		
							400g	-	Dieldrin	ND	-		
				M*				-	Total DDT	0.01	-		
									Dieldrin	ND	-		
			2	Fat			401g+	-	Total DDT	0.01	-		
									Dieldrin	0.01	-		
				M*				-	Total DDT	0.01	-		
									Dieldrin	0.01	-		
	Strathmore	1964	7	PG			0-200g	-	DDT	0.53	-	41	** Ducklings
							**		DDE	0.56	-		
									Dieldrin	0.23	-		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Gadwall (cont'd)	Alberta (cont'd)												
	Strathmore	1964	11	Fat		0-200g **		-	Total DDT	7.19	-	42	** Ducklings
									Dieldrin	0.08	-		
				M*				-	Total DDT	0.14	-	42	M* = breast muscle and/or leg muscle
									Dieldrin	Trace	-		
			2	Fat		201g-400g		-	Total DDT	0.25	-	42	
									Dieldrin	ND	-		
				M*				-	Total DDT	0.02	-	42	
									Dieldrin	ND	-		
			2	Fat		401+g		-	Total DDT	0.01	-	42	
									Dieldrin	0.01	-		
				M*				-	Total DDT	0.01	-	42	
									Dieldrin	0.01	-		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Anatidae	Ontario												
Pintail													
(Anas acuta)	Wabigoon Lake	July 20- Aug. 25 1970	1	L			AD	-	Hg	0.35	-	69,70,71	
		July 20- July 28 1971	1	L			IM	-	Hg	0.37	-		
	Clay Lake		3	L			AD	-	Hg	4.38	(1.91-6.16)	69,70,71	
			2	L			IM	-	Hg	0.93	(0.91-0.95)		
	Ball Lake		1	L			IM	-	Hg	0.27	-	69,70,71	
	Maynard Lake		2	L			AD	-	Hg	0.70	(0.64-0.77)	69,70,71	
			1	L			IM	-	Hg	0.23	-		
	Sydney Lake		1	L			AD	-	Hg	0.71	-	69,70,71	
	(Wabigoon, Clay, Ball, Maynard and Sydney Lakes)	July 20- Aug. 5 1970	7	L			AD	-	Hg	2.23 ± 0.84*	-	69,70,71	* $\bar{x}$ ± SE
		June 20- July 28 1971	7	Bm			AD	-	Hg	1.33 ± 0.56*	-		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Pintail (cont'd)	Ontario (cont'd)												
			3	L			IM**	-	Hg	0.72 ± 0.19*	(0.23-0.95)	69,70,71	** Ducklings
			3	Bm			IM**	-	Hg	0.22 ± 0.07*	(0.06-0.34)		
			7	L			AD		Hg	2.23 ± 0.69*	-	69,70,71	* $\bar{x}$ ± SE
									CH3Hg	1.34 ± 0.43*	-		
			7	Bm			AD	-	Hg	0.74 ± 10.30*	-	69,70,71	
									CH3Hg	0.45 ± 0.20*	-		
			3	L			IM**	-	Hg	0.70 ± 0.19*	-	69,70,71	** Ducklings
									CH3Hg	0.30 ± 0.04*	-		
			3	Bm			IM**	-	Hg	0.22 ± 0.69*	-	69,70,71	
									CH3Hg	0.12 ± 0.02*			
	Manitoba												
	(Province-wide)	1969	3*	Bm			AD	-	Hg	0.05	-	225	* pooled samples
			3*	L			AD	-	Hg	0.26	-		
	(Province-wide)	1969	8*	Bm			IM	-	Hg	0.03	-	225	
			8*	L			IM	-	Hg	0.13	-		
	Saskatchewan River Delta	Spring 1971	1	Bm			-	-	Hg	0.04	-	56	
		Fall 1971	2	Bm			IM	-	Hg	0.15	(0.14-0.16)	56	
			1	L			IM	-	Hg	0.25	-		
			1	L			AD	-	Hg	0.25	-		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Pintail (cont'd)	Manitoba (cont'd)												
	Lake Winnipeg	Spring	2	Bm				-	Hg	0.11	(0.10-0.12)	56	
		1971	2	L				-	Hg	0.23	(0.20-0.26)		
		Fall	3	Bm			IM	-	Hg	0.17	(0.04-0.23)	56	
		1971	2	L			IM	-	Hg	0.43	(0.21-0.64)		
	Saskatchewan												
	(Province-wide)	1969	3*	Bm			AD	-	Hg	0.02	-	225	* pooled samples
				L			AD	-	Hg	0.06	-		
	(Province-wide)	1969	6*	Bm			IM	-	Hg	0.06	-	225	
				L			IM	-	Hg	0.28	-		
	Old Wives Lake	1969	10	E			-	-	Hg	0.036	-	223	
			10	E	69.7	12.7	-	-	DDE	0.92	-	229	
									Dieldrin	0.050	-		
	Saskatchewan-Alberta	1970	12	Bm			IM	-	Hg	0.01	-	225	4 pooled samples
										0.04	-		
										0.05	-		
										0.31	-		
			9	Bm			AD	-	Hg	0.02	-		3 pooled samples
										0.07	-		
										0.14	-		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Pintail (cont'd)	Alberta												
	(Province-wide)	August 1969	16*	Bm			IM	-	Hg	0.04	-	225	* pooled samples
				L			IM	-	Hg	0.16	-	225	
	Strathmore	1964	4	Fat		0-200g **		-	Total DDT	12.18	-	41	** Ducklings
									Dieldrin	1.01	-		
				M*				-	Total DDT	0.48	-		M* = breast muscle and/or leg muscle
									Dieldrin	0.04	-		
			2	Fat		201g-400g		-	Total DDT	2.02	-		
									Dieldrin	0.01	-		
			3	M*				-	Total DDT	0.03	-		
									Dieldrin	ND	-		
			6	Fat		400g+		-	Total DDT	0.40	-		
									Dieldrin	0.03	-		
				M*				-	Total DDT	0.02	-		
									Dieldrin	ND	-		
	Strathmore	1964	4	Fat		0-200g **		-	Total DDT	12.18	-	42	** Ducklings
									Dieldrin	0.36	-		
			4	M*				-	Total DDT	0.48	-	42	M* = breast muscle and/or leg muscle
									Dieldrin	0.04	-		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Pintail (cont'd)	Alberta (cont'd)												
			2	Fat			201-400g	-	Total DDT	2.02	-		
									Dieldrin	0.01	-		
				M*				-	Total DDT	0.04	-		
									Dieldrin	ND	-		
			5	Fat			400g±	-	Total DDT	0.34			
									Dieldrin	0.03			
				M*				-	Total DDT	0.02	-		
									Dieldrin	ND	-		
	Strathmore	1964	8	PG			**	-	DDT	0.60	-	43	** Ducklings
									DDE	0.65	-		
									Dieldrin	0.33	-		
	Bashaw	Aug. 27 1970	10	Bm			IM	-	Hg	0.07 ± 0.02*	-	225	* $\bar{x}$ ± 95% confidence intervals
			10	Fe			IM	-	Hg	1.40 ± 0.53*	-	225	
			10	Bm			AD	-	Hg	0.11 ± 0.03*	-	225	
			10	Fe			AD	-	Hg	1.29 ± 0.51*	-	225	
	British Columbia												
	Westham Island 49°05' 123°10'	1970	1	Bm			-	-	Hg	0.01	-	51	

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Pintail (cont'd)	Northwest Territories												
	Mills Lake 61°30' 118°15'	1970	1	Bm			-	-	Hg	0.03	-	51	
	Yellowknife	1961-62	4	Wb(?)			-	-	Total DDT	1.0	-	202	

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Anatidae Green-winged Teal (*Anas crecca*)	Newfoundland												
	Tinker Harbour	Fall 1970	1	Bm			-	-	Hg	0.08	-	178	
	Newfoundland	Fall 1970	5	Wm			-	-	Hg	0.08	-	178	1 pooled analysis
	Nova Scotia												
	Sheffield Mills	Fall 1970	3	Bm			-	-	Hg	0.10	-	178	1 pooled analysis
	Nova Scotia	Fall 1970	10	Wm			-	-	Hg	0.08	-	178	2 pooled analyses
	New Brunswick												
	Sackville	Fall 1970	3	Bm			-	-	Hg	0.11	(0.09-014)	178	2 pooled analyses
	Sackville	Fall 1970	30	Wm			-	-	Hg	0.08	-	178	2 pooled analyses
	Fredericton 45°58' 66°39'	Fall 1970	1	Bm			-	-	Hg	0.31	-	178	
	New Brunswick	Fall 1970	30	Wm			-	-	Hg	0.18	-		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Green-winged Teal (cont'd)	Quebec												
	Southern Quebec	Fall 1970	5	Wm			-	-	Hg	0.13	-	178	1 pooled analysis
	Southern Quebec	Fall 1970	55	Wm			-	-	Hg	0.10	-	178	3 pooled analyses
	Upstream from Quebec City, St. Lawrence River	Fall 1970	55	Wm			-	-	Hg	0.13	-	178	3 pooled analyses
	Lacs Matagami, Waswanipi, au Goeland, Pustamica	Fall 1970	3	Bm			-	-	Hg	0.15	(0.04-0.30)	178	
	Nottaway River	Fall 1971	2	Bm			-	-	Hg	0.12	(0.11-0.12)	178	
	Lac Waswanipi 49°34' 76°29'	1971	1	Bm			-	-	Hg	0.12	-	12	
	Lac Matagami 49°53' 77°30'	1971	1	Bm			-	-	Hg	0.11	-	12	
	Lac Mistassini 50°15' 73°45'	1975-76	1	Wm			-	-	Hg	0.07	-	57	

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Green-winged Teal (cont'd)	Ontario												
	Wabigoon-English River System	Fall 1970	5	Wm			-	-	Hg	0.17	-	178	1 pooled analysis
	N. of Lake Superior	Fall 1970	5	Wm			-	-	Hg	0.20	-	178	1 pooled analysis
	Lake St. Clair	Fall 1970	30	Wm			-	-	Hg	0.05	-	178	2 pooled analyses
	N. of Lake Ontario		15	Wm			-	-	Hg	0.14	-	178	3 pooled analyses
	Clay Lake	Aug. 3-14, 1971	2	Bm			-	-	Hg	0.92	(0.79-1.05)	178	
	Wabigoon River, Clay Lake	Sept. 2 Oct. 4 1971	4	Bm			-	-	Hg	0.29	(0.13-0.52)	178	
	English River System	Sept. 27 Oct. 4 1971	4	Bm			-	-	Hg	0.17	(0.12-0.22)	178	
	Tetu Lake 50°11' 95°02'	1971	3	Bm			-	-	Hg	0.18	(0.15-0.19)	51	

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Green-winged Teal (cont'd)	Manitoba												
	Fort Churchill	1967	1	Fat			-	-	DDT	13.0	-	36	sprayed area
									DDD	8.50	-		
									DDE	14.5	-		
									Total DDT	36.0	-		
			3	Br			-	-	DDT + DDD	1.39	-	36	sprayed area
									Total DDT	2.77	-		
	Saskatchewan River Delta	Spring 1971	3	Bm			-	-	Hg	0.08	(0.06-0.11)	56	
		Spring 1972	10	Bm			-	-	Hg	0.18	(0.12-0.23)	56	
			4	L			-	-	Hg	0.39	(0.31-0.47)		
			4	Fe			-	-	Hg	0.92	(0.56-1.37)		
		Fall 1971	2	Bm			AD	-	Hg	0.30	(0.06-0.54)	56	
			1	L			AD	-	Hg	0.74			
		Fall 1972	2	Bm			IM	-	Hg	0.25	(0.12-0.39)	56	
			2	L			IM	-	Hg	0.31	(0.48-1.13)		
			2	Fe			-	-	Hg	2.00	(0.79-4.21)		
			1	Bm			AD	-	Hg	0.33	-	56	
			1	L			AD	-	Hg	0.66	-		
			1	Fe			AD	-	Hg	7.02	-		
	Lake Winnipeg	Spring 1971	3	Bm			-	-	Hg	0.08	(0.04-0.12)	56	
			3	L			-	-	Hg	0.34	(0.28-0.37)		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Green-winged	Manitoba												
Teal	(cont'd)												
(cont'd)		Fall	5	Bm			IM	-	Hg	0.18	(0.09-0.22)	56	
	1971		2	L			IM	-	Hg	0.80	(0.66-0.93)		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Anatidae	Prince Edward Island												
Blue-winged Teal (Anas discors)	Murray River	Fall 1970	1	Bm			-	-	Hg	0.07	-	178	
	New Brunswick												
	Milltown	Fall 1970	2	Bm			-	-	Hg	0.32	-	178	1 pooled analysis
	Fredericton 45°58′ 66°39′	Fall 1970	5	Bm			-	-	Hg	0.47	(0.42-0.55)	178	2 pooled analyses
	Tabusintac 47°20′ 65°01′	Fall 1970	1	Bm			-	-	Hg	0.07	-	178	
	Dalhousie 48°04′ 66°23′	Fall 1970	3	Bm			-	-	Hg	0.19	-	178	
	Quebec												
	Lacs Matagami, Waswanipi, au Goeland, Pustamica	1971	1	Bm			-	-	Hg	0.29	-	178	
	Bell River 49°01′ 77°05′	Sept. 7 Oct. 26 1971	5	Bm			-	-	Hg	0.342	(0.27-0.40)	12, 178	

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Blue-winged Teal (cont'd)	Ontario												
	Lake St. Clair 42°33' 82°29'	May 1970	4	Bm			-	F	Hg	0.68	(0.10-2.30)	60	
			4	L			-	F	Hg	1.53	(0.26-5.00)		
			4	K			-	F	Hg	1.40	(0.27-4.40)		
	Clay Lake 50°03' 93°30'	August 1971	17	Bm			IM	-	Hg	6.46 ± 0.89*	(3.8-10.4)	226, 227	* $\bar{x}$ ± 95% confidence intervals
			17	Wm			IM	-	Hg	4.71 ± 0.74*	-		* $\bar{x}$ ± 95% confidence intervals
	Clay Lake	August 1971	1	Bm			IM	-	Hg	10.4	-	227	
									CH_3Hg	7.4	-		
	Clay Lake 50°03' 93°30'	Aug. 3-14, 1971	17	Bm			-	-	Hg	5.91	(3.20-9.10)	178	
	Wabigoon River - Clay Lake	Sept. 27 Oct. 4 1971	2	Bm			-	-	Hg	1.94	(0.33-3.56)	178	
	English River System	Sept. 27 Oct. 4 1971	6	Bm			-	-	Hg	0.48	(0.21-0.99)	178	
	Manitoba												
	Saskatchewan River Delta	Spring 1971	12	Bm			-	-	Hg	0.26	(0.06-0.65)	56	
			2	L			-	-	Hg	0.84	(0.73-0.94)		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Blue-winged Teal	Manitoba (cont'd)												
		Spring 1972	20	Bm			-	-	Hg	0.23	(0.10-0.35)	56	
			5	L			-	-	Hg	0.63	(0.34-0.94)		
			5	Fe			-	-	Hg	3.16	(1.40-6.09)		
		Fall 1971	1	Bm			IM	-	Hg	0.18	-	56	
			1	L			IM	-	Hg	0.45	-		
			5	Bm			AD	-	Hg	0.13	(0.09-0.19)	56	
			2	L			AD	-	Hg	0.43	(0.19-0.67)		
		Fall 1972	11	Bm			IM	-	Hg	0.09	(0.05-0.16)	56	
			4	L			IM	-	Hg	0.16	(0.11-0.21)		
			4	Fe			IM	-	Hg	1.10	(0.39-2.01)		
			2	Bm			AD	-	Hg	0.16	(0.13-0.19)	56	
	Lake Winnipeg	Spring 1971	6	Bm			-	-	Hg	0.20	(0.08-0.31)	56	
			6	L			-	-	Hg	0.75	(0.25-1.20)		
		Fall 1971	3	Bm			IM	-	Hg	0.53	(0.44-0.62)	56	
			1	L			IM	-	Hg	1.09	-		
	Lake Winnipeg		3	Bm			AD	-	Hg	0.49	(0.12-0.76)	56	
			1	L			AD	-	Hg	1.05	-		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Blue-winged Teal (cont'd)	Alberta												
	Strathmore	1964	2	PG			IM**	-	DDT	0.85	-	43	** Ducklings
									DDE	0.13	-		
									Dieldrin	0.11	-		
	Lake Newell	1968	10	E	68.9	14.8	-	-	DDE	0.81	-	229	
									Dieldrin	0.027	-		
	Lake Newell	1968	10	E			-	-	Hg	0.210	-	223	

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Anatidae	Ontario												
American Wigeon													
(Anas americana)	Clay Lake 50°03' 93°30'	August 1971	5	Bm			-	-	Hg	0.48	(0.3-0.9)	227	
	Manitoba												
	Saskatchewan River Delta	Spring 1971	10	Bm			-	-	Hg	0.06	(0.02-0.08)	56	
			3	L			-	-		0.13	(0.09-0.16)		
		Spring 1972	1	Bm			-	-	Hg	0.04	-	56	
			1	L			-	-		0.04	-		
			1	Fe			-	-		3.06	-		
		Fall 1971	1	L			IM	-	Hg	0.13	-	56	
			3	Bm			AD	-	Hg	0.07	(0.04-0.08)	56	
			1	Bm			AD	-		0.66	-		
			1	L			AD	-		0.71	-		
			1	Fe			AD	-		1.25	-		
		Fall 1972	1	L			AD	-	Hg	0.71	-	56	
	Lake Winnipeg	Fall 1971	3	Bm			IM	-	Hg	0.06	(0.05-0.08)	56	
			2	Bm			AD	-	Hg	0.03	(0.02-0.05)	56	
			2	L			IM	-	Hg	0.09	(0.05-0.13)	56	
			1	L			AD	-	Hg	0.09	-	56	

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
American Wigeon (cont'd)	Alberta												
	Strathmore	? 1964	6	Fat		0-200g		-	Total DDT	0.37	-	41	** Ducklings
						**			Dieldrin	0.01	-		
			7	M*		-		-	Total DDT	0.02	-		M* breast muscle
									Dieldrin	ND	-		and/or leg muscle
			2	Fat		201-400g		-	Total DDT	0.30	-	41	
									Dieldrin	ND	-		
			4	M*		-		-	Total DDT	ND	-	41	
									Dieldrin	ND	-		
			2	Fat		400g±		-	Total DDT	0.09	-	41	
									Dieldrin	ND	-		
			4	M*				-	Total DDT	0.04	-	41	
									Dieldrin	ND	-		
	Strathmore	1964	4	Fat		0-200g		-	Total DDT	0.47	-	42	** Ducklings
						**			Dieldrin	0.01	-		
				M*		-		-	Total DDT	0.02	-		M* breast muscle
									Dieldrin	TRACE	-		and/or leg muscle
			2	Fat		201-400g		-	Total DDT	0.30	-		
									Dieldrin	ND	-		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
American Wigeon (cont'd)	Alberta (cont'd)			M*			-	-	Total DDT	ND	-		M* breast muscle and/or leg muscle
									Dieldrin	ND	-		
			2	Fat			400g±	-	Total DDT	0.09	-		
									Dieldrin	ND	-		
				M*			-	-	Total DDT	0.04	-		
									Dieldrin	ND	-		
	Strathmore	1964	3	PG			IM	-	DDT	0.25	-	43	
									DDE	0.27	-		
									Dieldrin	0.09	-		
	Lake Newell	1968	10	E	68.2	16.4	-	-	DDE	0.09	-	229	
									Dieldrin	0.032	-		
	Lake Newell	1968	10	E			-	-	Hg	0.047	-	223	
	Northwest Territories												
	Yellowknife	1961-62	3	Wb(?)			-	-	Total DDT	0.2	(0.1-0.2)	202	

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Anatidae	Manitoba												
Northern Shoveler (*Anas clypeata*)	Fort Churchill	1967	3	Fat			-	-	DDT	12.9	-	36	sprayed area
									DDD	14.3	-		
									DDE	11.2	-		
									Total DDT	38.4	(14.1-83.1)		
			3	Br		6.4	-	-	DDT + DDD	0.874	-	36	sprayed area
									Total DDT	1.28	-		
			3	L			-	-	Total DDT	1.13	-	36	sprayed area
			2	I			-	-	Total DDT	1.47	-	36	sprayed area
			2	K		1.4	-	-	Total DDT	0.588	-	36	sprayed area
			3	M		3.3	-	-	Total DDT	0.865	-	36	sprayed area
	Saskatchewan River Delta	Spring 1971	11	Bm			-	-	Hg	0.35	(0.15-0.51)	56	
			2	L			-	-		1.23	(0.59-1.86)		
		Spring 1972	1	Bm			-	-	Hg	0.37	-	56	
			1	L			-	-		1.27	-		
			1	Fe			-	-		10.46			
		Fall 1971	3	Bm			IM	-	Hg	0.12	(0.10-0.15)	56	
			1	L			IM	-		0.38	-		
			2	Bm			AD	-	Hg	0.19	(0.13-0.25)	56	
			1	L			AD	-		0.39	-		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Northern Shoveler (cont'd)	Manitoba (cont'd)												
		Fall 1972	1	Bm			IM	-	Hg	0.13	-	56	
			1	L			IM	-		0.12	-		
			1	Fe			IM	-		0.72	-		
			1	Bm			AD	-	Hg	0.74	-	56	
			1	L			AD	-		0.97	-		
			1	Fe			AD	-		3.44	-		
	Lake Winnipeg	Spring 1971	3	Bm			-	-	Hg	0.29	(0.20-0.39)	56	
			3	L			-	-		1.18	(0.95-1.30)		
		Fall 1971	1	Bm			AD	-	Hg	0.28	-	56	
			1	L			AD	-		1.02	-		
	Saskatchewan-Alberta	1970	1*	Bm			IM	-	Hg	0.34	-	225	* pool of 3

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Anatidae	New Brunswick												
Wood Duck (*Aix sponsa*)	Milltown	Fall 1970	2	Bm			-	-	Hg	0.16	(0.12-0.21)	178	
	Quebec												
	Baie Noire, Ottawa River	1968	3	L			-	-	Hg	0.16	(0.10-0.21)	68, 73	

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Anatidae	Ontario												
Redhead													
(Aythya americana)	Wabigoon-English River System	Fall 1970	5	Wm			-	-	Hg	0.01	-	178	1 pooled analysis
	Lake St. Clair		30	Wm			-	-	Hg	0.07	-	178	2 pooled analyses
	Lake St. Clair 42°33′ 82°29′	1970	12	Bm			-	-	Hg	0.10	(0.03-0.18)	178	
	Walpole Island	Summer 1986	16	L	-	-	-	-	OCS	85.60 ± 102.64**		92	*IUPAC no. (Ref 21)
									HCB	20.01 ± 28.57**			**ppb
									QCB	1.18 ± 1.47**			non-migratory
			12						PCB 28*	0.40 ± 0.32***			redheads
									PCB 101*	0.43 ± 0.52***			
									PCB 180*	1.46 ± 1.42**			
		Summer 1986	16	M	-	-	-	-	OCS	4.78 ± 4.43**		92	
									HCB	10.76 ± 15.91**			
									QCB	0.77 ± 0.78**			
			10						PCB 28*	0.23 ± 0.28***			
									PCB 101*	0.10 ± 0.21***			
									PCB 180*	0.97 ± 1.39**			
		Fall 1986	2	L	-	-	-	-	OCS	18.93 ± 15.30**		92	*IUPAC no. (Ref 21)
									HCB	2.04 ± 1.44**			**ppb
									QCB	0.49 ± 0.13**			***ppb, below limit
									PCB 28*	0.01 ± 0.01***			of quantification
									PCB 101*	0.36 ± 0.02***			
									PCB 180*	0.08 ± 0.03***			migratory redheads

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Redhead	Ontario												
(cont'd)	(cont'd)	Fall	2	M	-	-	-	-	OCS	3.49 ± 4.02**		92	
		1986							HCB	1.66 ± 1.19**			
									QCB	0.82 ± 0.61**			
									PCB 28*	0.17 ± 0.05***			
									PCB 101*	ND			
									PCB 180*	0.07 ± 0.10***			
	Manitoba												
	Saskatchewan River	Fall	1	Bm			IM	-	Hg	0.12	-	56	
	Delta	1971	1	L			IM			0.39	-		
	Lake Winnipeg	Fall	1	Bm			IM	-	Hg	0.10	-	56	
		1971	1	Bm			AD	-	Hg	0.04	-		
		1	L				IM	-	Hg	0.11	-		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Anatidae Ring-Necked Duck (*Aythya collaris*)	Newfoundland												
	Grand Falls	Fall 1970	1	Bm			-	-	Hg	0.04	-	178	
	New Brunswick	Fall 1970	30	Wm			-	-	Hg	0.06	-	178	2 pooled analyses
	Quebec												
	Southern Quebec	Fall 1970	15	Wm			-	-	Hg	0.16	-	178	3 pooled analyses
	Southern Quebec	Fall 1970	5	Wm			-	-	Hg	0.08	-	178	1 pooled analysis
	St. Lawrence River upstream from Quebec City	Fall 1970	5	Wm			-	-	Hg	0.18	-	178	1 pooled analysis
	Lac Evans 50°55′ 77°00′	Sept. 7 Oct. 26 1971	1	Bm			-	-	Hg	0.07	-	12, 178	
	Lac Waswanipi 49°34′ 76°29′	Sept. 7 Oct. 26 1971	3	Bm			-	-	Hg	0.09	(0.03-0.20)	12, 178	

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Ring-necked Duck (cont'd)	Ontario												
	Wabigoon-English River System	Fall 1970	30	Wm			-	-	Hg	0.04	-	178	2 pooled analyses
	N. of Lake Superior	Fall 1970	25	Wm			-	-	Hg	0.07	-	178	1 pooled analysis
	Lake St. Clair	Fall 1970	5	Wm			-	-	Hg	0.07	-	178	1 pooled analysis
	Upper Ottawa River	Fall 1970	5	Wm			-	-	Hg	0.14	-	178	1 pooled analysis
	N. of Lake Ontario	Fall 1970	25	Wm			-	-	Hg	0.04	-	178	5 pooled analyses
	Wabigoon River - Clay Lake	Sept.27 Oct. 4 1971	3	Bm			-	-	Hg	0.38	(0.01-0.93)	178	
	English River System		3	Bm			-	-	Hg	0.01	(<0.01-0.18)	178	
	Manitoba												
	Saskatchewan River Delta	Spring 1971	1	Bm			-	-	Hg	0.03	-	56	

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Ring-necked Duck (cont'd)	Manitoba (cont'd)												
		Spring 1972	3	Bm			-	-	Hg	0.08	-	56	
			3	L			-	-		0.12	(0.05-0.17)		
			3	Fe			-	-		1.26	(0.56-2.33)		
	Lake Winnipeg	Fall 1971	3	Bm			IM	-	Hg	0.08	(0.06-0.10)	56	
			1	L			AD	-	Hg	0.58	-		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Anatidae	Ontario												
Canvasback (Aythya valisineria)	N. of Lake Superior	Fall 1970	10	Wm			-	-	Hg	0.04	-	178	2 pooled analyses
	Manitoba												
	Saskatchewan River Delta	Spring 1971	7	Bm			-	-	Hg	0.08	(0.05-0.12)	56	
			2	L			-	-		0.38	(0.28-0.48)		
		Fall 1971	8	Bm			IM	-	Hg	0.09	(0.02-0.26)	56	
		Fall 1972	1	Bm			IM	-	Hg	0.12	-	56	
			1	L			IM	-		0.15	-		
			1	Fe			IM	-		0.69	-		
	Lake Winnipeg	Fall 1971	1	Bm			AD	-	Hg	0.02	-	56	
			1	L			AD	-		0.06	-		
	Manitoba	1972-73	51	E			-	-	p,p'-DDE	0.39*	(ND-5.8)	207	* geometric means
									p,p'-DDT	0.03*	(ND-1.1)		ND = not detectable
									Dieldrin	0.01*	(ND-0.22)		
									HCB	0.01*	(ND-0.08)		*** Aroclor 1254 or 1260
									PCB***	1.1*	(<0.5-29)		
			14	E			-	-	Hg	0.04*	(<0.05-0.10)	207	

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Canvasback (cont'd)	Saskatchewan												
	(Province-wide)	August 1969	2**	Bm			IM	-	Hg	0.01	-	225	** pooled samples
			2**	L			IM	-		0.03	-		
	Old Wives Lake	1969	10	E			-	-	Hg	0.061	-	223	
		1972-73	24	E			-	-	p,p'-DDE	0.18*	(ND-0.92)	207	* geometric means
									p,p'-DDT	0.01*	(ND-0.21)		ND = not detectable
									Dieldrin	0.01*	(ND-0.18)		
									HCB	ND	-		*** Aroclor 1254 or
									PCB***	0.93*	(ND-12)		1260
			6	E			-	-	Hg	0.04*	(<0.05-0.06)	207	
	Alberta												
		1972-73	5	E			-	-	p,p'-DDE	0.29*	(ND-0.52)	207	* geometric means
									p,p'-DDT	ND	-		ND = not detectable
									Dieldrin	ND	-		
									HCB	ND	-		*** Aroclor 1254 or
									PCB***	0.33*	(0.5-0.72)		1260
			4	E			-	-	Hg	<0.05*	-	207	
	British Columbia												
	Westham Island 49°05' 123°10'	1970	1	Bm			-	-	Hg	0.14	-	51	

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Anatidae	Nova Scotia												
Greater Scaup (*Aythya marila*)	-	Fall 1970	5	Wm			-	-	Hg	0.03	-	178	1 pooled analysis
	Quebec												
	Southern Quebec	Fall 1970	15	Wm			-	-	Hg	0.11	-	178	3 pooled analyses
	Southern Quebec	Fall 1970	30	Wm			-	-	Hg	0.10	-	178	2 pooled analyses
	St. Lawrence River upstream from Quebec City	Fall 1970	10	Wm			-	-	Hg	0.12	-	178	2 pooled analyses
	Lac Mistassini 51°00′ 73°37′	1971	1	Bm			-	-	Hg	< 0.01	-	12, 178	
	Ontario												
	Lake St. Clair	Fall 1970	15	Wm			-	-	Hg	0.21	-	178	3 pooled analyses
	N. of Lake Ontario	Fall 1970	10	Wm			-	-	Hg	0.10	-	178	2 pooled analyses
	Lake St. Clair 42°33′ 82°29′	1970	7	Bm			-	-	Hg	0.59	(0.03-2.30)	178	

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Greater Scaup (cont'd)	Ontario (cont'd)												
	Detroit River	Winter 1981	3	C	583	16.3	2AD 1+	2F 1+M	PCB*	11.0 ± 2	(8.3-13)		
									HCB	0.37 ± 0.17	(0.16-0.78)		
							1M		BHC	0.013 ± 0.005	(0.004-0.023)	205	* sum of PCB congeners
									BHC	0.012 ± 0.0019	(0.00086-0.015)		
									BHC	0.0016 ± 0.0004	(0.0011-0.0022)		
									BHC	0.0024	-		
									HE	0.014 ± 0.0015	(0.012-0.017)		
									Trans-chlordane	0.0029	-		
									Cis-chlordane	0.0048 ± 0.0014	(0.0030-0.0072)		
									Trans-nonachlor	0.33 ± 0.031	(0.28-0.37)		
									Cis-nonachlor	0.049 ± 0.020	(0.025-0.074)		
									DDE	1.3 ± 0.25	(0.84-1.6)		
									DDD	0.14 ± 0.045	(0.70-0.18)		
									DDT	0.040 ± 0.0094	(0.027-0.054)		
	Manitoba												
	Fort Churchill	1967	1	Fat			-	-	DDT	6.86	-	36	sprayed
									DDD	8.35	-		
									DDE	9.45	-		
	Saskatchewan River Delta	1971	2	Bm			IM	-	Hg	0.20	(0.12-0.27)	56	
	Lake Winnipeg	1971	1	L			IM	-	Hg	0.36	-	56	

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Greater Scaup (cont'd)	British Columbia												
	Iona Island	March 1976	10	L			-	-	Ag	0.32 ± 0.08*	-	228	* $\bar{x}$ ± SE
									Cu	17.24 ± 1.54*	-		
									Hg	0.25 ± 0.05*	-		
									Pb	1.33 ± 0.27*	-		
									Zn	41.61 ± 0.99*	-		
	Roberts Bank	March 1976	10	L			-	-	Ag	0.04 ± 0.004*	-	228	* $\bar{x}$ ± SE
									Cu	19.59 ± 1.80*	-		
									Hg	0.26 ± 0.03*	-		
									Pb	0.35 ± 0.14*	-		
									Zn	40.23 ± 1.42*	-		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Anatidae Lesser Scaup (Aythya affinis)	Nova Scotia												
	-	Fall 1970	5	Wm			-	-	Hg	0.07	-	178	1 pooled analysis
	Quebec												
	Southern Quebec	Fall 1970	10	Wm			-	-	Hg	0.19	-	178	2 pooled analyses
	Southern Quebec	Fall 1970	30	Wm			-	-	Hg	0.09	-	178	2 pooled analyses
	St. Lawrence River upstream from Quebec City	Fall 1970	30	Wm			-	-	Hg	0.13	-	178	2 pooled analyses
	Lac Evans 50°55′ 77°00′	1971	1	Bm			-	-	Hg	0.24	-	12, 178	
	Bell River 49°01′ 77°05′	1971	1	Bm			-	-	Hg	0.06	-	12, 178	
	Lac Mistassini 50°30′ 74°00′	1975-76	1	Wm			-	-	Hg	0.10	-	57	
	Ontario												
	Wabigoon-English River System	Fall 1970	25	Wm			-	-	Hg	0.19	-	178	1 pooled analysis

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Lesser Scaup (cont'd)	Ontario (cont'd)												
	N. of Lake Superior	Fall 1970	10	Wm			-	-	Hg	0.22	-	178	2 pooled analyses
	Lake St. Clair	Fall 1970	30	Wm			-	-	Hg	0.16	-	178	2 pooled analyses
	N. of Lake Ontario	Fall 1970	10	Wm			-	-	Hg	0.22	-	178	2 pooled analyses
	Lake St. Clair	1970	3	Bm			-	M	Hg	0.68	(0.54-0.91)	60	
			3	L			-	M	Hg	3.10	(1.8-5.60)		
			3	L			-	M	Hg	1.92	(0.96-2.60)		
	Lake St. Clair	1970	1	Bm			-	F	Hg	1.2	-	60	
			1	L			-	F	Hg	3.4	-		
			1	K			-	F	Hg	2.3	-		
	Lake St. Clair 42°33' 82°29'	1970	14	Bm			-	-	Hg	0.22	(0.05-1.32)	178	

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Lesser Scaup (cont'd)	Ontario (cont'd)												
	Detroit River	Winter 1981	7	C	57.0	17.8	3IM	F	PCB*	10.0 ± 4.9	(2.7-20)	205	*Sum of PCB congeners
							4AD		HCB	0.33 ± 0.12	(0.15-0.77)		
									BHC	0.016 ± 0.013	(0.00460-0.039)		
									BHC	0.013 ± 0.0031	(0.0885-0.016)		
									BHC	0.0050 ± 0.0021	(0.0024-0.0075)		
									BHC	ND	-		ND = not detectable
									HE	0.014 ± 0.0023	(0.011-0.017)		
									Trans-chlordane	0.0025 ± 0.0003	(0.0021-0.0028)		
									Cis-chlordane	0.0057 ± 0.0032	(0.0057-0.014)		
									Trans-nonachlor	0.17 ± 0.076	(0.056-0.28)		
									Cis-nonachlor	0.023 ± 0.0097	(0.0034-0.054)		
									DDE	0.80 ± 0.33	(0.29-1.2)		
									DDD	0.093 ± 0.027	(0.039-0.16)		
									DDT	0.025	-		
	Manitoba												
	Saskatchewan River Delta	Spring 1971	13	Bm			-	-	Hg	0.16	(0.08-0.33)	56	
			3	L			-	-	Hg	0.89	(0.44-1.40)		
		Spring 1972	21	Bm			-	-	Hg	0.19	(0.06-0.70)	56	
			6	L			-	-	Hg	0.47	(0.16-0.85)		
			6	Fe			-	-	Hg	1.69	(1.00-2.98)		
		Fall 1971	5	Bm			IM	-	Hg	0.19	(0.11-0.39)	56	
			3	L			IM	-	Hg	0.41	(0.31-0.53)		
			2	Bm			AD	-	Hg	0.16	(0.10-0.22)	56	

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Lesser Scaup (cont'd)	Manitoba (cont'd)												
		Fall 1972	11	Bm			IM	-	Hg	0.16	(0.09-0.36)	56	
			5	L			IM	-	Hg	0.27	(0.18-0.37)		
			5	Fe			IM	-	Hg	1.25	(0.57-2.66)		
			8	Bm			AD	-	Hg	0.24	(0.08-0.86)	56	
	Lake Winnipeg	Spring 1971	3	Bm			-	-	Hg	0.32	(0.08-0.76)	56	
			3	L			-	-	Hg	1.00	(0.42-2.10)		
		Fall 1971	6	Bm			IM	-	Hg	0.16	(0.07-0.27)	56	
			1	L			IM	-	Hg	0.40	-		
	Saskatchewan												
	(Province-wide)	August 1969	4*	Bm			IM	-	Hg	0.23	-	225	* pooled samples
			4*	L			IM	-	Hg	0.62	-		
	Saskatchewan-Alberta	1970	7	Bm			IM	-	Hg	0.16	-	225	2 pooled samples
										0.20	-		
			7	Bm			AD	-	Hg	0.11	-	225	2 pooled samples
										0.19	-		
	Alberta												
	Strathmore	1964	1	PG			**	-	DDT	3.77	-	43	** Ducklings
							**	-	DDE	0.88	-		
							**	-	Dieldrin	2.29	-		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Lesser Scaup (cont'd)	Alberta (cont'd)												
	(Province-wide)	August 1969	4*	Bm			AD	-	Hg	0.15	-	225	* pooled samples
			4*	L			AD	-	Hg	0.42	-	225	
	(Province-wide)	August 1969	14*	Bm			IM	-	Hg	0.18	-	225	* pooled samples
			14*	L			IM	-	Hg	0.43	-	225	* pooled samples
	L. Therien Lake	1968	10	E	67.4	16.1	-	-	DDE	0.33	-	229	
									Dieldrin	0.020	-		
	L. Therien Lake	1968	10	E			-	-	Hg	0.202	-	223	
	Chip Lake	1968	10	E	65.5	15.2	-	-	DDE	1.02	-	229	
									Dieldrin	0.19	-		
	Chip Lake	1968	10	E			-	-	Hg	0.032	-	223	
	Lake Newell	1968	10	E	68.1	14.9	-	-	DDE	0.36	-	229	
									Dieldrin	0.022	-		
	Lake Newell	1968	10	E			-	-	Hg	0.161	-	223	
	Northwest Territories												
	Yellowknife	1961-62	1	Wb(?)			-	-	Total DDT	ND	-	202	May be Greater Scaup (not indicated)

