Canadian Wildlife Service Research and Surveys in Eastern Canada Relating to the Black Duck

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The purpose of this report is to provide a summary of recent Canadian Wildlife Service surveys and research pertaining to the Black Duck. A number of studies have been focused specifically on the Black Duck, while others have provided information on all waterfowl in an area. The importance of the latter work in supplying baseline data on the Black Duck should not be underestimated.

While most of the work described in this report has been done by CWS biologists and technicians, some studies have been the result of CWS funded research.

For the purposes of discussion, surveys and research will be described separately.

1 - Surveys

The Canadian Wildlife Service has been conducting four main types of waterfowl surveys in eastern Canada in recent years:

i) breeding population surveys
ii) fall and spring population surveys
iii) winter surveys
iv) harvest and species composition surveys 1967-1975

Breeding Population Surveys

Historically, a number of breeding population surveys have been conducted in eastern Canada. The sporadic nature and lack of standard procedures have rendered many results unsuitable for reliable production estimates or for determining population trends. Much time has been spent in experimental studies intended to derive efficient survey methods to deal with problems of adequate and representative coverage of breeding and production areas and to provide more reliable and reproducible results. No reliable and economical method suitable for extensive sampling in forested areas where ducks are at low densities has been found, although adequate sampling

techniques for use in relatively open country have been developed in Ontario.

Atlantic Provinces

In New Brunswick and Nova Scotia, Boyer (1956) conducted breeding pair and brood counts from 1949-1955. During that period most of the brood counts were made in areas such as the Saint John River Valley and the New Brunswick - Nova Scotia border region which are not considered representative of the Maritimes. In 1955 coverage was increased sufficiently to represent larger areas of New Brunswick and Nova Scotia (Boyer 1956). Brood counts were carried out by walking through waterfowl areas with a dog. Counts were made twice on survey areas during the period from early June to the end of August.

Bartlett (1963) surveyed breeding populations on Prince Edward Island from 1957-1963. Limited coverage and low intensity of sampling prior to 1961, resulted in few counts that could be used to indicate trends in brood production. Ecological factors affecting production of Black Ducks on Prince Edward Island were examined and brood-rearing areas identified.

In 1961, Erskine examined the relative effectiveness of the different breeding surveys conducted in Nova Scotia. Comparisons were made between ground surveys, intensive coverage (walking or canoeing around the entire study area), rapid coverage (spot counts from adjacent vantage points) and aerial counts to determine the proportion of breeding pairs and broods recorded in each survey. Dates of survey, method, intensity of coverage, time of day and reproducibility were also investigated. That study provided useful information on the limitations of breeding population surveys in eastern Canada:

1) in any one year, no brood survey revealed more than about two-thirds of the total number of broods of all species found on the study areas by repeated brood surveys

2) rapid coverage was only 70-80% as effective as intensive searches and aerial counts were only 30% as effective as intensive surveys

3) timing of survey was an important factor in reproducibility from year to year.

It was concluded that yearly changes in waterfowl production could only be adequately assessed by sampling all major regions, due to large variations in habitat and associated breeding populations.

In 1967, Erskine attempted to census breeding ducks in the forested, less productive habitat of Nova Scotia and New Brunswick. The study was based on the premise that although these areas do not support high densities, their extent especially in New Brunswick is so large that they produce many ducks. Erskine (1967) found ducks present on about one-half of the 45 areas surveyed. His findings indicated that nest and brood survival were likely to be relatively high.

Breeding pair surveys were conducted from 1970-1973 by CWS in the Sackville area and on marshes of eastern New Brunswick and Nova Scotia. Helicopter brood surveys were flown from 1967-1976 for impoundments and natural marshes outside these areas.

In 1976, pilot breeding pair and production surveys were conducted in Westmorland County, New Brunswick in an effort to establish a production per 100 hectare figure for one or more habitat types. The sampling system was developed from aerial photograph interpretation of wetland types. Twenty-one blocks approximately one square-mile in size were randomly selected and ground counts of all observed waterfowl made.

