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The impact of the Migratory Birds Convention Act and of seasonal phenology on recreational hunting of waterfowl in northwestern Canada

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Abstract

Sales of migratory game bird hunting permits and the reports of respondents to the National Harvest Surveys in 1979–85 are used to compare the impact of restrictions imposed by the Migratory Birds Convention Act and the effects of seasonal phenology on hunting opportunity and success in northwestern Canada. Comparisons have been made using specially defined zones in the Yukon and the District of MacKenzie, Northwest Territories, and in the northern parts of each of the four western provinces. The shortness of the hunting season in the Yukon and MacKenzie District, resulting from the opening date of 1 September required by the Migratory Birds Convention and the early onset of winter, has been largely offset by high daily bag limits and by relatively low competition between hunters. As a result, residents in the two territories on average enjoy waterfowl hunting success equal to, or better than, that of residents in the northern parts of the western provinces and above the national average. Recreational hunters in the territories generally have a higher daily success and seasonal kill of ducks than do hunters in the provinces, but take fewer geese.

Introduction

There is a longstanding belief in some quarters that residents of the Yukon and Northwest Territories wishing to engage in recreational hunting of waterfowl are at a disadvantage because the Migratory Birds Convention Act of 1917 does not permit any hunting season for migratory game birds to open before 1 September. Many northern residents feel that their opportunity to hunt is thus unduly restricted because of the early onset of winter and the early date of southward migration. That latitudinal fact of life has been compensated for in the Migratory Birds Regulations for the territories: there are no possession limits (as there are elsewhere in Canada), and daily bag limits for ducks and geese are 25 and 10 respectively. In southern Canada, comparable daily limits are generally no more than 8 and 6 respectively, with a possession limit equal to two daily bag limits.

Results

This study compares reported hunting opportunity for and success in taking ducks and geese in five territorial and eight provincial zones (two in the northern portions of each of the western provinces abutting the two territories) (Fig. 1). These zones were specially defined to see what changes in success and opportunity occur at different latitudes. In the two territories, each zone incorporates three degrees of latitude, and in the provinces each zone encompasses two degrees of latitude. Because migratory game bird hunting permits are not available in the Districts of Franklin and Keewatin, where there are few people who would be required to possess the permit, this analysis has been restricted to the District of MacKenzie and the Yukon Territory.

The data used were derived from the sales records of migratory game bird hunting permits and responses to the National Harvest Survey (NHS) and the Species Composition Survey (SCS) for the period 1979–85 inclusive. Because of the small numbers of hunters involved and variations in their response when selected for the survey, data for the seven-year period were summed and divided by seven to produce an annual average. The record of permit sales by zone is given in Table 1: the average number sold ranged from 34 in the lower MacKenzie (Zone 03) to 2855 in Zone 11 of northern Alberta. The number of US "duck stamps" sold in Alaska are also shown in Table 1, because many territorial residents tend to identify with that state.

Permit sales have been in general decline throughout Canada since 1979, showing a 27% decrease by 1985, (though a slight recovery in 1986). Table 1 shows a similar trend in the northwest, with a drop in annual sales from 7429 in 1979 to 5163 in 1985, a decrease of 30.5%. Permit sales declined by 19.8% in the territories (Zones 01–05 inclusive), and by 33% in the provincial northern zones (06–13). The relative stability of permit sales in the MacKenzie District (–5.6%) is striking and surprising, given the rapid demographic changes that must occur in service industries when mining and oil development wax and wane. It may be a reflection of good waterfowl populations and hunting opportunity.

Figure 2, derived from the duck and goose calendars of respondents to the NHS, shows the dates and number of days on which hunting activity was reported to have occurred in each zone — shown separately for ducks and geese. The numeral marks the median date of reported hunting. Because of the very small annual samples in some zones, results from all seven years have been pooled. There are annual variations not depicted in Figure 2. In some years hunting may be terminated prematurely in some zones by the early onset of winter, although published dates of freeze-up show that "early winters" are infrequent (Allen 1974, confirmed by more recent unpublished Atmospheric Environment Service records). The fewest days of hunting opportunity were experienced by the 34 permit-holders hunting in Zone 03 and the maximum by the much larger numbers in Zone 11 (north-central Alberta). The reported duck hunting seasons in the south

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of the MacKenzie District (Zones 04 and 05) are surprisingly long, as are the indicated median dates of hunting activity, and are not significantly different from those of northern Manitoba, Saskatchewan, and Alberta (Zones 06, 08, and 10).

Tables 2 and 3 summarize hunting activity and success in all zones, for ducks and geese respectively. For duck hunting, the five territorial zones ranked in the top six zones at least three times in each category: Zones 05, 04, and 03 (Northwest Territories) ranked first, second, and third, and 01 (Yukon) sixth. Goose hunters in the territories were not as fortunate, geese being scarce in the areas where most permit-buyers live because of the lack of suitable staging areas during southward migration; yet in terms of average kill of geese per successful hunt, four of the six highest averages are in territorial zones 03, 04, 02, and 05 respectively.