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Lesser Scaup (cont'd)	Northwest Territories (cont'd)		4	E			-	-	Total DDT	2.2	(1.3-4.0)	202	

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Anatidae	Newfoundland												
Common Goldeneye (Bucephala clangula)		Fall 1970	5	Wm			-	-	Hg	0.25	-	178	1 pooled analysis
	Nova Scotia												
		Fall 1970	10	Wm			-	-	Hg	0.20	-	178	2 pooled analyses
	New Brunswick												
	Fredericton 45°58′ 66°39′	Fall 1970	2	Bm			-	-	Hg	0.83	-	178	1 pooled analysis
	Milltown	Fall 1970	1	Bm			-	-	Hg	0.45	-	178	
	Southern New Brunswick	Fall 1970	30	Wm			-	-	Hg	0.22	-	178	2 pooled analyses
	Quebec												
	Baie Noire Ottawa River	1968	1	L			-	-	Hg	0.63	-	68, 73	
	Southern Quebec	Fall 1970	10	Wm			-	-	Hg	0.18	-	178	2 pooled analyses

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Common Goldeneye (cont'd)	Quebec (cont'd)												
	St. Lawrence R. upstream from Quebec City	Fall 1970	30	Wm			-	-	Hg	0.37	-	178	2 pooled analyses
	Nottaway River	Fall 1971	4	Bm			-	-	Hg	0.20	(0.13-0.30)	178	
	Lac Mistassini 51°00' 73°37'	Sept. 7 Oct. 26 1971	1	Bm			-	-	Hg	0.59	-	12,178	
	Lac Evans 50°55' 77°00'	1971	2	Bm			-	-	Hg	0.285	(0.12-0.45)	12,178	
	Lac Parent 48°38' 77°03'	1971	7	Bm			-	-	Hg	0.096	(0.06-0.13)	12,178	
	Bell River 49°01' 77°05'	1971	2	Bm			-	-	Hg	2.535	(2.13-2.94)	12,178	
	Lac Waswanipi 49°34' 76°29'	1971	3	Bm			-	-	Hg	0.17	(0.13-0.21)	12,178	
	Lac Matagami 49°53' 77°30'	1971	1	Bm			-	-	Hg	0.30	-	12,178	

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Common Goldeneye (cont'd)	Ontario (cont'd)												
	Wabigoon Lake	July 20	4	L			AD	-	Hg	2.21	(0.48-5.64)	69,70,71	
		Aug. 5 1970	1	L			IM	-	Hg	0.22	-		
	Clay Lake	June 20	5	L			AD	-	Hg	18.53	(8.44-30.80)	69,70,71	
		July 28 1971	4	L			IM	-	Hg	22.08	(1.82-31.00)		
	Ball Lake	June 20	3	L			AD	-	Hg	13.39	(3.31-28.00)	69,70,71	
		July 28 1971	4	L			IM	-	Hg	1.71	(0.35-3.69)		
	Maynard Lake	June 20	3	L			AD	-	Hg	2.19	(0.55-5.10)	69,70,71	
		July 28 1971	3	L			IM	-	Hg	0.28	(0.22-0.44)		
	Sydney Lake	June 20	2	L			AD	-	Hg	2.97	(1.07-4.87)	69,70,71	
		July 28 1971	3	L			IM	-	Hg	0.53	(0.22-1.05)		
	Northwestern Ontario (Wabigoon, Clay, Ball, Maynard, Sydney Lakes)	June 20	13	L			AD	-	Hg	4.23 ± 1.04*	-	69,70,71	* $\bar{x}$ ± SE
		July 28 1971	13	Bm			AD	-	Hg	1.22 ± 0.38*	-		
			5	L			IM**	-	Hg	12.49 ± 6.08*	(0.22-31.00)	69,70,71	** Ducklings
			5	Bm			IM**	-	Hg	6.31 ± 3.09*	(0.14-15.30)		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Common Goldeneye (cont'd)	Ontario (cont'd)												
	Wabigoon River-Clay Lake	Sept. 27 Oct. 4 1971	4	Bm			-	-	Hg	3.04	(0.27-7.31)	178	
	English River System	Sept. 27 Oct. 4 1971	7	Bm			-	-	Hg	0.46	(0.07-1.36)	178	
	Clay Lake 50°03' 93°30'	August 1971	21	Bm			IM	-	Hg	7.80 ± 2.66*	(0.9-19.4)	226, 227	* $\bar{x}$ ± 95% confidence
			21	Wm			IM	-	Hg	5.36 ± 1.91*	-	226	
	Clay Lake	August 1971	1	Bm			IM	-	Hg	16.8	-	227	
									CH_3Hg	12.3	-		
			1	Bm			IM	-	Hg	19.4	-		
									CH_3Hg	14.9	-		
	Wabigoon Lake 49°45' 92°44'	July 1971	4	Bm			-	-	Hg	0.37	(0.20-0.46)	51	
	Clay Lake 50°03' 93°30'	August 1971	10	Bm			-	-	Hg	7.45	(0.58-14.7)	51, 178	
	Wabigoon River	Sept. 1972	2	Bm			-	-	Hg	1.64	(1.52-1.75)	51	
	Maynard Lake 50°22' 93°50'	1971	5	Bm			-	-	Hg	0.54	(0.09-1.18)	51	

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Common Goldeneye (cont'd)	Ontario (cont'd)												
	Indian Lake 50°15' 94°04'	1971	2	Bm			-	-	Hg	0.47	(0.39-0.55)	51	
	Separation Lake 50°14' 94°24'	1971	1	Bm			-	-	Hg	0.47	-	51	
		1972	3	Bm			-	-	Hg	0.56	(0.40-0.73)	51	
	Northwestern Ontario	July 20 Aug. 5 1970	12	L			AD	-	Hg	4.50 ± 1.20*	-	69,70,71	* $\bar{x}$ ± SE
									CH_3Hg	1.37 ± 0.42*	-		
		June 20 July 28 1971	12	Bm			AD	-	Hg	1.30 ± 0.41*	-	69,70,71	
									CH_3Hg	0.76 ± 0.25*	-		
	Northwestern Ontario	June 20 July 28 1971	3	L			IM**	-	Hg	19.51 ± 7.99*	-	69,70,71	** Ducklings
									CH_3Hg	10.67 ± 4.35*	-		
			3	Bm			IM**	-	Hg	9.88 ± 4.06*	-	69,70,71	
									CH_3Hg	7.10 ± 2.91*	-		
	Ball Lake (English-Wabigoon River System)	Sept. 1972	4	L			IM	M	Hg	5.72 ± 2.32*	(2.50-8.23)	11	* $\bar{x}$ ± SD each value is an average of 3 individual analyses
			4	Bm			IM	M	Hg	1.76 ± 0.78*	(0.75-2.60)		
			5	L			IM	F	Hg	2.73 ± 0.26*	(2.43-3.19)	11	
			5	Bm			IM	F	Hg	1.17 ± 0.53*	(0.62-2.10)		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Common Goldeneye (cont'd)	Ontario (cont'd)												
	Tetu Lake 50°11' 95°02'	1971	3	Bm			-	-	Hg	0.15	(0.07-0.24)	51	
	St. Clair River	Dec. 1985	9	L		4.38			QCB	0.028	-	234	
									HCB	0.199	-		
									DDE	0.064	-		
									Photomirex	ND	-		ND = not detectable
									Mirex	ND	-		
									PCB	0.753	-		
									OCS	0.280	-		
									BHC	ND			
									Oxychlordane	0.010	-		
									Cis-chlordane	0.001	-		
									Trans-nonachlor	0.003	-		
									Cis-nonachlor	0.002	-		
									DDD	0.005	-		
									DDT	0.003	-		
									HE	0.016	-		
									Dieldrin	0.039	-		
									TeCB	0.053	-		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Common Goldeneye (cont'd)	Ontario (cont'd)												
	St. Clair River	Dec. 1985	9	M		3.90			QCB	0.036	-	234	
									HCB	0.177	-		
									DDE	0.068	-		
									Photomirex	ND	-		ND = not detectable
									Mirex	ND	-		
									PCB	0.689	-		
									OCS	0.072	-		
									BHC	ND	-		
									Oxychlordane	0.005	-		
									Cia-chlordane	0.001	-		
									Trans-nonachlor	0.002	-		
									Cia-nonachlor	0.002	-		
									DDD	0.004	-		
									DDT	0.003	-		
									HE	0.005	-		
									Dieldrin	0.013	-		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Common Goldeneye (cont'd)	Ontario (cont'd)												
	St. Clair River	Feb. 1986	10	L		4.15			QCB	0.019	-	234	ND = not detectable
									HCB	0.415	-		
									DDE	0.149	-		
									Photomirex	ND	-		
									Mirex	ND	-		
									PCB	1.28	-		
									OCS	0.773	-		
									BHC	ND	-		
									Oxychlordane	0.031	-		
									Cis-chlordane	0.002	-		
									Trans-nonachlor	0.009	-		
									Cis-nonachlor	0.003	-		
									DDD	0.014	-		
									DDT	0.005	-		
									HE	0.049	-		
									Dieldrin	0.101	-		
									TeCB	ND	-		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Common Goldeneye (cont'd)	Ontario (cont'd)												
	St. Clair River	Feb. 1986	10	M		2.82			QCB	0.013	-	234	ND = not detectable
									HCB	0.273	-		
									DDE	0.122	-		
									Photomirex	ND	-		
									Mirex	ND	-		
									PCB	1.06	-		
									OCS	0.173	-		
									BHC	ND	-		
									Oxychlordane	0.012	-		
									Cis-chlordane	0.001	-		
									Trans-nonachlor	0.006	-		
									Cis-nonachlor	0.003	-		
									DDD	0.005	-		
									DDT	0.005	-		
									HE	0.013	-		
									Dieldrin	0.032	-		
									TeCB	ND	-		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Common Goldeneye (cont'd)	Ontario (cont'd)												
	Detroit River	Winter 1981	3	C	55.6	20.7	1AD +2IM	2F +1M	PCB*	7.6 ± 1.8	(4.2-11.0)	205	* Sum of PCB congeners
									HCB	1.7 ± 1.2	(0.16-4.8)		
									-BHC	0.01 ± 0.004	(0.004-0.017)		
									-BHC	0.002	-		ND = not detectable
									-BHC	ND	-		
									HE	ND	-		
									Trans-chlordane	ND	-		
									Cia-chlordane	ND	-		
									Trans-nonachlor	0.081 ± 0.007	(0.071-0.091)		
									Cis-nonachlor	0.013 ± 0.0089	(0.0056-0.028)		
									DDE	0.48 ± 0.18	(0.29-0.72)		
									DDD	0.08 ± 0.0024	(0.061-0.12)		
									DDT	0.040	-		
	Manitoba												
	Saskatchewan River Delta	Spring 1971	2	Bm					Hg	0.63	(0.58-0.67)	56	
			2	L					Hg	3.60	(3.60)		
	Lake Winnipeg	Fall 1971	1	Bm			IM		Hg	0.72	-		
			2	Bm			AD		Hg	0.12	(0.12-0.13)		
			1	L			AD		Hg	0.58	-		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Anatidae	Manitoba												
Bufflehead													
(Bucephala	Saskatchewan River	Spring	5	Bm			-	-	Hg	0.36	(0.10-0.79)	56	
albeola)	Delta	1971	1	L			-	-	Hg	3.80	-		
	Lake Winnipeg	Spring	4	Bm			-	-	Hg	0.52	(0.36-0.84)	56	
		1971	4	L			-	-	Hg	1.78	(1.40-2.40)		
		Fall	3	Bm			AD	-	Hg	0.28	(0.10-0.56)	56	
		1971	1	L			AD	-	Hg	0.36	-		
	Saskatchewan-Alberta												
		1970	1*	Bm			IM	-	Hg	0.26	-	225	* Pool of 4
			1*	Bm			IM	-	Hg	0.30	-		* Pool of 3

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Anatidae	Newfoundland												
Oldsquaw													
(Clangula	St. John's	May 1-5	2	C			AD	M	p,p'-DDE	0.3	(0.2-0.4)	182	
hyemalis)		1971							PCB (Aroclor1254)	1	(1-1)		
									Endrin	ND	-		ND = not detectable
			2	C			AD	F	p,p'-DDE	0.2	(0.2-0.3)	182	
									PCB (Aroclor1254)	1	(1-1)		
									Endrin	Nd	-		
			2	C			IM	M	p,p'-DDE	0.2	-	182	
									PCB (Aroclor1254)	1	(1-1)		
									Endrin	ND	-		
			2	C			IM	F	p,p'-DDE	0.1	-	182	
									PCB (Aroclor1254)	1	(1-1)		
									Endrin	ND	-		
	Quebec												
	Lac Mistassini	1975-76	1*	Wm			-	-	Hg	0.15	-	57	* Pool of 2 to 5
	50°30' 74°00'												ducks
	Ontario												
	Lake Huron	May 11	2	C			AD	M	p,p'-DDE	19.4	(7.4-31.3)	182	
	(Saginaw Bay)	1971							PCB (Aroclor1254)	62	(47-77)		
									Endrin	0.3	(0.2-0.4)		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Oldsquaw (cont'd)	Ontario (cont'd)		1	C			AD	F	p,p'-DDE	21.9	-	182	
									PCB (Aroclor1254)	50	-		
									Endrin	0.4	-		
			2	C			IM	M	p,p'-DDE	8.2	(5.7-10.7)	182	
									PCB (Aroclor1254)	21	(20-22)		
									Endrin	0.2	(0.2-0.3)		
	Presqu'ile Point Lake Ontario	Nov. 23 Dec. 13 1972	1	C			AD	M	p,p'-DDE	5.7	-	182	
									PCB (Aroclor1254)	32	-		
									Endrin	<0.1	-		
			4	C			AD	F	p,p'-DDE	1.9	(0.6-2.2)	182	
									PCB (Aroclor1254)	21	(3-35)		
									Endrin	< 0.1	-		
			4	C			IM	M	p,p'-DDE	1.2	(0.9-2.2)	182	
									PCB (Aroclor1254)	9	(3-20)		
									Endrin	0.1	(<0.1-0.2)		
			4	C			IM	F	p,p'-DDE	1.6	(1.0-2.5)	182	
									PCB (Aroclor1254)	9	(5-15)		
									Endrin	0.1	(<0.1-0.3)		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Oldsquaw (cont'd)	Northwest Territories												
	NW Hudson Bay near Eskimo Point and Rankin Inlet	Jan. 7- Aug. 8 1971	33	L			AD	-	Hg	1.30 ± 0.15*	(0.31-4.39)	181	* $\bar{x}$ ± SE
		July 25- Aug. 2 1971	12	L			IM	-	Hg	0.29 ± 0.03*	(0.15-0.46)	181	
		June 28- July 11 1971	11	E			-	-	Hg	0.20 ± 0.03*	(0.09-0.44)	181	
	Eskimo Point, Diana River and Rankin Inlet	June 7- 10, 1971	10	C			AD	M	p,p'-DDE	6.4	(0.7-21.9)	182	ND = not detectable
									PCB (Aroclor1254)	25	(3-81)		
									Endrin	< 0.1	ND-0.1		
		June 7- 10, 1971	10	C			AD	F	p,p'-DDE	6.5	(0.6-19.8)	182	
									PCB (Aroclor1254)	18	(3-44)		
									Endrin	< 0.1	(Trace-0.2)		
		June 29- July 11 1971	11	C			AD	F	p,p'-DDE	4.7	(0.1-16.0)	182	females with clutches
									PCB (Aroclor1254)	24	(1-95)		
									Endrin	< 0.1	(Trace-0.1)		
		June 29- July 11 1971	11	E			-	-	p,p'-DDE	7.6	(0.2-19.1)	182	
									PCB (Aroclor1254)	48	(<1-172)		
									Endrin	0.1	(ND-0.2)		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Oldsquaw (cont'd)	Northwest Territories (cont'd)												
		July 25-Aug. 2 1971	3	C			AD	F	p,p'-DDE	2.8	(0.3-7.6)	182	females with broods
									PCB (Aroclor1254)	14	(2-32)		
									Endrin	ND	-		
		July 25-Aug. 2 1971	3	C			IM	-	p,p'-DDE	2.1	(0.2-3.1)	182	broods
									PCB (Aroclor1254)	25	(1-63)		
									Endrin	< 0.1	(ND-<0.1)		
		Aug. 8 1971	5	C			AD	F	p,p'-DDE	2.6	(0.3-7.7)	182	moulting females with broods
									PCB (Aroclor1254)	21	(1-57)		
									Endrin	ND	-		
		July 10-Aug. 8 1971	4	C			AD	M	p,p'-DDE	2.9	(0.6-6.8)	182	subadult males
									PCB (Aroclor1254)	15	(<1-43)		
									Endrin	< 0.1	(ND-<0.1)		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Anatidae	New Brunswick												
Common Eider (Somateria mollissima)	--		5	E			-	-	DDE	1.75*	(1.15-2.66)**	90	** 95% confidence intervals
									PCB	13.0*	(3.77-50.1)**		
	Low Duck Island	1972	5	E	66.4	16.6	-	-	DDE	0.59*	(0.36-0.96)	177	* geometric means
									PCB (Aroclor1260)	4.67*	(1.94-30.0)		
									Dieldrin	0.02*	(0.01-0.04)		
									Hg	0.05*	(0.04-0.09)		
	Quoddy	1978-79	11	Bm	-	-	-	-	Hg	0.153	-	33	
				L	-	-	-	-	Hg	0.987	-		
				K	-	-	-	-	Hg	0.358	-		
	Quebec												
	--		21	E			-	-	DDE	0.98*	(0.80-1.20)**	90	Dry weight basis
									PCB	2.44*	(1.66-3.59)**		* geometric means
													** 95% confidence intervals
	Inner Birch Island	1972	5	E	66.7	17.6	-	-	DDE	0.38*	(0.17-0.54)	177	* geometric means
									PCB (Aroclor1260)	1.83*	(0.45-3.17)		
									Dieldrin	0.02*	(0.01-0.03)		
									Hg	0.08*	(0.05-0.21)		
	Watshishu	1972	5	E	66.7	21.1	-	-	DDE	0.29*	(0.25-0.34)	177	
									PCB (Aroclor1260)	0.52*	(0.36-0.67)		
									Dieldrin	0.01*	(0.01-0.01)		
									Hg	0.08*	(0.05-0.12)		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Common Eider (cont'd)	Quebec (cont'd)												
	Ile Ste-Marie	1972	10	C	66.0	21.4	-	-	DDE	0.29*	(0.21-0.69)	177	
									PCB (Aroclor1260)	0.57*	(0.35-2.03)		
									Dieldrin	0.01*	(ND-6.02)		
									Hg	0.03*	(0.01-0.06)		
	Northwest Territories												
	Broughton Island	October 1985	5	M	1.73		-	-	s-CBZ	1.51 ± 1.31*	(0.05-3.64)	161	
									s-HCH	0.89 ± 0.63*	(0.01-1.78)		
									s-chlor	1.63 ± 1.01*	(0.01-2.78)		*NG/G
									s-DDT	0.60 ± 0.32*	(0.36-1.06)		
									s-PCB	11.83 ± 8.75*	(0.62-24.84)		
									Toxaphene	4.27 ± 9.46*	(1.00-23.50)		
									Dieldrin	0.83 ± 0.73*	(0.10-1.84)		
		October 1985	5	L	4.48				s-CBZ	4.64 ± 1.58*	(2.41-6.88)	161	
									s-HCH	1.41 ± 0.76*	(0.35-2.20)		
									s-chlor	7.19 ± 2.24*	(4.32-10.42)		*NG/G
									s-DDT	2.61 ± 1.72*	(0.91-5.91)	161	
									s-PCB	24.34 ± 13.90*	(8.53-45.08)		
									Toxaphene	10.44 ± 14.42*	(11.00-37.74)		
									Dieldrin	5.41 ± 2.51*	(2.96-9.24)		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Anatidae	Quebec												
White-winged Scoter *Melanitta fusca*)	Lac Chibougamau 49°50′ 74°15′	1971	4	Bm			-	-	Hg	0.12	(0.04-0.22)	12	

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Anatidae													
Black Scoter (Melanitta nigra)	Quebec												
	Lac Mistassini 50°30′ 73°40′	1975-76	1*	Wm			-	-	Hg	0.08	-	57	*Pool of 2 to 5 birds
	Lac Matagami 49°50′ 77°30′	1975-76	1	Wm			-	-	Hg	0.09	-	57	
	Lac Mistassini 50°23′ 73°45′	1975-76	2*	Wm			-	-	Hg	0.13	-	57	*Pool of 2 to 5 birds

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Anatidae	Quebec												
Surf Scoter (Melanitta perspicillata)	Lac Mistassini 51°00′ 73°37′	Sept.7-Oct. 26 1971	3	Bm			-	-	Hg	0.10	(0.06-0.13)	12	
	Lac Evans 50°55′ 77°00′	1971	2	Bm			-	-	Hg	0.145	(0.13-0.16)	12	
	Lac Parent 48°38′ 77°03′	1971	5	Bm			-	-	Hg	0.368	(0.13-0.57)	12	
	Lac Chibougamau 49°50′ 74°15′	1971	1	Bm			-	-	Hg	0.15	-	12	
	Lac Pusticamica 49°21′ 76°23′	1971	1	Bm			-	-	Hg	0.21	-	12	
	Lac Matagami 49°53′ 77°30′	1971	4	Bm			-	-	Hg	0.15	(0.10-0.21)	12	
	Lac Mistassini 50°15′ 73°45′	1975-76	2*	Wm			-	-	Hg	0.09	-	57	*pool of 2 to 5 birds
	Lac Mistassini 50°30′ 74°00′	1975-76	2*	Wm			-	-	Hg	0.12	-	57	*pool of 2 to 5 birds
	Lac Matagami	1975-76	1	Wm			-	-	Hg	0.36	-	57	

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Surf Scoter (cont'd)	British Columbia												
	Iona Island	March 1976	10	L			-	-	Ag	0.14 ± 0.03*	-	228	* $\bar{x}$ ± SE
									Cu	10.96 ± 1.21*	-		
									Hg	2.12 ± 0.20*	-		
									Pb	0.24 ± 0.03*	-		
									Zn	35.92 ± 1.87*	-		
	Roberts Bank	March 1976	10	L			-	-	Ag	0.03 ± 0.004*	-	228	
									Cu	10.41 ± 1.30*	-		
									Hg	0.93 ± 0.17*	-		
									Pb	0.14 ± 0.02*	-		
									Zn	31.01 ± 1.67*	-		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Anatidae	Ontario												
Ruddy Duck													
(Oxyura	Walpole Island	Fall	6	L	-	-	-	-	OCS	4.63 ± 5.57**	-	92	*IUPAC no. (Ref 21)
jamaicensis)		1986							HCB	1.43 ± 1.36**	-		**ppb
									QCB	0.19 ± 0.26***	-		***ppb, below limit
									PCB 28*	0.31 ± 0.53***	-		of quantification
									PCB 101*	0.06 ± 0.10***	-		migratory ruddy
									PCB 180*	0.21 ± 0.25***	-		ducks
			6	M	-	-	-	-	OCS	1.30 ± 0.80**	-		*IUPAC no. (Ref 21)
									HCB	1.41 ± 1.11**	-		**ppb
									QCB	0.85 ± 0.38**	-		***ppb, below limit
									PCB 28*	0.38 ± 0.43***	-		of quantification
									PCB 101*	0.08 ± 0.14***	-		migratory ruddy
									PCB 180*	0.72 ± 0.40***			ducks
	Manitoba												
	Saskatchewan River	Fall	1	Bm			IM	-	Hg	0.08	-	56	
	Delta	1971	1	L			IM	-	Hg	0.25	-		
			1	Fe			IM	-	Hg	0.90	-		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Anatidae Common Merganser (Mergus merganser)	New Brunswick												
	Lower St. John River	Fall 1970	2	Bm			-	-	Hg	4.00	-	178	
	Quebec												
	Lac Evans 50°55′ 77°00′	Fall 1971	1	Bm			-	-	Hg	0.40	-	12, 178	
	Lac Mistassini 51°00′ 73°37′	Fall 1971	1	Bm			-	-	Hg	0.62	-	12, 178	
	Lac Waswanipi 49°34′ 76°29′	Fall 1971	7	Bm			-	-	Hg	0.44	(0.34-0.79)	12, 178	
	Bell River - Lac Quevillon 49°04′ 76°57′	Fall 1971	2	Bm			-	-	Hg	1.305	(0.74-1.87)	12, 178	
	Lac au Goeland 49°47′ 76°48′	1971	1	Bm			-	-	Hg	0.44	-	12, 178	
	Lac Matagami 49°53′ 77°30′	1971	1	Bm			-	-	Hg	0.45	-	12	
	Lac Mistassini 50°30′ 74°00′	1975-76	1*	Wm			-	-	Hg	2.60	-	57	*Pool of 2 to 5 birds

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Common Merganser (cont'd)	Ontario												
	Ball Lake (English-Wabigoon River System)	Sept. 1972	4	L			IM	M	Hg	4.27 ± 2.38*	(1.50-7.44)	11	* x ± SD
				Bm			IM	M	Hg	1.61 ± 0.94*	(0.51-3.03)		
		Sept. 1972	9	L			IM	F	Hg	26.47 ± 27.57*	(4.02-98.56)	11	each value is an average of 3 individual analyses
				Bm			IM	F	Hg	3.92 ± 2.40*	(1.51-8.36)		
		Sept. 1972	1	L			A	M	Hg	12.94	-	11	
				Bm			A	M	Hg	2.13	-		
		Sept. 1972	1	L			A	F	Hg	61.59	-	11	
				Bm			A	F	Hg	1.84	-		
	Wabigoon Lake 49°45' 92°44'	July 1971	3	Bm			-	-	Hg	1.17	(1.01-1.37)	51	
	Clay Lake 50°03' 93°30'	1971	1	Bm			-	-	Hg	2.20	-	51	
	Wabigoon River	Sept. 1972	2	Bm			-	-	Hg	1.26	(0.64-1.89)	51	
	Wabigoon Lake	July 20-Aug. 5 1970	3	L			AD	-	Hg	6.10	(4.93-7.33)	69,70,71	

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Common Merganser (cont'd)	Ontario (cont'd)												
	Clay Lake	June 20- July 28 1971	3	L			AD	-	Hg	46.68	(18.10-72.32)	69,70,71	
			2	L			IM	-	Hg	9.90	(2.00-17.80)		
	Ball Lake	June 20- July 28 1971	5	L			AD	-	Hg	50.82	(30.80-86.50)	69,70,71	
			4	L			IM	-	Hg	1.66	(0.45-2.36)		
	Maynard Lake	June 20- July 28 1971	2	L			AD	-	Hg	6.57	(4.85-8.31)	69,70,71	
			3	L			IM	-	Hg	0.62	(0.31-1.05)		
	Sydney Lake	June 20- July 28 1971	11	L			AD	-	Hg	10.53	(2.57-23.80)	69,70,71	
			8	L			IM	-	Hg	0.56	(0.31-1.16)		
	Northwestern Ontario (Wabigoon, Clay, Ball, Maynard, Sydney Lakes)	June 20- July 28 1971	22	L			AD	-	Hg	22.23 ± 5.22*	-	69,70,71	* $\bar{x}$ ± SE
			22	Bm			AD	-	Hg	6.12 ± 1.65*	-		
			2	L			IM**	-	Hg	0.78	(0.50-1.05)	69,70,71	** Ducklings
			2	Bm			IM**	-	Hg	0.16	(0.10-0.22)		
	Northwestern Ontario	July 20- Aug. 5 1970	10	L			AD	-	Hg	10.69 ± 1.92*	-	69,70,71	* $\bar{x}$ ± SE
									CH3Hg	1.10 ± 0.13*	-		
			10	Bm			AD	-	Hg	1.50 ± 0.26*	-	69,70,71	
									CH3Hg	0.84 ± 0.12*	-		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Common Merganser (cont'd)	Ontario (cont'd)												
		June 20-July 28 1971	2	L			IM**	-	Hg	0.79	-	69,70,71	** Ducklings
									CH3Hg	0.19	-		
			2	Bm			IM**	-	Hg	0.16	-	69,70,71	
									CH3Hg	0.08	-		
	Ball Lake (English-Wabigoon River System)	1970	4	Bm			-	-	Hg	12.1	(5.12-17.6)	51	
	Indian Lake 50°15' 94°04'	1972	2	Bm			-	-	Hg	2.79	(2.08-3.49)	51	
	Separation Lake 50°14' 94°24'	1972	2	Bm			-	-	Hg	1.91	(1.14-2.68)	51	
	Clay Lake 50°03' 93°30'	August 1971	17	Bm			IM	-	Hg	6.79 ± 1.16*	(4.4-13.1)	226,227	* $\bar{x}$ ± 95% confidence intervals
			17	Wm			IM	-	Hg	4.78 ± 0.80*	-	226,227	

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Common Merganser (cont'd)	Ontario (cont'd)												
	St. Clair River	Dec. 1985	21	L		3.16			QCB	0.110	-	234	
									HCB	0.145	-		
									DDE	0.210	-		
									Mirex	ND			
									PCB	1.296	-		
									OCS	0.196	-		
									α-BHC	0.008	-		
									β-BHC	ND			
									δ-BHC	ND			
									Oxychlordane	0.018	-		
									Cis-chlordane	0.003	-		
									Trans-nonachlor	0.010	-		
									Cis-nonachlor	0.005	-		
									DDD	0.025	-		
									DDT	0.005	-		
									HE	0.022	-		
									Dieldrin	0.069	-		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Common Merganser (cont'd)	Ontario (cont'd) St. Clair River (cont'd)	Feb. 1986	11	L		4.74			QCB	0.053	-	234	ND = not detectable
									HCB	0.190	-		
									DDE	0.307	-		
									Mirex	ND			
									PCBs	2.135	-		
									OCS	0.381	-		
									α-BHC	0.010	-		
									β-BHC	0.001	-		
									δ-BHC	ND			
									Oxychlordane	0.025	-		
									Cis-chlordane	0.004	-		
									Trans-nonachlor	0.020	-		
									Cis-nonachlor	0.010	-		
									DDE	0.030	-		
									DDT	0.007	-		
									HE	0.027	-		
									Dieldrin	0.084	-		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Common Merganser (cont'd)	Ontario (cont'd)												
	St. Clair River (cont'd)		11	M		4.34			QCB	0.055	-	234	ND = not detectable
									HCB	0.178	-		
									DDE	0.398	-		
									Mirex	ND	-		
									PBCs	2.855	-		
									OCS	0.167	-		
									α-BHC	0.011	-		
									β-BHC	0.001	-		
									δ-BHC	0.001	-		
									Oxychlordane	0.022	-		
									Cis-chlordane	0.006	-		
									Trans-nonachlor	0.026	-		
									Cis-nonachlor	0.014	-		
									DDD	0.038	-		
									DDT	0.015	-		
									HE	0.016	-		
									Dieldrin	0.054	-		
	Alberta												
	(Province-wide)	August 1969	2	Bm				IM	Hg	0.80	-	225	
			2	L				IM	Hg	1.98	-	225	

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Anatidae Hooded Merganser (Lophodytes cucullatus)	Quebec												
	Lac Matagami	1975-76	1	Wm			-	-	Hg	0.38	-	57	
	Ontario												
	Ball Lake (English-Wabigoon River System)	Sept. 1972	1	L			IM	M	Hg	4.50	-	11	each value is an average of 3 individual analyses
				Bm						2.94	-		
			1	L			A	F	Hg	1.62	-	11	
				Bm						0.65	-		
	Clay Lake 50°03′ 93°30′	August 1971	7	Bm			IM**	-	Hg	12.31 ± 4.57*	(3.9-17.6)	226,227	* $\bar{x}$ ± 95% confidence intervals
			7	Wm			IM**	-	Hg	8.87 ± 3.60*	-	225	** all immature except one adult
	Winnipeg River	1971	2	Bm			-	-	Hg	0.93	(0.78-0.98)	51	
	Clay Lake	August 1971	1	Bm			-	-	Hg	17.9	-	228	
									CH3Hg	17.8	-		
	Manitoba												
	Saskatchewan River Delta	1972	1	Bm			AD	-	Hg	0.26	-	56	
			1	L			AD	-	Hg	0.87	-	56	
			1	Fe			AD	-	Hg	0.26	-	56	

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Hooded Merganser (cont'd)	Manitoba (cont'd)												
	Dauphin	June 1986	1*	E			-	-	Hg	0.47		52	*Pool of 4
									β-BHC	<0.03			**Aroclor 1254:1260, 1:1
									HE	<0.03			
									Cis-chlordane	<0.02			
									Dieldrin	0.04			
									DDE	0.17			
									DDD	<0.03			
									DDT	<0.04			
									Mirex	<0.05			
									PCB**	<0.08			

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Anatidae	New Brunswick												
Red-breasted Merganser (Mergus serrator)	Baie des Chaleurs Bathurst	1969	2	E			-	-	Hg	0.81	(0.45-1.17)	68,73	
	Quebec												
	Lac Chibougamau 49°50′ 74°15′	Sept. 7 Oct. 26 1971	1	Bm			-	-	Hg	0.58	-	12	
	Lac Pusticamica 49°21′ 76°23′	1971	4	Bm			-	-	Hg	0.67	(0.48-1.02)	12	
	Lac Matagami 49°53′ 77°30′	1971	1	Bm			-	-	Hg	0.29	-	12	
	Lac Mistassini	1975-76	1	Wm			-	-	Hg	0.18	-	57	
	Lac Matagami 49°50′ 77°30′	1975-76	1	Wm			-	-	Hg	1.27	-	57	

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Red-breasted Merganser (cont'd)	Manitoba												
	Dorothy Lake	June 1986	1*	E			-	-	Hg	0.66		52	*Pool of 4
									β-BHC	<0.03			**Aroclor 1254:1260, 1:1
									HE	<0.03			
									Cis-chlordane	<0.02			
									Dieldrin	0.06			
									DDE	0.89			
									DDD	<0.03			
									DDT	0.04			
									Mirex	<0.05			
									PCB**	7.60			

Table 2. Residue levels in Phasianidae sampled in Canada

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Phasianidae	British Columbia												
Blue Grouse (*Dendragapus obscurus*)	Kamloops 50°40′ 120°05′	1975	3	M			-	-	Hg	0.12	(0.06-0.17)	51	

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Phasianidae	British Columbia												
Spruce Grouse													
(Dendragapus	Cariboo	1975	3	M			-	-	Hg	0.11	(0.05-0.15)	51	
canadensis)	53°-- 122°--												

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Phasianidae	Ontario												
Ruffed Grouse													
(*Bonasa umbellus*)	Falconbridge Township 46°32'N 80°45'E	Late May 1980	11	Fe			-	-	Cu	33.0 ± 3.1*	-	190	20 km northeast of smelters premoult
									Ni	20.1 ± 2.8*	-		
									Fe	253 ± 22*	-		
		Early Sept. 1980	11	Fe			-	-	Cu	5.1 ± 0.2*	-	190	postmoult
									Ni	1.1 ± 0.7*	-		
									Fe	36 ± 5.0*	-		
	Blewett Township 47°15'N 81°30'E	Late May 1980	11	Fe			-	-	Cu	6.5 ± 0.8*	-	190	100 km north of smelters premoult
									Ni	4.3 ± 1.3*	-		
									Fe	150 ± 39*	-		
		Early Sept. 1980	11	Fe			-	-	Cu	4.7 ± 0.5*	-	190	postmoult ND - below detection limit < 0.5 ug/g
									Ni	ND	-		
									Fe	39 ± 4.0*	-		
													* $\bar{x}$ ± SE ug/g dry weight
	Falconbridge Township 46°32'N 80°45'E	Late May 1980	9	K			-	-	Cu	24.6 ± 1.7*	-	191	20 km northeast of smelters premoult
									Ni	2.8 ± 0.6*	-		
									Fe	395 ± 30*	-		
		Early Sept. 1980	10	K			-	-	Cu	14.8 ± 1.5*	-	191	postmoult
									Ni	2.1 ± 0.7*	-		
									Fe	254 ± 14*	-		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Ruffed Grouse (cont'd)	Ontario (cont'd)												
	Blewett Township 47°15'N 81°30'E	Late May 1980	10	K			-	-	Cu	19.8 ± 0.9*	-	191	100 km north of smelters premoult
									Ni	1.7 ± 1.0*	-		
									Fe	386 ± 29*	-		
		Early Sept. 1980	11	K			-	-	Cu	11.7 ± 1.3*	-	191	postmoult
									Ni	ND	-		ND - below detection limit < 0.5 ug/g
									Fe	225 ± 9.0*	-		
													* $\bar{x}$ ± SE ug/g dry weight
	Falconbridge Township 46°32'N 80°45'E	Late May 1980	11	L			-	-	Cu	13.5 ± 0.7*	-	191	20 km northeast of smelters premoult
									Ni	1.0 ± 0.3*	-		
									Fe	1510 ± 495*	-		
		Early Sept. 1980	11	L			-	-	Cu	14.5 ± 0.9*	-	191	postmoult
									Ni	3.5 ± 0.6*	-		
									Fe	3905 ± 523*	-		
	Blewett Township 47°15'N 81°30'E	Late May 1980	11	L			-	-	Cu	16.3 ± 0.8*	-	191	100 km north of smelters premoult
									Ni	0.9 ± 0.3*	-		
									Fe	2452 ± 333*	-		
		Early Sept. 1980	11	L			-	-	Cu	12.6 ± 0.5*	-	191	postmoult
									Ni	0.7 ± 0.3*	-		
									Fe	1899 ± 133*	-		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Ruffed Grouse (cont'd)	Ontario (cont'd)												
	Falconbridge Township 46°32'N 80°45'E	Late May 1980	11	Bm			-	-	Cu	1.9 ± 0.1*	-	191	premoult
									Ni	1.4 ± 0.8*	-		
									Fe	20 ± 4.0*	-		
		Early Sept. 1980	11	Bm			-	-	Cu	1.5 ± 0.1*	-	191	postmout
									Ni	0.2 ± 0.1*	-		
									Fe	12 ± 1.0*	-		
	Blewett Township 47°15'N 81°30'E	Late May 1980	11	Bm			-	-	Cu	2.3 ± 0.2*	-	191	premoult
									Ni	ND			
									Fe	15 ± 1.0*	-		
		Early Sept. 1980	11	Bm			-	-	Cu	1.5 ± 0.1*	-	191	postmoult
									Ni	0.2 ± 0.1*	-		ND - below
									Fe	11 ± 1.0*	-		detection limit <5.0 ug/g
													* $\bar{x}$ ± SE ug/g dry weight
	Falconbridge Township 46°32'N 80°45'E	Late May 1980	11	Fe			-	-	Cu	16.7 ± 0.8*	-	190	20 km northeast of smelters premoult
									Ni	7.3 ± 0.6*	-		
									Fe	108 ± 10*	-		
		Early Sept. 1980	11	Fe			-	-	Cu	9.9 ± 0.7*	-	190	postmoult
									Ni	4.8 ± 0.7*	-		
									Fe	71 ± 12*	-		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Ruffed Grouse (cont'd)	Ontario (cont'd)												
	Blewett Township 47°15'N 81°30'E	Late May 1980	11	Fe			-	-	Cu	6.8 ± 0.3*	-	190	100 km north of smelters premoult
									Ni	2.9 ± 0.6*	-		
									Fe	77 ± 8*			
		Early Sept. 1980	11	Fe			-	-	Cu	5.4 ± 0.4*	-	190	postmoult
									Ni	0.8 ± 0.4*	-		* x ± SE
									Fe	36 ± 5*	-		ug/g dry weight
	Niagara Peninsula	1971	12	E	9.2 (7.8-10.5)		-	-	Total DDT	1.54	(1.08-2.17)	88	ND - below 0.05 ppm for Dieldrin and Total DDT ad 0.05 for PCBs
									Dieldrin	0.21	(0.14-0.35)		
									PCB***	0.4	(ND-1.2)		
			12	extractable fat of eggs			-	-	Total DDT**	16.7		88	
									Dieldrin	2.28			
									PCB***	12.0			** DDE = 60% DDD = 9.0% DDT = 31.0%
	British Columbia												***Aroclor 1254: 1260, 1:2 to 1:5
	Cariboo 53°-- 122°--	1975	1	M			-	-	Hg	0.17	-	51	
	Fort St. John 56°15' 120°50'	1971	1	M			-	-	Hg	0.13	-	51	