Quebec

Intensive breeding pair and brood counts have been made in the St. Lawrence estuary since 1963 (Reed 1964, 1968, 1973, 1975). Breeding populations were also studied at Iles-de-la-Paix near Montreal by Laperle (1974) and by Munro in the Lake St. Peter area. The details of these studies

will be described in the section following on research.

Brood counts and surveys in addition to various data on broods are collected annually at Ile Verte and Cap Tourmente in southern Quebec as part of ongoing studies providing breeding and production data for the Black Duck amongst other waterfowl. Nest surveys are also conducted in these areas.

In Labrador-Ungava, Gillespie and Wetmore (1974) conducted surveys using helicopter and fixed wing aircrafts in May and June and late July in 1970 and 1971 and again in early June 1972. Because of low waterfowl densities in many parts of this area, biophysical maps were used to eliminate areas of low waterfowl potential from the survey. A method of stratified sampling was used to improve the efficiency and reliability of surveys. Objectives of this study were to estimate breeding population levels and productivity of waterfowl and relate distribution to biophysical characteristics of the regions in the establishment of baseline data for comparison after the Hydro development of Churchill Falls.

Densities of adult waterfowl seen during the surveys were expressed as birds and pairs per 100 square miles. Brood counts and mean brood size were recorded for the Lake Plateau area of southwest Labrador.

Ontario

In Ontario, during the spring of 1951, Stirret and Harris conducted extensive ground surveys to determine the status of waterfowl in probable breeding areas. Examination of selected habitat for 82 sites south of a line through Sault Ste. Marie was performed by walking and travelling by boat or canoe. Similar surveys were made in 1952-1954 but were subsequently discontinued. Results of these surveys, however, for the purpose of determining species composition were largely reproducible. In 1971, Collins resurveyed 52 of the 82 sites examined in 1951 (Collin 1974).

Because survey methods in 1951 were not entirely clear, individual counts of species were not suitable for determining population densities. Survey sites were examined by travelling selected water areas by canoe, walking and scanning from the shore. Each cover type considered likely to hold breeding waterfowl was search intensively.

Extensive breeding pair surveys were initiated by Dennis (1974a) in 1971 and 1972 in Ontario south of 48° north, and conducted again in the spring of 1976. The survey, which was timed to coincide with the onset of nesting by Mallards and Black Ducks was based on 280 one-quarter-square mile randomly selected plots. Survey sites were located by placing grids on a map outlining two strata of breeding habitat in southern Ontario.

Ground crews counted all waterfowl observed on each plot by walking and scanning from the shore. A canoe was used to check water areas that could not be assessed adequately by walking. Large scale aerial photographs were used by observers to determine likely waterfowl areas in the plot, so as to increase the efficiency of the search. A dog was used to help find and flush nesting ducks.

Dennis (1974a) considered only the males as representing pairs for the purposes of the calculations of potential breeding pairs and estimated breeding pair density. Estimated numbers and density of breeding waterfowl were determined for 1971 and 1972.

In 1973, waterfowl breeding pair counts were conducted by Dennis (1974b) in a clay-plain area and a section of Precambrian Shield of north-central Ontario. Relative abundance of ducks within habitat classes of this area were determined. The ground survey technique was similar to that used in breeding pair surveys in southern Ontario in 1971 and 1972. Waterfowl counts on the one-half-square mile plots were conducted by two teams, each with two observers, between May 6 and June 1, 1973. The sampling plan was modified from that used in southern Ontario by establishing 344 equally

spaced plots using a grid overlay and a map. The habitat characteristics of the plots were established by air photo interpretation and were categorized according to waterfowl suitability. A total of 199 plots were included in the final selection, 75% of which were selected from areas judged to be good waterfowl habitat.

Although CWS is not actively involved in breeding population surveys in northern Ontario, mid-June helicopter surveys of the Ontario James and Hudson Bay coastline have been set up in 1976 to determine the density of breeding birds and to locate and count species known to undergo a moult migration to the coast.

Fall and Spring Population Surveys

Aerial surveys during the spring and fall have been flown for most major rivers, lakes and coastal areas of eatern Canada. Large gaps in the data between years and lack of systematic observations have rendered many of the results of limited use for determining population trends.