Tables 4 and 5 show hunter activity per week expressed as percentages of total hunting effort in each zone (to eliminate the differences in scale of the numbers hunting in the various zones). Note that the peak of duck hunting in territorial Zone 05 occurred not in the first week of the season but in the third. The general pattern in the north (and in many southern parts of Canada) is for duck hunting activity to be greatest in the first week and to decline thereafter.

For many years the Migratory Birds Regulations for the territories have been drafted to compensate for the shortened window of opportunity by providing higher bag limits and removing requirements for possession limits. The frequencies of reported daily bags of ducks and geese (Tables 6 and 7) give some indication of the extent to which this added opportunity is used by territorial hunters. In the five territorial zones, 16.6% of the reported daily duck bags are six or greater, compared with only 7.4% in the provinces. An estimated 23% of the total territorial kill can be assigned to the expanded limits, especially in Zones 03, 04, and 05, where daily bags of greater than six represent 26.2, 15.3, and 9.5% respectively of all reported kills.

If, for example, the daily bag limit in Zone 04 had been 6, rather than 25, the number of birds killed would have been reduced by 27%. There is no doubt that territorial residents do take advantage of the expanded limits provided under the Migratory Game Birds Regulations.

Additional analyses by seven-day intervals showing changes in hunter activity and success for ducks and geese for each sample zone have been placed in the CWS Report Library (Report CWSC 3885). An example of the format of these analyses is given in Table 8 (NWT Sampling Zone 04). The first interval begins on the last Wednesday in August to standardize the intervals over a number of years and does not coincide precisely with weeks within the month.

Waterfowl hunting by territorial residents outside the territories

In addition to hunting within the territories, many residents either buy permits locally, then proceed south to the provinces, or purchase permits when south on holidays. On average, 125 permits are purchased in the provinces by residents of the Northwest Territories and Yukon Territory, primarily in Alberta (40%) and British Columbia (25%). This average sale is in addition to the average of 1269 permits sold in the two territories. In addition, other persons buying their permits in the territories and claiming territorial residency do some hunting locally, then proceed south on holidays or to overwinter and do most of their hunting there. Their reported kill and general activity are incorporated into estimates derived for the province of hunt and not for the territory of residence or permit purchase. How many hunters do this is not entirely clear, but rough estimates derived from Table 4 of the NHS indicate that it is at least as great as the number who purchase permits in the provinces (125). The principal quarry of these hunters in the south appears to be geese, not ducks.

Table 9 compares hunter success in Zone 01 (Yukon), Zones 04 and 05 combined (MacKenzie), and the northern NHS zones* in each of the provinces that abut the territories. (The two most northern zones in the territories — 02 and 03 — where only 45 and 34 permits respectively were sold, have been excluded.) In biological terms it is realistic to compare Yukon 01 with British Columbia NHS Stratum 01 and MacKenzie 04 and 05 with Alberta NHS Stratum 02. The average kill of ducks and geese by territorial hunters exceeds that in the adjacent parts of the provinces, and, except for geese in Zone 01 (Yukon), territorial averages exceed the national average for both ducks and geese. A comparison is also made with available data from Alaska. While US statistics do not distinguish between successful duck and goose hunters, it should be noted that duck stamp buyers in Alaska killed an average of 5.2 ducks and 0.95 geese per season, whereas migratory game bird hunting permit buyers in the territories killed 10.1 ducks and 1.1 geese per season.

Some spokespersons for recreational hunters seek to equate conditions in the interior of the territories with those in Alaska, especially southern Alaska. In reality the chronology of breeding seasons in most of the two areas is significantly different. Break-up occurs much later in the Canadian north than in Alaska south of Fairbanks. The Canadian season extends correspondingly later into the autumn. It is unrealistic to compare seasons simply on the basis of latitude.

Regulations related to opening seasons not only must conform to the Migratory Birds Convention but also to key elements in the life history of waterfowl. Snow geese nesting at Kendall Island, Anderson Delta, and Banks Island rarely complete egg laying by 20 June. Incubation requires another 22 days, bringing the likely date of last hatch to 12 July. Adults then enter a moult and begin to fly when the goslings are about 42 days post hatch. This means that flight begins for a significant portion of the population in mid- or late August. No recreational hunter or administrator would want to be accused of opening a season on birds still flightless or with soft primaries. Hunting before 1 September, even as far south as Yellowknife or Whitehorse, would also certainly be detrimental to diving ducks such as scaup, many of which are still flightless or with soft primaries on 1 September. Opening in August would undoubtedly lead to overharvest of philopatric females in areas of easy access, such as between Yellowknife and Rae, resulting in the local burnout situation first described by Hochbaum (1947).

Studies by Murdy (1964), Trauger (1971), and Trauger and Bromley (unpubl.) and summaries furnished by Bellrose (1976) provide a basis for estimating the probable impact of an open season beginning before 1 September in the vicinity of Yellowknife, Northwest Territories. Lesser Scaup and Green-winged Teal are selected as examples because of their importance in the bag of territorial residents, even though these species are not well represented in the SCS. The chronological events of their life history, along with those of Lesser Snow Geese, are given in Figure 3. Similar, but more extensive, data in Figure 4 (derived from Alliston 1984) demonstrate the situation in the lower MacKenzie District. It can be assumed that the situation in Zone 04 is intermediate between those presented in Figures 3 and 4.