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Phasianidae	Manitoba												
Willow Ptarmigan (*Lagopus lagopus*)	Fort Churchill	1967	9	L			-	-	DDT	ND	-	36	sprayed area
									DDD	0.149	-		
									DDE	0.188	-		
									Total DDT	0.337	(0.069-1.000)		
	Fort Churchill	1967	1	Fat			-	-	DDT	1.75	-	36	sprayed area
									DDD	0.63	-		
									DDE	1.02	-		
									Total DDT	3.40	-		
	Fort Churchill	1967	4	L			-	-	DDT	0.006	-	36	unsprayed area
									DDD	0.017	-		
									DDE	0.012	-		
									Total DDT	0.035	(0.010-0.104)		
	Fort Churchill	1967	1	Fat			-	-	DDT	0.129	-	36	unsprayed area
									DDD	0.085	-		
									DDE	0.00	-		
									Total DDT	0.214	-		
	Fort Churchill	1967	8	Br			-	-	DDT + DDD	0.079	-	36	sprayed area
									Total DDT	0.115	-		
	Fort Churchill	1967	5	Br			-	-	DDT + DDD	ND	-	36	unsprayed area
									Total DDT	ND	-		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Phasianidae Sharp-tailed Grouse (*Tympanuchus phasianellus*)	*Saskatchewan*												
	-	1968	7	L			-	-	Hg	0.202 ± 0.151*	(0.021-1.11)	73	* $\bar{x}$ ± SE
	Alberta												
	Fort MacLeod to Pincher Creek	July 1969	1	Bm			-	-	Hg	0.010	-	125	

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Phasianidae Ring-necked Pheasant (*Phasianus colchicus*)	Ontario												
	Niagara Peninsula	1971	10	E		10.7 (8.8-12.2)	-	-	Total DDT	0.15	(0.06-0.52)	88	ND = below 0.005 ppm for Total DDT and Dieldrin and 0.05 ppm for PCBs
									Dieldrin	0.01	(ND-0.03)		
									PCB***	0.3	(ND-2.0)		
									Hg	0.06	(0.02-0.13)		
		1971	10	extractable fat of eggs			-	-	Total DDT**	1.4		88	** DDE = 73.0% DDE = 6.6% DDT = 20.4% *** Aroclor 1254: 1260, 1:2 to 1:5
									Dieldrin	0.09			
									PCB***	2.8			
	Alberta	1968	10	L			-	-	Hg	2.835 ± 0.583*	(0.484-5.92)	72	* $\bar{x}$ ± SE
	Bow Island to Taber	July 1969	3	Bm			AD	M	Hg	0.794	-	125	
	Bassano to Brooks	July 1969	3	Bm			AD	M	Hg	0.413	-	125	
	Bassano to Brooks	July 1969	3	Bm			AD	M	Hg	0.238	-	125	
	Lethbridge to Raymond	July 1969	3	Bm			AD	M	Hg	0.259	-	125	
	Claresholm to Vulcain	July 1969	2	Bm			AD	M	Hg	0.679	-	125	

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Ring-necked Pheasant (cont'd)	Alberta (cont'd)												
	Bassano to Brooks	July 1969	3	L			AD	M	Hg	1.98	-	125	
	Lethbridge to Raymond		3	L			AD	M	Hg	0.412	-	125	
	British Columbia												
	Westham Island	Oct. 1 1963	1	Wb			-	F	DDT	ND	-	220	sprayed area
		Oct. 1 1963	1	Wb			-	F	DDT	ND	-		
		Oct. 1 1963	1	Wb			-	F	DDT	0.1	-		
		Oct. 1 1963	1	Wb			-	F	DDT	0.1	-		
		Oct. 1 1963	1	Wb			-	M	DDT	< 0.05	-		
		Oct. 1 1963	1	Wb			-	M	DDT	0.07	-		
		Oct. 1 1963	1	Wb			-	M	DDT	0.1	-		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Ring-necked Pheasant (cont'd)	British Columbia (cont'd)												
	Westham Island (cont'd)	Oct. 1 1963	1	Wb			-	M	DDT	< 0.05	-		
		Oct. 1 1963	1	Wb			-	M	DDT	ND	-		
		Nov. 28 1963	1	Wb			-	M	DDT	ND	-		
			1	Wb			-	M	DDT	ND	-		
			1	Wb			-	F	DDT	ND	-		
	Bear Creek Dump Surrey	Oct. 1 1963	1	Wb			-	M	DDT	0.07	-	220	unsprayed area
			1	Wb			-	M	DDT	0.07	-		
			1	Wb			-	M	DDT	0.1	-		
			1	Wb			-	M	DDT	ND	-		
			1	Wb			-	F	DDT	< 0.05	-		
			1	Wb			-	F	DDT	ND	-		
	Wright's Ladner	Oct. 1 1963	1	Wb			-	F	DDT	ND	-		
			1	Wb			-	M	DDT	0.07	-		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Phasianidae	British Columbia												
Chukar													
(*Alectoris*	Osoyoos Lake	Oct. 1	1	Wb			-	M	DDT	0.1	-	220	
chukar)		1963					-	M	DDT	0.07	-		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Phasianidae Gray Partridge (*Perdix perdix*)	Saskatchewan												
	-	1968	9	L			-	-	Hg	0.549 ± 0.506*	(0.019-4.50)	72	* $\bar{x}$ ± SE
	Alberta												
	Bow Island to Taber	July 1969	6	Bm			AD	-	Hg	0.450	-	125	
	Bassano to Brooks	July 1969	3	Bm			AD	-	Hg	0.361	-	125	
	Lethbridge to Raymond	July 1969	1	Bm			AD	-	Hg	0.314	-	125	
	Claresholm to Vulcain	July 1969	2	Bm			AD	-	Hg	0.527	-	125	
	-	1968	7	L			-	-	Hg	1.115 ± 0.406*	(0.447-2.71)	72	* $\bar{x}$ ± SE

Table 3. Residue levels in Rallidae sampled in Canada.

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Rallidae	Ontario												
Common Moorhen (*Gallinula chloropus*)	Lake St. Clair	1970	1	C			-	M	Hg	0.41	-	60	
			1	L			-	M	Hg	1.40	-	60	

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Rallidae	Alberta												
American Coot (*Fulica americana*)	Lake Newell	1968	10	E			-	-	Hg	0.076	-	223	
	Lake Newell	1968	10	E	66.0	8.8	-	-	DDE	0.41	-	229	
									Dieldrin	0.004	-		

Table 4. Residue levels in Scolopacidae sampled in Canada.

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Scolopacidae American Woodcock (*Scolopax minor*)	New Brunswick and Nova Scotia												
	New Brunswick and Nova Scotia	Spring 1961	9*	Wb(?)			AD	M	Hep	0.3	(0.0-1.3)	260	Dry weight, spring arrivals * 2 from Nova Scotia
									DDT	2.0	(0.0-8.0)		
	New Brunswick	Spring 1963	11	Wb			AD	M+F*	Hep	7.2	(2.0-31.1)	260	* 9 males and 2 females
									DDT	5.4	(Trace-16.8)		
	New Brunswick	1959	10	Wb			-	M+F*	Hep	0.3	-	260	* 7 males and 3 females pooled samples
	New Brunswick	1960	5	Wb			-	-	Hep	0.8	-	260	pooled samples
			5	Wb			-	-	Hep	0.5	-	260	pooled samples
	New Brunswick	1961	7	Wb			AD	M	Hep	0.7	(0.0-1.8)	260	
									DDT	0.9	(0.5-2.0)		
	New Brunswick	Spring 1961	6	Wb			AD	F	Hep	0.3	(0.0-1.0)	260	
									DDT	0.03	(0.0-0.2)		
	New Brunswick	Spring 1963	5	Wb			AD	F	Hep	4.1	(1.0-6.7)	260	
									DDT	1.1	(0.4-1.9)		
	New Brunswick	1961	11	E			-	-	Hep	1.7	(0.0-2.3)	260	
									DDT	1.2	(0.0-1.7)		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
American Woodcock (cont'd)	New Brunswick and Nova Scotia (cont'd)												
	New Brunswick	1963	13	E			-	-	Hep	0.06	(ND-0.8)	260	
									DDT	1.3	(0.4-4.9)		
	New Brunswick												
	Bettsburg	May/June 1971	1 or 2	E	10.5	73.5	-	-	DDE	5.93	-	54	ND = none detected beyond the sensitivity of the method <0.001 ppm
									DDD	0.26	-		
									p,p'-DDT	1.06	-		
					10.4	75.7	-	-	DDE	4.54	-	54	
									DDD	0.13	-		
									p,p'-DDT	0.43	-		
	Fredericton	May/June 1971	1 or 2	E	9.4	75.2	-	-	DDE	5.91	-	54	
									DDD	0.04	-		
									p,p'-DDT	0.07	-		
					10.3	74.2	-	-	DDE	5.16	-	54	
									DDD	0.07	-		
									p,p'-DDT	0.17	-		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
American Woodcock (cont'd)	New Brunswick (cont'd)												
	Harvey Station	May/June 1971	1 or 2	E	8.1	75.2	-	-	DDE	0.49	-	54	ND = none detected beyond the sensitivity of the method <0.001 ppm
									DDD	ND	-		
									p,p'-DDT	ND	-		
					9.2	74.0	-	-	DDE	0.55	-	54	
									DDD	0.03	-		
									p,p'-DDT	0.04	-		
					8.9	73.9	-	-	DDE	2.13	-	54	
									DDD	ND	-		
									p,p'-DDT	ND	-		
					10.0	72.2			DDE	2.85	-	54	
									DDD	ND	-		
									p,p'-DDT	ND	-		
	Oromocto	May/June 1971	1 or 2	E	9.6	73.6	-	-	DDE	0.88	-	54	
									DDD	ND	-		
									p,p'-DDT	ND	-		
					10.3	75.1	-	-	DDE	0.83	-	54	
									DDD	ND	-		
									p,p'-DDT	0.01	-		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
American Woodcock (cont'd)	New Brunswick (cont'd)												
	Maugerville	May/June 1971	1 or 2	E	10.9	74.2	-	-	DDE	14.9	-	54	b = contamination from agricultural spraying in vicinity
									DDD	0.03	-		
									p,p'-DDT	0.04	-		
					9.1	75.1	-	-	DDE	11.8	-	54	
									DDD	0.05	-		
									p,p'-DDT	0.14	-		
	Ripples	May/June 1971	1 or 2	E	6.4	76.0	-	-	DDE	0.87	-	54	
									DDD	0.05	-		
									p,p'-DDT	0.14	-		
					6.6	76.6	-	-	DDE	0.93	-	54	
									DDD	0.03	-		
									p,p'-DDT	0.06	-		
					10.0	75.0	-	-	DDE	0.45	-	54	ND = none detected beyond the sensitivity of the method <0.001 ppm
									DDD	ND	-		
									p,p'-DDT	ND	-		
					10.0	74.1	-	-	DDE	0.34	-	54	
									DDD	ND	-		
									p,p'-DDT	ND	-		

SPECIES	LOCATION	DATE	N	TISSUE	$\%H_2O$	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
American Woodcock (cont'd)	New Brunswick (cont'd)												
	Stanley	May/June 1971	1 or 2	E	5.1	79.1	-	-	DDE	1.12	-	54	
									DDD	0.19	-		
									p,p'-DDT	0.08	-		
					5.6	78.0	-	-	DDE	1.39	-	54	
									DDD	0.14	-		
									p,p'-DDT	0.32	-		
	Spruce Lake	May/June 1971	1 or 2	E	11.6	70.5	-	-	DDE	1.39	-	54	
									DDD	0.04	-		
									p,p'-DDT	0.04	-		
					10.2	70.5	-	-	DDE	0.84	-	54	
									DDD	0.02	-		
									p,p'-DDT	0.03	-		
	Doaktown	May/June 1971	1 or 2	E	8.2	75.0	-	-	DDE	4.12	-	54	
									DDD	0.19	-		
									p,p'-DDT	1.40	-		
					9.6	73.2	-	-	DDE	5.67	-	54	
									DDD	0.46	-		
									p,p'-DDT	3.74	-		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
American Woodcock (cont'd)	New Brunswick (cont'd)												
	Plaster Rock	May/June 1971	1 or 2	E	7.9	73.8	-	-	DDE	1.94	-	54	
									DDD	0.02	-		
									p,p'-DDT	0.04	-		
	Queenstown	May/June 1971	1 or 2	E	8.0	76.0	-	-	DDE	0.64	-	54	
									DDD	0.02	-		
									p,p'-DDT	0.04	-		
					8.3	74.7	-	-	DDE	0.67	-	54	
									DDD	0.02	-		
									p,p'-DDT	0.05	-		
	Canterbury	May/June 1971	1 or 2	E	9.9	71.2	-	-	DDE	0.47	-	54	
									DDD	0.03	-		
									p,p'-DDT	0.09	-		
	Blissfield	May/June 1971	1 or 2	E	8.9	77.1	-	-	DDE	2.65	-	54	
									DDD	0.03	-		
									p,p'-DDT	0.04	-		
					9.2	76.0	-	-	DDE	5.19	-	54	
									DDD	0.05	-		
									p,p'-DDT	0.05	-		

SPECIES	LOCATION	DATE	N	TISSUE	$\%H_2O$	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
American Woodcock (cont'd)	New Brunswick (cont'd)												
	St. Stephen	May/June 1971	1 or 2	E	8.2	75.7	-	-	DDE	0.22	-	54	ND = none detected beyond the sensitivity of the method <0.001 ppm
									DDD	ND	-		
									p,p'-DDT	ND	-		
					9.5	75.0	-	-	DDE	0.28	-	54	
									DDD	ND	-		
									p,p'-DDT	ND	-		
	Ludlow	May/June 1971	1 or 2	E	9.0	74.8	-	-	DDE	4.58	-	54	
									DDD	0.10	-		
									p,p'-DDT	0.25	-		
					10.7	73.1	-	-	DDE	5.24	-	54	
									DDD	0.16	-		
									p,p'-DDT	0.68	-		
	Bronson Settlement	May/June 1971	1 or 2	E	7.8	75.6	-	-	DDE	1.21	-	54	
									DDD	0.06	-		
									p,p'-DDT	0.36	-		
					9.7	75.1	-	-	DDE	2.95	-	54	
									DDD	0.04	-		
									p,p'-DDT	0.31	-		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
American Woodcock (cont'd)	New Brunswick (cont'd)												
	Chelmsford	May/June 1971	1 or 2	E	9.3	72.4	-	-	DDE	2.55	-	54	
									DDD	0.08	-		
									p,p'-DDT	0.27	-		
					9.1	73.4	-	-	DDE	1.48	-	54	
									DDD	0.07	-		
									p,p'-DDT	0.21	-		
	Arthurette	May/June 1971	1 or 2	E	9.9	74.2	-	-	DDE	0.77	-	54	
									DDD	0.02	-		
									p,p'-DDT	0.03	-		
					9.7	74.1	-	-	DDE	0.86	-	54	
									DDD	0.02	-		
									p,p'-DDT	0.03	-		
	McGivney	May/June 1971	1 or 2	E	8.8	75.2	-	-	DDE	11.1	-	54	
									DDD	0.18	-		
									p,p'-DDT	0.35	-		
					8.2	76.3	-	-	DDE	7.54	-	54	
									DDD	0.13	-		
									p,p'-DDT	0.32	-		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS	
American Woodcock (cont'd)	New Brunswick (cont'd)												spray history (lb. DDT/ acre)	No. of analyses
		Fall 1969	2	Bm			-	-	Total DDT	0.02	-	55	none	2
			11	Bm			-	-	Total DDT	1.33 ± 0.48*	-	55	2.6	4
		Fall 1970	16	Bm			-	-	Total DDT	0.07 ± 0.02*	-	55	none	33
			15	Bm			-	-	Total DDT	0.14 ± 0.03*	-	55	0.5	8
			20	Bm			-	-	Total DDT	0.61 ± 0.46*	-	55	0.6	8
			23	Bm			-	-	Total DDT	0.22 ± 0.08*	-	55	0.7	7
			2	Bm			-	-	Total DDT	0.25	-	55	0.9	1
			4	Bm			-	-	Total DDT	0.20 ± 0.05*	-	55	1.0	2
			6	Bm			-	-	Total DDT	0.51 ± 0.36*	-	55	1.2	3
			22	Bm			-	-	Total DDT	0.16 ± 0.01*	-	55	1.5	6
			1	Bm			-	-	Total DDT	0.42	-	55	1.6	1
			2	Bm			-	-	Total DDT	0.80	-	55	2.2	2

* $\bar{x} \pm SE$

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS	
American Woodcock (cont'd)	New Brunswick (cont'd)												spray history (lb. DDT/ acre)	No. of analyses
			45	Bm			-	-	Total DDT	2.33 ± 0.54*	-	55	2.6	14
			5	Bm			-	-	Total DDT	1.21 ± 0.81*	-	55	2.8	5
			2	Bm			-	-	Total DDT	0.66	-	55	2.9	2
		Fall 1971	45	Bm			-	-	Total DDT	0.10 ± 0.03*	-	55	none	17
			2	Bm			-	-	Total DDT	0.14	-	55	0.1	1
			1	Bm			-	-	Total DDT	0.13	-	55	0.2	1
			35	Bm			-	-	Total DDT	0.57 ± 0.16*	-	55	0.6	15
			1	Bm			-	-	Total DDT	0.15	-	55	1.5	1
			5	Bm			-	-	Total DDT	0.65	-	55	2.2	2
			80	Bm			-	-	Total DDT	1.38 ± 0.40*	-	55	2.6	21
			3	Bm			-	-	Total DDT	1.59 ± 0.90*	-	55	2.8	3
			34	Bm			-	-	Total DDT	0.81 ± 0.46*	-	55	2.9	5

* $\bar{x}$ ± SE

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
American Woodcock (cont'd)	New Brunswick (cont'd)												
	Unsprayed	1970											
	45°23'N 66°55'W	Sept. 29	7*	Bm			-	-	Total DDT	0.02	-	55	* No. of woodcocks in composite sample analysed
		Oct. 7	9*							0.08	-		
		Oct. 13	7*							0.05	-		
		Oct. 20	5*							0.08	-		
		Oct. 27	7*							0.04	-		
		Nov. 4	6*							0.04	-		
	45°47'N 65°15'W	1970											
		Oct. 6	5*	Bm			-	-	Total DDT	0.03	-	55	
		Oct. 14	7*							0.03	-		
		Oct. 21	8*							0.04	-		
		Oct. 28	4*							0.03	-		
		Nov. 3	1*							0.07	-		
	Sprayed	1970											
	(2.6 lb DDT/acre)	Oct. 8	6*	Bm			-	-	Total DDT	4.46	-	55	
	46°27'N 66°15'W	Oct. 19	15*							1.12	-		
		Oct. 21	7*							1.28	-		
		Oct. 24	2*							1.43	-		
		Oct. 26	5*							1.78	-		
		Oct. 28	2*							1.41	-		
		Oct. 31	1*							2.97	-		
	46°27'N 66°15'W	1971											
		Oct. 5	18*	Bm			-	-	Total DDT	1.48	-	55	
		Oct. 9	14*							1.01	-		
		Oct. 22	15*							1.10	-		
		Oct. 29	13*							1.27	-		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
American Woodcock (cont'd)	New Brunswick (cont'd)												
		Sept. 1970	10*	Bm			-	-	Total DDT**	176.0	(45.8-77.1)	173	heavy spray history *(10 analyses)
			7*	Bm			-	-	Total DDT**	52.4	(13.5-89.6)	173	moderately heavy spray history *(6 analyses)
			7*	Bm			-	-	Total DDT**	26.9	(21.0-38.5)	173	moderate spray history *(4 analyses)
			13*	Bm			-	-	Total DDT**	30.1	(5.7-184)	173	light spray history *(10 analyses)
			9*	Bm			-	-	Total DDT**	4.9	(3.1-14.3)	173	no spray history *(9 analyses)
	Bettsburg	Sept. to Nov. 1970	39	Bm			-	-	Total DDT**	53.0	(33.2-135)	173	
	Pomeroy Bridge & Sorrel Ridge		56	Bm			-	-	Total DDT**	1.5	(0.6-2.8)	173	
	Mersereau Stream		25	Bm			-	-	Total DDT**	2.8	(0.9-3.6)	173	
	Mill Brook & Henderson Settlement		57	Bm			-	-	Total DDT**	1.2	(0.7-2.4)	173	** lipid weight basis

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
American Woodcock (cont'd)	New Brunswick (cont'd)												
	Fredericton & Hanwell		25	Bm			-	-	Total DDT**	3.5	(1.1-5.1)	173	
	Leclerc		7	Bm			-	-	Total DDT**	7.0	-	173	
	Siegas River		4	Bm			-	-	Total DDT**	3.5	-	173	**lipid weight basis
	Blue Mountain & Bear Brook & Sisson Brook & Currie		49	Bm			-	-	Total DDT**	6.1	(3.5-12.2)	173	**lipid weight basis
	-	1961	3	Wb (?)			im*	-	DDT	1.4	(ND-1.8)	260	dry weight * broods (2-14 days old)
		1963	1	Wb (?)			im***	-	Hep DDT	Trace 1.5	- -	260	*** broods (2 days old)
	-	1959	20	Wb (?)			AD + im	M+F	Hep DDT	1.5 0.7	(ND-4.3) (ND-2.4)	260	premigrants
		1960	10	Wb (?)			AD + im	M+F	Hep DDT	- 0.4	- (ND-1.8)	260	
		1961	16	Wb (?)			AD + im	M+F	Hep DDT	0.5 1.41	(ND-2.6) (ND-5.1)	260	

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
American Woodcock (cont'd)	New Brunswick (cont'd)												
	-	1960	10	Wb (?)			AD	M+F	Hep	1.6	(0.7-1.8)	260	fall migrants
									DDT	1.1	(ND-2.8)		
		1961	11	Wb (?)			AD	M+F	Hep	0.4	(ND-1.5)	260	
									DDT	1.7	(ND-7.0)		
	-	- ?	17	Wb*			-	-	DDE	13.0	-	126	* body fat residues divided by ten
			16	Wb*			-	-	DDE	1.8	-	126	
			8	Wb*			-	-	DDE	0.6	-	126	
	-	Oct. 1969	11*	Bm			-	-	Total DDT**	29.9	(17.1-50.4)	173	**lipid weight basis *(4 analyses) moderately heavy spray history
	-		4*	Bm			-	-	Total DDT**	6.5	-	173	**lipid weight basis *(1 analysis) light spray history
			2*	Bm			-	-	Total DDT**	0.6	(0.55-0.64)	173	**lipid weight basis *(2 analyses) no spray history

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
American Woodcock (cont'd)	Ontario												
	-	1970-76	106	Bm			-	-	HCB	< 0.01 ppm	-	91	pooled samples
	-	1973	15	M			-	-	DDE	0.96*		170	* geometric means
									PCB	0.44*	-		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Scolopacidae Common Snipe (*Gallinago gallinago*)	Newfoundland												
	-	-	5	Fat	-	-	-	-	DDE	0.04*	-	126	* body fat residues divided by ten

Table 5. Residue levels in Alcidae sampled in Canada.
(also see Noble and Elliott, 1986)

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Alcidae	Newfoundland												
Razorbill													
(Alca torda)	-	-	2	Bm			-	-	DDE	1.23*	-	90	* geometric means
									PCB	4.66*	-		dry weight basis
	Quebec												
	Gulf of St. Lawrence												
	Pelerins Islands 47°43'N 69°45'W	May 29 1978	3	E (fresh)			-	-	Total DDT	3.49	(3.05-3.55)*	40	* variance
									Dieldrin	0.23	(0.16-0.25)*		
									HE	0.08	(0.07-0.09)*		
									Cis-chlordane	0.38	(0.33-0.52)*		
									Oxychlordane	0.15	(0.14-0.16)*		
									BHC	0.1	(0.19-0.24)*		
									PCB(Aroclor 1260)	24.7	(23.2-28.3)*		
	Pelerins Islands 47°43'N 69°45'W	May 29 1978	3	E (addled)			-	-	Total DDT	9.45	(8.28-47.15)*	40	* variance
									Dieldrin	0.47	(0.40-0.94)*		
									HE	0.21	(0.15-0.27)*		
									Cis-chlordane	0.60	(0.46-1.18)*		
									Oxychlordane	0.41	(0.37-0.69)*		
									BHC	0.64	(0.54-0.73)*		
									PCB(Aroclor 1260)	75.4	(63.1-132.0)*		

SPECIES	LOCATION	DATE	N	TISSUE	$\%H_2O$	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Razorbill (cont'd)	Quebec (cont'd)												
	Gulf of St. Lawrence												
	Sainte-Marie Islands 50°19'N 59°39'W	June 16 1978	5	E (fresh)	71.3	11.2	-	-	Total DDT	1.95	(1.80-2.34)*	40	* variance
									Dieldrin	0.19	(0.10-0.21)*		
									HE	0.07	(0.05-0.08)*		
									Cis-chlordane	0.14	(0.12-0.20)*		
									Oxychlordane	0.10	(0.08-0.14)*		
									BHC	0.20	(0.16-0.23)*		
									PCB (Aroclor 1260)	10.9	(7.70-11.9)*		
	Sainte-Marie Islands 50°19'N 59°39'W	July 24 1978	5	E (addled)	68.0	12.8	-	-	Total DDT	3.27	(1.74-6.82)*	40	* variance
									Dieldrin	0.17	(0.14-0.22)*		
									HE	0.08	(0.07-0.10)*		
									Cis-chlordane	0.23	(0.08-0.27)*		
									Oxychlordane	0.12	(0.09-0.18)*		
									BHC	0.22	(0.19-0.31)*		
									PCB (Aroclor1260)	16.6	(8.4-26.1)*		
	-	-	10	E			-	-	DDE	12.4*	(8.24-18.8)**	90	Dry weight basis
									PCB	50.7*	(34.4-74.8)**		* geometric means
													** 95% confidence intervals
	Carrousel Island	1972	5	E	71.4	14.4	-	-	DDE	4.54*	(2.30-14.9)	177	* geometric means
									PCB (Aroclor1260)	21.7*	(12.8-37.3)		
									Dieldrin	0.15*	(0.08-0.52)		
									Hg	0.08*	(0.01-0.19)		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Razorbill (cont'd)	Quebec (cont'd)												
	Ile Ste.-Marie	1972	5	E	72.4	17.2	-	-	DDE	2.75*	(1.82-3.28)	177	
									PCB (Aroclor1260)	9.34*	(6.29-15.0)		
									Dieldrin	0.10*	(0.06-0.15)		
									Hg	0.12*	(0.08-0.15)		
	Brion Island	1973	3	E	72.0	12.5	-	-	DDE	2.55*	(2.14-3.10)	177	
									PCB (Aroclor1260)	8.37*	(7.72-12.1)		
									Dieldrin	0.121*	(0.01-0.16)		
									Hg	0.11*	(0.04-0.25)		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Alcide Common Murre (Uria aalge)	Newfoundland												
	-	-	2	Bm			-	-	DDE	1.09*	-	90	dry weight basis
									PCB	1.07*	-		* geometric means
	Labrador	-	9	E			-	-	DDE	0.77	-	176	
	-	-	10	M			-	-	DDE	0.30	-	176	
							-	-	PCB	0.31	-		
	Quebec	-	4	E			-	-	DDE	6.34*	(3.17-12.7)**	90	* geometric means
									PCB	6.90*	(1.86-25.7)**		** 95% confidence intervals
	Ile Ste.-Marie	1971	4	E	67.6	17.0	-	-	DDE	2.03*	(1.28-3.81)	177	
							-	-	PCB (Aroclor1260)	2.21*	(0.94-7.00)		
							-	-	Dieldrin	0.02*	(0.02-0.03)		
							-	-	Hg	0.12*	(0.08-0.17)		
	British Columbia												
	-	-	2	L			-	-	DDE	1.89*	-	90	Dry weight basis
							-	-	PCB	3.69*	-		* geometric means
	-	-	1	Wb			-	-	DDE	3.25*	-	90	
							-	-	PCB	2.80*	-		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Alcidae	Northwest												
Thick-billed	Territories												
Murre													
(*Uria lomvia*)	Southeast of	July-	2	Bm			IM	-	As	17.99 ± 6.01*	(13.74-22.24)	187	* $\bar{x}$ ± SD
	Maxwell Bay,	August							Cu	4.91 ± 0.86*	(4.30-5.52)		Hg - wet weight
	West of Cape	1976							Zn	31.37 ± 2.62*	(29.51-33.22)		other metals - dry
	Lancaster Sound								Cd	0.37 ± 0.28*	(0.17-0.56)		weight
									Cr	1.61 ± 1.36*	(0.65-2.57)		ND - non-detectable
									V	ND	-		
									Hg	0.042 ± 0.00*	(0.042-0.043)		
			2	L			IM	-	As	6.79 ± 0.87*	(6.17-7.40)	187	
									Cu	12.35 ± 3.25*	(10.05-14.64)		
									Zn	65.50 ± 0.45*	(65.18-65.82)		
									Cd	1.24 ± 0.45*	(0.92-1.56)		
									Cr	0.23 ± 0.02*	(0.22-0.25)		
									V	ND	-		
									Hg	0.06 ± 0.04*	(0.034-0.089)		
			1	Bo			IM	-	Pb	22.94 ± 4.14*	(20.01-25.87)	187	
	Southeast of	July-	8	Bm			AD	-	As	13.70 ± 9.91*	(2.36-26.03)	187	Hg - wet weight
	Maxwell Bay,	August							Cu	12.55 ± 3.87*	(6.62-18.80)		other metals - dry
	West of Cape	1976							Zn	31.82 ± 5.95*	(22.24-37.84)		weight
	Warrender								Cd	2.21 ± 2.23*	(0.61-6.95)		ND - non-detectable
	Lancaster sound								Cr	1.72 ± 1.30*	(0.26-4.02)		* $\bar{x}$ ± SD
									V	ND	-		
									Hg	0.31 ± 0.12*	(0.125-0.539)		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Thick-billed Murre (cont'd)	Northwest Territories (cont'd)												
	Southeast of Maxwell Bay, West of Cape Warrender Lancaster Sound (cont'd)		8	L			AD	-	As	35.64 ± 40.29*	(5.80-90.87)	187	
									Cu	17.24 ± 3.97*	(12.08-23.08)		
									Zn	106.74 ± 26.74*	(76.33-148.97)		
									Cd	23.15 ± 7.47*	(15.18-38.92)		
									Cr	1.89 ± 1.92*	(0.24-5.11)		
									V	ND	-		
									Hg	0.70 ± 0.48*	(0.392-1.845)		
			8	Bo			AD		Pb	9.58 ± 6.24*	(2.69-20.05)		
	Southeast of Maxwell Bay, West of Cape Warrender Lancaster Sound	July-August 1976	2	Fat			IM	-	DDE	1.4 ± 0.01*	(1.35-1.39)	187	* $\bar{x}$ ± SD
									p,p'-DDT	-	(Trace-0.57)		lipid weight basis
									p,p'-DDD	-	(Trace-0.78)		ND = non-detectable
									o,p'-DDT	-	(Trace-1.68)		
									HCB	-	(ND-0.46)		Trace levels not
									PCB	-	(ND-0.20)		included in
									Total DDT	-	(1.35-4.42)		calculation of mean
			8	Fat			AD	-	DDE	4.58 ± 2.59*	(1.63-9.56)	187	
									p,p'-DDT	2.21 ± 1.35*	(Trace-3.75)		
									p,p'-DDD	1.83 ± 1.76*	(Trace-4.95)		
									o,p'-DDT	1.94 ± 1.69*	(Trace-4.84)		
									HCB	0.62 ± 0.83*	(ND-1.20)		
									PCB	1.25 ± 1.34*	(ND-2.20)		
									Total DDT	-	(1.63-22.57)		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Thick-billed Murre (cont'd)	Northwest Territories (cont'd)												
	Prince Leopold Island	1975	10	L		4.5	AD	-	DDE	0.06		163	* Aroclor 1254:1260 on a 1:1 basis
									PCB*	0.22			
			12	E		12.6	-	-	DDE	0.31			
									PCB*	0.72			
		1976	12	L		7.0	AD	-	DDE	0.19			
									PCB*	0.53			
			10	E		14.3	-	-	DDE	0.44			
									PCB*	1.01			
			10	L		10.5	IM	-	DDE	0.17			
									PCB*	0.44			
		1977	11	L		5.7	AD	-	DDE	0.12			
									PCB*	0.36			
			10	E		12.6	-	-	DDE	0.39			
									PCB*	0.91			
			9	L		5.2	IM	-	DDE	0.05			
									PCB*	0.15			

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Alcidae	Newfoundland												
Black Guillemot (Cepphus grylle)	-	-	1	Bm			-	-	DDE	1.00*	-	90	Dry weight basis
									PCB	3.18*	-		* geometric means
	New Brunswick												
	Quoddy Region	1978-84	4	Bm			AD	-	Hg	0.113	-	33	
				L			AD	-	Hg	0.513	-		
				K			AD	-	Hg	0.491	-		
				Br			AD	-	Hg	0.123	-		
	Quebec												
	Magdalen Islands	1973	3	E	73.8	9.9	-	-	DDE	1.04*	(1.28-3.81)	177	* geometric means
									PCB (Aroclor1260)	2.13*	(0.94-7.00)		
									Dieldrin	0.02*	(0.02-0.03)		
									Hg	0.13*	(0.08-0.17)		total Hg
	Northwest Territories												
	Dundas Harbour, Lancaster Sound	July-August 1976	5	Bm			IM	-	As	12.66 ± 6.88**	(7.12-24.37)	187	** $\bar{x}$ ± SD
									Cu	15.72 ± 1.47**	(14.16-17.38)		Hg - wet weight
									Zn	40.32 ± 3.71**	(36.28-45.98)		other metals - dry weight
									Cd	0.59 ± 0.22**	(0.24-0.82)		
									Cr	0.87 ± 0.15**	(0.67-1.02)		ND = non-detectable
									V	ND	-		
									Hg	0.13 ± 0.05**	(0.073-0.216)		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Black Guillemot (cont'd)	Northwest Territories (cont'd)												
	Dundas Harbour, Lancaster Sound	1976	5	L			IM	-	As	20.38 ± 17.56*	(6.43-50.14)	187	* $\bar{x}$ ± SD
									Cu	16.05 ± 1.72*	(13.86 ± 17.92)		Hg - wet weight
									Zn	84.86 ± 10.44*	(73.44-98.40)		other metals - dry
									Cd	0.83 ± 0.19*	(0.64-1.14)		weight
									Cr	0.80 ± 0.44*	(0.24-1.34)		ND = non-detectable
									V	ND	-		
									Hg	0.23 ± 0.09*	(0.134-0.368)		
	Dundas Harbour, Lancaster Sound	1976	5	Bo			IM	-	Pb	17.25 ± 3.36*	(13.41-22.46)	187	
	Dundas Harbour, Lancaster Sound	July-August 1976	5	Bm			AD	-	As	10.58 ± 6.75*	(4.11-21.45)	187	* $\bar{x}$ ± SD
									Cu	15.19 ± 2.19*	(11.68-17.28)		Hg - wet weight
									Zn	27.76 ± 4.34*	(23.53-33.82)		other metals - dry
									Cd	0.68 ± 0.41*	(0.19-1.32)		weight
									Cr	0.87 ± 0.33*	(0.39-1.17)		ND = non-detectable
									V	ND	-		
									Hg	0.27 ± 0.04*	(0.232-0.328)		
	Dundas Harbour, Lancaster Sound	1976	5	L			AD	-	As	7.48 ± 2.74*	(4.20-11.22)	187	
									Cu	18.60 ± 1.78*	(15.70-20.42)		
									Zn	90.95 ± 12.68*	(73.98-103.92)		
									Cd	15.11 ± 4.98*	(9.80-22.90)		
									Cr	0.35 ± 0.12*	(0.22-0.52)		
									V	ND	-		
									Hg	0.78 ± 0.25*	(0.582-1.190)		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Black Guillemot (cont'd)	Northwest Territories (cont'd)												
	Dundas Harbour, Lancaster Sound	1976	5	Bo			AD	-	Pb	21.48 ± 7.62*	(14.56-34.37)	187	
	Dundas Harbour, Lancaster Sound	July-August 1976	5	Fat			IM	-	DDE	0.40 ± 0.26*	(Trace-0.70)	187	* $\bar{x}$ ± SD
									p,p'-DDT	-	(ND-0.12)		lipid weight basis
									p,p'-DDD	-	(ND-0.09)		ND = non-detectable
									o,p'-DDT	-	(ND-0.21)		Trace levels not
									HCB	ND	-		included in calcu-
									PCB	-	(ND-Trace)		lation of mean
									Total DDT	-	(Trace-0.85)		
			5	Fat			AD	-	DDE	3.97 ± 2.31*	(2..01-6.61)	187	
									p,p'-DDT	3.79 ± 2.14*	(0.99-6.88)		
									p,p'-DDD	2.79 ± 2.01*	(1.42-6.29)		
									o,p'-DDT	2.60 ± 3.08*	(0.67-7.93)		
									HCB	0.64 ± 0.78*	(ND-1.20)		
									PCB	0.90 ± 0.28*	(ND-1.10)		
									Total DDT	-	(6.94-27.71)		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Alcidae	British Columbia												
Pigeon													
Guillemot	-	-	3	E			-	-	DDE	1.90*	-	90	Dry weight basis
(Cepphus			3	E			-	-	PCB	5.93*	-	90	* geometric means
columba)													