In the mid 1960's, emphasis was placed on surveys in eastern Canada that could be used to identify key staging areas for habitat preservation. From this information migration chronology, species composition, and utilization of marshes by waterfowl and hunters have been largely determined. These surveys are now considered important in environmental assessment programs and determining the effects of habitat deterioration on waterfowl.

Atlantic Provinces

Aerial surveys of important migration areas have been conducted for a number of years in the Maritimes. Migration and staging areas have been reasonably well defined and chronology and species composition determined.

Quebec

Waterfowl counts on the St. Lawrence River in Quebec have provided roughly ten years data on migrants. Laperle (unpublished reports 1966 & 1967)

conducted surveys for spring and autumn periods in 1966 and 1967. Aerial counts during the spring were repeated every week starting at the end of March and ending in the first week of May to determine spring migration chronology. Fall counts were repeated every week from the end of August to mid November. Observations were made on utilization of marshes by waterfowl and changes in behaviour and distribution of birds upon the opening of the duck season.

Aerial surveys from 1966-1972 were used by Bourget (1974) to determine use of intertidal marshes in the vicinity of Quebec City. Blacks were the most abundant duck species present in this area during spring and autumn. Snow Goose numbers however, tend to be emphasized in waterfowl counts in this area.

Ontario

Spring and autumn surveys are flown for the shorelines of the southern Great Lakes, Ottawa and St. Lawrence rivers.

Waterfowl use of the Ontario shorelines of the southern Great Lakes during migration was evaluated by Dennis and Chandler (1974) for spring and autumn migration periods from 1968-1973. Two observers in a fixed-wing aircraft estimated waterfowl numbers during flights throughout the spring and fall staging periods. The spring survey included the period from March 1 to June 1 and autumn period August 16 - January 1. The purpose of the study was to record and account for the relative use of areas near or adjacent to the southern Great Lakes. Total waterfowl days and waterfowl days per acre for various sections of this area were calculated for certain species and sub-groups of waterfowl including the Mallard and Black Duck. The effects of hunting pressure, artificial feeding areas, sanctuaries and forms of human distrubance that modify waterfowl use of these areas were discussed.

Spring and autumn surveys for Lake St. Clair, Detroit River,

Lake Erie, Niagara River and Lake Ontario have been flown at least once in entirety, the more important areas, (such as Lake St. Clair) much more frequently. These areas will be resurveyed in the next five years, though there is no intention of resuming routine seasonal surveys.

For northern areas of Ontario, CWS will be conducting late August fixed wing aerial surveys of the James and Hudson Bay coasts in 1976.

A study of the feeding ecology of migrant waterfowl staging in the Longridge Point area, north of Moosonee on the James Bay coast will be initiated in 1976 to examine migration chronology, species population densities and differential habitat utilization of migrants.

Winter Surveys

Atlantic Provinces

Aerial surveys of wintering birds have been conducted in the Maritimes for a number of years. Ground counts have also been made. With relatively large wintering Black Duck populations on Prince Edward Island and in parts of southern Nova Scotia, wintering estimates could represent a significant source of information for determining population trends in these areas.

Quebec

A winter duck survey was conducted during February 1974 in Quebec (Reed and Bourget, 1975). Ground and aerial counts provided data on wintering Black Ducks along the St. Lawrence River. These surveys were extended eastward in 1975 and 1976: few Black Ducks were found in the Gulf during winter.

Winter survey results are available from previous years for the Montreal area and the north shore of the estuary.

Ontario

From 1968-1975 winter surveys in Ontario were conducted intermittently. Since the province and private cooperators conduct winter surveys each year, CWS aerial counts during winter are not planned for future continuation.

Harvest and Species Composition Surveys

The Harvest survey samples the universe of Migratory Game Bird Hunting Permit (MGBHP) purchasers at the end of the hunting season, the cut off date for which is mid-January. The results of this survey are used to estimate harvest by province and zone. Four categories of MGBHP purchasers were sampled in 1975: two from the current year (new and inconsistent hunters) and two from the previous year (experienced hunters).