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Alcidae	British Columbia												
Marbled Murrelet (*Brachyramphus mermoratus*)	Port Alberni	1968	3	L			-	-	Hg	0.38	(0.33-0.46)	73	
	Horseshoe Bay	1968	3	L			-	-	Hg	2.23	(0.19-4.9)	73	
	-	-	3	Fat			-	-	DDE	2.26*	-	90	Dry weight
									PCB	1.73*	-		* geometric means

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Alcidae	British Columbia												
Ancient Murrelet (*Synthliboramphus antiquus*)	-	1971	2	Wb			AD	-	DDE	2.78*	-	90, 170	Dry weight
							AD	-	PCB	2.78*	-		* geometric means
	-	1971	2	Wb			IM	-	DDE	16.8*	-	90, 170	
							IM	-	PCB	2.70*	-		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Alcidae	British Columbia												
Cassin's Auklet													
(*Ptychoramphus aleuticus*)	-	-	1	E			-	-	DDE	9.73*	-	90	Dry weight basis
							-	-	PCB	2.00*	-		* geometric means
	-	1971	2	Wb			-	-	DDE	1.45*	-	90, 170	
							-	-	PCB	1.18*	-		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Alcidae	British Columbia												
Rhinoceros Auklet (*Cerorhinca monocerata*)	-	-	2	E			-	-	DDE	8.36*	-	90	Dry weight
							-	-	PCB	6.40*	-		* geometric means
	-	-	2	Wb			-	-	DDE	16.4*	-	90	
							-	-	PCB	7.68*	-		
	-	-	2	Fat			-	-	DDE	14.1*	-	90	
							-	-	PCB	3.67*	-		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Alcidae	Newfoundland												
Atlantic Puffin (*Fratercula arctica*)	Gannet Island	1972	5	E	70.7	13.7	-	-	DDE	0.57*	(0.43-0.73)	177	* geometric means
									PCB (Aroclor1260)	2.32*	(1.69-2.90)		
									Dieldrin	0.05*	(0.04-0.06)		
									Hg	0.18*	(0.16-0.21)		
	Bird Island	1972	5	E	72.0	17.5	-	-	DDE	0.58*	(0.48-0.90)	177	
									PCB (Aroclor1260)	1.90*	(1.48-3.06)		
									Dieldrin	0.04*	(0.03-0.05)		
									Hg	0.18*	(0.10-0.34)		
	Great Island	1972	3	E	68.7	15.8	-	-	DDE	0.76*	(0.52-0.89)	177	
									PCB (Aroclor1260)	1.67*	(1.49-1.99)		
									Dieldrin	0.05*	(0.04-0.06)		
									Hg	0.26*	(0.21-0.33)		
		1976	5	E	71.5	10.2	-	-	DDE	0.59*	(0.43-0.87)	177	
									PCB (Aroclor1260)	1.86*	(1.13-2.00)		
									Dieldrin	0.04*	(0.04-0.05)		
									Hg	0.23*	(0.14-0.28)		
		1980	5	E	71.4	10.7	-	-	DDE	0.55*	(0.35-0.78)	166, 175	
									PCB (Aroclor1260)	2.49*	(1.90-3.41)		
									Dieldrin	0.04*	(0.02-0.06)		
									Hg	0.32*	(0.18-0.54)		
		1984	5	E	73.5	9.0	-	-	DDE	0.30*	(0.23-0.41)	166, 175	***Aroclor 1254: 1260, 1:1
									PCB***	0.99*	(0.82-1.11)		
									Dieldrin	0.04*	(0.04-0.05)		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Atlantic Puffin (cont'd)	Newfoundland (cont'd)												
	-	-	10	E			-	-	DDE	2.01*	(1.69-4.03)**	90	Dry weight basis
									PCB	7.35*	(5.99-9.01)**		* geometric means
													** 95% confidence intervals
		-	2	Bm			-	-	DDE	1.04*	-	90	
									PCB	1.47*	-		
	-	1973	5	Wb			-	-	DDE	0.73*	(0.59-0.89)**	90, 170	
									PCB	1.14*	(0.94-1.39)**		
	-		20	E			-	-	DDE	0.67	-	126	
	New Brunswick												
	Machias Seal Island	1972	5	E	71.5	13.0	-	-	DDE	2.57*	(1.97-3.89)	177	* geometric means
									PCB (Aroclor1260)	7.20*	(5.80-8.19)		
									Dieldrin	0.09*	(0.07-0.11)		
									Hg	0.20*	(0.18-0.26)		
		1976	5	E	70.7	11.3	-	-	DDE	1.27*	(0.75-1.76)	177	
									PCB (Aroclor1260)	6.10*	(4.73-6.59)		
									Dieldrin	0.08*	(0.06-0.13)		
									Hg	0.09*	(0.06-0.12)		
	-	-	5	E					DDE	9.04*	(6.43-12.7)**	90	Dry weight basis
									PCB	25.3*	(22.1-29.1)**		* geometric means
													** 95% confidence intervals

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Atlantic Puffin (cont'd)	New Brunswick (cont'd)												
		1980	5	E	70.5	12.9	-	-	DDE	1.03*	(0.85-1.17)	166, 175	
									PCB (Aroclor1260)	5.31*	(4.28-6.34)		
									Dieldrin	0.02*	(0.02-0.05)		
									Hg	0.18*	(0.15-0.23)		
		1984	5	E	73.4	11.3	-	-	DDE	0.74*	(0.55-1.09)	166, 175	*** Aroclor 1254: 1260, 1:1
									PCB***	3.20*	(2.26-4.20)		
									Dieldrin	0.05*	(0.04-0.08)		
	Quebec												
	Betchouane	1972	5	E	71.4	16.2	-	-	DDE	1.19*	(0.75-2.28)	177	* geometric means
									PCB (Aroclor1260)	4.42*	(2.76-7.40)		
									Dieldrin	0.06*	(0.05-0.10)		
									Hg	0.15*	(0.10-0.22)		
	Ile Ste-Marie	1972	9	E	71.1	16.7			DDE	0.99*	(0.62-1.72)	177	
									PCB (Aroclor1260)	2.89*	(1.20-5.11)		
									Dieldrin	0.06*	(0.04-0.10)		
									Hg	0.16*	(0.07-0.24)		
	Perroquet Island	1972	5	E	69.8	14.8	-	-	DDE	1.49*	(1.22-1.70)	177	
									PCB (Aroclor1260)	3.99*	(3.08-5.08)		
									Dieldrin	0.07*	(0.05-0.09)		
									Hg	0.16*	(0.08-0.20)		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Atlantic Puffin (cont'd)	Quebec (cont'd)												
	Brion Island	1973	1	E	73.2	10.2	-	-	DDE	1.46*	-	177	
									PCB (Aroclor1260)	4.19*	-		
									Dieldrin	0.06*	-		
									Hg	0.16*	-		
		1968-72	21	E			-	-	DDE	3.64*	(3.02-4.40)**	90	Dry weight basis
									PCB	10.6*	(8.57-13.1)**		* geometric means
													** 95% confidence intervals

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Alcidae	British Columbia												
Tufted Puffin													
(Fratercula	-	1969-72	1	E			-	-	DDE	1.58*	-	90	Dry weight basis
cirrhata)									PCB	2.46*			* geometric means
	-	1969-72	2	Wb			-	-	DDE	0.94*	-	90	
									PCB	2.67*	-		

Table 6. Residue levels in Columbidae sampled in Canada

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Columbidae Mourning Dove (*Zenaidura macroura*)	Ontario												
	Niagara Peninsula	1971	3	E			-	-	Total DDT	0.26	(0.10-0.42)	88	ND - below 0.005 ppm for DDT (sum) and Dieldrin and 0.05 ppm for PCBs
						6.7	-	-	Dieldrin	0.36	(ND-1.09)		
							-	-	PCB**	0.1	(0.1-0.2)		
	Niagara Peninsula	1971	3	extractable fat in egg			-	-	Total DDT*	3.9	-	88	* DDE = 100% DDD = 0.0% DDT = 0.0% **Aroclor 1254: 1260, 1:2 to 1:5
									Dieldrin	5.40	-		
									PCB**	1.5	-		
	Saskatchewan												
	-	1968	1	L			-	-	Hg	0.415	-	72	
	Alberta												
	-	1968	8	L			-	-	Hg	0.239 ± 0.053*	(0.139-0.319)	72	* $\bar{x}$ ± SE

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%LIPID	AGE	SEX	RESIDUE	MEAN (PPM)	RANGE	REFERENCE	REMARKS
Columbidae	Saskatchewan												
Rock Dove													
(*Columba livia*)	-	1968	1	L			-	-	Hg	0.415	-	72	
	-	1971	1	Wb			-	-	DDE	0.01*	-	170	* geometric means
									PCB	0.01*	-		
	Alberta												
	-	1968	3	L			-	-	Hg	0.705 ± 0.364**	(0.015-3.16)	72	** $\bar{x}$ ± SE
	-	1971	3	Wb			-	-	DDE	0.03*	-	170	* geometric means

APPENDIX 2.

Residue data of game birds from the NRTCR. Residue levels are expressed on a wet-weight basis as pooled values or as mean ± standard deviation. ND ≤ 0.0005. Values reported as ≤ 0.01 should be treated as being near or below the detection limit depending on the year and/or the laboratory of analysis. Abbreviations used for describing tissues correspond to those given in Appendix 5.

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%FAT	RESIDUE	MEAN (PPM)	RANGE	REMARKS
Canada Goose	Newfoundland									
(Brant canadensis)	54°40′ 65°40′	1970	1	Bm	-	-	Hg	0.005		
	New Brunswick									
	47°40′ 65°48′	1970	1	Bm	-	-	Hg	0.010		
	Quebec									
	49°53′ 77°30′	1971	1	Bm	-	-	Hg	ND		
	49°47′ 76°48′	1971	3	Bm	-	-	Hg	ND	-	
	50°30′ 74°00′	1976	2	M	71.5	-	Hg	0.005	-	
	49°50′ 77°30′	1976	1	M	71.3	-	Hg	0.005		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%FAT	RESIDUE	MEAN (PPM)	RANGE	REMARKS
Canada Goose (cont'd)	Ontario									
	Albany	Spring 1985	1*	Bm	70.9	3.1	HCB	0.001		* Pool of 4
							p,p'-DDE	ND		** Aroclor
							Mirex	ND		1254:1260,
							PCB**	ND		1:1
							BHC	ND		
							Oxychlordane	ND		
							Trans-nonachlor	ND		
							Cis-nonachlor	ND		
							p,p'-DDD	ND		
							p,p'-DDT	ND		
							HE	ND		
							Dieldrin	ND		
							Hg	0.0025		
	Winisk	Spring 1985	1*	Bm	68.1	4.5	HCB	0.001		* Pool of 6
							p,p'-DDE	0.003		** Aroclor
							Mirex	ND		1254:1260,
							PCB**	0.006		1:1
							BHC	ND		
							Oxychlordane	ND		
							Trans-nonachlor	0.001		
							Cis-nonachlor	ND		
							p,p'-DDD	ND		
							p,p'-DDT	0.002		
							HE	0.001		
							Dieldrin	0.005		
							Hg	0.005		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%FAT	RESIDUE	MEAN (PPM)	RANGE	REMARKS
Canada Goose (cont'd)	Ontario (cont'd)									
	Attawapiskat	Spring 1985	1*	Bm	67.6	6.5	HCB	0.001		*Pool of 10
							p,p'-DDE	0.008		** Aroclor
							Mirex	ND		1254:1260,
							PCB**	0.006		1:1
							BHC	ND		
							Oxychlordane	ND		
							Trans-nonachlor	0.001		
							p,p'-DDD	ND		
							p,p'-DDT	ND		
							HE	0.003		
							Dieldrin	0.004		
							Hg	0.003		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%FAT	RESIDUE	MEAN (PPM)	RANGE	REMARKS
Canada Goose	Ontario									
(cont'd)	(cont'd)	Feb.	1	L	68.8	4.2	1245-TeCB	0.009		
		1988					1234-TeCB	0.001		
							QCB	ND		
							HCB	0.0006		
							OCS	ND		
							Trans-nonachlor	ND		
							DDE	0.004		
							Photomirex	ND		**Aroclor
							Mirex	ND		1254:1260,
							α -HCH	ND		1:1
							β -HCH	ND		
							γ -HCH	ND		
							Oxychlordane	ND		
							Trans-chlordane	ND		
							Cis-chlordane	ND		
							Cis-nonachlor	ND		
							HE	0.001		
							Dieldrin	0.019		
							PCB**	0.006		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%FAT	RESIDUE	MEAN (PPM)	RANGE	REMARKS
Canada Goose (cont'd)	Saskatchewan									
	49°29' 109°27'	1969	1	E	66.4	15.7	DDE	0.016	-	
							Dieldrin	0.012	-	
							HE	0.009	-	
	Alberta									
	50°34' 116°02'	1968	1	E	68.6	14.7	DDE	0.040		
							Dieldrin	0.078		
							HE	ND		
							Hg	0.025		
	50°24' 111°58'	1968	1	E	69.1	15.8	DDE	0.030		
							Dieldrin	0.022		
							HE	ND		
							Hg	0.031		
	50°29' 110°23'	1968	3	E	62.5	16.5	DDE	4.35 ± 7.40	0.05-12.9	
							Dieldrin	0.033 ± 0.030	0.008-0.7	
							HE	0.004 ± 0.006	ND-0.011	
							Hg	0.029 ± 0.003	0.027-0.033	
	50°45' 112°31'	1968	1	E	43.7	27.0	DDE	0.036		
							Dieldrin	0.011		
							HE	0.023		
							Hg	0.027		
	49°47' 113°20'	1968	1	E	59.0	24.0	DD	0.037		
							Dieldrin	0.037		
							HE	0.485		
							Hg	0.040		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%FAT	RESIDUE	MEAN (PPM)	RANGE	REMARKS
Canada Goose (cont'd)	Alberta (cont'd)									
	50°04' 112°03'	1969	2	E	70.0	17.0	DDE	0.040 ± 0.017	0.028-0.052	
							Dieldrin	0.010		
							HE	0.635 ± 0.880	0.011-1.26	
			1	E	67.0	17.7	Hg	0.022		
	52°01' 113°01'	1969	1	E	64.0	16.3	DDE	0.039		
							Dieldrin	0.016		
							HE	0.078		
							Hg	0.012		
	British Columbia									
	49°99' 119°99'	1967	2	E	63.9	17.4	DDE	0.477 ± 0.040	0.451-0.503	
							Dieldrin	0.022 ± 0.025	0.004-0.039	
							HE	ND	-	
	49°99' 119°99'	1967	1	E	58.0	-	Hg	0.013		
	49°99' 119°99'	1967	1	Br	82.0	5.4	DDE	0.080		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%FAT	RESIDUE	MEAN (PPM)	RANGE	REMARKS
Snow Goose	Ontario									
(Chen caerulescens)										
	Winisk	1985	1*	Bm	67.2	4.1	HCB	ND		* Pool of 4
							p,p'-DDE	0.001		** Aroclor
							Mirex	ND		1254:1260,
							PCB**	ND		1:1
							BHC	ND		
							Oxychlordane	ND		
							Trans-nonachlor	ND		
							Cis-nonachlor	ND		
							p,p'-DDD	ND		
							p,p'-DDT	ND		
							HE	ND		
							Dieldrin	ND		
							Hg	0.0025		
	Moose Factory	1985	1*	Bm	67.3	4.6	HCB	ND		* Pool of 7
							p,p'DDE	ND		** Aroclor
							Mirex	ND		1254:1260,
							PCB**	ND		1:1
							BHC	ND		
							Oxychlordane	ND		
							Trans-nonachlor	ND		
							p,p'-DDD	ND		
							p,p'-DDT	ND		
							HE	ND		
							Dieldrin	ND		
							Hg	0.0025		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%FAT	RESIDUE	MEAN (PPM)	RANGE	REMARKS
Snow Goose (cont'd)	British Columbia									
	49°10' 123°13'	1968	4	Br	77.2	5.6	DDE	0.007 ± 0.005	0.001-0.013	
							Dieldrin	0.002 ± 0.002	ND-0.010	
							HE	ND	-	
	49°12' 123°13'	1968	4	Bm	61.5	5.8	DDE	0.011 ± 0.003	0.008-0.015	
							Dieldrin	0.003 ± 0.002	ND-0.005	
							HE	ND	-	
	49°10' 123°13'	1969	1	Bm	69.6	6.8	DDE	ND	-	
							Dieldrin	ND	-	
							HE	ND	-	
							Hg	0.0100	-	
	Northwest Territories									
	(not determined)	1968	13	E*	-	-	DDE	0.029 ± 0.027	ND-0.052	* Fat basis
							Dieldrin	0.153 ± 0.260	0.003-0.898	
							HE	0.024 ± 0.050	ND-0.056	

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%FAT	RESIDUE	MEAN (PPM)	RANGE	REMARKS
Mallard (*Anas platyrhynchos*)	Ontario									
	Windermere Basin	Dec. 1985	1*	L	71.0	5.42	HCB	0.002		* Pool of 9
							DDE	0.050		** Aroclor 1254:1260, 1:1
							Photomirex	ND		
							Mirex	ND		
							PCB**	3.51		
							BHC	ND		
							Oxychlordane	0.008		
							Cis-chlordane	0.001		
							Trans-nonachlor	0.004		
							Cis-nonachlor	0.001		
							DDD	0.004		
							DDT	0.001		
							HE	0.007		
							Dieldrin	0.073		
							Hg	0.026		
							Pb	0.45		
							Cd	0.045		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%FAT	RESIDUE	MEAN (PPM)	RANGE	REMARKS
Mallard (cont'd)	Ontario (cont'd)		1*	Bm	70.5	3.55	HCB	ND		* Pool of 9
							DDE	0.037		** Aroclor
							Photomirex	ND		1254:1260,
							Mirex	ND		1:1
							PCB**	1.28		
							BHC	ND		
							Oxychlordane	0.001		
							Cis-chlordane	ND		
							Trans-nonachlor	ND		
							Cis-nonachlor	0.001		
							DDD	0.003		
							DDT	ND		
							HE	0.001		
							Dieldrin	0.007		
			9	Bm	-	-	Hg	0.03	0.005-0.15	
							Pb	0.54	0.015-3.99	
							Cd	0.011	0.003-0.020	

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%FAT	RESIDUE	MEAN (PPM)	RANGE	REMARKS
Mallard (cont'd)	Ontario (cont'd)									
	Upper Canada Village	Sept. 1983	4*	Br	-	-	Pb		0.005-0.065**	*Pools of 5
			6*	Bm	-	-	Pb		0.009-0.03**	**Results from various analytical labora-tories
							Hg		0.03-0.05	
							Cd		0.003-0.006	
			4*	K	-	-	Pb		0.021-0.19*	
			4*	L	-	-	Pb		0.009-0.18**	
	Detroit River	Nov. 1987	5	Bm	-	-	Hg	0.06	0.03-0.09	
							Pb	5.6	0.015-27.9	
							Cd	0.007	0.003-0.012	
	St. Mary's	Nov. 1987	5	Bm	-	-	Hg	0.04	0.02-0.08	
							Pb	0.09	0.03-0.21	
							Cd	0.005	0.003-0.006	

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%FAT	RESIDUE	MEAN (PPM)	RANGE	REMARKS
Mallard (cont'd)	Ontario (cont'd)									
	Long Point LE	Dec. 1987	5	Bm	-	-	Hg	0.05	0.03-0.08	
							Pb	1.01	0.015-3.3	
							Cd	0.011	0.003-0.033	
	Lake St. Clair	Dec. 1987	5	Bm	-	-	Hg	0.14	0.02-0.51	
							Pb	0.32	0.03-1.32	
							Cd	0.006	0.003-0.011	

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%FAT	RESIDUE	MEAN (PPM)	RANGE	REMARKS
American Black Duck (*Anas rubripes*)	Newfoundland									
	48°50′ 55°30′	1970	1	Bm	-	-	Hg	0.090		
	54°20′ 58°00′	1970	1	Bm	-	-	Hg	0.050		
	49°15′ 58°00′	1970	1	Wm	73.2	-	Hg	0.100		
	48°35′ 55°40′	1976	2	Wm	71.3	2.45	Hg	0.003 ± 0.003	ND-0.005	
							Dieldrin	0.003 ± 0.003	ND-0.005	
							HE	0.005 ± 0.0	-	
							HCB	ND	-	
							PCB	ND	-	
							Oxychlordane	0.003 ± 0.003	ND-0.005	
							Mirex	ND	-	
	Prince Edward Island									
	46°00′ 64°40′	1970	2	Bm	-	-	Hg	0.065 ± 0.020	0.050-0.080	
	46°00′ 64°30′	1970		Wm	73.6	-	Hg	0.090 ± 0.014	0.080-0.100	
	Nova Scotia									
	45°55′ 64°12′	1967	1	E	64.9	15.4	DDE	0.168		
							Dieldrin	0.160		
							HE	ND		
	45°08′ 64°28′	1970	2	Bm	-	-	Hg	0.08 ± 0.014	0.07-0.09	
	45°45′ 64°17′	1970	1	Bm	-	-	Hg	0.200		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%FAT	RESIDUE	MEAN (PPM)	RANGE	REMARKS
American Black Duck (cont'd)	Nova Scotia (cont'd)									
	44°00' 65°00'	1970	2	Wm	71.25	-	Hg	0.065 ± 0.021	0.050-0.080	
	New Brunswick									
	46°00' 62°20'	1969	1	E	63.3	16.0	DDE	0.488		
							Dieldrin	0.025		
							HE	0.002		
	45°53' 66°25'	1970	2	Bm	-	-	Hg	0.310 ± 0.010	0.30-0.32	
	47°40' 65°25'	1970	3	Bm	-	-	Hg	0.150 ± 0.160	0.01-0.32	
	47°40' 65°25'	1970	1	Bm	72.4	3.2	DDE	0.1230		
							Dieldrin	0.0030		
							Hg	ND		
	45°10' 67°18'	1970	1	Bm	74.4	0.8	DDE	0.0120		
							Dieldrin	ND		
							HE	ND		
							Hg	0.110		
							Mirex	ND		
	47°20' 64°55'	1970	2	Bm	-	-	Hg	0.085 ± 0.007	0.080-0.090	
	47°27' 64°56'	1970	1	BM	-	-	Hg	0.010		
	45°54' 64°22'	1970	1	Bm	-	-	Hg	0.090		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%FAT	RESIDUE	MEAN (PPM)	RANGE	REMARKS
American Black Duck (cont'd)	New Brunswick (cont'd)									
	47°40' 65°20'	1970	1	Bm	72.8	1.6	Mirex	ND		
							DDE	0.200		
							Dieldrin	ND		
							HE	ND		
	45°30' 66°30'	1970	3	Wm	73.2	-	Hg	0.130 ± 0.006	0.120-0.130	
	45°16' 66°03'	1975	2	Wm	-	-	Hg	0.055 ± 0.007	0.050-0.060	
	45°58' 66°35'	1975	2	Wm	-	-	Hg	0.075 ± 0.035	0.05-0.10	
	45°32' 65°51'	1975	2	Wm	-	-	Hg	0.035 ± 0.007	0.03-0.04	
	45°31' 66°05'	1975	1	Wm	-	-	Hg	0.030		
	45°50' 66°07'	1975	1	Wm	-	-	Hg	0.030		
	45°22' 66°14'	1975	1	Wm	-	-	Hg	0.110		
	45°47' 66°15'	1975	1	Wm	-	-	Hg	0.070		
	45°51' 66°29'	1975	1	Wm	-	-	Hg	0.040		
	46°00' 66°13'	1975	1	Wm	-	-	Hg	0.040		
	45°41' 66°07'	1975	1	Wm	-	-	Hg	0.040		
	45°32' 65°51'	1975	1	Wm	-	-	Hg	0.040		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%FAT	RESIDUE	MEAN (PPM)	RANGE	REMARKS
American Black Duck (cont'd)	New Brunswick (cont'd)									
	45°41' 66°07'	1975	2	Wm	71.0	2.6	DDE	0.010		
							Dieldrin	0.005		
							HE	0.005		
							HCB	0.001		
							DCB	0.06 ± 0.01	0.050-0.070	
							Oxychlordane	0.003 ± 0.003	ND-0.005	
							Mirex	0.001		
	Quebec									
	58°32' 68°10'	1967	1	Bm	56.3	1.0	DDE	0.168		
							Dieldrin	0.015		
							HE	ND		
	48°00' 69°21'	1968	5	E	66.34	14.2	DDE	0.870 ± 1.200	0.2930-3.01	
							Dieldrin	0.130 ± 0.240	ND-0.533	
							HE	ND		
	48°06' 69°19'	1968	4	E	65.9	20.35	DDE	1.53 ± 0.71	0.720-2.390	
							Dieldrin	0.040 ± 0.020	0.017-0.064	
							HE	ND	-	
	45°20' 73°51'	1968	3	E	69.9	13.6	DDE	4.180 ± 4.100	0.771-8.750	
							Dieldrin	0.060 ± 0.050	0.037-0.119	
							HE	ND	-	

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%FAT	RESIDUE	MEAN (PPM)	RANGE	REMARKS
American Black Duck (cont'd)	Quebec (cont'd)									
	45°36' 75°15'	1968	5	L	67.0	-	Hg	0.441 ± 0.020	0.021-0.771	
	45°12' 74°20'	1970	3	Bm	-	-	Hg	0.140 ± 0.020	0.120-0.160	
	45°26' 73°48'	1970	3	Bm	-	-	Hg	0.310 ± 0.100	0.240-0.430	
	45°35' 75°10'	1970	3	Bm	-	-	Hg	0.150 ± 0.070	0.070-0.220	
	45°12' 74°20'	1970	3	Wm	-	-	Hg	0.170 ± 0.030	0.140-0.200	
	45°26' 73°48'	1970	3	Wm	-	-	Hg	0.320 ± 0.014	0.200-0.480	
	45°35' 75°10'	1970	3	Wm	-	-	Hg	0.150 ± 0.050	0.090-0.180	
	48°00' 66°00'	1970		Wm	73.3	-	Hg	0.09		
	46°30' 72°00'	1970	3	Wm	74.3	-	Hg	0.17 ± 0.03	0.14-0.19	
	45°30' 73°30'	1970	3	Wm	75.3	-	Hg	0.18 ± 0.07	0.10-0.23	
	45°45' 74°30'	1970	2	Wm	74.9	-	Hg	0.08 ± 0.07	0.03-0.13	
	49°53' 77°30'	1971	1	Bm	-	-	Hg	0.11		
	49°47' 76°48'	1971	2	Bm	-	-	Hg	0.11 ± 0.056	0.07-0.15	
	49°01' 77°05'	1971	2	Bm	-	-	Hg	0.55 ± 0.71	0.05-1.05	

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%FAT	RESIDUE	MEAN (PPM)	RANGE	REMARKS
American Black Duck (cont'd)	Quebec (cont'd)									
	49°34' 76°29'	1971	1	Bm	-	-	Hg	1.00		
	48°38' 77°03	1971	1	Bm	-	-	Hg	0.20		
	50°14' 77°00'	1976	1	Bm	70.5	-	Hg	0.180		
	49°50' 77°30'	1976	1	Wm	72.5	-	Hg	0.180		
	46°24' 72°17'	1976	1	Wm	72.9	0.8	DDE	ND		
							Dieldrin	ND		
							HE	ND		
							HCB	ND		
							PCB	ND		
							Oxychlordane	ND		
							Mirex	ND		
	undetermined	1976	3	Wm	71.0	1.1	DDE	0.01	-	
							Dieldrin	0.002 ± 0.003	ND-0.005	
							HE	0.004 ± 0.003	ND-0.005	
							HCB	ND	-	
							PCB	ND	-	
							Oxychlordane	ND	-	
							Mirex	ND	-	

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%FAT	RESIDUE	MEAN (PPM)	RANGE	REMARKS
American Black Duck (cont'd)	Quebec (cont'd)									
	Grandes Bergeronnes	March 1988	1*	L	71.9	4.0	1245-TeCB	0.002		*Pool of 9
							1234-TeCB	ND		
							QCB	0.0007		
							HCB	0.008		
							OCS	0.002		
							Trans-nonachlor	0.006		
							DDE	0.021		
							Photomirex	0.001		
							Mirex	0.001		**Aroclor 1254:1260, 1:1
							α-HCH	ND		
							β-HCH	ND		
							γ-HCH	ND		
							Oxychlordane	0.015		
							Trans-chlordane	ND		
							Cis-chlordane	ND		
							Cis-nonachlor	ND		
							HE	0.01		
							Dieldrin	0.016		
							PCB**	0.17		
				Bm	69.5	3.3	1245-TeCB	0.002		
							1234-TeCB	ND		
							QCB	ND		
							HCB	0.005		
							OCS	ND		
							Trans-nonachlor	0.0014		
							DDE	0.015		
							Mirex	0.0006		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%FAT	RESIDUE	MEAN (PPM)	RANGE	REMARKS
American Black Duck (cont'd)	Quebec (cont'd)									
		March 1988		Bm			-HCH	ND		
							-HCH	ND		
							-HCH	ND		
							Oxychlordane	0.003		
							Trans-chlordane	ND		
							Cis-chlordane	ND		
							Cis-nonachlor	ND		
							HE	0.001		
							Dieldrin	0.002		
							PCB**	0.10		
	Ontario									
	42°20' 82°27'	1970		Bm	-	-	Hg	0.02		
	42°20' 82°27'	1970		Bm	73.4	2.0	DDE	0.139		
							Dieldrin	0.075		
							HE	ND		
							HCB	ND		
							PCB	ND		
							Oxychlordane	ND		
							Mirex	ND		
							Hg	0.01		
	48°45' 89°00'	1970	2	Wm	69.7	-	Hg	0.15 ± 0.05	0.11-0.18	
	42°30' 82°00'	1970	3	Wm	72.2	-	Hg	0.09 ± 0.03	0.06-0.12	

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%FAT	RESIDUE	MEAN (PPM)	RANGE	REMARKS
American Black Duck (cont'd)	Ontario (cont'd)									
	44°30' 76°00'	1970	1	Wm	73.2	-	Hg	0.06		
	44°15' 77°00'	1970	1	Wm	74.5	-	Hg	0.13		
	45°00' 75°00'	1970	2	Wm	69.6	-	Hg	0.08 ± 0.03	0.06-0.10	
	46°00' 78°00'	1970	1	Wm	67.6	-	Hg	0.23		
	45°15' 76°30'	1970	3	Wm	69.6	-	Hg	0.14 ± 0.06	0.07-0.20	
	46°00' 78°00'	1970	3	Wm	71.2	-	Hg	0.27 ± 0.06	0.20-0.30	
	49°55' 94°40'	1971	1	-	-	-	Hg	0.13		
	Ranger Lakes	1984	2	L	-	-	Cd	0.25 ± 0.07	0.2-0.3	
							Pb	0.47 ± 0.52	0.1-0.84	
							Hg	0.224 ± 0.030	0.204-0.244	
	Ranger Lakes	1985	10	L	-	-	Cd	0.25 ± 0.07	0.2-0.3	
							Pb	0.077 ± 0.050	0.020-0.170	
							Hg	0.27 ± 0.17	0.11-0.56	
	Wanapitei Lakes	1985	12	L	-	-	Cd	0.025 ± 0.039	0.05-0.14	
							Pb	0.12 ± 0.19	0.02-0.66	
							Hg	0.22 ± 0.25	0.03-0.97	

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%FAT	RESIDUE	MEAN (PPM)	RANGE	REMARKS
Gadwall (*Anas strepera*)	Ontario									
	Windermere Basin	Aug. 1986	1*	L	74.3	3.12	HCB	ND		* Pool of 5
							DDE	0.045		** Aroclor
							Photomirex	ND		1254:1260,
							Mirex	0.003		1:1
							PCB**	1.46		
							BHC	ND		
							Oxychlordane	0.009		
							Cis-chlordane	0.002		
							Trans-nonachlor	0.003		
							Cis-nonachlor	0.001		
							DDD	0.002		
							DDT	ND		
							HE	0.007		
							Dieldrin	0.021		
				Bm	73.7	1.61	HCB	ND		
							DDE	0.017		
							Photomirex	ND		
							Mirex	ND		
							PCB**	0.514		
							BHC	ND		
							Oxychlordane	0.001		
							Cis-chlordane	ND		
							Trans-nonachlor	ND		
							Cis-nonachlor	ND		
							DDD	ND		
							DDT	ND		
							HE	ND		
							Dieldrin	0.002		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%FAT	RESIDUE	MEAN (PPM)	RANGE	REMARKS
Gadwall (cont'd)	Ontario (cont'd)									
			4	Bm	-	-	Hg	0.02	0.005-0.02	
							Pb	0.10	0.015-0.17	
							Cd	0.005	0.003-0.008	

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%FAT	RESIDUE	MEAN (PPM)	RANGE	REMARKS
Wood Duck (*Aix sponsa*)	New Brunswick									
	46°23′ 66°05′	1967	1	Br	78.8	6.8	DDE	0.817		
							Dieldrin	ND		
							HE	ND		
	45°10′ 67°18′	1970	1	Bm	-	-	Hg	0.165 ± 0.06	0.120-0.210	
	Quebec									
	45°36′ 75°15′	1968	3	L	67.7	-	Hg	0.160 ± 0.06	0.101-0.212	
	British Columbia									
	49°06′ 116°31′	1968	1	Br	80.9	6.3	DDE	0.094		
							Dieldrin	ND		
							HE	ND		
	49°00′ 116°31′	1968	1	Bm	71.9	1.7	DDE	0.023		
							Dieldrin	0.004		
							HE	ND		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%FAT	RESIDUE	MEAN (PPM)	RANGE	REMARKS
Greater Scaup (*Aythya marila*)	Ontario									
	Windermere Basin	March 1986	1*	L	71.8	7.53	HCB	0.043		* Pool of 7
							DDE	1.95		** Aroclor
							Photomirex	0.064		1254:1260,
							Mirex	0.518		1:1
							PCB**	70.9		
							BHC	0.005		
							Oxychlordane	0.080		
							Cis-chlordane	ND		
							Trans-nonachlor	0.015		
							Cis-nonachlor	ND		
							DDD	0.065		
							DDT	0.009		
							HE	0.039		
							Dieldrin	0.081		
							Hg	0.0025		
							Pb	1.7		
							Cd	2.7		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%FAT	RESIDUE	MEAN (PPM)	RANGE	REMARKS
Greater Scaup (cont'd)	Ontario (cont'd)			Bm	72.2	3.09	HCB	0.012		
							DDE	0.270		
							Photomirex	0.014		
							Mirex	0.076		
							PCB**	8.75		
							BHC	0.001		
							Oxychlordane	0.007		
							Cis-chlordane	ND		
							Trans-nonachlor	0.004		
							Cis-nonachlor	ND		
							DDD	0.012		
							DDT	0.001		
							HE	0.007		
							Dieldrin	0.006		
	Windermere Basin	March 1986	6	Bm	-	-	Hg	0.02	0.005-0.06	
							Pb	0.07	0.015-0.14	
							Cd	0.109	0.003-0.125	
	PE County	Fall 1986	1*	Bm			Hg	0.06		*Pool of 6 (juvenile males)
							Pb	0.06		
							Cd	0.036		
			1*	Bm			Hg	0.12		*Pool of 6 (juvenile females)
							Pb	3.58		
							Cd	0.018		
			1*	Bm			Hg	0.14		*Pool of 10 (adult males)
							Pb	0.015		
							Cd	0.027		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%FAT	RESIDUE	MEAN (PPM)	RANGE	REMARKS
Greater Scaup (cont'd)	Ontario (cont'd)		1*	Bm			Hg	0.16		*Pool of 10 (adult females)
							Pb	5.44		
							Cd	0.019		
	Nut Island	Oct 1987	4	Bm			Hg	0.07	0.03-0.12	adults
							Pb	0.23	0.06-0.39	
							Cd	0.031	0.012-0.054	
		Nov. 1987	4	Bm			Hg	0.22	0.07-0.55	adults
							Pb	6.32	0.03-24.9	
							Cd	0.037	0.009-0.063	

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%FAT	RESIDUE	MEAN (PPM)	RANGE	REMARKS
Lesser Scaup (*Aythya affinis*)	Ontario									
	Windermere Basin	March 1986	1*	L	68.2	8.57	HCB	0.014		* Pool of 4
							DDE	0.155		** Aroclor
							Photomirex	ND		1254:1260,
							Mirex	0.006		1:1
							PCB**	19.0		
							BHC	ND		
							Oxychlordane	0.012		
							Cis-chlordane	ND		
							Trans-nonachlor	0.002		
							Cis-nonachlor	ND		
							DDD	0.030		
							DDT	0.002		
							HE	0.015		
							Dieldrin	0.060		
							Hg	0.025		
							Pb	1.3		
							Cd	0.78		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%FAT	RESIDUE	MEAN (PPM)	RANGE	REMARKS
Lesser Scaup (cont'd)	Ontario (cont'd)			Bm	68.2	4.36	HCB	0.011		
							DDE	0.134		
							Photomirex	ND		
							Mirex	0.006		
							PCB**	9.75		
							BHC	ND		
							Oxychlordane	0.003		
							Cis-chlordane	ND		
							Trans-nonachlor	0.001		
							Cis-nonachlor	ND		
							DDD	0.025		
							DDT	0.006		
							HE	0.003		
							Dieldrin	0.011		
	Windermere Basin	March 1986	4	Bm	-	-	Hg	0.009	0.005-0.01	
							Pb	0.23	0.09-0.47	
							Cd	0.010	0.003-0.018	
	PE County	Fall 1986	1*	Bm	-	-	Hg	0.17		*Pool of 10 (adult males)
							Pb	0.18		
							Cd	0.020		
			1*	Bm	-	-	Hg	0.15		*Pool of 10 (adult females)
							Pb	0.03		
							Cd	0.010		
			1*	Bm	-	-	Hg	0.14		*Pool of 10 (juvenile females)
							Pb	0.03		
							Cd	0.017		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%FAT	RESIDUE	MEAN (PPM)	RANGE	REMARKS
Lesser Scaup (cont'd)	Ontario (cont'd)		1*	Bm	-	-	Hg	0.12		*Pool of 7 (juvenile males)
							Pb	0.015		
							Cd	0.011		
	Nut Island	Oct. 1987	1	Bm	-	-	Hg	0.07		adult male
							Pb	0.73		
							Cd	0.003		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%FAT	RESIDUE	MEAN (PPM)	RANGE	REMARKS
Ring-necked Duck (*Aythya collaris*)	Ontario									
	Wanapitei Lakes	1984	8	L	-	-	Cd	0.11 ± 0.12	0.05-0.40	
							Pb	0.13 ± 0.07	0.05-0.22	
							Hg	0.25 ± 0.14	0.13-0.57	
		1985	11	L	-	-	Cd	0.07 ± 0.09	0.003-0.32	
							Pb	0.34 ± 0.66	0.05-2.06	
							Hg	0.25 ± 0.23	0.075-0.36	
	Ranger Lakes	1984	7	L	-	-	Cd	0.42 ± 0.03	0.05-0.20	
							Pb	0.19 ± 0.18	0.020-0.49	
							Hg	0.48 ± 0.20	0.214-0.69	
		1985	3	L	-	-	Cd	0.12 ± 0.07	0.05-0.19	
							Pb	0.09 ± 0.02	0.09-0.130	
							Hg	0.33 ± 0.12	0.26-0.27	

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%FAT	RESIDUE	MEAN (PPM)	RANGE	REMARKS
Common Goldeneye (*Bucephala clangula*)	Newfoundland									
	49°15′ 58°00′	1970	1	Wm	71.5	-	Hg	0.25		
	48°56′ 55°40′	1976	2	Wm	68.5	1.2	DDE	0.017 ± 0.018	ND-0.03	
							Dieldrin	0.003 ± 0.003	ND-0.005	
							HE	0.05	-	
							HCB	0.005	-	
							PCB	0.28 ± 0.04	ND-0.55	
							Oxychlordane	ND	-	
							Mirex	ND	-	
	Nova Scotia									
	44°00′ 65°03′	1970	2	Wm	69.8	-	Hg	0.195 ± 0.007	0.19-0.20	
	New Brunswick									
	46°23′ 66°05′	1967	1	Br	77.9	7.5	DDE	0.567		
							Dieldrin	ND		
							HE	ND		
	45°10′ 67°18′	1970	1	Bm	-	-	Hg	0.45		
	45°52′ 68°29′	1970	1	Bm	-	-	Hg	0.83		
	45°30′ 66°30′	1970	1	Wm	71.5	-	Hg	0.25 ± 0.07	0.2-0.3	
	45°58′ 66°30′	1975	2	Wm	-	-	Hg	0.30 ± 0.07	0.25-0.35	
	45°16′ 66°03′	1975	1	Wm	-	-	Hg	0.19		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%FAT	RESIDUE	MEAN (PPM)	RANGE	REMARKS
Common Goldeneye (cont'd)	New Brunswick (cont'd)									
	45°41' 66°07'	1976	2	Wm	64.8	2.5	DDE	0.07 ± 0.04	0.01-0.04	
							Dieldrin	0.003 ± 0.003	ND-0.005	
							HE	0.005		
							HCB	ND		
							PCB	ND		
							Oxychlordane	0.003 ± 0.003	ND-0.005	
							Mirex	0.005		
	Quebec									
	45°30' 75°15'	1968	1	L	70.0	-	Hg	0.63		
	46°30' 72°00'	1970	2	Wm	73.4	-	Hg	0.28 ± 0.18	0.15-0.41	
	45°00' 73°00'	1970	2	Wm	74.0	-	Hg	0.19 ± 0.05	0.15-0.22	
	49°53' 77°30'	1971	1	Bm	-	-	Hg	0.30	-	
	49°01' 77°05'	1971	2	Bm	-	-	Hg	2.54 ± 0.57	2.13-2.94	
	50°55' 77°00'	1971	2	Bm	-	-	Hg	0.29 ± 0.23	0.12-0.45	
	49°34' 76°29'	1971	3	Bm	-	-	Hg	0.17 ± 0.04	0.13-0.21	
	48°38' 77°03'	1971	7	Bm	-	-	Hg	0.09 ± 0.03	0.06-0.13	
	51°00' 73°37'	1971	1	Bm	-	-	Hg	0.59		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%FAT	RESIDUE	MEAN (PPM)	RANGE	REMARKS
Common Goldeneye (cont'd)	Quebec (cont'd)									
	46°24' 72°19'	1976	1	Wm	70.0	2.4	DDE	0.02		
							Dieldrin	0.01		
							HE	0.01		
							HCB	0.005		
							PCB	ND		
							Oxychlordane	0.01		
							Mirex	ND		
	Baie de Bondesir and Baie de Rochers	March 1988	1*	L	69.3	3.5	1245-TeCB	0.002		*Pool of 5
							1234-TeCB	ND		
							QCB	0.0009		
							HCB	0.009		
							OCS	0.002		
							Trans-nonachlor	0.005		
							DDE	0.026		
							Photomirex	0.001		**Aroclor 1254:1260, 1:1
							Mirex	0.001		
							α-HCH	ND		
							β-HCH	0.0007		
							γ-HCH	ND		
							Oxychlordane	0.011		
							Trans-chlordane	ND		
							Cis-chlordane	ND		
							Cis-nonachlor	0.0008		
							HE	0.008		
							Dieldrin	0.015		
							PCB**	0.29		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%FAT	RESIDUE	MEAN (PPM)	RANGE	REMARKS
Common Goldeneye (cont'd)	Quebec (cont'd)									
		March 1988		Bm	68.3	4.9	1245-TeCB	0.001		
							1234-TeCB	ND		
							QCB	0.002		
							HCB	0.017		
							OCS	0.0007		
							Trans-nonachlor	0.007		
							DDE	0.052		
							Photomirex	0.002		
							Mirex	0.003		
							α-HCH	0.001		
							β-HCH	0.001		
							γ-HCH	ND		
							Oxychlordane	0.009		
							Trans-chlordane	ND		
							Cis-chlordane	ND		
							Cis-nonachlor	0.002		
							HE	0.005		
							Dieldrin	0.009		
							PCB**	0.48		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%FAT	RESIDUE	MEAN (PPM)	RANGE	REMARKS
Common Goldeneye (cont'd)	Ontario									
	50°18' 94°00'	1970	1	L	-	-	Hg	28.3		
	50°40' 94°25'	1971	5	L	-	-	Hg	1.51 ± 1.92	0.22-4.87	
	50°22' 93°50'	1971	6	L	-	-	Hg	1.24 ± 1.91	0.19-5.10	
	49°45' 92°44'	1971	6	L	-	-	Hg	1.50 ± 2.11	0.20-5.64	
	50°03' 93°30'	1971	6	L	-	-	Hg	18.3 ± 12.1	1.8-31.0	
	50°18' 94°00'	1971	6	L	-	-	Hg	3.17 ± 3.1	0.35-8.86	
	50°10' 94°10'	1971	1	Bm	-	-	Hg	1.36		
	50°15' 94°05'	1971	3	Bm	-	-	Hg	0.47 ± 0.08	0.39-0.55	
	50°03' 90°30'	1971	3	Bm	-	-	Hg	2.91 ± 3.8	0.23-7.31	
	50°11' 95°00'	1971	3	Bm	-	-	Hg	0.16 ± 0.09	0.07-0.24	
	49°53' 93°17'	1971	1	Bm	-	-	Hg	3.42		
	50°40' 94°25'	1971	2	Bm	-	-	Hg	0.595 ± 0.52	0.23-0.96	
	50°22' 93°50'	1971	4	Bm	-	-	Hg	1.51 ± 0.29	0.15-0.80	
	49°45' 92°44'	1971	4	Bm	-	-	Hg	0.37 ± 0.13	0.20-0.48	

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%FAT	RESIDUE	MEAN (PPM)	RANGE	REMARKS
Common Goldeneye (cont'd)	Ontario (cont'd)									
	50°03' 93°30'	1971	4	Bm	-	-	Hg	9.23 ± 6.4	3.20-15.3	
	50°18' 94°00'	1971	2	Bm	-	-	Hg	2.37 ± 1.66	1.19-3.55	
	94°02' 50°15'	1972	1	Bm	-	-	Hg	0.48		
	94°03' 50°16'	1972	3	Bm	-	-	Hg	0.6 ± 0.3	0.28-0.89	
	93°52' 50°16'	1972	2	Bm	-	-	Hg	1.64 ± 0.16	1.52-1.75	
	93°02' 50°14'	1972	1	Bm	-	-	Hg	0.74		
	94°24' 50°13'	1972	1	Bm	-	-	Hg	0.73		
	94°27' 50°18'	1972	1	Bm	-	-	Hg	0.40		
	94°25' 50°17'	1972	1	Bm	-	-	Hg	0.56		
	44°20' 76°10'	1976	1	Wm	70.5	1.9	DDE	0.01		
							Dieldrin	0.01		
							HE	0.005		
							HCB	0.005		
							PCB	ND		
							Oxychlordane	0.005		
							Mirex	0.005		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%FAT	RESIDUE	MEAN (PPM)	RANGE	REMARKS
Common Goldeneye (cont'd)	Ontario (cont'd)									
	43°15' 79°04'	1976	1	Wm	63.6	2.7	DDE	0.02		
							Dieldrin	0.01		
							HE	0.005		
							HCB	0.005		
							PCB	ND		
							Oxychlordane	0.005		
							Mirex	ND		
	45°15' 80°45'	1976	1	Wm	71.3	2.0	DDE	0.005		
							Dieldrin	0.005		
							HE	0.005		
							HCB	0.005		
							PCB	ND		
							Oxychlordane	0.005		
							Mirex	ND		
	40°30' 81°00'	1976	1	Wm	71.1	2.4	DDE	0.005		
							Dieldrin	0.005		
							HE	0.005		
							HCB	ND		
							PCB	ND		
							Oxychlordane	0.005		
							Mirex	ND		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%FAT	RESIDUE	MEAN (PPM)	RANGE	REMARKS
Common Goldeneye (cont'd)	Ontario (cont'd)									
	46°31' 84°20'	1976	1	Wm	71.1	1.5	DDE	0.005		
							Dieldrin	0.005		
							HE	0.01		
							HCB	ND		
							PCB	ND		
							Oxychlordane	0.005		
							Mirex	ND		
	48°28' 81°20'	1976	1	Wm	67.1	0.8	DDE	ND		
							Dieldrin	0.005		
							HE	0.01		
							HCB	ND		
							Oxychlordane	0.005		
							Mirex	ND		
	48°25' 89°00'	1976	1	Wm	57.5	2.3	DDE	0.01		
							Dieldrin	0.01		
							HE	0.005		
							HCB	ND		
							PCB	ND		
							Oxychlordane	0.005		
							Mirex	ND		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%FAT	RESIDUE	MEAN (PPM)	RANGE	REMARKS
Common Goldeneye (cont'd)	Ontario (cont'd)									
	50°38' 93°17'	1976	1	Wm	66,9	2.0	DDE	0.02		
							Dieldrin	0.005		
							HE	0.01		
							HCB	ND		
							PCB	0.22		
							Oxychlordane	0.005		
							Mirex	ND		
	Ranger Lakes	1984	13	L	-	-	Cd	0.39 ± 0.30	0.0-1.0	
							Pb	0.74 ± 1.80	0.05-6.72	
							Hg	0.41 ± 0.26	0.184-0.9292	
		1985	5	L	-	-	Cd	0.37 ± 0.32	0.43-0.25	
							Pb	0.19 ± 0.19	0.024-0.439	
							Hg	0.52 ± 0.2	0.269-0.772	
	Wanapitei Lakes	1984	4	L	-	-	Cd	0.075 ± 0.096	0.0-0.2	
							Pb	0.14 ± 0.10	0.06-0.29	
							Hg	0.28 ± 0.09	0.17-0.33	
		1985	4	L	-	-	Cd	0.07 ± 0.02	0.06-0.09	
							Pb	0.19 ± 0.02	0.046-0.489	
							Hg	0.25 ± 0.04	0.21-0.30	

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%FAT	RESIDUE	MEAN (PPM)	RANGE	REMARKS
Common Goldeneye (cont'd)	Ontario (cont'd)									
	St. Clair River	Dec 1985	1*	L	70.0	4.4	Hg	1.4		* Pool of 9
							Pb	1.2		
							Cd	1.0		
		Feb 1986	6	Bm	-	-	Hg	0.67	0.14-2.25	adult males
							Pb	6.4	0.06-27.9	
							Cd	0.063	0.014-0.104	
			1*	Bm	-	-	Hg	0.42		* Pool of 4
							Pb	4.24		
							Cd	0.019		
			1*	L	70.2	4.5	Hg	0.81		*Pool of 10
							Pb	1.6		
							Cd	0.91		
	Amherst Island	Dec. 1987	3	Bm	-	-	Hg	0.30	0.15-0.42	
							Pb	0.07	0.03-0.12	
							Cd	0.042	0.011-0.068	
	Niagara River	Feb. 1988	1	Bm	-	-	Hg	0.46		Adult male
							Pb	0.15		
							Cd	0.023		
	Manitoba	1971	10	Bm	-	-	Hg	7.45 ± 5.3	0.58-14.7	

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%FAT	RESIDUE	MEAN (PPM)	RANGE	REMARKS
Barrow's Goldeneye (*Bucephals islandica*)	Quebec Baie de Rochers	March 1988	1*	L	70.1	3.5	1245-TeCB	0.009		*Pool of 4
							1234-TeCB	ND		
							QCB	0.0005		
							HCB	0.008		
							OCS	0.002		
							Trans-nonachlor	0.001		
							DDE	0.021		
							Photomirex	0.0007		
							Mirex	0.0007		**Aroclor 1254:1260, 1:1
							α-HCH	ND		
							β-HCH	0.0006		
							γ-HCH	ND		
							Oxychlordane	0.009		
							Trans-chlordane	ND		
							Cis-chlordane	ND		
							HE	0.006		
							Dieldrin	0.010		
							PCB**	0.21		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%FAT	RESIDUE	MEAN (PPM)	RANGE	REMARKS
Barrow's Goldeneye (cont'd)	Quebec (cont'd)									
				Bm	69.7	2.4	1245-TeCB	0.010		
							1234-TeCB	ND		
							QCB	ND		
							HCB	0.007		
							OCS	ND		
							Trans-nonachlor	0.0009		
							DDE	0.017		
							Photomirex	ND		
							Mirex	0.0006		
							α-HCH	ND		
							β-HCH	ND		
							γ-HCH	ND		
							Oxychlordane	0.003		
							Trans-chlordane	ND		
							Cis-chlordane	ND		
							Cis-nonachlor	ND		
							HE	0.001		
							Dieldrin	0.004		
							PCB**	0.13		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%FAT	RESIDUE	MEAN (PPM)	RANGE	REMARKS
Bufflehead (Bucephala albeola)	Ontario									
	Windermere Basin	March 1986	1*	L	72.4	4.85	HCB	0.176		* Pool of 2
							DDE	5.41		** Aroclor
							Photomirex	ND		1254:1260,
							Mirex	0.175		1:1
							PCB**	395.7		
							BHC	0.034		
							Oxychlordane	0.308		
							Cis-chlordane	0.003		
							Trans-nonachlor	0.088		
							Cis-nonachlor	ND		
							DDD	0.581		
							DDT	0.058		
							HE	0.079		
							Dieldrin	0.190		
							Hg	0.093		
							Pb	0.92		
							Cd	0.42		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%FAT	RESIDUE	MEAN (PPM)	RANGE	REMARKS
Bufflehead (cont'd)	Ontario (cont'd)		1*	M	74.6	1.12	HCB	0.029		
							DDE	1.56		
							Photomirex	0.043		
							Mirex	0.129		
							PCB**	44.4		
							BHC	ND		
							Oxychlordane	0.052		
							Cis-chlordane	ND		
							Trans-nonachlor	0.007		
							Cis-nonachlor	ND		
							DDD	0.110		
							DDT	ND		
							HE	0.012		
							Dieldrin	0.025		
	Windermere Basin	March 1986	2	M	-	-	Hg	0.15	0.02-0.28	
							Pb	0.12	0.05-0.18	
							Cd	0.14	0.13-0.14	

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%FAT	RESIDUE	MEAN (PPM)	RANGE	REMARKS
Oldsquaw (*Clangula hyemalis*)	Quebec									
	50°30′ 74°00′	1976	1	Wm	69.4	-	Hg	0.15		
	Les Escoumins	Feb 1988	1	L	67.3	5.2	1245-TeCB	0.001		*Pool of 10
							1234-TeCB	0.001		
							QCB	0.005		
							HCB	0.065		
							OCS	0.009		
							Trans-nonachlor	0.031		
							DDE	0.40		
							Photomirex	0.008		
							Mirex	0.009		**Aroclor 1254:1260, 1:1
							α-HCH	0.064		
							β-HCH	0.003		
							γ-HCH	ND		
							Oxychlordane	0.048		
							Trans-chlordane	ND		
							Cis-chlordane	0.002		
							Cis-nonachlor	0.007		
							HE	0.03		
							Dieldrin	0.058		
							PCB**	1.89		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%FAT	RESIDUE	MEAN (PPM)	RANGE	REMARKS
Oldsquaw	Quebec									
(cont'd)	(cont'd)			Bm	68.4	3.3	1245-TeCB	0.0008		
							1234-TeCB	0.0006		
							QCB	0.003		
							HCB	0.032		
							OCS	0.006		
							Trans-nonachlor	0.014		
							DDE	0.19		
							Photomirex	0.004		
							Mirex	0.005		
	Les Escoumins			Bm			α-HCH	0.025		
							β-HCH	0.001		
							γ-HCH	ND		
							Oxychlordane	0.017		
							Trans-chlordane	ND		
							Cis-chlordane	0.001		
							Cis-nonachlor	0.004		
							HE	0.009		
							Dieldrin	0.019		
							PCB**	0.92		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%FAT	RESIDUE	MEAN (PPM)	RANGE	REMARKS
Oldsquaw (cont'd)	Ontario									
	PE County	Fall 1986	1*	Bm	-	-	Hg	0.14		*Pool of 7 (adult males)
							Pb	0.12		
							Cd	0.080		
			1*	Bm	-	-	Hg	0.14		*Pool of 2 (adult females)
							Pb	0.11		
							Cd	0.037		
			1*	Bm	-	-	Hg	0.14		*Pool of 5 (juvenile females)
							Pb	0.17		
							Cd	0.079		
	Niagara River	Feb. 1988	4	Bm	-	-	Hg	0.23	0.17-0.31	adults
							Pb	5.97	0.015-23.8	
							Cd	0.111	0.092-0.142	

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%FAT	RESIDUE	MEAN (PPM)	RANGE	REMARKS
Oldsquaw (cont'd)	British Columbia									
	49°02' 123°03'	1968	5	Br	74.1	5.9	DDE	0.15 ± 0.01	0.20-0.48	
							Dieldrin	0.002 ± 0.001	0.001-0.003	
							HE	ND	-	
			5	Br	68.2	2.2	DDE	0.041 ± 0.006	0.035-0.051	
							Dieldrin	0.003 ± 0.002	0.002-0.005	
							HE	ND	-	
	Northwest Territories									
	62°51' 92°11'	1971	2	L	-	-	Hg	1.37 ± 0.36	1.11-1.62	
	62°49' 92°11'	1971	4	L	-	-	Hg	1.09 ± 0.41	0.67-1.63	
	62°50' 92°11'	1971	4	L	-	-	Hg	1.63 ± 0.25	1.31-1.92	
	61°23' 93°44'	1971	7	L	-	-	Hg	1.67 ± 1.89	0.31-4.39	
	61°08' 93°56'	1971	1	L	-	-	Hg	0.76		
	62°50' 92°19'	1971	1	L	-	-	Hg	1.61		
	61°08' 93°56'	1971	1	L	-	-	Hg	0.84		
	62°49' 92°06'	1971	15	L	-	-	Hg	0.47 ± 0.38	0.18-1.27	
	62°51' 92°12'	1971	5	L	-	-	Hg	1.09 ± 0.46	0.60-1.69	

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%FAT	RESIDUE	MEAN (PPM)	RANGE	REMARKS
Oldsquaw (cont'd)	Northwest Territories (cont'd)									
	62°50' 92°19'	1971	5	L	-	-	Hg	1.19 ± 0.68	0.67-2.34	

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%FAT	RESIDUE	MEAN (PPM)	RANGE	REMARKS
Common Eider (*Somateria mollissima*)	Newfoundland									
	49°40′ 54°35′	1969	2	Bm	-	-	Hg	0.09 ± 0.02	0.07-1.00	
	54°20′ 58°00′	1970	1	Bm	-	-	Hg	0.05		
	New Brunswick									
	44°42′ 66°43′	1972	5	E	66.4	16.6	DDE	0.62 ± 0.22	0.36-0.96	
							Dieldrin	0.11 ± 0.01	0.01-0.04	
							HE	0.04 ± 0.008	ND-0.02	
							Hg	0.056 ± 0.021	0.04-0.09	
							HCB	0.022 ± 0.008	0.01-0.03	
	Quebec									
	58°48′ 69°40′	1967	1	Bm	69.4	0.3	DDE	0.016		
							Dieldrin	ND		
							HE	ND		
	50°13′ 64°00′	1972	6	E	67.3	17.8	DDE	0.51 ± 0.27	0.17-1.0	
							Dieldrin	0.18 ± 0.02	0.01-0.06	
							HE	0.008 ± 0.007	ND-0.02	
							Hg	0.1 ± 0.07	0.03-0.21	
							HCB	0.03 ± 0.03	0.005-0.1	

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%FAT	RESIDUE	MEAN (PPM)	RANGE	REMARKS
Common Eider (cont'd)	Quebec (cont'd)									
	50°16' 62°31'	1972	4	E	67.0	20.7	DDE	0.29 ± 0.04	0.25-0.33	
							Dieldrin	0.1	-	
							HE	0.01 ± 0.005	0.01-0.02	
							Hg	0.09 ± 0.03	0.05-0.12	
							HCB	0.02 ± 0.01	0.01-0.02	
	50°18' 59°38'	1972	10	E	66.2	21.4	DDE	0.31 ± 0.14	0.21-0.31	
							Dieldrin	0.09 ± 0.006	0.0-0.02	
							HE	0.009 ± 0.010	0.0-0.02	
							Hg	0.033 ± 0.02	ND-0.06	
							HCB	0.016 ± 0.007	0.01-0.03	

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%FAT	RESIDUE	MEAN (PPM)	RANGE	REMARKS
Hooded Merganser (*Lophodytes cucullatus*)	Quebec									
	49°50′ 77°30′	1976	1	Wm	77.4	-	Hg	0.34		
	Ontario									
	49°55′ 94°40′	1971	2	Bm	-	-	Hg	0.88 ± 0.14	0.78-0.98	
	Wanapitei Lakes	1984	3	L	-	-	Cd	0.15 ± 0.13	0.05-0.3	
							Pb	0.29 ± 0.11	0.22-0.42	
							Hg	0.45 ± 0.07	0.39-0.53	
	Ranger Lakes	1984	2	L	-	-	Cd	0.15 ± 0.07	0.1-0.2	
							Pb	0.34 ± 0.38	0.07-0.61	
							Hg	0.689 ± 0.340	0.449-0.929	
	Wanapitei Lakes	1985	5	L	-	-	Cd	0.084 ± 0.040	0.05-0.120	
							Pb	0.040 ± 0.008	0.031-0.050	
							Hg	0.34 ± 0.22	0.110-0.646	
	Ranger Lakes	1985	6	L	-	-	Cd	0.10 ± 0.06	0.05-0.19	
							Pb	0.067 ± 0.050	0.023-0.172	
							Hg	0.44 ± 0.24	ND-0.694	

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%FAT	RESIDUE	MEAN (PPM)	RANGE	REMARKS
Common Merganser (*Mergus merganser*)	Newfoundland									
	48°56′ 55°40′	1976	2	Wm	70.6	1 0	DDE	0.04	-	
							Dieldrin	0.05	-	
							HE	0.003 ± 0.003	ND-0.005	
							HB	0.005	-	
							PCB	0.24 ± 0.02	0.22-0.25	
							Oxychlordane	0.003 ± 0.003	ND-0.005	
							Mirex	ND	-	
	New Brunswick									
	45°59′ 66°48′	1970	1	Bm	-	-	Hg	4.0		
	48°04′ 66°20′	1982	12	L	-	-	Hg	4.39 ± 4.36	0.88-10.1	
							Ag	< 0.06	0.05-0.09	
							Al	< 0.6	0.1-3.0	
							Ba	< 0.06	0.04-0.11	
							Be	< 0.005	0.004-0.005	
							Ca	117.4 ± 44.5	71.6-204.0	
							Cd	< 0.2	< 0.1-0.3	
							Co	< 0.5	< 0.4-0.5	
							Cr	0.6 ± 0.3	0.4-1.4	
							Cu	8.12 ± 1.72	4.97-10.7	
							Fe	427 ± 156	147-739	
							K	2925 ± 173.3	2700-3220	
							Mg	248 ± 14	223-226	
							Mn	5.97 ± 0.81	4.6-7.3	
							Mo	< 2	-	
							Na	1094.2 ± 839	950-1310	
							Ni	< 0.5	< 0.4-0.5	

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%FAT	RESIDUE	MEAN (PPM)	RANGE	REMARKS
Common Merganser (cont'd)	New Brunswick (cont'd)									
	48°04' 66°20'						P	3309.2 ± 148.5	3180-3540	
	(cont'd)						Pb	< 0.5	-	
							Sr	0.164 ± 0.067	0.08-0.31	
							Th	<0.05	< 0.4-0.5	
							Ti	<0.06	0.4-0.17	
							V	<0.14 ± 0.067	0.08-0.18	
							Zn	33.5 ± 3.52	27.2-41.2	
							Zr	< 0.5	< 0.4-0.5	
	48°04' 66°20'	1982	12	K	-	-	Ag	< 0.05	-	
							Al	< 1.38	< 0.1-6.9	
							Ba	< 0.06	< 0.05-0.09	
							Be	< 0.005	-	
							Ca	203.6 ± 91.2	112-401	
							Cd	< 0.6	< 0.1-1.6	
							Co	< 0.5	-	
							Cr	0.575 ± 0.441	0.3-1.9	
							Cu	4.85 ± 1.09	3.43-6.72	
							Fe	194.5 ± 34.3	137-269	
							Hg	2.10 ± 1.55	340-4090	
							K	3080.1 ± 144.3	2810-3330	
							Mg	222.9 ± 130	206-253	
							Mn	2.66 ± 3.12	2.2-3.3	
							Mo	< 2	-	
							Na	1197 ± 344	1220-1390	
							Ni	< 0.6	< 0.5-0.8	
							P	3140 ± 100	2960-3350	
							Pb	< 22.5	< 0.5-245	
							Sr	0.22 ± 0.10	0.10-0.40	

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%FAT	RESIDUE	MEAN (PPM)	RANGE	REMARKS
Common Merganser (cont'd)	New Brunswick (cont'd)									
	48°04' 66°20' (cont'd)						Th	< 0.5	-	
							Ti	< 0.07	0.05-0.23	
							V	< 0.10	0.05-0.16	
							Zn	23.1 ± 2.3	20.1-27.3	
							Zr	< 0.5	-	
	Quebec									
	49°53' 77°30'	1971	1	Bm	-	-	Hg	0.45		
	49°47' 76°48'	1971	1	Bm	-	-	Hg	0.44		
	49°04' 76°57'	1971	2	Bm	-	-	Hg	1.3 ± 0.8	0.74-1.87	
	50°55' 77°00'	1971	1	Bm	-	-	Hg	0.400		
	49°34' 76°25'	1971	6	Bm	-	-	Hg	0.42 ± 0.19	0.35-0.79	
	51°00' 73°37'	1971	1	Bm	-	-	Hg	0.62		
	50°30' 74°00'	1976	1	Wm	74.1		Hg	2.6		
	Undetermined	1976	1	Wm	59.5	1.9	DDE	0.26		
							Dieldrin	0.01		
							HE	0.005		
							HCB	0.005		
							PCB	1.29		
							Oxychlordane	0.01		
							Mirex	0.001		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%FAT	RESIDUE	MEAN (PPM)	RANGE	REMARKS
Common Merganser (cont'd)	Ontario									
	50°40' 94°24'	1970	9	L	-	-	Hg	6.39 ± 5.93	0.31-18.80	
	50°03' 93°30'	1970	5	L	-	-	Hg	46.64 ± 24.46	17.8-72.3	
	50°18' 94°00'	1970	5	L	-	-	Hg	50.82 ± 22	30.8-86.5	
	50°40' 94°25'	1970	1	L	-	-	H	8.29		
	50°22' 93°50'	1970	5	L	-	-	Hg	3.00 ± 3.5	0.31-8.31	
	50°40' 94°25'	1970	3	Bm	-	-	Hg	1.66 ± 0.54	1.08-2.15	
	50°03' 93°30'	1970	4	Bm	-	-	Hg	16.26 ± 10.8	3.52-28.5	
	50°18' 94°00'	1970	4	Bm	-	-	Hg	12.1 ± 6.1	5.12-17.60	
	50°22' 93°50'	1970	5	Bm	-	-	Hg	0.54 ± 0.43	0.49-1.18	
	50°40' 94°25'	1971	9	L	-	-	Hg	6.65 ± 8.50	0.43-23.80	
	49°45' 92°24'	1971	6	L	-	-	Hg	3.31 ± 3.15	0.42-7.33	
	50°03' 93°30'	1971	2	L	-	-	Hg	10.05 ± 11.38	2.0-18.1	
	50°18' 94°00'	1971	4	L	-	-	Hg	1.66 ± 0.85	0.45-2.36	
	50°40' 94°25'	1971	4	Bm	-	-	Hg	2.03 ± 0.98	1.05-3.31	
	49°45' 92°44'	1971	3	Bm	-	-	Hg	1.17 ± 0.18	1.01-1.37	

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%FAT	RESIDUE	MEAN (PPM)	RANGE	REMARKS
Common Merganser (cont'd)	Ontario (cont'd)									
	50°03′ 93°30′	1971	1	Bm	-	-	Hg	2.20		
	94°04′ 50°16′	1972	2	Bm	-	-	Hg	2.78 ± 10.99	2.08-3.49	
	93°59′ 50°16′	1972	1	Bm	-	-	Hg	1.89		
	50°15′ 94°25′	1972	2	Bm	-	-	Hg	1.91 ± 1.09	1.14-2.68	
	50°16′ 90°55′	1972	1	Bm	-	-	Hg	0.64		
	45°54′ 80°58′	1975	1	E	65.4	17.1	DDE	13.8		
							Dieldrin	1.38		
							HE	0.41		
							HCB	0.100		
							PCB	34.000		
							Hg	0.2700		
	46°30′ 81°00′	1976	1	Wm	71.9	1.2	DDE	0.04		
							Dieldrin	ND		
							HE	ND		
							HCB	ND		
							PCB	0.260		
							Oxychlordane	0.005		
							Mirex	ND		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%FAT	RESIDUE	MEAN (PPM)	RANGE	REMARKS
Common Merganser (cont'd)	Ontario (cont'd)									
	46°31' 84°20'	1976	1	Wm	66.4	0.8	DDE	13.8		
							Dieldrin	0.005		
							HE	0.005		
							HCB	ND		
							PCB	1.00		
							Oxychlordane	0.01		
							Mirex	ND		
	St. Clair River	Dec. 1985	1*	L	69.6	3.2	QCB	0.11		*Pool of 21
							HCB	0.145		** Aroclor
							DDE	0.210		1254:1260,
							Mirex	ND		1:1
							PCB**	1.296		
							OCS	0.196		
							α-BHC	0.008		
							β-BHC	ND		
							γ-BHC	ND		
							Oxychlordane	0.018		
							Cis-chlordane	0.003		
							Trans-nonachlor	0.010		
							Cis-nonachlor	0.005		
							DDD	0.025		
							DDT	0.005		
							HE	0.022		
							Dieldrin	0.069		
							Hg	5.4		
							Pb	0.59		
							Cd	0.18		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%FAT	RESIDUE	MEAN (PPM)	RANGE	REMARKS
Common Merganser (cont'd)	Ontario (cont'd)									
		1986	1*	Bm	69.2	4.3	QCB	0.055		*Pool of 11
							HCB	0.178		** Aroclor
							DDE	0.398		1254:1260,
							Mirex	ND		1:1
							PCB**	2.855		
							OCS	0.167		
							α-BHC	0.011		
							β-BHC	0.001		
							γ-BHC	<0.001		
							Oxychlordane	0.022		
							Cis-chlordane	0.006		
							Trans-nonachlor	0.026		
							Cis-nonachlor	0.014		
							DDD	0.038		
							DDT	0.015		
							HE	0.016		
							Dieldrin	0.054		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%FAT	RESIDUE	MEAN (PPM)	RANGE	REMARKS
Common Merganser (cont'd)	Ontario (cont'd)									
	St. Clair River	Feb. 1986	*1	L	69.3	4.7	QCB	0.053		*Pool of 11
							HCB	0.190		** Aroclor
							DDE	0.307		1254:1260,
							Mirex	ND		1:1
							PCB**	2.135		
							OCS	0.381		
							α-BHC	0.010		
							β-BHC	0.001		
							γ-BHC	ND		
							Oxychlordane	0.025		
							Cis-chlordane	0.004		
							Trans-nonachlor	0.02		
							Cis-nonachlor	0.01		
							DDD	0.03		
							DDT	0.007		
							HE	0.027		
							Dieldrin	0.084		
							Hg	6.7		
							Pb	0.76		
							Cd	0.295		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%FAT	RESIDUE	MEAN (PPM)	RANGE	REMARKS
Common Merganser (cont'd)	Ontario (cont'd)									
	St. Clair River	Dec. 1985	1*	Bm	68.0	3.6	DDD	0.008		*Pool of 6
							DDE	0.050		**Aroclor
							DDT	0.002		1254:1260,
							Dieldrin	0.007		1:1
							HE	0.002		
							Mirex	ND		
							Photomirex	ND		
							PCB**	0.586		
							Oxychlordane	0.004		
							Cis-chlordane	0.002		
							Trans-nonachlor	0.002		
							Cis-nonachlor	0.002		
							OCS	0.083		
							1234-TeCB	0.014		
							QCB	0.072		
							HCB	0.276		
							α-BHC	ND		
			2	Bm	-	-	Hg	0.34	0.30-0.38	adult
							Pb	0.73	0.14-1.31	females
							Cd	0.006		
			1*	Bm	-	-	Hg	1.18		*Pool of 8
							Pb	0.39		(juveniles)
							Cd	0.006		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%FAT	RESIDUE	MEAN (PPM)	RANGE	REMARKS
Common Merganser (cont'd)	Ontario (cont'd)									
	St. Clair River	Dec. 1985	1*	L	72.4	4.3	DDD	0.007		*Pool of 6
							DDE	0.042		**Aroclor
							DDT	ND		1254:1260;
							Dieldrin	0.042		1:1
							HE	0.013		
							Mirex	ND		
							Photoirex	ND		
							PCB**	0.776		
							Oxychlordane	0.010		
							Cis-chlordane	0.004		
							Trans-nonachlor	0.012		
							Cis-nonachlor	0.002		
							OCS	0.493		
							1234-TeCB	0.021		
							QCB	0.097		
							HCB	0.311		
							α-BHC	ND		
							β-BHC	ND		
							Hg	0.065		
							Pb	1.6		
							Cd	0.29		
		Jan. 1986	7	Bm	-	-	Hg	0.97	0.48-1.41	adult
							Pb	0.23	0.03-0.53	females
							Cd	0.012	0.003-0.023	

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%FAT	RESIDUE	MEAN (PPM)	RANGE	REMARKS
Common Merganser (cont'd)	Ontario (cont'd)									
	St. Clair River	Feb. 1986	1*	Bm	68.4	3.8	DDD	0.001		*Pool of 6
							DDE	0.021		**Aroclor 1254:1260, 1:1
							DDT	0.001		
							Dieldrin	0.002		
							HE	0.001		
							Mirex	ND		
							Photomirex	ND		
							PCB**	0.112		
							Oxychlordane	0.002		
							Cis-chlordane	ND		
							Trans-nonachlor	0.001		
							Cis-nonachlor	ND		
							OCS	0.005		
							1234-TeCB	ND		
							QCB	0.003		
							HCB	0.010		
							α-BHC	ND		
							β-BHC	ND		
			1*	Bm	-	-	Hg	1.02		*Pool of 5
							Pb	4.09		
							Cd	0.010		
			6	Bm	-	-	Hg	1.08	0.67-1.51	adults
							Pb	0.06	0.03-0.13	
							Cd	0.011	0.006-0.022	