The Species Composition Survey or parts survey is used to provide data for determining the total harvest of birds by species. All hunters sampled for this survey are exclusive of Harvest survey contacts. Five categories of hunters were sampled in 1975:

i) hunters who bought last year and were not sampled last year
ii) hunters who reported shooting more than 5 waterfowl on the Harvest survey of the previous year
iii) hunters who reported shooting one and not more than 5 waterfowl on the Harvest survey of the previous year
iv) residents who reported hunting last year and submitted at least one wing or tail fan in last year's Species Survey
v) residents who did not report hunting last year

From 1972-1975 both the complexity of sampling and the accuracy of the National harvest survey results have increased significantly. In 1975-1976 a number of improvements were made, the effects of which will not be entirely seen until the 1976-77 season. These improvements include the following which affect harvest estimates in eastern Canada and consequently the estimation of Black Duck kill:

1) an increase in the initial sample for the National Harvest Survey from 30,000 - 40,500 with most of the increase awarded to areas of (a) high goose kill or (b) large variance. The sample of hunters increased from 16,476 in 1974-1975 in eastern Canada to 20,000 in 1975-76.

The increase in sampling intensity in eastern Canada served to reduce the confidence intervals associated with duck harvest estimates. In the Atlantic provinces these were reduced from roughly 17% down to 13% in 1975-76. The intent of an increased sample in Ontario and Quebec and key zones of the Atlantic provinces is to provide more reliable information in degree blocks where a large kill has already been identified as well as to improve the response rate in the 1976-1977 Species survey by increasing the proportion of successful hunters in the sample invited to send in duck wings.

2) additional species breakdown for both ducks and geese were incorporated into the species survey, such as AOU's 132.1, 133.1 etc.

3) an analysis of harvest by degree block. A program was developed in 1975-76 to provide a breakdown of estimated harvest by degree block and species composition where adequate data are available.

The following is a list of additional changes and developments that CWS is committed to for the coming season.

1) In 1976-77 the system will be improved to include statistical limits on the estimates of harvest. Progress Notes will include this additional information.

2) Creation of a new sub-sample in the National Harvest Survey to derive a harvest estimate for all non-residents of Canada. At present "non-renewal" non-residents are sampled but the renewals (50%) are not sampled. In the future, non-residents will be sampled as a block in each province and zone with sufficient numbers to warrant such a scheme.

3) In the coming season CWS will be cooperating with Nova Scotia on a sociological survey of hunters.

The possibility of increasing the sampling intensity in parts of southern Quebec and throughout N.B., to further reduce the variance associated with estimates of the duck harvest, is also being evaluated. Optimally this would mean estimates of kill for Black Ducks within 10% accuracy.

Some problems still limit full utilization of Harvest survey data. The National Harvest Survey system is primarily oriented to national kill figures. Although reasonably accurate for provincial estimates, the accuracy declines for the zone and declines considerably for the degree block, so that estimates derived for small reference areas are often so unreliable as to be useless. There are also problems in estimating harvest for scarce species or those of markedly discontinuous distribution.

Techniques are being developed and tested which will permit intensive area-specific and sub-population studies, should the necessary additional money and manpower be made available by clients desiring such studies. Intensive surveys can be expensive and few additional ones could

be undertaken by existing staff who are already fully occupied at peak periods.

II - Research

The Canadian Wildlife Service has been involved in a number of research studies which have added substantially to the knowledge of the Black Duck in eastern Canada. Much of this work has pertained specifically to requirements and success of breeding Black Ducks while other studies have been directed towards examining habitat conditions and resulting waterfowl distribution.

Several banding and harvest analyses of the Black Duck in eastern Canada have been initiated, re-commended or extended in the last year to provide information on population trends and hunting opportunities for the Black Duck.

Atlantic Provinces

Black Duck breeding and brood production have been studied by Boyer (1956) in Nova Scotia and New Brunswick and by Bartlett (1973) on Prince Edward Island. Boyer (1956) made observations on breeding behaviour and brood survival. Habitat and food utilization by adults and young were also examined. Bartlett (1963) studied the ecological factors affecting production and determined Black Duck production in terms of habitat types. Data on number of nests and dates of egg laying were collected from 1958 to 1961. Many of these results were lost sight of and have only recently been reissued - (Boyer, edited by Smith, 1975), (Bartlett, edited by Smith, 1974).

Waterfowl use of impoundments in the New Brunswick and Nova Scotia border region has been examined since the late 1960's (Whitman 1976). Numbers of breeding pairs and broods utilizing the flooded freshwater impoundments and adjacent natural marshes were recorded. The importance of macro-invertebrates to waterfowl production from studies of food requirements of the Black Duck has been documented. The relationship

between invertebrate abundance and Black Duck breeding chronology has also been considered.

The incidence of blood parasites have been examined in the Maritimes and related to waterfowl use of impoundments.

Habitat requirements and utilization by breeding blacks and broods will be studied in 1976 on National Wildlife Areas in New Brunswick using bio-telemetry. Nesting birds will be monitored from nest initiation through flying age of the brood. Time and causes of brood mortality will be studied.

Quebec

Breeding studies of the Black Duck have been conducted extensively and intensively in the St. Lawrence Region of Quebec. Reed (1964, 1968, 1973 and 1975) has contributed considerably to the knowledge of breeding behaviour, habitat requirements and reproductive output of the Black Duck in the St. Lawrence estuary.

Basic requirements of breeding blacks and habitat types utilized at various stages of the breeding cycle have been identified in this area (Reed 1973). Numbers of breeding pairs, nests, clutch size and ducklings produced were collected in considerable detail from 1963-1973 (Reed 1975). Nesting success in terms of eggs hatched per breeding female was tabulated and survival of broods recorded. Extensive information collected on nesting and brood rearing enabled Reed (1975) to make an appraisal of production of fledged young.

Nesting studies have also been conducted at Iles-de-la-Paix in Lake St. Louis, Quebec (Laperle 1974). Breeding pair counts were made by canoe along island shorelines followed by systematic nest searching from 1968-1970. Estimates of waterfowl breeding populations, nest chronology, success and production were determined for this area. In 1971-1972 the

islands were again searched for nests and success rates determined. Brood rearing and production were also examined during this period. Between 1968 and 1972 water levels were recorded and effects on nests sites, availability and production evaluated. Comparisons were made between Black Duck and Mallard success rates as shown by ducklings produced per successful female.

Additional studies by graduate students on breeding ecology and movement and habitat use by brood-rearing ducks at Lake St. Francis, Quebec, have been made. No review of this work is made at this time.

Ontario

Research on breeding waterfowl in Ontario has not been focused directly on Black Ducks as it has in other parts of eastern Canada. Studies resulting from surveys such as those of Collins (1974) and Dennis (1974a, 1974b) have however contributed significant information regarding the number of breeding blacks in parts of Ontario.

Patterson (1974, 1976) studied duck populations in a system of beaver ponds near Ottawa in eastern Ontario. Twenty one beaver ponds were used to collect breeding and nesting data between 1966 and 1970. Number and location of breeding pairs, broods and fledged ducks were recorded and subsequent estimates of breeding pairs and production made for all duck species present on these areas. Patterns of habitat utilization and habitat requirements of the various life stages were assessed on the basis of seasonal distribution of duck populations.

Harvest Analysis

As the sale of the Migratory Game Bird Hunting permit and National Harvest surveys are relatively new developments in Canada, few analyses on the Canadian Black Duck harvest have been made in the past.

Recently however, a few studies have been undertaken. Black Duck harvest data for eastern Canada have been examined for the period from 1968-1975 to determine trends in harvest and success rates and hunter activity. (Newell and Boyd in preparation)

Quebec

In 1964 and 1966-1973 bag checks were conducted by CWS and the Quebec Wildlife Service on opening weekend in the St. Lawrence estuary (Reed and Boyd 1974). Data on harvest, hunters, waterfowl species, age and sex composition were collected from the south shore of the St. Lawrence. Comparisons were made of harvest data for the local harvest on opening weekend and the estimated duck harvest for Quebec from National surveys. The impact of opening day hunting on locally breeding Black Ducks was discussed and possible means of protecting local breeders examined.

Ontario

The relative abundance of Mallards and Black Ducks as shown by harvest figures taken from hunting clubs in southwestern Ontario from 1941-1973 has been examined (Dennis and Newell in preparation). Increases in the number of Mallards in the harvest are related to land use changes which affect the fall population more than do changes in breeding habitat.