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%FAT	RESIDUE	MEAN (PPM)	RANGE	REMARKS
Common Merganser (cont'd)	Ontario (cont'd)									
	St. Clair River	Feb. 1986	1*	L	71.0	4.2	DDD	0.001		*Pool of 6
							DDE	0.018		**Aroclor
							DDT	0.001		1254:1260,
							Dieldrin	0.008		1:1
							HE	0.005		
							Mirex	0.147		
							Photomirex	ND		
							PCB**	0.147		
							Oxychlordane	0.005		
							Cis-chlordane	ND		
							Trans-nonachlor	0.001		
							Cis-nonachlor	ND		
							OCS	0.041		
							1234-TeCB	ND		
							QCB	0.003		
							HCB	0.011		
							α-BHC	ND		
							β-BHC	ND		
							Hg	0.036		
							Pb	1.6		
							Cd	0.45		
	Saskatchewan									
	54°20' 102°50'	1970	4	E	-	-	Hg	0.35 ± 0.22	0.11-0.61	
	Alberta									
	50°40' 112°05'	1969	1	L	68.0	-	Hg	1.93		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%FAT	RESIDUE	MEAN (PPM)	RANGE	REMARKS
Willow Ptarmigan (*Lagopus lagopus*)	Manitoba									
	58°46′ 93°12′	1967	5	Br	78.6	6.9	DDE	0.02 ± 0.01	0.018-0.031	
							Dieldrin	0.005 ± 0.004	0.002-0.012	
							HE	ND	-	
			5	M	73.3	2.2	DDE	0.012 ± 0.003	0.007-0.015	
							Dieldrin	0.001	-	
							HE	ND	-	
			1	F	94.0	3.9	DDE	0.093		
							Dieldrin	0.003		
							HE	ND		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%FAT	RESIDUE	MEAN (PPM)	RANGE	REMARKS
Sharp-tailed Grouse (*Tympanuchus phasianellus*)	*Manitoba*									
	Undetermined	1969	5	M	72.6	-	Hg	0.006 ± 0.003	0.004-0.01	
	Saskatchewan									
	49°30′ 103°55′	1968	1	L	71.0	-	Hg	0.037		
	50°40′ 104°30′	1968	1	L	69.0	-	Hg	0.099		
	50°15′ 107°05′	1968	2	L	73.5	-	Hg	0.06 ± 0.70	0.125-1.11	
	50°10′ 105°55′	1968	1	L	70.0	-	Hg	0.022		
	50°10′ 106°20′	1968	1	L	75.0	-	Hg	0.021		
	50°35′ 107°50′	1968	1	L	71.0	-	Hg	0.036		
			1	Br	79.0	8.9	DDE	0.003		
							Dieldrin	0.006		
							HE	ND		
	51°14′ 109°10′	1971	1	Wb	67.2	4.7	DDE	0.028		
							Dieldrin	ND		
							HE	ND		
							HCB	ND		
							Mirex	ND		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%FAT	RESIDUE	MEAN (PPM)	RANGE	REMARKS
Gray Partridge (*Perdix perdix*)	Nova Scotia									
	45°05′ 64°30′	1969	1	Bm	-	-	Hg	ND		
	45°08′ 64°30′	1970	1	Bm	-	-	Hg	0.09		
	45°07′ 64°22′	1970	1	Bm	66.8	13.2	DDE	7.36		
							Dieldrin	0.03		
							HE	0.06		
	Ontario									
	45°55′ 75°22′	1965	1	Br	80.0	6.5	DDE	ND		
							Dieldrin	ND		
							HE	ND		
	45°07′ 75°17′	1965	5	F	25.3	70.5	DDE	0.02 ± 0.02	0.005-0.042	
							Dieldrin	ND		
							HE	ND		
	45°11′ 75°07′	1965	3	F	24.7	71.6	DDE	0.01 ± 0.005	0.005-0.014	
							Dieldrin	ND		
							HE	ND		
	44°55′ 75°22′	1965	2	F	22.9	75.7	DDD	0.058 ± 0.05	0.026-0.09	
							Dieldrin	ND		
							HE	ND		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%FAT	RESIDUE	MEAN (PPM)	RANGE	REMARKS
Gray Partridge (cont'd)	Manitoba									
	Undetermined	1969	3	M	72.3		Hg	0.04 ± 0.06	0.007-0.11	
	50°13' 98°57'	1969	1	M	73.0		Hg	0.006		
	Saskatchewan									
	49°10' 105°00'	1967	1	E	67.5	15.6	DDE	0.08		
							Dieldrin	0.022		
							HE	ND		
	49°00' 105°00'	1967	1	Go	76.0	1.4	DDE	0.058		
							Dieldrin	0.005		
							HE	0.017		
			1	E	69.3	15.4	DDE	0.007		
							Dieldrin	0.002		
							HE	ND		
			1	F	11.0	89.0	DDE	0.059		
							Dieldrin	0.016		
							HE	0.022		
	50°15' 106°50'	1968	1	L	68.0	-	Hg	2.31 ± 3.23	0.019-4.60	
	50°25' 106°05'	1968	1	L	69.0	-	Hg	0.038		
	49°35' 103°50'	1968	1	L	69.0	-	Hg	0.05		
	49°40' 103°50'	1968	1	L	61.0	-	Hg	0.05		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%FAT	RESIDUE	MEAN (PPM)	RANGE	REMARKS
Gray Partridge (cont'd)	Saskatchewan (cont'd)									
	50°15′ 107°15′	1968	1	L	67.0	-	Hg	0.051		
	50°25′ 106°05′	1968	1	L	70.0	-	Hg	0.032		
	50°10′ 105°50′	1968	1.	L	66.0	-	Hg	0.19		
	50°45′ 105°50′	1968	1	L	73.0	-	Hg	0.089		
	50°15′ 107°50′	1969	2	Bm	73.5	-	Hg	0.026 ± 0.016	0.015-0.037	
	50°36′ 107°48′	1969	1	Bm	74.0	-	Hg	0.003		
	49°55′ 109°29′	1969	1	Bm	75.0	-	Hg	0.028		
	49°09′ 103°30′	1969	2	Bm	72.5	-	Hg	0.006		
	49°30′ 104°25′	1969	1	Bm	73.0	-	Hg	0.003		
	51°55′ 107°08′	1970		Bm	71.6	1.2	DDE	ND		
							Dieldrin	ND		
							HE	ND		
							HCB	ND		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%FAT	RESIDUE	MEAN (PPM)	RANGE	REMARKS
Gray Partridge (cont'd)	Alberta									
	51°03' 113°23'	1964	3	I	-	-	Dieldrin	0.026 ± 0.040	ND-0.08	
	51°03' 113°99'	1964	1	I	-	-	Dieldrin	0.080		
	50°35' 111°53'	1964	2	I	-	-	Dieldrin	0.03 ± 0.04	ND-0.06	
	51°03' 113°23'	1964	3	I	-	-	Dieldrin	0.010 ± 0.004	ND-0.16	
	49°40' 111°10'	1968	1	L	61.0	-	Hg	2.59		
	53°15' 113°45'	1968	1	L	70.0	-	Hg	0.699		
	49°40' 112°20'	1968	2	L	67.5	-	Hg	0.67 ± 0.03	0.447-0.880	
	49°52' 110°45'	1968	1	L	71.0	-	Hg	0.141	-	
	49°40' 111°55'	1968	2	L	67.0	-	Hg	2.32 ± 2.80	0.34-4.30	
	49°35' 112°25'	1968	1	L	71.0	-	Hg	2.71		
	49°52' 110°54'	1968	1	Br	80.0	7.7	DDE	0.03		
							Dieldrin	0.008		
							HE	ND		
	53°16' 113°43'	1968	1	Br	78.9	7.9	DDE	0.015		
							Dieldrin	0.006		
							HE	0.022		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%FAT	RESIDUE	MEAN (PPM)	RANGE	REMARKS
Gray Partridge (cont'd)	Alberta (cont'd)									
	49°42' 110°50'	1968	1	Br	78.9	8.4	DDE	0.015		
							Dieldrin	0.006		
							HE	0.022		

SPECIES	LOCATION	DATE	N	TISSUE	$\%H_2O$	%FAT	RESIDUE	MEAN (PPM)	RANGE	REMARKS
Razorbill (*Alca torda*)	Newfoundland									
	53°48′ 56°26′	1970	2	Pm	71.2	3.0	DDE	0.36 ± 0.04	0.331-0.382	
							Dieldrin	ND	-	
							HE	ND	-	
							Hg	0.325 ± 0.02	0.31-0.34	
							HCB	ND	-	
	Quebec									
	50°05′ 66°23′	1972	5	E	71.4	14.3	DDE	5.77 ± 5.18	2.3-14.9	
							Dieldrin	0.20 ± 0.18	0.08-0.52	
							HE	0.03 ± 0.005	0.02-0.03	
							Hg	0.12 ± 0.07	0.01-0.19	
							HCB	0.06 ± 0.02	0.04-0.08	
	50°18′ 59°38′	1972	5	E	72.4	17.2	DDE	2.80 ± 0.90	1.82-4.11	
							Dieldrin	0.11 ± 0.04	0.06-0.15	
							HE	0.03 ± 0.005	0.02-0.03	
							Hg	0.12 ± 0.03	0.08-0.15	
							HCB	0.10 ± 0.03	0.07-0.14	
	47°45′ 69°41′	1978	7	E	61.2	8.5	DDE	10.15 ± 15.7	1.09-45.3	
							Dieldrin	3.56 ± 0.29	0.04-0.94	
							HE	0.13 ± 0.09	0.03-0.15	
							HCB	0.37 ± 0.26	0.08-0.73	
							PCB	37.22 ± 28.00	9.65-83.10	
							Oxychlordane	0.28 ± 0.22	0.04-0.37	

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%FAT	RESIDUE	MEAN (PPM)	RANGE	REMARKS
Razorbill (cont'd)	Quebec (cont'd)									
	50°17' 59°43'	1978	5	E	70.2	11.2	DDE	1.71 ± 0.22	1.45-1.96	
							Dieldrin	0.16 ± 0.05	0.10-0.21	
							HE	0.066 ± 0.015	0.05-0.08	
							HCB	0.196 ± 0.025	0.16-0.23	
							PCB	11.586 ± 1.813	8.63-13.4	
							Oxychlordane	0.102 ± 0.023	0.08-0.14	
	50°19' 59°39'	1978	4	E	68.58	13.0	DDE	2.503 ± 0.736	1.47-3.18	
							Dieldrin	0.173 ± 0.034	0.14-0.22	
							HE	0.085 ± 0.013	0.08-0.10	
							HCB	0.238 ± 0.051	0.19-0.31	
							PCB	16.27 ± 4.71	9.28-19.6	
							Oxychlordane	0.115 ± 0.017	0.09-0.12	
	47°43' 69°44'	1978	1	L	69.0	3.7	DDE	0.67		
							Dieldrin	0.03		
							HE	0.02		
							HCB	0.06		
							PCB	7.38		
							Oxychlordane	0.04		
			1	Br	79.4	2.8	DDE	0.23		
							Dieldrin	0.04		
							HE	0.01		
							HCB	0.03		
							PCB	2.55		
							Oxychlordane	0.01		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%FAT	RESIDUE	MEAN (PPM)	RANGE	REMARKS
Razorbill (cont'd)	Quebec (cont'd)									
	47°45' 69°41'	1978	1	Wb	71.2	10.7	DDE	2.81		
							Dieldrin	0.13		
							HE	0.06		
							HCB	0.21		
							PCB	28.0		
							Oxychlordane	0.19		
	47°48' 61°28'	1973	3	E	72.08	12.5	DDE	2.58 ± 0.48	2.14-3.10	
							Dieldrin	0.127 ± 0.029	0.11-0.16	
							HE	0.043 ± 0.015	0.03-0.06	
							HCB	0.07 ± 0.026	0.05-0.10	
							PCB	9.83 ± 2.19	7.72-12.1	
	50°17' 59°43'	1972	1	E	71.6	11.2	DDE	1.94		
							Dieldrin	0.19		
							HE	0.07		
							HCB	0.21		
							PCB	13.8		
							Oxychlordane	0.13		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%FAT	RESIDUE	MEAN (PPM)	RANGE	REMARKS
Common Murre (*Uria aalge*)	Newfoundland									
	49°45′ 53°11′	1968	10	E	69.8	13.8	DDE	1.004 ± 0.302	0.613-1.530	
							Dieldrin	0.026 ± 0.008	0.008-0.300	
							HE	0.005 ± 0.007	ND-0.017	
	53°48′ 56°26′	1970	2	Bm	72.6	3.6	Hg	0.175 ± 0.049	0.14-0.21	
							DDE	0.308 ± 0.033	0.285-0.331	
							Dieldrin	ND		
							HE	ND		
	Quebec									
	50°20′ 59°40′	1971	4	E	67.6	16.9	DDE	2.215 ± 1.120	1.280-3.81	
							Dieldrin	0.025 ± 0.006	0.002-0.003	
							HE	0.02 ± 0.005	0.01-0.02	
							Hg	0.123 ± 0.04	0.08-0.17	
							HCB	0.088 ± 0.064	0.02-0.16	
	British Columbia									
	49°00′ 122°46′	1970	2	L	68.0	5.4	DDE	0.605 ± 0.035	0.58-0.63	
							Dieldrin	0.01	-	
							HE	ND	-	
							Mirex	ND	-	
							Hg	0.32 ± 0.13	0.23-0.41	

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%FAT	RESIDUE	MEAN (PPM)	RANGE	REMARKS
Common Murre (cont'd)	Northwest Territories									
	53°99' 132°99'	1970	1	Wb	62.8	11.5	DDE	1.21		
							Dieldrin	0.025		
							HE	0.015		
							Hg	0.1		
							HCB	0.016		
							Mirex	ND		

SPECIES	LOCATION	DATE	N	TISSUE	$\%H_2O$	%FAT	RESIDUE	MEAN (PPM)	RANGE	REMARKS
Thick-billed Murre (*Uria lomvia*)	Quebec									
	58°42′ 68°16′	1967	1	Bm	63.8	0.7	DDE	0.066		
							Dieldrin	0.016		
							HE	ND		
	58°48′ 69°50′	1967	2	Bm	63.2	0.5	DDE	0.075 ± 0.018	0.062-0.88	
							Dieldrin	0.009	0.008-0.009	
							HE	ND		
	Northwest Territories									
	74°02′ 90°00′	1975	12	E	71.4	12.6	DDE	0.321 ± 0.141	0.05-0.60	
							Dieldrin	0.02 ± 0.007	0.01-0.03	*Aroclor 1254:1260, 1:1
							HE	0.004 ± 0.003	ND-0.01	
							HCB	0.102 ± 0.003	0.06-0.14	
							PCB *	0.743 ± 0.003	0.49-1.55	
							Oxychlordane	0.019 ± 0.005	0.01-0.03	
			10	L	69.5	4.5	DDE	0.206 ± 0.147	0.03-0.46	
							Dieldrin	0.009 ± 0.002	0.005-0.01	
							HE	0.002 ± 0.003	ND-0.01	
							HCB	0.032 ± 0.021	0.01-0.08	
							PCB *	0.220 ± 0.096	0.15-0.39	
							Oxychlordane	0.006 ± 0.003	ND-0.01	

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%FAT	RESIDUE	MEAN (PPM)	RANGE	REMARKS
Thick-billed Murre (cont'd)	Northwest Territories (cont'd)									
	74°02' 90°00'	1976	11.	L	70.9	6.6	DDE	0.206 ± 0.147	0.03-0.46	*Aroclor 1254:1260, 1:1
							Dieldrin	0.004 ± 0.005	ND-0.01	
							HE	0.005 ± 0.006	ND-0.01	
							HCB	0.083 ± 0.074	0.02-0.20	
							PCB *	0.55 ± 0.035	0.21-1.24	
							Oxychlordane	0.012 ± 0.007	ND-0.03	
		1977	10	E	71.0	12.6	DDE	0.394 ± 0.121	0.24-0.62	
							Dieldrin	0.020 ± 0.020	0.005-0.03	
							HE	0.005		
							HCB	0.112 ± 0.027	0.08-0.16	
							PCB *	0.913 ± 0.036	0.51-1.68	
							Oxychlordane	0.025 ± 0.007	0.02-0.04	
			20	L	70.5	3.7	DDE	0.085 ± 0.067	0.02-0.23	
							Dieldrin	0.006 ± 0.005	0.005-0.02	
							HE	0.002 ± 0.003	0.005-0.01	
							HCB	0.029 ± 0.019	0.01-0.09	
							PCB *	0.244 ± 0.188	0.06-0.77	
							Oxychlordane	0.008 ± 0.004	ND-0.02	

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%FAT	RESIDUE	MEAN (PPM)	RANGE	REMARKS
Dovekie	Newfoundland									
(*Alle alle*)										
	49°16′ 58°14′	1968	9	Bm	71.1	1.4	DDE	0.021 ± 0.007	0.013-0.03	
							Dieldrin	0.006 ± 0.002	0.003-0.01	
							HE	ND	-	

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%FAT	RESIDUE	MEAN (PPM)	RANGE	REMARKS
Black Guillemot (*Cepphus grylle*)	Newfoundland									
	53°48′ 56°26′	1970	1	Bm	73.2	1.6	DDE	0.268		
							Dieldrin	ND		
							HE	ND		
							Hg	0.29		
							HCB	ND		
							Mirex	ND		
	47°36′ 61°33′	1973	3	E	73.8	9.9	DDE	1.067 ± 0.278	0.75-1.27	
							Dieldrin	0.023 ± 0.023	0.01-0.05	
							HE	0.02 ± 0.01	0.01-0.03	
							Hg	0.13 ± 0.035	0.10-0.17	
	Quebec									
	58°48′ 69°50′	1967	3	Bm	64.6	0.8	DDE	0.030 ± 0.017	0.013-0.046	
							Dieldrin	ND		
							HE	ND		
	Northwest Territories									
	65°50′ 92°11′	1982	1	Wb	66.9	5.0	DDE	0.11		
							Dieldrin	0.02		
							HE	0.02		
							Hg	0.34		
							HCB	0.074		
							PCB	0.80		
							Oxychlordane	0.02		
							HCH	0.02		
							Mirex	0.01		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%FAT	RESIDUE	MEAN (PPM)	RANGE	REMARKS
Atlantic Puffin (*Fratercula arctica*)	Newfoundland									
	47°02′ 52°53′	1968	19	E	73.2	9.9	DDE	0.670 ± 0.317	0.024-1.42	
							Dieldrin	0.042 ± 0.015	0.03-0.067	
							HE	ND	-	
	47°11′ 52°49′	1968	5	Wb	66.3	8.4	DDE	0.248 ± 0.05	0.195-0.328	
							Dieldrin	0.025 ± 0.008	0.021-0.028	
							HE	0.01 ± 0.005	0.006-0.018	
							Hg	0.238 ± 0.057	0.14-0.27	
	53°48′ 50°26′	1970	2	Bm	72.6	1.8	DDE	0.288 ± 0.061	0.244-0.311	
							Dieldrin	ND	-	
							HE	ND	-	
							Hg	0.16	-	
							Mirex	ND	-	
	53°56′ 56°31′	1972	5	E	72.0	17.5	DDE	0.596 ± 0.174	0.48-0.9	
							Dieldrin	0.042 ± 0.008	0.03-0.05	
							HE	0.012 ± 0.011	ND-0.02	
							Hg	0.18 ± 0.023	0.16-0.20	
							HCB	0.032 ± 0.018	0.01-0.05	
	53°43′ 56°15′	1972	5	E	70.7	13.7	DDE	0.582 ± 0.131	0.43-0.73	
							Dieldrin	0.048 ± 0.008	0.03-0.05	
							HE	0.034 ± 0.105	0.02-0.06	
							Hg	0.18 ± 0.023	0.16-0.20	
							HCB	0.032 ± 0.018	0.01-0.05	

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%FAT	RESIDUE	MEAN (PPM)	RANGE	REMARKS
Atlantic Puffin (cont'd)	Newfoundland (cont'd)									
	47°11' 52°46'	1976	5	E	71.5	10.2	DDE	0.604 ± 0.163	0.430-0.870	
							Dieldrin	0.044 ± 0.005	0.040-0.05	
							HE	0.016 ± 0.005	0.01-0.02	
							HCB	0.048 ± 0.004	0.04-0.05	
							PCB	2.42 ± 0.196	2.11-2.64	
							Oxychlordane	0.046 ± 0.005	0.04-0.05	
		1980	5	E	71.0	10.7	DDE	0.578 ± 0.18	0.35-0.78	
							Dieldrin	0.044 ± 0.018	0.02-0.06	
							HE	0.022 ± 0.004	0.02-0.03	
							HCB	0.092 ± 0.004	0.09-0.10	
							PCB	2.558 ± 0.621	1.91-3.37	
							Oxychlordane	0.04 ± 0.01	0.03-0.06	
							HCH	0.007 ± 0.003	0.005-0.01	
							Mirex	0.016 ± 0.005	0.01-0.02	
	New Brunswick									
	44°30' 67°06'	1972	5	E	71.5	13.0	DDE	2.678 ± 0.881	1.97-3.89	
							Dieldrin	0.09 ± 0.019	0.07-0.11	
							HE	0.016 ± 0.005	0.01-0.02	
							Hg	0.206 ± 0.034	0.18-0.26	
							HCB	0.064 ± 0.031	0.03-0.10	

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%FAT	RESIDUE	MEAN (PPM)	RANGE	REMARKS
Atlantic Puffin (cont'd)	New Brunswick (cont'd)									
	44°25' 67°05'		5	Wb	62.1	11.1	DDE	1.678 ± 0.881	1.39-2.15	
							Dieldrin	0.064 ± 0.017	0.04-0.08	
							HE	0.021 ± 0.014	0.005-0.04	
							HCB	0.044 ± 0.009	0.04-0.06	
							PCB	5.238 ± 1.203	3.97-7.05	
	44°30' 67°06'	1976	5	E	70.7	11.8	DDE	1.324 ± 0.406	0.75-1.76	
							Dieldrin	0.088 ± 0.041	0.04-0.13	
							HE	0.03 ± 0.007	0.02-0.04	
							Hg	0.094 ± 0.028	0.06-0.12	
							HCB	0.1 ± 0.016	0.08-0.12	
							PCB	7.304 ± 0.947	5.62-7.83	
							Oxychlordane	0.072 ± 0.013	0.05-0.08	
	44°30' 67°66'	1980	5	E	70.6	12.9	DDE	1.036 ± 0.153	0.85-1.17	
							Dieldrin	0.038 ± 0.013	0.02-0.05	
							HE	0.028 ± 0.003	0.02-0.04	
							HCB	0.084 ± 0.019	0.06-0.11	
							PCB	5.606 ± 1.053	4.38-6.64	
							Oxychlordane	0.06 ± 0.01	0.05-0.08	
							HCH	0.008 ± 0.003	0.005-0.01	
							Mirex	0.026 ± 0.005	0.02-0.03	

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%FAT	RESIDUE	MEAN (PPM)	RANGE	REMARKS
Atlantic Puffin (cont'd)	Quebec									
	50°25′ 59°35′	1971	3	E	68.7	15.8	DDE	0.66 ± 0.2	0.52-0.89	
							Dieldrin	0.05 ± 0.01	0.04-0.06	
							HE	0.017 ± 0.006	0.01-0.02	
							Hg	0.26 ± 0.06	0.21-0.33	
							HCB	0.06 ± 0.02	0.04-0.07	
	50°12′ 63°13′	1972	4	E	63.9	15.5	DDE	1.385 ± 0.738	0.75-2.28	
							Dieldrin	0.067 ± 0.024	0.055-0.10	
							HE	0.012 ± 0.005	0.01-0.02	
							Hg	0.175 ± 0.037	0.13-0.22	
							HCB	0.098 ± 0.041	0.05-0.15	
	50°18′ 59°38′	1972	9	E	71.1	16.6	DDE	1.04 ± 0.328	0.81-1.72	
							Dieldrin	0.578 ± 0.02	0.04-0.10	
							HE	0.009 ± 0.002	0.005-0.01	
							Hg	0.172 ± 0.058	0.07-0.24	
							HCB	0.067 ± 0.044	0.05-0.14	
	51°26′ 57°14′	1972	5	E	69.9	14.8	DDE	1.496 ± 0.19	1.22-1.70	
							Dieldrin	0.066 ± 0.015	0.05-0.09	
							HE	0.008 ± 0.004	ND-0.01	
							Hg	0.164 ± 0.049	0.08-0.2	
							HCB	0.072 ± 0.028	0.04-0.09	
	47°48′ 61°28′	1972	1	E	73.2	10.2	DDE	1.46		
							Dieldrin	0.06		
							HE	0.02		
							HCB	0.03		
							PCB	4.85		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%FAT	RESIDUE	MEAN (PPM)	RANGE	REMARKS
Tufted Puffin (*Fratercula cirrhata*)	British Columbia									
	49°10′ 126°05′	1970	1	E	73.2	10.0	DDE	0.424		
							Dieldrin	0.015		
							HE	ND		
							Hg	0.110		
							HCB	0.1290		
	53°99′ 132°99′	1971	2	Wb	62.6	8.2	DDE	0.370 ± 0.156	0.259-0.48	
							Dieldrin	0.0150 ± 0.015	ND-0.021	
							HE	0.006 ± 0.008	ND-0.12	
							Hg	0.3 ± 0.0566	0.26-0.34	
							HCB	0.064 ± 0.079	0.007-0.012	
							Mirex	ND	-	

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%FAT	RESIDUE	MEAN (PPM)	RANGE	REMARKS
Rock Dove (*Columba livia*)	Quebec									
	45°24′ 73°57′	1976	5	Wb	71.4	3.8	DDE	0.37 ± 0.205	0.13-0.69	
							Dieldrin	ND	-	
							HE	ND	-	
							Hg	0.005	-	
							HCB	0.0032 ± 0.002	ND-0.005	
							PCB	0.286 ± 0.224	0.12-0.66	
							Oxychlordane	ND	-	
							Mirex	ND	-	
	45°26′ 75°13′	1977	5	Wb	70.6	3.5	DDE	0.416 ± 0.491	0.06-1.15	
							Dieldrin	ND	-	
							HE	ND	-	
							Hg	0.005	-	
							HCB	0.0023 ± 0.0025	ND-0.005	
							PCB	0.222 ± 0.251	0.04-0.66	
							Oxychlordane	0.003 ± 0.004	ND-0.01	
							Mirex	ND	-	
	46°49′ 71°12′	1981	1	Wb	62.8	6.4	DDE	0.02		
							Dieldrin	ND		
							HE	ND		
							Hg	0.01		
							HCB	0.005		
							PCB	0.170		
							Oxychlordane	0.10		
							HCH	0.005		
							Mirex	ND		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%FAT	RESIDUE	MEAN (PPM)	RANGE	REMARKS
Rock Dove (cont'd)	Quebec (cont'd)									
	45°30' 73°32'	1982	1	Wb	63.8	6.5	DDE	0.01		
							Dieldrin	0.0025		
							HE	0.0025		
							Hg	0.005		
							HCB	ND		
							PCB	0.42		
							Oxychlordane	0.0025		
							HCH	0.0025		
	Ontario									
	45°25' 75°42'	1969	2	Wm	78	4.3	DDE	0.252 ± 0.069	0.203-0.300	
							Dieldrin	0.0085 ± 0.005	0.005-0.12	
							HE	ND	-	
	45°26' 75°26'	1982	1	Wb	64.7	6.6	DDE	0.01		
							Dieldrin	0.0025		
							HE	0.0025		
							Hg	0.005		
							HCB	ND		
							PCB	0.45		
							Oxychlordane	0.0025		
							HCH	0.0025		
							Mirex	0.0025		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%FAT	RESIDUE	MEAN (PPM)	RANGE	REMARKS
Rock Dove (cont'd)	Saskatchewan									
	49°55' 106°35'	1968	1	L	70.0	-	HG	0.278		
	51°55' 107°08'	1970	1	Bm	69.7	4.0	DDE	ND		
							Dieldrin	ND		
							HE	0.018		
							HCB	ND		
							Mirex	ND		
	Alberta									
	49°52' 112°26'	1968	1	E	76.0	10.0	DDE	0.101		
							Dieldrin	1.93		
							HE	0.127		
							Hg	0.045		
	53°15' 113°75'	1968	1	L	74.0		Hg	0.912		
	53°13' 113°50'	1968	1	L	72.0		Hg	0.446		
	49°40' 112°25'	1968	1	L	73.0		Hg	3.16		
	49°50' 111°05'	1968	1	L	76.0	-	Hg	0.296		
	49°47' 111°30'	1968	1	L	71.0	-	Hg	0.456		

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%FAT	RESIDUE	MEAN (PPM)	RANGE	REMARKS
Rock Dove (cont'd)	Alberta (cont'd)									
	49°50' 112°50'	1968	1	L	74.0	-	Hg	0.065		
	50°45' 112°31'	1968	2	L	73.0	-	Hg	0.154 ± 0.196	0.015-0.292	
	53°16' 113°49'	1968	2	Br	80.2	6.0	DDE	0.014	-	
							Dieldrin	0.004 ± 0.001	ND-0.005	
							HE	0.104 ± 0.122	0.018-0.19	
	49°42' 110°50'	1968	1	Br	79.7	9.3	DDE	0.017		
							Dieldrin	0.009		
							HE	0.016		
	56°07' 118°04'	1968	1	Br	81.0	5.8	DDE	0.015		
							Dieldrin	0.026		
							HE	0.131		
	49°50' 112°50'	1968	2	Br	80.9	6.3	DDE	0.023 ± 0.001	0.022-0.023	
							Dieldrin	0.048 ± 0.05	0.012-0.083	
							HE	0.043 ± 0.033	0.020-0.066	
	50°45' 112°31'	1968	2	Br	81.1	6.4	DDE	0.006	-	
							Dieldrin	0.002	-	
							HE	ND	-	

SPECIES	LOCATION	DATE	N	TISSUE	%H_2O	%FAT	RESIDUE	MEAN (PPM)	RANGE	REMARKS
Rock Dove (cont'd)	Alberta (cont'd)									
	51°33' 111°20'	1971	1	Wb	63.4	6.0	DDE	0.064		
							Dieldrin	ND		
							HE	0.086		
							HCB	ND		
							Mirex	ND		
	51°32' 111°13'	1971	1	Wb	66.7	5.2	DDE	0.027		
							Dieldrin	0.013		
							HE	0.823		
							HCB	ND		
							Mirex	ND		
	53°30' 113°30'	1977	5	Wb	68.6	4.6	DDE	0.366 ± 0.741	0.01-1.69	
							Dieldrin	ND	-	
							HE	ND	-	
							HCB	0.003 ± 0.003	ND-0.005	
							PCB	0.774 ± 1.37	0.08-3.23	
							Oxychlordane	ND	-	
	British Columbia									
	49°55' 106°35'	1968	5	Br	80.7	14.9	DDE	0.02		
							Dieldrin	0.008		
							HE	0.723		

APPENDIX 3:

Species included in the summary tables of Canadian data and their bibliographic source.

Common Names	Scientific Names	Reference Number
ANATIDAE		
Canada Goose	*Branta canadensis*	12, 57, 60, 88, 223, 229
Snow Goose	*Chen caerulescens*	51, 150
Mallard	*Anas platyrhynchos*	51, 56, 57, 60, 69, 70, 71, 72, 86, 88, 92, 178, 185, 188, 202, 223, 225, 226, 227, 229, 234
American Black Duck	*Anas rubripes*	12, 57, 68, 73, 105, 126, 141, 151, 178, 185, 186, 262
Gadwall	*Anas strepera*	41, 42, 56, 223, 229
Northern Pintail	*Anas acuta*	41, 42, 43, 51, 56, 69, 70, 71, 202, 223, 225, 229
Green-winged Teal	*Anas crecca*	12, 36, 51, 56, 57, 178
Blue-winged Teal	*Anas discors*	12, 43, 56, 60, 178, 223, 226, 227, 229
American Wigeon	*Anas americana*	41, 42, 43, 56, 202, 223, 227, 229
Northern Shoveler	*Anas clypeata*	36, 56, 225
Wood Duck	*Aix sponsa*	68, 73, 178
Redhead	*Aythya americana*	56, 92, 178
Ring-necked Duck	*Aythya collaris*	12, 56, 178
Canvasback	*Aythya valisineria*	51, 56, 178, 207, 223, 225
Greater Scaup	*Aythya marila*	12, 36, 56, 178, 205, 228
Lesser Scaup	*Aythya affinis*	12, 43, 56, 57, 60, 178, 202, 205, 223, 225, 229

Common Names	Scientific Names	Reference Number
ANATIDAE (cont'd)		
Common Goldeneye	Bucephala clangula	11, 12, 51, 56, 68, 69, 70, 71, 73, 178, 205, 226, 227, 234
Bufflehead	Bucephala albeola	56, 225
Oldsquaw	Clangula hyemalis	57, 181, 182
Common Eider	Somateria mollissima	33, 90, 161, 177
White-winged Scoter	Melanitta fusca	12
Surf Scoter	Melanitta perspicillata	12, 57, 228
Black Scoter	Melanitta nigra	57
Ruddy Duck	Oxyura jumaicensis	56, 92
Common Merganser	Mergus merganser	11, 12, 51, 57, 69, 70, 71, 178, 225, 226, 227, 234
Hooded Merganser	Lophodytes cucullatus	11, 51, 52, 56, 57, 225, 226, 227, 228
Red-breasted Merganser	Mergus serrator	12, 52, 57, 68, 73
PHASIANIDAE		
Blue Grouse	Dendragapus obscurus	51
Spruce Grouse	Dendragapus canadensis	51
Ruffed Grouse	Bonasa umbellus	51, 88, 190, 191
Willow Ptarmigan	Lagopus lagopus	36
Sharp-tailed Grouse	Tympanuchus phasianellus	73, 125
Ring-necked Pheasant	Phasianus colchicus	72, 88, 125, 220
Chukar	Alectoris chukar	220
Gray Partridge	Perdix perdix	72, 125

Common Names	Scientific Names	Reference Number
RALLIDAE		
Common Moorhen	Gallinula chloropus	60
American Coot	Fulica americana	223, 229
SCOLOPACIDAE		
American Woodcock	Scolopax minor	54, 55, 91, 126, 170, 173, 260
Common Snipe	Gallinago gallinago	126
ALCIDAE		
Razorbill	Alca torda	40, 90, 177
Common Murre	Uria aalge	90, 176, 177
Thick-billed Murre	Uria lomvia	163, 187
Black Guillemot	Cepphus grylle	33, 90, 177, 187
Pigeon Guillemot	Cepphus columba	90
Marbled Murrelet	Brachyramphus marmoratus	73, 90
Ancient Murrelet	Synthliboramphus antiquus	90, 170
Cassin's Auklet	Ptychoramphus aleuticus	90, 170
Rhinoceros Auklet	Cerorhinca monocerata	90
Atlantic Puffin	Fratercula arctica	90, 126, 166, 170, 175, 177
Tufted Puffin	Fratercula cirrhata	90
COLUMBIDAE		
Mourning Dove	Zanaida macroura	72, 88
Rock Dove	Columba livia	72, 170

APPENDIX 4:

Chemical residues includes in the summary tables of Canadian data and their bibliographic sources.

Common/Chemical Name	Abbreviation	Reference Number
Arsenic	As	187
Benzene hexachloride	BHC	40, 52, 141, 150, 205, 229, 234
Chlorobenzene	CBZ	161
Cadmium	Cd	187
Chromium	Cr	187
Copper	Cu	185, 187, 190, 191, 228
Dichlorodiphenyltrichloroethane	DDT	36, 41, 43, 52, 54, 126, 141, 151, 186, 187, 188, 205, 207, 220, 234, 260
Dichlorodiphenyldichloroethane	DDD	36, 52, 54, 126, 141, 151, 186, 187, 188, 205, 234
Dichlorodiphenyldichloroethylene	DDE	36, 41, 43, 52, 54, 90, 105, 126, 141, 151, 163, 166, 170, 175, 176, 177, 182, 186, 187, 188, 205, 207, 229, 234, 262
DDT and metabolites	Total DDT	36, 40, 41, 42, 55, 88, 150, 161, 173, 187, 202
Dodecachlorooctahydromethane	Mirex	52, 141, 234
Heptachlor	Hep	229, 260
Heptachlor epoxide	HE	40, 52, 126, 141, 151, 188, 205, 229, 234
Heptachlorobornane	Toxaphene	161
Hexachlorobenzene	HCB	91, 92, 141, 187, 205, 207, 234
Hexachloroepoxyoctahydro-endo, -endo-dimethylnaphthalene	Endrin	182

Common/Chemical Name	Abbreviation	Reference Number
Hexachloroepoxyoctahydro-endo, exo-dimethylnaphathalene	Dieldrin	40, 41, 42, 43, 52, 88, 126, 141, 150, 151, 161, 166, 175, 177, 186, 207, 229, 234
Hexachlorocyclohexane	HCH	161
Iron	Fe	190, 191
Lead	Pb	187, 228
Organolead	Me_3Pb^+ Me_2Pb^+ $MeEt_2Pb^{2+}$ Me_2Pb^{2+} Et_3Pb^+ Et_2Pb^+ $MeEtPb^{2+}$	86 86 86 86 86 86 86
Mercury (Total)	Hg	11, 12, 33, 51, 52, 56, 57, 60, 68, 69, 70, 71, 72, 73, 88, 105, 125, 150, 166, 175, 177, 178, 181, 187, 207, 223, 225, 226, 227, 228
Methylmercury	CH_3Hg	69, 70, 71, 227
Monohydromirex	Photomirex	234
Nickel	Ni	185, 190, 191
Nonachlorotetrahydromethanoindane	Nonachlor	141, 205, 234
Octachlorodihydrodicyclopentadiene	Chlordane	40, 52, 141, 161, 205, 234
Octachlorohexahydromethanoindene	Oxychlordane	41, 141, 161, 234
Octachlorostyrene	OCS	92, 141, 234
Pentachlorobenzene	QCB	92, 234

Common/Chemical Name	Abbreviation	Reference Number
Polychlorinated biphenyls	PCB	40, 52, 88, 90, 92, 105, 126, 141, 150, 151, 161, 163, 166, 170, 175, 176, 177, 182, 187, 188, 205, 207, 234, 262
Silver	Ag	228
Tetrachlorobenzene	TeCB	234
Vanadium	V	187
Zinc	Zn	185, 187, 228

APPENDIX 5:

Tissues included in the summary tables of Canadian data and their bibliographic sources.

Tissue	Abbreviation	Reference Number
Bone	Bo	187
Brain	Br	33, 36, 86, 150
Breast muscle	Bm	11, 12, 33, 51, 55, 56, 60, 69, 70, 71, 86, 90, 91, 125, 141, 173, 178, 187, 191, 225, 226, 227, 228
Carcass	C	60, 150, 177, 182, 205
Egg	E	40, 52, 54, 68, 73, 88, 90, 105, 126, 150, 151, 163, 166, 175, 176, 177, 181, 182, 186, 188, 202, 207, 223, 229, 260, 262
Fat	Fat	36, 41, 42, 90, 126, 187
Feather	Fe	56, 185, 190, 225
Gonad	Go	NRTCR
Intestine	I	36
Kidney	K	33, 36, 60, 86, 191
Liver	L	11, 33, 36, 56, 60, 68, 69, 70, 71, 72, 73, 86, 90, 92, 125, 141, 150, 161, 163, 181, 187, 191, 225, 228, 234
Muscle (other than breast and wing muscles or not specified)	M	36, 41, 42, 51, 92, 161, 170, 176, 234
Preen (uropygial gland)	PG	41, 43
Whole body	Wb	90, 126, 170, 202, 220, 260
Wing muscle	Wm	57, 150, 178, 225, 226, 227

APPENDIX 6:

Sampling locations included in the summary tables of Canadian data and their bibliographic sources.

Location	Reference Number
Newfoundland	90, 126, 166, 170, 175, 176, 177, 178, 182
Nova Scotia	105, 126, 178, 260
Prince Edward Island	178
New Brunswick	33, 54, 55, 68, 73, 90, 105, 126, 151, 166, 173, 175, 177, 178, 260, 262
Quebec	12, 40, 57, 68, 73, 90, 105, 141, 150, 151, 177, 178, 186
Ontario	11, 51, 60, 69, 70, 71, 86, 88, 91, 92, 170, 178, 182, 185, 190, 191, 205, 226, 227, 228, 234
Manitoba	36, 52, 56, 207, 225
Saskatchewan	72, 73, 170, 185, 207, 223, 225, 229
Alberta	41, 42, 43, 72, 125, 170, 188, 207, 223, 225, 229
British Columbia	51, 73, 90, 170, 220, 228
Yukon	--
Northwest Territories	51, 150, 161, 163, 181, 182, 187, 202

APPENDIX 7:

Residue surveys of game birds conducted in the United States.

Table 1. Residue surveys of Anatidae conducted in the United States.

SPECIES	TISSUE	RESIDUE	LOCATION	DATE	REFERENCE
Whistling Swan (*Cygnus columbianus*)	fat	DDT, DDE, DDD	California	1963-65	Keith and Hunt 1966
	liver, bone	Pb	Eastern USA (Florida to New England)		Bagley and Locke, 1967b
	liver, muscle	Hg	Wisconsin	1970	Kleinert and Degurse, 1972
Canada Goose (*Branta canadensis*)	leg bones liver kidney spleen lungs caeca heart	Pb	Wisconsin	1940	Adler, 1944
	liver, skeleton, soft tissues	Pb	Washington	1949-54	Hansen *et al.*, 1957
	bone (tibia) brain, liver	Pb	Delaware		Bagley and Locke, 1967a
	carcass	Hg	Lake St. Clair, Michigan	1970	Dustman *et al.*, 1972
	liver, muscle	Hg	Wisconsin	1970	Kleinert and Degurse, 1972
	liver	Pb	Maryland	-	Scanlon *et al.*, 1980
	carcass	p,p'-DDT, p,p'-DDD p,p'-DDE, oxychlordane, HE, Dieldrin, Endrin, PCBs	California Alaska	1973-74	Anderson *et al.*, 1984
	blood, breast muscle, kidney, liver, ulna bone	Pb	Colorado	1974	Szymczak and Adrian, 1978

SPECIES	TISSUE	RESIDUE	LOCATION	DATE	REFERENCE
Canada Goose (cont'd)	egg contents egg shells	Be-7, Na-22, K-40, Mn-54, Co-60, Zn-65, Sy-90, Zr-95, Ru-106, Cs-137, Ce-144, Pu	Columbia River, Washington	1974	Rickard and Sweany, 1977
	wing bone	Pb	Missouri	1974-75	White and Stendell, 1977
	breast muscle	Cs-137 gross beta radioactivity	Ohio	1975	Adams, 1976
	brain, liver,	PCBs, As, Be, Cd, Hg, Pb	New York	1975	Baker et al. 1976
	carcass	DDT (total), Dieldrin, PCB (Aroclor 1254), Carbaryl	Idaho	1976	Perry, 1979
	egg	DDE, Heptachlor epoxide, Oxychlordane, trans-Nonachlor, cis-Nonachlor, HCB, PCBs	Oregon	1976-771	Blus et al., 1979
	liver	Pb	Louisiana	1980-81	Shealy, 1982
	breast muscle, fat liver	Endrin	Washington	1981-82	Blus et al., 1983
	brain, breast muscle, fat, liver	PCB, DDE, Mirex	New York	1979-80	Kim et al., 1984
	breast muscle, fat, liver	PCB, DDE, Mirex	New York	1981-1982	Kim et al., 1985
	blood	Pb	Illinois	1975	Anderson and Havera, 1985

SPECIES	TISSUE	RESIDUE	LOCATION	DATE	REFERENCE
Canada Goose (cont'd)	egg, brain	DDE, DDT, Dieldrin HE, oxychlordane, cis-nonachlor, trans-nonachlor, HCB, Mirex, PCBs, PCNB, -and -HCH	Oregon, Washington, and Idaho	1978-81	Blus *et al.*, 1984
Brant (*Branta bernicla*)	liver, bone (tibia)	Pb	Eastern U.S.A. (Florida to New England)	-	Bagley and Locke, 1967b
	brain, breast muscle, fat, liver	PCB, DDE, Mirex	New York	1979-80	Kim *et al.*, 1984
White-fronted Goose (*Anser albifrons*)	brain, kidney, brain-heart-liver kidney-muscle	Aldrin, Dieldrin Endrin, DDT (total), Hg	Texas	1967-71	Flickinger and King, 1972
	fat	DDT, DDE, DDD	California	1963-65	Keith and Hunt, 1966
	liver	Pb	Louisiana	1980-81	Shealy, 1982
	liver	Pb	Illinois	1980-81	Zwank *et al.*, 1985
Snow Goose (*Chen caerulescens*)	liver, bone (tibia)	Pb	Eastern U.S.A. (Florida to New England)	-	Bagley and Locke, 1967b
	brain, kidney, brain-heart-liver-kidney-muscle	Aldrin, Dieldrin Endrin, DDT (total), Hg	Texas	1967-71	Flickinger and King, 1972
	brain, breast muscle	Dieldrin, Hg	Texas	1972, 1974	Flickinger, 1979
	brain	Dieldrin	Missouri	1974	Babcock and Flickinger, 1977

SPECIES	TISSUE	RESIDUE	LOCATION	DATE	REFERENCE
Snow Goose (cont'd)	brain, fat	Aldrin, Dieldrin, Endrin, BHC, DDT, HCB, Heptachlor epoxide, Mirex, Methoxychlor, PCBs, Toxaphene	Louisiana	1975-76	West, 1977
	liver wing bone	Hg Pb	Louisiana	1975-76	West, 1977
	liver	Pb	Louisiana	1980-81	Shealy, 1982
	liver	Pb	Illinois	1980-81	Zwank *et al.* 1985
	brain, kidney, brain-heart-liver-kidney-muscle	Aldrin, Dieldrin, Endrin, DDT (total) Hg	Texas	1967-71	Flickinger and King, 1972
Ross' Goose (*Chen rossii*)	breast muscle, fat	DDT, DDE, DDD, Dieldrin, PCB	South Dakota	1970	Dunstan *et al.*, 1973
Mallard (*Anas platyrhynchos*)	heads	P-32, Zn-65	Washington	1960-61	Hanson and Case, 1962
	egg yolk, fat	DDT, DDE, DDD	California	1963-65	Keith and Hunt, 1966
	whole wing	DDT, DDE, DDD, Dieldrin	New York, Pennsylvannia	1964	Heath and Prouty, 1967
	liver, bone	Pb	Eastern U.S.A. (Florida to New England)		Bagley and Locke, 1967b
	breast muscle, egg	Hg	Lake St. Clair, Michigan	1970	Dustman *et al.* 1972
	breast muscle, fat, liver	DDT, DDE, DDD, Dieldrin, Heptachlor, epoxide, Hg	Iowa	1970	Johnson *et al.* 1971

SPECIES	TISSUE	RESIDUE	LOCATION	DATE	REFERENCE
Mallard (cont'd)	liver, muscle	Hg	Wisconsin	1970	Kleinert and Degurse, 1976
	liver	DDT, DDE	Louisiana	1970-71	White, 1976
	egg	Hg	Lake St. Clair, Michigan	1973	Stendell *et al.*, 1976
	wing bone	Pb	New York, Oklahoma Connecticut, Montana, California, Oregon	1974-75	White and Stendell, 1977
	breast muscle	Polybrominated biphenyl	Michigan	1974, 1976, 1977	Hesse and Powers, 1978
	muscle, skin, liver, gut, feathers	Cs-137, Cs-134, Se-75, Zn-65, Co-60, I-131, Cr-51, Na-24, Cl-144, Co-58, La-140, Ag-110, Cs-136, Co-57, Te-132, Ce-141, Mn-54, Ru-106, Nd-147, Se-46, Hf-175, Ru-103, Zr-95, Nb-95, Sb-124, Eu-154, Fe-59, Ba-140	Idaho	1974-78	Halford *et al.*, 1981
	muscle	Cs-137, Cs-134, Se-75, Zn-65, Co-60, I-131, Cr-51, Co-58	Idaho	1974-78	Halford *et al.*, 1982
	brain, liver, muscle	PCBs, As, Be, Cd, Hg, Pb	New York	1975	Baker *et al.*, 1976
	carcass	DDT (total, Dieldrin, PCB (Aroclor 1254), Carbaryl	Idaho	1976	Perry, 1979

SPECIES	TISSUE	RESIDUE	LOCATION	DATE	REFERENCE
Mallard (cont'd)	liver	Pb	Louisiana	1980-81	Shealy, 1982
	liver	Cd, Cu, Pb, Zn	Chesapeake Bay	1976-77, 1979-80	Di Giulio and Scanlon, 1984
	kidney	Cd, Cu, Pb, Zn	Chesapeake Bay	1976-77, 1979-80	Di Giulio and Scanlon, 1984
	ulnar bone	Pb, Zn	Chesapeake Bay	1976-77 1979-80	Di Giulio and Scanlon, 1984
	egg	PCB, DDT, DDE, Dieldrin, Heptachlor epoxide Toxaphene, HCB, Mirex, Endrin, Oxychlordane, cis-nonachlor, trans-nonachlor, cis-Chlordane PCS, PBB, Hg, As, Se, Cr, Pb, Cu, Zn, Cd	Wisconsin	1977-78	Haseltine *et al.*, 1981
	whole wing	DDT, DDE, DDD	Alabama	1978-79	Fleming and O'Shea, 1980
	carcass, muscle	DDT (total)	Alabama	1979	O'Shea *et al.*, 1980
	brain, breast muscle, fat, liver	PCB, DDE, Mirex	New York	1979-80	Kim *et al.*, 1984
	fat	2, 3, 7, 8 - tetrachlorodibenzo -p-dioxin 2, 5, 7, 8 - tetrachlorodiben-zofuran	New York	1980	O'Keefe *et al.*, 1984
	liver	Pb	Maryland	-	Scanlon *et al.*, 1980b
	brain, breast muscle, liver, fat	Endrin	Washington	1981-82	Blus *et al.*, 1983

SPECIES	TISSUE	RESIDUE	LOCATION	DATE	REFERENCE
Mallard (cont'd)	breast muscle, fat, liver	PCB, DDE, Mirex	New York	1981-82	Kim *et al.*, 1985
	whole body, minus skin, feet, intestinal tract	DDE, DDT, DDD, Dieldrin, heptachlor epoxide, PCBs	New Mexico, Texas	1982-83	White and Krynitsky, 1986
	Blood	Pb	Illinois	1979	Anderson and Havera, 1985
	liver	Pb	Illinois	1980-81	Zwank *et al.*, 1985
American Black Duck (*Anas rubripes*)	whole wing	DDT, DDE, DDD, Dieldrin	New York, Pennsylvannia	1964	Heath and Prouty, 1967
	egg	DDT, DDE, DDD, Dieldrin	Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Vermont	1964	Reichel and Addy, 1968
	liver, bone (tibia)	Pb	Eastern U.S.A. (Florida to England)		Bagley and Locke, 1967b
	liver, muscle	Hg	Wisconsin	1970	Kleinert and Degurse, 1972
	egg	p,p,'-DDE p,p,'-DDD, p,p, -DDT, Dieldrin, Heptachlor epoxide PCBs	Maine New Hampshire Vermont Massachusetts Connecticut New York New Jersey Delaware Maryland	1971	Longcore and Mulhern, 1973

SPECIES	TISSUE	RESIDUE	LOCATION	DATE	REFERENCE
American Black Duck (cont'd)	brain, liver, muscle	PCBs, As, Bc, Cd, Hg, Pb	New York	1975	Baker et al. 1976
	liver	Pb	Louisiana	1980-81	Shealy, 1982
	liver	Cd, Cu, Pb, Zn	Chesapeake Bay	1976-77 1979-80	Di Giulio and Scanlon, 1984
	kidney	Cd, Cu, Pb, Zn	Chesapeake Bay	1976-77 1979-80	Di Giulio and Scanlon, 1984
	ulnar bone	Pb, Zn	Chesapeake Bay	1976-77 1979-80	Di Giulio and Scanlon, 1984
	egg	PCB, DDT, DDE, DDD, Dieldrin, Heptachlor epoxide Toxaphene, HCB, Mirex, Endrin, Oxychlordane, cis-Nonachlor, trans-Nonachlor, cis-Chlordane, PCS, PBB, Hg, As, Se, Cr, Pb, Cu, Zn, Cd	Wisconsin	1977	Haseltine et al., 1981
	brain, breast muscle, fat, liver	PCB, DDE, Mirex	New York	1979-80	Kim et al., 1984
	wing bone	Pb	Massachusetts New Jersey	1974-75	White and Stendell, 1977
	fat	2, 3, 7, 8, tetrachlorodibenzo-p-dioxin, 2, 3, 7, 8, tetrachlorodibenzofuran	New York	1980	O'Keefe et al., 1984
	liver	Pb	Maryland	-	Scanlon et al., 1980b
	breast muscle, fat, liver	PCB, DDE, Mirex	New York	1981-82	Kim et al., 1985

SPECIES	TISSUE	RESIDUE	LOCATION	DATE	REFERENCE
Mottled Duck (*Anas fulvigula*)	brain, carcass, gizzard, kidney	Aldrin, Dieldrin Endrin, DDT (total), Hg	Texas	1967-71	Flickinger and King, 1972
	liver	Pb	Louisiana	1980-81	Shealy, 1982
	breast muscle	Ra-226, Pb, As, F, Fa	Florida	1980	Montalbano *et al.*, 1983
Gadwall (*Anas strepera*)	fat, liver, muscle	DDT, DDE, DDD	California	1963-65	Keith and Hunt, 1966
	liver	DDT, DDE	Louisiana	1970-71	White, 1976
	carcass	DDT (total) Dieldrin, PCB (Aroclor), Carbaryl	Idaho	1976	Perry, 1979
	liver	Cd, Cu, Pb, Zn	Chesapeake Bay	1976-77 1979-80	Di Giulio and Scanlon, 1984
	ulnar bone	Pb, Zn	Chesapeake Bay	1976-77 1979-80	Di Giulio and Scanlon, 1984
	egg	PCB, DDT, DDE, DDD, Dieldrin, Heptachlor epoxide Toxaphene, HCB, Mirex, Endrin, Oxychlordane, cis-Nonachlor, trans-Nonachlor, cis-Chlordane, PCS, Pb, Hg, As, Se, Cr, Pb, Cu, Zn, Cd	Wisconsin	1977-78	Haseltine *et al.*, 1981
	liver	Pb	Louisiana	1980-81	Shealy, 1982
	brain, breast muscle, fat, liver	PCB, DDE, Mirex	New York	1979-80	Kim *et al.*, 1984

SPECIES	TISSUE	RESIDUE	LOCATION	DATE	REFERENCE
Gadwall (cont'd)	liver	Pb	Maryland	-	Scanlon *et al.*, 1980b
Northern Pintail (*Anas acuta*)	fat	DDT, DDE, DDD	California	1963-65	Keith and Hunt, 1966
	liver, bone	Pb	Eastern U.S.A. (Florida to New England)	-	Bagley and Locke, 1967b
	egg albumen, liver	Hg	North Dakota	1969-70	Krapu *et al.*, 1973
	breast muscle, kidney, liver	Hg	North Dakota	1969-70	Swanson *et al.*, 1972
	breast muscle, fat, liver	DDT, DDE, DDD, Dieldrin, Heptachlor epoxide, Hg	Iowa	1970	Jonhson *et al.*, 1971
	liver, muscle	Hg	Wisconsin	1970	Kleinert and Deguire, 1972
	liver	DDT, DDE	Louisiana	1970-71	White, 1976
	wing bone	Pb	Utah, California, Oregon	1974-75	White and Stendell, 1977
	breast muscle	Polybrominated biphenyl	Michigan	1974, 1976, 1977	Hesse and Powers, 1978
	muscle, skin, liver, gut, feathers	Cs-137, Cs-134, Se-75, Zn-65, Co-60, I-131, Cr-51, Na-24, Cl-144, Co-58, La-140, Ag-110, Cs-136, Co-57, Te-132, Ce-141, Mn-54, Ru-106, Nd-147, Se-46, Hf-175, Ru-103, Zr-95, Nb-95, Sb-124, Eu-154, Fe-59, Ba-140	Idaho	1974-78	Halford *et al.*, 1981

SPECIES	TISSUE	RESIDUE	LOCATION	DATE	REFERENCE
Northern Pintail (cont'd)	muscle	Cs-137, Cs-134, Se-75, Zn-65, Co-60, I-131, Cr-51, Co-58	Idaho	1974-78	Halford et al., 1982
	liver	Pb	Louisiana	1980-81	Shealy, 1982
	liver	Pb	Maryland		Scanlon et al., 1980b
	liver	Cd, Cu, Pb, Zn	Chesapeake Bay	1976-77 1979-80	Di Giulio and Scanlon, 1984
	kidney	Cd, Cu, Pb, Zn	Chesapeake Bay	1976-77 1979-80	Di Giulio and Scanlon, 1984
	liver	Pb	Illinois	1980-81	Zwank et al., 1985
Green-winged Teal (Anas crecca)	muscle	Cs-137, Cs-134, Se-75, Zn-65, Co-60, I-131, Cr-51, Co-58	Idaho	1974-78	Halford et al., 1982
	liver	Pb	Maryland	-	Scanlon et al., 1980b
	liver	Pb	Louisiana	1980-81	Shealy, 1982
	liver	Cd, Cu, Pb, Zn	Chesapeake Bay	1976-77 1979-80	Di Giulio and Scanlon, 1984
	kidney	Cd, Cu, Pb, Zn	Chesapeake Bay	1976-77 1979-80	Di Giulio and Scanlon, 1984
	ulnar bone	Pb, Zn	Chesapeake Bay	1976-77 1979-80	Di Giulio and Scanlon, 1984
	breast muscle, fat, liver	PCB, DDE, Mirex	New York	1981-82 1985	Kim et al., 1985
	liver	Cd, Hg, Pb, Zn	Texas	1981-82	White and Cromartie, 1985

SPECIES	TISSUE	RESIDUE	LOCATION	DATE	REFERENCE
Green-winged Teal (cont'd)	kidney	Se	Texas	1981-82	White and Cromartie, 1985
Blue-winged Teal (*Anas discors*)	brain, carcass, kidney	Aldrin, Dieldrin, Eldrin, DDT (total), Hg	Texas	1967-71	Flickinger and King, 1972
	egg	DDT DDE, DDD, p,p'-DDT, Dieldrin, Heptachlor epoxide	Iowa	1969	Johnson *et al.*, 1970
	liver, kidney, carcass	Hg	Lake St. Clair, Michigan	1970	Dustman *et al.*, 1972
	liver, muscle	Hg	Wisconsin	1970	Kleinert and Degurse, 1972
	liver	DDT, DDE	Louisiana	1970-71	White, 1976
	breast muscle	Polybrominated biphenyl	Michigan	1974, 1976, 1977	Hesse and Powers, 1978
	carcass	DDT (total), Dieldrin, PCB (Aroclor 1254), Carbaryl	Idaho	1976	Perry, 1979
	carcass	DDT, DDE, DDD, Dieldrin, HE, chlordane isomers Endrin, Toxaphene hexachlorobenzene PCBs, Mirex	Missouri, Texas		White *et al.*, 1981
	liver	Pb	Louisiana	1980-81	Shealy, 1982
	brain, breast muscle, fat, liver	PCB, DDE, Mirex	New York	1979-80	Kim *et al.*, 1984
	gizzard	liver	Illinois	1980-81	Zwank *et al.*, 1985

SPECIES	TISSUE	RESIDUE	LOCATION	DATE	REFERENCE
Cinnamon Teal (*Anas cyanoptera*)	egg yolk, fat	DDT, DDE, DDD	California	1963-65	Keith and Hunt, 1966
American Wigeon (*Anas americana*)	fat	DDT, DDE, DDD	California	1963-65	Keith and Hunt, 1966
	breast muscle, fat, liver	DDT, DDE, DDD, Dieldrin, Heptachlor epoxide, Hg	Iowa	1970	Johnson *et al.*, 1971
	liver, muscle	Hg	Wisconsin	1970	Kleinert and Degurse, 1972
	liver	DDT, DDE	Louisiana	1970-71	White, 1976
	liver	DDT (total) Dieldrin, PCB (Aroclor 1254), Carbaryl	Idaho	1976	Perry, 1979
	liver	Pb	Louisiana	1980-81	Shealy, 1982
	liver	Cd, Cu, Pb, Zn	Chesapeake Bay	1976-77 1979-80	Di Giulio and Scanlon, 1984
	kidney	Cd, Cu, Pb, Zn	Chesapeake Bay Chesapeake Bay	1976-77 1979-80	Di Giulio and Scanlon, 1984
	ulnar bone	Pb, Zn	Chesapeake Bay	1976-77 1979-80	Di Giulio and Scanlon, 1984
	liver	Pb	Maryland		Scanlon *et al.*, 1980b

SPECIES	TISSUE	RESIDUE	LOCATION	DATE	REFERENCE
Northern Shoveler (Anas clypeata)	fat	DDT, DDE, DDD	California	1963-65	Keith and Hunt, 1966
	fat, uropygial gland	p,p'-DDE, DDT (total), Dieldrin	Florida	1969-74	Johntson, 1976
	breast muscle, fat	DDT, DDE, DDD, Dieldrin, Heptachlor epoxide, Hg	Iowa	1970	Johnson et al., 1971
	liver, muscle	Hg	Winconsin	1970	Kleinert and Degurse, 1972
	liver	Pb	Louisiana	1980-81	Shealy, 1982
	liver	DDT, DDE	Louisiana	1970-71	Zwank et al., 1985
	breast muscle, kidney, liver	Hg	North Dakota	1969-70	Swanson et al., 1972
	liver	Pb	Maryland		Scanlon et al., 1980b
	carcass	DDE, DDT, Dieldrin, HCB, PCB	California	1980-81	Ohlendorf and Miller, 1984
	breast muscle, fat, liver	PCB, DDE, Mirex	New York	1984-82	Kim et al., 1985
Fulvous Whistling Duck (Dendrocygna bicolor)	carcass	DDT, DDD, DDE, Dieldrin, Endrin, HE, oxychlordane, chlordane, nonachlor, Toxaphene, PCB	Texas, Colorado	1983	Flickinger and et al., 1986
	brain, carcass, egg, whole body	Aldrin, Dieldrin, Endrin, DDT (Total), Hg	Texas	1967-71	Flickinger King, 1972

SPECIES	TISSUE	RESIDUE	LOCATION	DATE	REFERENCE
Wood Duck (*Aix sponsa*)	liver, bone (tibia)	Pb	Eastern U.S.A. (Florida to New England)		Bagley and Locke, 1967b
	liver, muscle	Hg	Wisconsin	1970	Kleinert and Degurse, 1972
	liver	DDT, DDE	Louisiana	1970-71	White, 1976
	breast muscle, fat, liver	Hg	Tennessee	1972-73	Lindsay and Dimmick, 1983
	breast muscle	Polybrominated biphenyl	Michigan	1974, 1976, 1977	Hesse and Powers, 1978
	liver	Pb	Louisiana	1980-81	Shealy, 1982
	liver	Cd, Cu, Pb, Zn	Chesapeake Bay	1976-77, 1979-80	Di Giulio and Scanlon, 1984
	kidney	Cd, Cu, Pb, Zn	Chesapeake Bay	1976-77, 1979-80	Di Giulio and Scanlon, 1984
	ulnar bone	Cd, Cu, Pb, Zn	Chesapeake Bay	1976-77, 1979-80	Di Giulio and Scanlon, 1984
	breast muscle	DDT, DDE, DDD	Alabama	1979	Fleming and Cromartie, 1981
	fat	2, 3, 7, 8 - tetrachlorodibenzo-dioxin 2, 3, 7, 8 - tetrachloridibenzo-furan	New York	1980	O'Keefe *et al.*, 1984
	liver	Pb	Maryland		Scanlon *et al.*, 1980b
	breast muscle, fat, liver	PCB, DDE, Mirex	New York	1981-82	Kim *et al.* 1985
	whole body	Polychlorinated dibenzodioxins, polychlorinated dibenzofurans	Arkansas, Bayou Meta	1985	Perkins and Yaich, 1986

SPECIES	TISSUE	RESIDUE	LOCATION	DATE	REFERENCE
Redhead (*Aythya americana*)	fat, egg	DDT, DDE, DDD	California	1963-65	Keith and Hunt, 1966
	liver, muscle	Hg	Wisconsin	1970	Kleinert and Deguise, 1972
	carcass	DDT (total), Dieldrin, PCB (Aroclor 1254), Carbaryl	Idaho	1976	Perry, 1979
	liver	Pb	Louisiana	1980-81	Shealy, 1982
Ring-necked Duck (*Aythya collaris*)	liver, muscle	Hg	Wisconsin	1970	Kleinert and Degurse, 1972
	liver	DDT, DDE	Louisiana	1970-71	White, 1976
	whole body	Radiocesium	South Carolina	1971-72	Brisbin *et al.*, 1973
	liver	Cd, Cu, Pb, Zn	Chesapeake Bay	1976-77, 1979-80	Di Giulio and Scanlon, 1984
	liver	Pb	Louisiana	1980-81	Shealy, 1982
	kidney	Cd, Cu, Pb, Zn	Chesapeake Bay	1976-77	Di Giulio and Scanlon, 1984
	ulnar bone	Pb, Zn	Chesapeak Bay	1976-77	Di Giulio and Scanlon, 1984
Canvasback (*Aythya valisineria*)	fat	DDT, DDE, DDD	California	1963-65	Keith and Hunt, 1966
	liver, bone (tibia)	Pb	Eastern U.S.A. (Florida to New England)		Bagley and Locke, 1967b
	liver, muscle	Hg	Wisconsin	1970	Kleinert and Degurse, 1972

SPECIES	TISSUE	RESIDUE	LOCATION	DATE	REFERENCE
Canvasback (cont'd)	egg	p,p'-DDT, p,p'-DDE, Dieldrin, HCB, PCBs, Hg	Nevada, North Dakota	1972-73	Stendell et al., 1977
	carcass	DDE, DDT, DDD, Dieldrin, PCB (Aroclor 1260) Toxaphene, cis-Chlordane, trans-Nonachlor, Oxychlordane, HCB, Heptachlor epoxide	Cheseapeake Bay, Maryland	1973, 1975	White et al., 1979
	liver	Cd, Cr, Cu, Hg, Pb, Zn	Chesapeake Bay Maryland	1973	White et al., 1979
	liver	Pb	Chesapeake Bay Maryland	1975-76	White et al., 1979
	kidney	Cd	Chesapeake Bay Maryland	1975-76	White et al., 1979
	wing bone	Pb	Chesapeake Bay Maryland	1975	White et al., 1979
	brain, liver	PCBs, As, Be, Cd, Hg, Pb	New York	1975	Baker et al., 1976
	liver	Hg, Ni	Wisconsin, Iowa	1976-77	Fleming, 1981
	wing bone	Pb	Wisconsin, Iowa	1976-77	Fleming, 1981
	kidney	Cd	Wisconsin, Iowa	1976-77	Fleming, 1981
	livers	Cd, Cu, Pb, Zn	Chesapeake Bay	1976-77 1979-80	Di Giulio and Scanlon, 1974
	kidneys	Cd, Cu, Pb, Zn	Chesapeake Bay	1976-77 1979-80	Di Giulio and Scanlon, 1974
	ulnar bones	Pb, Zn	Chesapeake Bay	1976-77 1979-80	Di Giulio and Scanlon, 1974
	liver	Pb	Louisiana	1980-81	Shealy, 1982

SPECIES	TISSUE	RESIDUE	LOCATION	DATE	REFERENCE
Canvasback (cont'd)	wing	DDE, Dieldrin, PCBs	California	1980-81	Ohlendorf an and Miller, 1984
	breast muscle livers	PCB, DDE, Mirex	New York	1981-82	Kim et al., 1985
	blood	Pb	Illinois	1979	Anderson and Havera, 1985
Greater Scaup (Aythya marila)	liver, muscle	Hg	Wisconsin	1970	Kleinert and Degurse, 1972
	brain, liver, muscle	PCBs, As, Be, Cd, Hg, Pb	New York	1975	Baker et al., 1976
	livers	Cd, Cu, Pb, Zn	Chesapeake Bay	1976-77 1979-80	Di Giulio and Scanlon, 1984
	kidney	Cd, Cu, Pb, Zn	Chesapeake Bay	1976-77 1979-80	Di Giulio and Scanlon, 1984
	ulnar bone	Pb, Zn	Chesapeake Bay	1976-77 1979-80	Di Giulio and Scanlon, 1984
	brain, breast muscle, fat, liver	PCB, DDE, Mirex	New York	1979-80	Kim et al., 1984
	liver	Pb	Maryland		Scanlon et al., 1980b
	carcass	PCBs, HCB, HE, chlordane, nonachlor, DDE, DDD, DDT	Michigan (Detroit River)	1981	Smith at al., 1985

SPECIES	TISSUE	RESIDUE	LOCATION	DATE	REFERENCE
Lesser Scaup (*Aythya affinis*)	fat	DDT, DDE, DDD	California	1963-65	Keith and Hunt, 1966
	liver, kidney, carcass	Hg	Lake St. Clair, Michigan	1979	Dustman *et al.*, 1972
	breast muscle, fat, liver	DDT, DDE, DDD Dieldrin, Heptachlor epoxide, Hg	Iowa	1970	Johnson *et al.*, 1971
	liver, muscle	Hg	Wisconsin	1970	Kleinert and Deguise, 1972
	liver	DDT, DDE	Louisiana	1970-71	White, 1976
	whole body	Radiocesium	South Carolina	1971-72	Brisbin *et al.*, 1973
	liver, kidney wing bone	Pb	Illinois	1972	Anderson, 1975
	muscle	Ca-137, Cs-134, Se-75, Zn-65, Co-60, I-131, Cr-51, Co-58	Idaho	1974-78	Halford *et al.*, 1982
	liver	Pb	Maryland		Scanlon *et al.*, 1980b
	muscle, skin, liver, gut, feathers	Cs-137, Cs-134, Se-75, Zn-65, Co-60, I-131, Cr-51, Na-24, Cl-144, Co-58, La-140, Ag-110, Cs-136, Co-57, Te-132, Ce-141, Mn-54, Ru-106, Nd-147, Se-46, Hf-175, Ru-103, Zr-95, Nb-95, Sb-124, Eu-154, Fe-59, Ba-140	Idaho	1974-78	Halford *et al.*, 1981

SPECIES	TISSUE	RESIDUE	LOCATION	DATE	REFERENCE
Lesser Scaup (cont'd)	liver	Cd, Cu, Pb, Zn	Chesapeake Bay	1976-77 1979-80	Di Giulio and Scanlon, 1984
	kidney	Cd, Cu, Pb, Zn	Chesapeake Bay	1976-77 1979-80	Di Giulio and Scanlon, 1984
	ulnar bone	Pb, Zn	Chesapeake Bay	1976-77 1979-80	Di Giulio and Scanlon, 1984
	wing	DDE, Dieldrin, PCBs	California	1980-81	Ohlendorf and Miller, 1984
	carcass	PCBs, HCB, HE, chlordane, nonachlor, DDE, DDD, DDT	Michigan (Detroit River)	1981	Smith et al., 1985
Common Goldeneye (Bucephala clangula)	fat, muscle	DDD, DDE	California	1960	Linn and Stanley, 1969
	liver, muscle	Hg	Wisconsin	1970	Kleinert and Degurse, 1972
	liver, kidney wing bone	Pb	Illinois	1972	Anderson, 1975
	muscle, skin, liver, gut, feathers	Cs-137, Cs-134, Se-75, Zn-65, Co-60, I-131, Cr-51, Na-24, Cl-144, Co-58, La-140, Ag-110, Cs-136, Co-57, Te-132, Ce-141, Mn-54, Ru-106, Nd-147, Se-46, Hf-175, Ru-103, Zr-95, Nb-95, Sb-124, Eu-154, Fe-59, Ba-140	Idaho	1974-78	Halford et al., 1981

SPECIES	TISSUE	RESIDUE	LOCATION	DATE	REFERENCE
Common Goldeneye (cont'd)	muscle	Cs-137, Cs-134, Se-75, Zn-65, Co-60, I-131, Cr-51, Co-58	Idaho	1974-78	Halford et al., 1982
	brain, breast muscle, fat, liver	PCB, DDE, Mirex	New York	1979-80	Kim et al., 1984
	carcass	PCBs, HCB, HE, chlordane, non-achlor, DDE, DDD, DDT	Michigan (Detroit River)	1981	Smith et al., 1985
	fat	PCB, DDE, DDD+DDT Dieldrin, Oxychlordane, Mirex, HE, HCB	New York (Niagara River)	1984-85	Foley and Batcheller, 1988
Bufflehead (Bucephala albeola)	liver	Pb	Maryland	-	Scanlon et al., 1980b
	liver, muscle	Hg	Wisconsin	1970	Kleinert and Degurse, 1972
	whole body	Radiocesium	South Carolina	1971-72	Brisbin et al., 1973
	muscle, skin, liver, gut, feathers	Cs-137, Cs-134, Se-75, Zn-65, Co-60, I-131, Cr-51, Na-24, Cl-144, Co-58, La-140, Ag-110, Cs-136, Co-57, Te-132, CE-141, Mn-54, Ru-106, Nd-147, Se-46, Hf-175, Ru-103, Zr-95, Nb-95, Sb-124, Eu-154, Fe-59, Ba-140	Idaho	1974-78	Halford et al., 1981

SPECIES	TISSUE	RESIDUE	LOCATION	DATE	REFERENCE
Bufflehead (cont'd)	muscle	Cs-137, Cs-134, Se-75, Zn-65, Co-60, I-131, Cr-51, Co-58	Idaho	1974-78	Halford *et al.*, 1982
	brain, liver	PCBs, As, Be, Cd, Hg, Pb	New York	1975	Baker *et al.*, 1976
	brain, breast muscle, fat, liver	PCB, DDE, Mirex	New York	1979-80	Kim *et al.*, 1984
	liver	Cd, Cu, Pb, Zn	Chesapeake Bay	1976-77 1979-80	Di Giulio and Scanlon, 1984
	kidney	Cd, Cu, Pb, Zn	Chesapeake Bay	1976-77 1979-80	Di Giulio and Scanlon, 1984
	ulnar bone	Pb, Zn	Chesapeake Bay	1976-77 1979-80	Di Giulio and Scanlon, 1984
Oldsquaw (*Clandula hyemalis*)	brain, breast muscle, fat	DDT, DDE, DDD	Lake Michigan,	1964	Hickey *et al.*, 1966
	carcass	p,p'-DDE, PCBs, Endrin	Lake Michigan	1969-72	Petersen and Ellarson, 1978
	carcass	p,p'-DDE, PCBs, Endrin	Maine	1971-73	Petersen and Ellarson, 1978
	carcass	p,p'-DDE, PCBs, Endrin	Alaska	1971-73	Petersen and Ellarson, 1978
	egg, liver	Hg	Lake Michigan Wisconsin	1971	Petersen and Ellarson, 1978
	liver	Pb	Maryland	-	Scanlon *et al.*, 1980b
	livers	Cd, Cu, Pb, Zn	Chesapeake Bay	1976-77 1979-80	Di Giulio and Scanlon, 1984
	kidneys	Cd, Cu, Pb, Zn	Chesapeake Bay	1976-77 1979-80	Di Giulio and Scanlon, 1984
	ulnar bones	Pb, Zn	Chesapeake Bay	1976-77 1979-80	Di Giulio and Scanlon, 1984

SPECIES	TISSUE	RESIDUE	LOCATION	DATE	REFERENCE
Common Eider (*Somateria mollissima*)	egg	p,p'-DDE, PCBs	Maine	1977	Szaro *et al.*, 1979
White-winged Scoter (*Melanitta fusca*)	liver, bone	Pb	Eastern U.S.A. (Florida to New England)		Bagley and Locke, 1967b
	brain, liver, muscle	PCBs, As, Be, Cd, Hg, Hg	New York	1975	Baker *et al.*, 1976
	livers	Cd, Cu, Pb, Zn	Chesapeake Bay	1976-77 1979-80	Di Giulio and Scanlon, 1984
	kidney	Cd, Cu, Pb, Zn	Chesapeake Bay	1976-77 1979-80	Di Giulio and Scanlon, 1984
	ulnar bone	Pb, Zn	Chesapeake Bay	1976-77 1979-80	Di Giulio and Scanlon, 1984
	brain, breast muscle, fat, live	PCB, DDE, Mirex	New York	1979-80	Kim *et al.*, 1984
	liver	Pb	Maryland	1979-80	Scanlon *et al.*, 1980b
Surf Scoter (*Melanitta perspicillata*)	liver, bone (tibia)	Pb	Eastern U.S.A. (Florida to New England)	-	Bagley and Locke, 1967b
Black Scoter (*Melanitta nigra*)	liver, bone (tibia)	Pb	Eastern U.S.A. (Florida to New England)	-	Bagley and Locke, 1967b