Banding

Banding analyses of the Black Duck in eastern Canada are few in number. In 1968, Munro examined recoveries of Black Ducks from banding areas in eastern Canada for the period 1946-1960. Recovery distribution and mortality rates were examined to determine harvest areas and migration patterns of Black Ducks. Since that time more and more banding data have been collected. In the last year, CWS has initiated analyses based on this information to determine survival estimates, changes in wintering distribution and temporal and geographic distribution of recoveries from Canadian bandings.

Atlantic Provinces

A cooperative banding program was started in the Atlantic provinces in 1965. Black ducks are being banded in the Nova Scotia - New Brunswick border region, the St. John River Valley and a number of other areas.

Quebec

Banding studies have been conducted annually for many years at Baie-Johan-Beetz on the north shore of the Gulf of St. Lawrence and Isle Verte in the St. Lawrence estuary. There is presently a third station in operation on the Ottawa River at Thurso.

In conjunction with the banding operations at Thurso three studies were initiated in 1974. Information on recaptures of banded birds and turn over rates are being determined. Plumage characteristics of blacks and mallards are being collected to examine the extent of hybridization and dates and numbers of birds in stages of moult are being made to follow the progression of wing moult in this area.

Banding analyses have been made for early Baie-Johan-Beetz data by Lemieux and Moisan (1959), in which they examined mortality rates and recovery distribution of the Black Duck .

CWS Proposed Work and Recommendations

A considerable amount of information on the Black Duck based on surveys and research has been collected in eastern Canada. Because of well known problems of seeing and following Black Ducks, obtaining sufficient reliable data has proven to be extremely difficult. Most intensive surveys are not practicable with available time and manpower. Monitoring population changes in some key locations, however has been possible.

The use of a relative index to production from detailed surveys,

such as the number of breeding pairs as suggested by Reed (1975) may be the only measure that can be made on a long range basis.

In areas such as Nova Scotia and Prince Edward Island, on-going banding studies to determine the proportion of local breeding populations of Black Ducks in conjunction with winter surveys appears to be the best possible way to assess the population status of the two stocks of birds available there.

In heavily forested areas such as New Brunswick, extensive ground surveys have proven to be unpracticable. Selected ground counts in addition to an inventory of beaver ponds of differing ages, may be a means of obtaining production estimates if extrapolation procedures can be found.

Proposed Work

Emphasis is being placed by CWS on establishing baseline data in northern areas. In southern portions of Canada, particularly southern Ontario and southwestern Quebec, the Mallard is now the most common breeding species. If we are to estimate trends in breeding populations and production in Canada, more time and effort will have to be spent in determining the output from northern areas relative to that of southern Canada and the contiguous states.

A climatological analysis in northern Quebec and Labrador has been proposed by Reed to forecast poor production years. Attention will be given in future work to areas of Quebec and Labrador where habitat loss due to hydroelectric development may significantly reduce Black Duck production. Waterfowl surveys along the James and Hudson Bay coasts are already underway to provide additional baseline data.

Means of obtaining more reliable estimates of the Black Duck harvest are being implemented by increasing sampling intensity of the National surveys in New Brunswick and Quebec during 1976-77.

Evaluations of the extended duck seasons in Nova Scotia and Newfoundland are also being considered. Further analysis of harvest data is necessary to discover where more information is required from National surveys and how such data are to be used.

The Canadian Wildlife Service in conjunction with six other organizations: the Government of Quebec, Grand Council of Crees, Northern Quebec Inuit Association, James Bay Energy Corporation, James Bay Development Corporation and Hydro Quebec are involved in a Native Harvest survey in Quebec. As the Black Duck is believed to be a significant component of the Quebec Native Harvest, necessary information on Black Duck kill will be provided by this survey.

Recommendations

Research

Accelerated research by CWS, Ottawa leading to the development of meaningful estimates of mortality and survival is an urgent requirement. Present techniques, designed for large samples and/or extended time series are not generally applicable for the Black Duck.

Proceeding in parallel, a time related analysis of changes in distribution and recovery patterns should be undertaken before final decisions are made to completely recast current programs.