SPECIES	TISSUE	RESIDUE	LOCATION	DATE	REFERENCE
Hooded Merganser (*Lophodytes cucullatus*)	liver, bone (tibia)	Pb	Eastern U.S.A. (Florida to New England)	-	Bagley and Locke, 1967b
	egg	Hg	Wisconsin	1969-70	Faber and Hickey, 1973
	liver, muscle	Hg	Wisconsin	1970	Kleinert and Degurse, 1972
	egg	DDE, DDT, DDD, Dieldrin, PCB (Aroclor 1254), Hg	Arkansas, Idaho, Iowa, Maine, Michigan, Minnesota, Missouri, New Hamsphire, New York, North Dakota, Oregon, Tennessee, Vermont	1975	White and Cromartie, 1977
	egg	DDE, DDT, DDD, Dieldrin, PCB (Aroclor 1254), Hg	Michigan, Missouri, Wisconsin	1975	White and Cromartie, 1977
	brain, breast muscle, fat, liver	PCB, DDE, Mirex	New York	1979-80	Kim *et al.*, 1984
	breast muscle, fat, liver	PCB, DDE, Mirex	New York	1981-82	Kim *et al.*, 1985
Common Merganser (*Mergus merganser*)	fat, muscle	DDD, DDE	California	1962	Linn and Stanley, 1969
	egg	Hg	Wisconsin, Michigan	1969-70	Faber and Hickey, 1973

SPECIES	TISSUE	RESIDUE	LOCATION	DATE	REFERENCE
Common Merganser (cont'd)	egg	DDE, DDT, DDD, Dieldrin, Heptachlor epoxide, Mirex, Chlordane isomers, HCB, Toxaphene, PCBs, Endrin, Hg	Michigan Wisconsin	1975	White and Cromartie, 1977
	egg	PCB, DDT, DDE, DDD, Dieldrin, Heptachlor epoxide, Toxaphene, HCB, Mirex, Endrin, Oxychlordane, cis-Nonachlor, trans-Nonachlor, cis-Chlordane, PCS, PBB, Hg, As, Se, Cr, Pb, Cu, Zn, Cd	Wisconsin	1978	Haseltine *et al.*, 1981
	brain, breast muscle, fat, liver	PCB, DDE, Mirex	New York	1979-80	Kim *et al.*, 1984
	breast muscle, fat, liver	PCB, DDE, Mirex	New York	1981-82	Kim *et al.*, 1985
Red-breasted Merganser (*Mergus serrator*)	egg	Hg	Wisconsin	1969-70	Faber and Hickey, 1973
	fat uropygial gland	p,p'-DDE, DDT (total) Dieldrin	Florida	1969-74	Johnston, 1976
	egg	DDE, DDT, DDD, Dieldrin, Heptachlor epoxide Mirex, Chlordane isomers, HCB Toxaphene, PCBs, Endrin, Hg	Wisconsin	1975	White and Cromartie, 1977

SPECIES	TISSUE	RESIDUE	LOCATION	DATE	REFERENCE
Red-breasted Merganser (cont'd)	egg	DDT, DDE, DDD, Dieldrin, Endrin, Heptachlor epoxide Oxychlordane, cis-chlordane, trans-Nonachlor, cis-Nonachlor, Toxaphene, HCB, Mirex	Michigan	1977	Heinz *et al.*, 1983
	egg	PCBs, DDT, DDE, DDD, Dieldrin, Heptachlor epoxide Toxaphene, HCB, Mirex, Endrin, Oxychlordane, cis-chlordane, PCS, PBB, Hg, As, Se, Cr, Pb, Cu, Zn, Cd	Wisconsin	1977-78	Haseltine *et al.*, 1981
	brain breast muscle fat liver	PCB, DDE, Mirex	New York	1979-80	Kim *et al.*, 1984
Ruddy Duck (*Oxyura jamaicensis*)	fat	DDT, DDE, DDD	California	1963-65	Keith and Hunt, 1966
	liver, muscle	Hg	Wisconsin	1970	Kleinert and Degurse, 1972
	whole body	Radiocesium	South Carolina	1971-72	Brisbin *et al.*, 1973
	carcass	p,p'-DDT, p,p'-DDE, p,p'-DDD, Dieldrin, HCB, PCB, (Aroclor 1260)	New Jersey	1973	White and Kaiser, 1976

SPECIES	TISSUE	RESIDUE	LOCATION	DATE	REFERENCE
Ruddy Duck (cont'd)	liver	Cd, Hg, Pb	New Jersey	1973	White and Kaiser, 1976
	carcass	DDT (total) Dieldrin, PCB (Aroclor 1254), Carbaryl	Idaho	1976	Perry, 1979
	liver	Pb	Louisiana	1980-81	Shealy, 1982
	liver	Cd, Cu, Pb, Zn	Chesapeake Bay	1976-77 1979-80	Di Giulio and Scanlon, 1984
	kidney	Cd, Cu, Pb, Zn	Chesapeake Bay	1976-77 1979-80	Di Giulio and Scanlon, 1984
	ulnar bone	Pb, Zn	Chesapeake Bay	1976-77 1979-80	Di Giulio and Scanlon, 1984

Table 2. Residue surveys of Phasianidae conducted in the United States

SPECIES	TISSUE	RESIDUE	LOCATION	DATE	REFERENCE
Ruffed Grouse (*Bonasa umbellus*)	fat, uropygial gland	p,p'-DDE, DDT (total), Dieldrin	Florida	1969-74	Johnston, 1976
	liver, muscle	Hg	Wisconsin	1970	Kleinert and Degurae, 1972
	feathers (primary), feathers (tail)	Ag, Cu, Cd, Ni, Pb, Zn	Virginia	1977-79	Scanlon *et al.*, 1980a
Blue Grouse (*Dendragapus obscurus*)	fat	DDT, DDE, DDD	Montana	1963	Mussehl and Finley, 1967
Grouse (sp.)	breast muscle, thigh muscle	Aldrin, DDT (total), Dieldrin, Endrin, Heptachlor, Lindane, Methoxychlor	Tennessee	-	Blevins, 1979
	liver	Hg	Washington	1970-71	Adley and Brown, 1972
Sage Grouse (*Centrocercus urophasianus*)	muscle, gastrointestinal tract	Cr-51, Cs-137, Co-60, Ce-144, Cs-134, Nb-95, Zr-95, Ce-141, Ru-103, Lu-140, Se-75, Na-24, Ru-106, Co-58, Hg-203, Bu-140, Mn-54, Zn-65	Idaho	1977-80	Connelly and Markham, 1983
Sharp-tailed Grouse (*Tympanuchus phasianellus*)	fat	DDT, DDE, DDD, Dieldrin, Heptachlor epoxide, Lindane	South Dakota	1965-67	Greichus *et al.*, 1968

SPECIES	TISSUE	RESIDUE	LOCATION	DATE	REFERENCE
Rock Ptarmigan (*Lagopus mutus*)	brain, breast muscle, fat, liver	DDT, DDE, DDD, Dieldrin	Alaska	1967	Bell, 1969
	whole body	DDE, PCBs	Alaska	1970-71	Walker, 1977
Willow Ptarmigan (*Lagopus lagopus*)	whole body	DDE, PCBs	Alaska	1970-71	Walker, 1977
Ring-necked Pheasant (*Phasianus colchicus*)	liver	Hg	Washington	1970-71	Adley and Brown, 1972
	breast muscle, egg	Dieldrin	Illinois	1960	Labisky and Lutz, 1967
	fat, liver, muscle, egg yolk	DDT, DDE, DDD	California	1963-65	Keith and Hunt, 1966
	fat	DDT, DDE, DDD, Dieldrin, Heptachlor epoxide, Lindane	South Dakota	1965-67	Greichus *et al.*, 1968
	egg	p,p'-DDE, Dieldrin, Heptachlor epoxide	Illinois	1966	Greenberg and Edwards, 1970
	blood, bones, leg, bones, skull, bones, sternum, fat, feathers, feet, gizzard muscles, intestine, livers, muscles, legs, muscles, sternal	Ca, Mg, P, K, Na, Al, Ba, Bo, Cr, Co, Cu, Fe, Pb, Mn, Mo, Ni, Ag, Sv, Sn, Ti, Vi, Zn, Zr	Illinois	1966-67	Anderson and Stewart, 1970
	brain, egg, fat	Aldrin, Dieldrin, DDT, DDE, DDD, Heptachlor epoxide, Lindane	South Dakota	1967	Linder and Dahlgren, 1970

SPECIES	TISSUE	RESIDUE	LOCATION	DATE	REFERENCE
Ring-necked Pheasant (cont'd)	fat, subcutaneous fat, visceral, muscle, leg, muscle, sternum, liver, brain, gizzard lining, gizzard muscle, heart, kidneys, lungs, pancreas, ovary, oviduct, testes	p,p'-DDE, Dieldrin, Heptachlor epoxide	Illinois	1968	Anderson *et al.*, 1970
	egg	DDT, DDE, Dieldrin, Heptachlor epoxide, Lindane	Iowa	1969	Johnson *et al.*, 1970
	liver, muscle	Hg	Wisconsin	1970	Kleinert and Degurse, 1972
	breast muscle	p,p'-DDT, p,p'-DDE, Dieldrin, Hg, PCBs	Utah	1970-71	Smith *et al.*, 1974
	crop contents	Captan, Diazinon, Methoxychlor	Michigan	1972-73	Stromborg, 1979
	breast muscle, liver	Endrin	Washington	1981-82	Blus *et al.*, 1983
	skin, feathers, beak, feet, outer wing, joint, gastro intestinal tract	HCB, PCB, Heptachlor epoxide, Dieldrin	Kansas	1982	Layher *et al.*, 1985
Northern Bobwhite (*Colinus virginianus*)	carcass	Heptachlor epoxide	Georgia	1958	Rosene, 1965
	muscle	DDT, DDE, DDD, Heptachlor epoxide, Toxaphene	Alabama	1969	Causey *et al.*, 1972

SPECIES	TISSUE	RESIDUE	LOCATION	DATE	REFERENCE
Northern Bobwhite (cont'd)	feathers (primary)	Hg	Tennessee	1969-79	Whitehead, 1973
	brain, fat, liver	p,p'-DDT, o,p'-DDT, p,p'-DDE, p,p'-DDD, Mirex	Mississippi	1970	Baetcke *et al.*, 1972
	whole body	Mirex	Louisiana	1971-72	Collins *et al.*, 1974
	brain, fat, liver, muscle, stomach contents	Mirex	Florida	1972-74	Wheeler *et al.*, 1977
	breast muscle, fat	Mirex	South Carolina	1975-76	Kendall *et al.*, 1977
Quail (sp.)	liver	Hg	Washington	1970-71	Adley and Brown, 1972
	breast muscle, thigh muscle	Aldrin, DDT (total), Dieldrin, Endrin, Heptachlor, Lindane, Methoxychlor	Tennessee	-	Blevins, 1979
California Quail (*Callipepla californica*)	brain, breast muscle, carcass, liver	Endrin	Washington	1982-82	Blus *et al.*, 1983
Chukar (*Alectoris Chukar*)	liver	Hg	Washington	1970-71	Adley and Brown, 1972
	breast muscle	p,p'-DDT, p,p'-DDE, Dieldrin, PCBs, Hg	Utah	1970-71	Smith *et al.*, 1974
	brain, carcass	Endrin	Washington	1981-82	Blus *et al.*, 1983

SPECIES	TISSUE	RESIDUE	LOCATION	DATE	REFERENCE
Grey Partridge (*Perdix perdix*)	breast muscle	Hg	Montana	1969-70	Weigand, 1971
Wild Turkey (*Meleagris gallopavo*)	heart	p,p'-DDT, o,p'-DDT, p,p'-DDE, p,p'-DDD, Mirex	Mississippi	1970	Baetcke *et al.*, 1972
	feathers (primary)	Cd, Ni, Pb, Zn	Virginia	1976	Scanlon *et al.*, 1970a

Table 3. Residue surveys of Rallidae conducted in the United States.

SPECIES	TISSUE	RESIDUE	LOCATION	DATE	REFERENCE
King Rail (*Rallus elegans*)	liver, bone (tibia)	Pb	Eastern U.S.A. (Florida to New England)		Bagley and Locke, 1967b
	brain, heart, liver, kidney, muscle, ovary	Aldrin, Dieldrin, Endrin, DDT (total), Hg	Texas	1967-71	Flickinger and King, 1972
Clapper Rail (*Rallus longirostris*)	carcass	p,p,'-DDT, p,p'-DDE, p,p'-DDD, Dieldrin, PCBs	New Jersey	1967 1973	Klass and Belisle, 1977
	egg	DDT, DDE, DDD	New York	1969	Foehrenbach *et al.*, 1970
	fat, uropygial gland	p,p'-DDE, DDT (total), Dieldrin	Florida	1969-74	Johnston, 1976
	egg	DDE, PCBs	New Jersy South Carolina Virginia	1972-73	Klass *et al.*, 1980
Sora Rail (*Porzana carolina*)	bone (leg), liver	Pb	Maryland	1976	Stendell *et al.*, 1980
Purple Gallinule (*Porphyrula martinica*)	egg	p,p'-DDT, p,p'-DDE, Dieldrin, Heptachlor epoxide	Louisiana	1965-66	Causey *et al.*, 1968
	egg	Dieldrin, p,p,'-DDE	Louisiana	1968-69	Fowler *et al.*, 1971
	egg	DDE	Florida South Carolina	1972-73	Klaas *et al.*, 1980

SPECIES	TISSUE	RESIDUE	LOCATION	DATE	REFERENCE
Common Moorhen (*Gallinula chloropus*)	egg	p,p'-DDT, p,p'-DDE, Dieldrin, Heptachlor epoxide	Louisiana	1965-66	Causey *et al.*, 1968
	whole body	Aldrin, Dieldrin, Endrin, DDT (total), Hg	Texas	1967-71	Flickinger and King, 1972
	egg	Dieldrin, p,p'-DDE	Louisiana	1968-69	Fowler *et al.*, 1971
	carcass	Hg	Michigan	1970	Dustman *et al.*, 1972
	whole body	Radiocesium	South Carolina	1971-72	Brisbin *et al.*, 1973
	egg	DDE	Florida, Louisiana South Carolina	1972-73	Klaas *et al.*, 1980
American Coot (*Fulica americana*)	fat, egg yolk	DDT, DDE, DDD, Dieldrin, Endrin	California	1963-65	Keith and Hunt, 1966
	liver, bone (tibia)	Pb	Eastern U.S.A. (Florida to New England)	-	Bagley and Locke, 1967b
	egg	DDT DDE, DDD, p,p'-DDT, Dieldrin Heptachlor epoxide	Iowa	1969	Johnson *et al.*, 1970
	fat, uropygail gland	p,p'-DDE, DDT (total), Dieldrin	Florida	1969-74	Johnston, 1976
	liver muscle	Hg	Wisconsin	1970	Kleinert and Degurse, 1972
	whole body	radiocesium	South Carolina	1971-72	Brisbin *et al.*, 1973
	whole body	radiocesium	South Carolina	1971-72	Brisbin and Vargo, 1982

SPECIES	TISSUE	RESIDUE	LOCATION	DATE	REFERENCE
American Coot (cont'd)	liver, kidney wing bone	Pb	Illinois	1972	Anderson, 1975
	muscle	Cs-137, Cs-134, Se-75, Zn-65, Co-60, I-131, Cr-51, Co-58	Idaho	1974-78	Halford et al., 1982
	muscle, skin, liver, gut, feathers	Cs-137, Cs-134, Se-75, Zn-65, Co-60, I-131, Cr-51, Na-24, Cl-144, Co-58, La-140, Ag-110, Cs-136, Co-57, Te-132, Ce-141, Mn-54, Ru-106, Nd-147, Se-46, Hf-175, Ru-103, Zr-95, Nb-95, Sb-124, Eu-154, Fe-59, Ba-140	Idaho	1974-78	Halford et al., 1981
	brain, carcass feathers, liver	DDT, DDE, DDD, Dieldrin, Heptachlor epoxide	South Dakota	1975-76	Greichus et al., 1978
	carcass	As, Cd, Cu, Mg, Pb, Zn	South Dakota	1975-76	Greichus at al., 1978
	liver	Pb	Louisiana	1980-81	Shealy, 1982
	breast muscle, fat, gut contents, kidney, liver, primary feathers	Hg	South Carolina	1977-78	Clay et al., 1979
	brain, breast muscle, fat, liver	PCBs, DDE, Mirex	New York	1979-80	Kim et al., 1984
	whole body, minus skin, feet, intestinal tract	DDE, DDT, DDD, Dieldrin, HE, PCBs	New Mexico, Texas	1982-83	White and Krynitsky, 1986

SPECIES	TISSUE	RESIDUE	LOCATION	DATE	REFERENCE
American Coot (cont'd)	whole body, minus feet, beak, wing-tips and intestinal tract	DDE, TDE, DDT, DDMU, Toxaphene, PCBs, Dieldrin, Mirex, Endrin, BHC	Louisiana	1980	Niethammer *et al.*, 1984
	liver	Cu, Zn, Ni, Cd, Hg, Mo	Texas	1980-1982	White *et al.*, 1986

Table 4. Residue surveys of Gruidae in the United States

Sandhill Crane (*Grus canadensis*)	liver, bone (tibia)	Pb	Eastern U.S.A. (Florida to New England)	-	Bagley and *Locke, 1967b

Table 5. Residue surveys of Scoloparidae conducted in the United States.

SPECIES	TISSUE	RESIDUE	LOCATION	DATE	REFERENCE
American Woodcock (*Scolopax minor*)	carcass	DDT, DDE, DDD, Dieldrin, Heptachlor epoxide	Louisiana	1965	McLane *et al.*, 1971
	whole wing	DDT, DDE, DDD, Dieldrin, Mirex, PCBs	Georgia Louisiana Maine Michigan New Hampshire New Jersey New York North Carolina Pennsylvania South Carolina Wisconsin	1970-71	McLane *et al.*, 1973
	whole wing	DDT, DDE, DDD, Dieldrin, Heptachlor epoxide, Mirex, PCBs	Connecticut Georgia Louisiana Maine Massachusetts Michigan Minnesota New Hampshire New Jersey New York North Carolina Pennsylvania South Carolina Vermont Wisconsin	1971-72	McLane *et al.*, 1978

SPECIES	TISSUE	RESIDUE	LOCATION	DATE	REFERENCE
American Woodcock (cont'd)	breast muscle, whole wing, carcass	DDT (total) Dieldrin, PCBs, Hg.	Alabama Arkansas Connecticut Delaware Florida Georgia Illinois Indiana Iowa Kentucky Louisiana Maine Maryland Massachusetts Michigan Minnesota Mississippi Missouri New Hampshire New Jersey New York North Carolina Ohio Pennsylvania Rhode Island South Carolina Tennessee Texas Vermont Virginia West Virginia Wisconsin	1970-71	Clark and McLane, 1974
	breast muscle, thigh muscle	Aldrin, DDT (total), Dieldrin Endrin, Heptachlor, Lindane, Methoxychlor	Tennessee	-	Blevins, 1979

SPECIES	TISSUE	RESIDUE	LOCATION	DATE	REFERENCE
American Woodcock (cont'd)	feather (primary)	Pb	Alabama Arkansas Connecticut Delaware Florida Georgia Illinois Indiana Iowa Kentucky Louisiana Maine Maryland Massachusetts Michigan Minnesota Mississippi Missouri New Hampshire New Jersey New York North Carolina Ohio Pennsylvania Rhode Island South Carolina Tennessee Texas Vermont Virginia West Virginia Wisconsin	1976-77	Scanlon et al., 1979b
	brain, fat, heart, liver, muscle	Aldrin, Dieldrin, p,p'-DDE, Heptachlor epoxide, PCBs	Illinois	1978-79	Edwards et al., 1983

SPECIES	TISSUE	RESIDUE	LOCATION	DATE	REFERENCE
American Woodcock (cont'd)	whole wing	DDT, DDE, DDD, PCBs, Dieldrin, Mirex, Heptachlor epoxide, Nonachlor	Connecticut Georgia Louisiana Maine Maryland Massachusetts Michigan Minnesota New Hampshire New Jersey New York North Carolina Ohio Pennsylvania South Carolina Vermont Wisconsin	1975	McLane *et al.*, 1984

Table 6. Residue surveys of Columbidae conducted in the United States.

SPECIES	TISSUE	RESIDUE	LOCATION	DATE	REFERENCE
Band-tailed Pigeon (*Columba fasciata*)	breast muscle	Hg	Colorado	1969-1974	Braun *et al* 1977
Mourning Dove (*Zanaida macroura*)	liver bone (tibia)	Pb	Eastern U.S.A. (Florida to New England)	-	Bagley and Locke, 1967b
	brain, carcass, kidney	Aldrin, Dieldrin, Endrin, DDT (total), Hg	Texas	1967-71	Flickinger King, 1972
	breast muscle	DDT, DDE, DDD, Dieldrin, Heptachlor epoxide, Mirex	Rhode Island, Maryland, Pennsylvania Missouri, Kentucky, Virginia Arkansas, Tennessee North Carolina South Carolina Mississippi Alabama Georgia Louisiana Florida	1970-71	Kreitzer, 1974
	liver bone (femur)	Pb	Maryland Virginia North Carolina South Carolina	1977-78	Kendall and Scanlon, 1979
	brain, fat, heart	Aldrin, Dieldrin, p,p'-DDE, Heptachlor, Heptachlor epoxide, PCBs	Illinois	1978-79	Edwards *et al*., 1983

APPENDIX 8:

Nationwide residue surveys conducted by the U.S. Fish and Wildlife Service.

SPECIES	DATE	SAMPLE SIZE	NUMBER OF POOLS	TISSUES	RESIDUES	REFERENCE
Mallard American Black Duck	1965-66 1966-67	12,000	485	whole wing	DDE, DDT, DDD, Dieldrin, Heptachlor expoxide, Lindane	Heath, 1969
Mallard American Black Duck	1969-70	5,200	212	whole wing	DDE, DDT, DDD, Dieldrin, Heptachlor expoxide, Mercury, PCBs	Heath and Hill 1974
Mallard Mottled Duck Gadwall American Black Duck Northern Pintail Lesser scaup Canvasback Greater Scaup Common Goldeneye White-winged Scoter Ring-necked Duck Common Scoter Surf Scoter	1970-71	327	327	breast muscle	Mercury	Baskett, 1975
Mallard American Black Duck Northern Pintail Mottled Duck Canvasback Redhead Lesser Scaup	1972-73	4,190	96	wing bone	Lead	Stendell *et al.*, 1979
Mallard American Black Duck	1972-73	5,400	237	whole wing	DDE, DDT, DDD, Dieldrin PCBs	White and Heath, 1976
Mallard American Black Duck	1976-77	5,600	227	whole wing	DDE, DDT, DDD, Dieldrin, Endrin, Heptachlor epoxide, HCB, Mirex, PCBs Chlordane isomers	White, 1979

SPECIES	DATE	SAMPLE SIZE	NUMBER OF POOLS	TISSUES	RESIDUES	REFERENCE
Mallard American Black Duck	1979-80	5268	215	whole wing	DDE, DDT, DDD, Dieldrin, Endrin, Heptachlor epoxide, HCB, HCH, Lindane, Mirex, PCBs, Toxaphene, Chlordane isomers	Cain, 1981
Mallard American Black Duck	1981-82	6150	246	whole wing	DDE, DDT, DDD, DDMU, Dieldrin, Endrin, HE, PCBs, trans-nonachlor, cis-chlordane, Mirex, oxychlordane, cis-nonachlor, hexachlorobenzene, Toxaphene	Prouty and Bunck, 1986

APPENDIX 9:

Levels of organochlorine residues in duck wing pools by flyway for the nationwide surveys.

Organochlorine Residues, ppm wet weight

YEAR	REGION	NO. OF POOLS	DDE	DDT	DDD	DIELDRIN	PCBs
			AMERICAN BLACK DUCKS, ATLANTIC FLYWAY				
1965		89	1.23 ± 0.08	0.33 ± 0.03	0.12 ± 0.03	0.05 ± 0.01	NA
1969		42	1.42 ± 0.10	0.12 ± 0.01	0.33 ± 0.02	0.14 ± 0.06	1.20 ± 0.12
1972		44	0.35 ± 0.04	0.07 ± 0.01	0.02 ± 0.00	0.02 ± 0.00	1.36 ± 0.15
1976		32	0.39 ± 0.07	0.06 ± 0.01	0.03 ± 0.00	0.04 ± 0.01	0.52 ± 0.08
1979	North	16	0.31 (0.20-0.46)	-	-	-	0.65 (0.47-0.89)
	South	8	0.19 (0.14-0.27)	-	-	-	0.33 (0.19-0.56)
1981	North	13	0.19 (0.12-0.19)	-	-	-	0.40 (0.27-0.59)
	South	6	0.19 (0.10-0.34)	-	-	-	0.21 (0.15-0.30)
			MALLARDS, ATLANTIC FLYWAY				
1965-66		39	0.72 ± 0.08	0.25 ± 0.09	0.07 ± 0.01	NC[a]	NA
1969-70		18	1.05 ± 0.14	0.09 ± 0.01	0.02 ± 0.00	0.05 ± 0.03	1.29 ± 0.46
1972-73		21	0.44 ± 0.07	0.08 ± 0.01	0.06 ± 0.05	0.02 ± 0.00	1.24 ± 0.23
1976-77		20	0.32 ± 0.07	0.07 ± 0.01	0.02 ± 0.01	0.06 ± 0.03	0.52 ± 0.18
1979-80	North	16	0.30 (0.22-0.41)	-	-	-	0.49 (0.36-0.08)
	South	13	0.13 (0.08-0.21)	-	-	-	0.20 (0.12-0.33)
1981-82	North	17	0.24 (0.16-0.34)	-	-	-	0.44 (0.31-0.62)
	South	14	0.12 (0.06-0.23)	-	-	-	0.16 (0.10-0.27)
			MALLARDS, MISSISSIPPI FLYWAY				
1965-66		123	0.25 ± 0.02	0.06 ± 0.01	NC[a]	NC[a]	NA
1969-70		51	0.40 ± 0.06	0.08 ± 0.01	NC[a]	0.04 ± 0.00	0.35 ± 0.04
1972-73		61	0.37 ± 0.07	0.18 ± 0.06	NC[a]	0.02 ± 0.00	0.66 ± 0.30
1976-77		69	0.25 ± 0.04	0.07 ± 0.01	0.05 ± 0.03	0.05 ± 0.01	0.23 ± 0.03
1979-80	North	38	0.11 (0.09-0.13)	-	-	-	0.10 (NC-0.14)
	South	28	0.14 (0.10-0.20)	-	-	-	NC[b]
1981-82	North	45	0.07 (0.06-0.09)	-	-	-	0.10 (NC-0.13)
	South	33	0.12 (0.09-0.16)	-	-	-	NC (NC-0.11)

YEAR	REGION	NO. OF POOLS	DDE	DDT	DDD	DIELDRIN	PCBs
			MALLARDS, CENTRAL FLYWAY				
1965-66		117	0.17 ± 0.02	NC[a]	NC[a]	NC[a]	NA
1969-70		49	0.30 ± 0.10	0.03 ± 0.00	NC[a]	0.02 ± 0.00	1.17 ± 0.04
1972-73		56	0.15 ± 0.01	0.05 ± 0.00	NC[a]	NC[a]	1.10 ± 0.01
1976-77		56	0.28 ± 0.17	0.05 ± 0.01	0.03 ± 0.00	0.03 ± 0.01	0.15 ± 0.01
1979-80	North	26	0.06 (0.05-0.07)	-	-	-	NC[b]
	South	28	0.10 (0.07-0.13)	-	-	-	NC[b]
1981-82	North	33	0.04 (NC-0.05)	-	-	-	NC[b]
	South	37	0.09 (0.06-0.12)	-	-	-	NC[b]
			MALLARDS, PACIFIC FLYWAY				
1965-66		117	0.70 ± 0.06	0.14 ± 0.02	NC[a]	NC[a]	NA
1969-70		51	0.71 ± 0.05	0.11 ± 0.01	NC[a]	0.02 ± 0.00	0.13 ± 0.01
1972-73		55	0.34 ± 0.04	0.03 ± 0.06	NC[a]	NC[a]	0.11 ± 0.01
1976-77		50	0.22 ± 0.04	0.06 ± 0.01	0.03 ± 0.00	0.02 ± 0.00	0.16 + 0.04
1979-80	North	28	0.17 ±0.12-0.24)	-	-	-	NC[b]
	South	16	0.31 (0.19-0.52)	-	-	-	NC[b] (NC-0.10)
1981-82	North	34	0.17 (0.13-0.22)	-	-	-	NC[b]
	South	24	0.22 (0.13-0.36)	-	-	-	NC[b]

From 1965-66 to 1976-77 arithmetic mean + SE is given.
For the last two surveys, geometric mean and 95% confidence interval is reported.

NC[a] = Compound detected by gas chromatography (GC) but at level not confirmed by GC/mass spectrometry. For DDE, 0.01 NC < 0.04. For PCBs, 0.01 < NC < 0.10.

NC[b] = Compound detected but at level below 0.05 ppm.

NA = Not analyzed

Data taken from Heath (1969), Heath and Hill (1974), White and Heath (1976), White (1979), Cain (1981), and Prouty and Bunck (1986).

\- = detected in < 4 pools

APPENDIX 10:

Percentage of occurrence of organochlorine residues detected by Flyway for the 1979-80 nationwide surveys.

YEAR OF COLLECTION	NO. OF POOLS	Frequency of Occurrence (%)[a]					
		DDE	DDD	DDT	DIELDRIN	HE	PCBs
		BLACK DUCKS, ATLANTIC FLYWAY					
1979-1980	24	100	4	0	4	0	100
1981-1982	19	95	0	0	0	0	100
		MALLARDS, ATLANTIC FLYWAY					
1979-1980	29	97	0	0	7	0	90
1981-1982	31	94	0	6	0	0	87
		MALLARDS, MISSISSIPPI FLYWAY					
1979-1980	66	97	3	6	3	6	38
1981-1982	78	94	1	3	4	1	46
		MALLARDS, CENTRAL FLYWAY					
1979-1980	54	93	0	2	2	6	20
1981-1982	70	69	0	1	4	4	9
		MALLARDS, PACIFIC FLYWAY					
1979-1980	44	100	0	5	2	7	14
1981-1982	58	98	2	3	2	9	14

[a] According to results of gas/chromatography/mass spectrometry in 1981-82 collection. Data taken from Prouty and Bunck, 1986.

APPENDIX 11:

Incidences of game bird poisonings in North America where analyses of tissues or gastrointestinal tract contents were performed.

SUSPECTED CHEMICAL	SPECIES	TISSUES ANALYZED	LOCATION	DATE	REFERENCE
Aldrin-Dieldrin	Ring-necked Pheasant	muscle	Illinois	1960-1961	Labisky and Lutz, 1967
	Snow Goose Blue Goose White-fronted Goose Blue-winged Teal Mottled Duck King Rail	brain carcass kidney	Texas	1967-1971	Flickinger and King, 1972
	Snow Goose	brain breast muscle	Texas	1972-1974	Flickinger, 1979
	Snow Goose	brain	Missouri	1974	Babcock and Flickinger, 1977
Carbofuran	Hooded Merganser	gizzard	New York	1975	Stone, 1979
	Mourning Dove	gizzard	New York	1975	Stone, 1979
	Gadwall American Wigeon	gastrointestinal tract	California	1977	Hill and Fleming, 1982
Coumaphos	American Wigeon		Washington	1981	Coon, 1983
DDE	Common Murre	brain, muscle	Oregon	1969 & 1970	Scott *et al.*, 1975

SUSPECTED CHEMICAL	SPECIES	TISSUES ANALYZED	LOCATION	DATE	REFERENCE
Diazinon	Mallard American Black Duck	gizzard	New York	1970	Stone, 1979
	Canada Goose	food samples	New York	1975	Zinkl *et al.*, 1978
	Canada Goose	liver gizzard	New York	1976	Stone, 1979
	Canada Goose	gizzard	New York	1976	Stone, 1979
	Brant	gizzard	New York	1979	Stone and Knoch, 1982
	American Wigeon Gadwall	-	New Mexico	1980	Coon, 1983
	Canada Goose	gizzard	New York	1980	Stone and Knoch, 1982
	Brant	esophagus	New York	1980	Stone and Knoch, 1982
	Canada Goose	-	Virginia	1981	Coon, 1983
	Snow Goose Ross' Goose	-	New Mexico	1982	Coon, 1983
	American Wigeon	gizzard contents, liver	California	1983	Littrell, 1986

SUSPECTED CHEMICAL	SPECIES	TISSUES ANALYZED	LOCATION	DATE	REFERENCE
Diazinon and Chlorpyrifos	Canada Goose	gizzard contents	New York	1974	Stone, 1979
Dicrotophos	American Wigeon	-	Washington	1976	Coon, 1983
Endrin	California Quail Chukar	brain	Washington	1981-1982	Blus *et al.*, 1983
Fensulfothion	Wild Turkey	crop contents	Georgia	1972	Nettles, 1976
	Canada Goose	food samples	New York	1977	Stone, 1979
	Canada Goose Mallard Wood Duck Mourning Dove	-	Ohio	1981	Coon, 1983
Fenthion	American Wigeon Mallard	-	Idaho	1982	Coon, 1983
Heptachlor	Canada Goose	brain carcass	Oregon	1976-1977	Blus *et al.*, 1979

SUSPECTED CHEMICAL	SPECIES	TISSUES ANALYZED	LOCATION	DATE	REFERENCE
Lead	Canada Goose	caeca heart kidney leg bone liver lungs spleen	Wisconsin	1940	Adler, 1944
	Canada Goose	liver skeleton	Washington	1949-1954	Hansen *et al.*, 1957
	Ring-necked Pheasant	breast muscle liver	California	1963	Hunter and Rosen, 1965
	Canada Goose	brain liver tibia	Delaware	1965	Bagley *et al.*, 1967b
	Canada Goose	liver	Delaware	1966	Locke *et al.*, 1967
	Mourning Dove	liver tibia	Maryland	1966	Locke and Bagley, 1967a
	Canada Goose	breast muscle kidney liver ulna	Colorado	1972	Szymcazk and Adrian, 1978
	Lesser Scaup	kidney liver wing bone	Illinois	1972	Anderson, 1975
	Whistling Swan	liver	Washington	1981	Kendall and Driver, 1982

SUSPECTED CHEMICAL	SPECIES	TISSUES ANALYZED	LOCATION	DATE	REFERENCE
Lead (cont'd)	Snow Goose White-fronted Goose Goose Mallard American Black Duck Northern Pintail Canvasback Lesser Scaup	Liver	Louisiana	1980-81	Shealy, 1982
	Northern Pintail	Liver	Louisiana	1980-1981	Zwank et al., 1985
	Snow Goose	Liver	Louisiana	1980-1981	Zwank at al., 1985
	Mallard	Liver	Louisiana	1980-1981	Zwank et al., 1985
	Greater White-fronted Goose	Liver	Louisiana	1980-1981	Zwank et al., 1985
	Mallard	Blood	Illinois	1981-1983	Anderson and Havera, 1985
	Canvasback	Blood	Illinois	1981-1983	Anderson and Havera, 1985
	Canada Goose	Blood	Illinois	1981-1983	Anderson and Havera, 1985
Mercury	Snow Goose Blue Goose	kidney liver	Manitoba	1969	Broughton, 1969 (cited in McGrath, 1969)

SUSPECTED CHEMICAL	SPECIES	TISSUES ANALYZED	LOCATION	DATE	REFERENCE
Mevinphos	Mourning Dove	-	Arizona	1981	Coon, 1983
Mine waste (copper, lead, zinc)	Whistling Swan	liver	Idaho	1955	Chupp and Dalke 1964
Monocrotophos	Mourning Dove	-	Arizona	1980	Coon, 1983
	Snow Goose Blue-winged Teal	proventricular contents	Louisiana	1981	White et al., 1983b
	Blue-winged Teal	gastrointestinal tract contents	Texas	1982	Flickinger et al., 1984
Parathion (Methylparathion)	Snow Goose	stomach content	Oklahoma	1956, 1967	Unpublished data (cited in White et al., 1982b)
	Mourning Dove American Woodcock	-	New Jersey	1977	Coon, 1983
	Canada Goose	-	Oklahoma	1977	Coon, 1983
	Mourning Dove	crop contents	New Jersey	1977	Stone, 1979
	Canada Goose	stomach content	Texas	1980	Unpublished data (cited in White et al., 1982b)
	Canada Goose	-	Maryland	1981	Coon, 1983

SUSPECTED CHEMICAL	SPECIES	TISSUES ANALYZED	LOCATION	DATE	REFERENCE
Parathion (cont'd)	Canada Goose Ross' Goose Snow Goose White-fronted Goose	proventricular contents	Texas	1981	White *et al.*, 1982a
	Canada Goose White-fronted Goose Mallard Northern Pintail	gastrointestinal tract contents	Texas	1981	White *et al.*, 1982b
	Mourning Dove	-	New York	1982	Coon, 1983
Phorate	American Wigeon Gadwall Mallard	-	South Dakota	1982	Coon, 1983
	Canada Goose White-fronted Goose American Wigeon Mallard Northern Pintail	-	South Dakota	1982	Coon, 1983
Strychnine	Canada Goose	liver gizzard contents	Alberta	1968	Howell and Wishart, 1969

APPENDIX 12:

Maximum residue limits established by the Department of National Health and Welfare and the FAO/WHO for domestic poultry (Anon., 1980b).

MAXIMUM RESIDUE LIMITS IN POULTRY

	CANADA (mg/kg, on fat basis)	FAO/WHO (mg/kg), in carcass fat)
Aldrin	0.2	0.2
Arsenic	-	-
HCH, except lindane	0.1	-
Cadmium	-	-
Cesium	-	-
Chlordane isomers	0.1	0.05
Chlorophenols	-	-
Chromium	-	-
Copper	-	-
DDT and metabolites	1.0	5.0
Dieldrin	0.2	0.2
Dioxins	no residues permitted	-
Endrin	-	1.0
Furans	-	-
HCB	0.1 (guideline level)	-
Heptachlor and metabolites	0.2	0.2
Iron	-	-
Lead	-	-
Lindane	0.7	0.7
Mercury (total)	-	-
Methylmercury	-	-
Mirex	-	-
Nickel	-	-
PCB	0.5 (guideline level)	-
Selenium	-	-
Strontium	-	-
Toxaphene	-	-
Vanadium	-	-
Zinc	-	-