Operations

Because of the ineffectiveness of banding at some locations and the small resultant samples derived at considerable expense in terms of time and money, a consolidation of effort is in order. A review will be made to determine whether the present distribution of banding effort is providing data useful to Canada or is merely an adjunct to fill U.S.

management needs.

For the 1976/77 field season no change in banding targets in the Atlantic provinces nor Quebec is proposed. In, Ontario cancellation of most Ministry of Natural Resources Cooperative banding sites and a reduced CWS involvement have been authorized.

For 1977/78 the situation is as follows:

Ontario

Temporarily cease operations in southern Ontario except for CWS as per 1976/77.

Quebec

Maintain existing banding stations in Quebec at Baie Johan Beetz, Ottawa River at Thurso, and Isle Verte as in 1976/77.

Atlantic Provinces

(1) Maintain preseason and post season banding in Prince Edward Island and eastern Nova Scotia.

(2) Continue preseason banding in Nova Scotia and border marshes except for purposes of research. There appears to be little more that can be derived from banding in these areas in terms of developing management strategies.

(3) Provide additional banding effort to the St. John River Valley in New Brunswick. Optimum numbers of banding required for survival estimates with reasonable confidence intervals are in the order of 1,000-1,500 immatures and the same for adults. Estimates with higher standard deviations may be obtained for smaller banded samples. The number of birds recovered, however, is the important factor in estimating survival.

Consideration should be given to improving low recovery and reporting rates to maximize data obtained from banding.

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Table 1 - Sampling Intensity and Confidence Intervals on Duck Harvest Estimates from the National Surveys

Province	1974 Permit Sales	1974 Net Contacts*	1974 Sampling Intensity	1975 Permit Sales	1975 Net Contacts*	1975 Sampling Intensity
NFLD	25,127	2,978	11.9%	30,115	3,818	12.7%
PEI	5,038	1,047	20.8%	4,963	1,028	20.7%
NS	13,791	2,245	16.3%	13,990	2,333	16.7%
NB	11,916	2,088	17.5%	12,930	2,239	17.3%
QUE	58,345	3,348	5.7%	63,768	4,036	6.3%
ONT	136,469	4,770	3.5%	148,670	6,546	4.4%
TOTAL	250,686	16,476	6.6%	274.436	20,000	7.3%

Confidence intervals (90%) on total duck kill estimates from the National Surveys**

	NFLD	PEI	NS	NB	QUE	ONT	TOTAL
1974	0.24	0.17	0.14	0.13	0.10	0.06	0.056
1975	0.11	0.15	0.11	0.13	0.09	0.06	0.043

* net contacts are the number of hunters estimated to have been contacted after non-deliverable and late returned questionnaires are deducted from original sample.

** the coefficient of variance, which is the standard error as a percentage of the estimate has been used. For the 90% confidence interval, the coefficient of variance is multiplied by a factor of 1.65.

Table 2 - Estimates of Duck Kill and 90% Confidence Intervals from the National Surveys

	NFLD	PEI	N.S.	N.B.	QUE	ONT	TOTAL
1974							
estimate	103,834	31,417	105,478	58,723	569,019	811,532	1,680,003
	±24,920	±5,341	±14,767	±7,634	±56,902	±48,692	± 94,080
1975							
estimate	101,671	28,445	117,792	59,061	465,608	937,188	1,709,183
	±11,184	±4,267	±12,957	±7,678	±41,905	±56,231	± 72,811

Estimates of Black Duck Kill and 90% Confidence Interval*

	NFLD	PEI	N.S.	N.B.	QUE	ONT	TOTAL
1974							
estimate	28,817	15,060	44,639	22,234	111,215	84,803	306,768
	±6,916	±2,560	±6,249	±2,890	±11,121	±5,088	±17,179
1975							
estimate	32,929	14,149	58,114	22,880	91,426	84,182	303,680
	±3,622	±2,122	±6,392	±2,974	±8,228	±5,051	±12,937

* As the confidence intervals cannot be established for an individual duck species from the Harvest Survey, the intervals for Black Duck estimates are extrapolated from those for the total duck kill estimates.