Inability to harvest the local production of species such as Pintail, which begin breeding, moulting, and emigrating earlier, is not limited to areas north of 60°N. Southern Manitoba, for example, has a fall flight of Blue-winged Teal in excess of one million and harvests only 15 000. Fewer than 50 000 Pintails breeding in southern Alberta and Saskatchewan are taken from a fall flight that in some years exceeds two million birds. Nothing can be done to change phenology; it is a biological fact of life that most Pintails and Blue-winged Teal have begun their exodus from southern Canada as early as 15 August. Those species that do not begin to leave until later are generally those that have relatively slow development, large clutches, and long incubation periods.

The SCS provides a basis for estimating the species composition of the kill of waterfowl. Wing receipts from both the Yukon and MacKenzie for 1979–85 have been combined in Tables 10 and 11 to give some indication of the species composition of the kill in the NWT. Use of the SCS as a measure of change in hunting effort by weekly interval is not satisfactory because receipts tend to be a function of the supply of envelopes and not of hunting activity. A dwindling supply of envelopes leads to more complete reporting of species taken early in the season than of those taken later in the season (Cooch *et al.* 1978). Effectively, comparisons of species composition can be made within weekly intervals and not between intervals in terms of the numbers of a particular species killed. Because of the small sample size available from the two territories, it was not deemed sensible to produce separate tables for each special sampling zone (01-05 inclusive), and the species composition is determined for the entire MacKenzie District (Table 10) and the entire Yukon (Table 11). Within the northern zones of the provinces no differences from the tables of relative abundance published annually in the NHS reports were detected, and they are therefore not repeated here.

The SCS is also used to provide an assessment of the age and sex ratios of the kill. Because of limited samples available from the two territories, computation of ratios is not feasible except for Mallards combined for both territories (N = 208), where the ratio is 4.78 immatures per adult. The comparable ratio for the special northern provincial sample zones is 2.31. These data are unadjusted for relative vulnerability, because of a lack of pre-season banding data from the territories. They should not be interpreted to infer better production in the territories when compared with the provinces. A more reasonable conclusion is that, given the size of the Mallard kill occurring early in the season when local production is most vulnerable, the high ratio in the territories is a reflection of the general immaturity of the birds produced in that region. In short, the observed high immature:adult ratio in the territories is a further measure of the impact of phenology, not of high reproductive success.

Discussion

Although there is no doubt that the number of days available for hunting ducks or geese increases as one proceeds south, there is also no doubt that the high daily bag limits, lack of a possession limit, low hunting pressure, and the opportunity for Sunday hunting in the territories result in recreational hunters in all zones of the two territories achieving a success rate and seasonal bag equal to or greater than that which is possible in most areas further south. Moreover, the reports of hunters in the NHS show that in the southern zones of the territories (where most people live and most recreational hunting is carried on), effective season lengths and the median dates of hunting activity are little different from those several hundred kilometres to the south. In the MacKenzie Delta, geese are available in early September, as they are at Churchill, Manitoba, though access may not be as easy. Lack of easy access to concentrations of staging waterfowl (especially geese) probably has a greater impact on recreational hunting than the lack of birds during the legal open hunting season.

The proposals by those who call for renegotiation of the Migratory Birds Convention to allow opening the waterfowl hunting season, as early as 1 August, for the benefit of northern recreational hunters and tourists are biologically unsound. Although such an amendment would lead initially to increased kills, this would be followed by rapid depletion of breeding populations in the vicinity of communities, because significant proportions of locally breeding ducks would still be flightless or at best just regaining their powers of flight. It is difficult to believe that recreational hunters in the territories would wish to be associated with killing flightless birds.

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*These NHS zones have different boundaries from the smaller special zones used earlier in this study.

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Table 1
Annual sales of migratory game bird hunting permits in the territories and the northern parts of the western provinces, 1979–85, and duck stamp sales in Alaska during the same period

Zone	Area	Year							$\bar{x}$
		1979	1980	1981	1982	1983	1984	1985	
01	Yukon Territory	543	483	464	522	422	449	324	458
02	Yukon Territory	41	42	50	50	52	47	37	45
03	Northwest Territories	27	26	25	32	42	45	41	34
04	Northwest Territories	92	74	69	81	90	83	57	78
05	Northwest Territories	636	632	670	687	618	722	615	654
06	Manitoba	380	388	378	364	370	319	322	360
07	Manitoba	402	378	340	322	252	248	223	309
08	Saskatchewan	43	66	73	25	6	8	8	33
09	Saskatchewan	39	39	41	44	36	48	38	41
10	Alberta	701	668	610	594	592	696	619	640
11	Alberta	3 438	3 462	3 103	2 587	2 566	2 569	2 259	2 855
12	British Columbia	86	77	108	102	90	80	57	86
13	British Columbia	1 001	1 021	961	834	733	631	563	820
Total		7 429	7 356	6 892	6 244	5 869	5 945	5 163	6 413
Duck stamps sold in Alaska		19 689	20 110	15 814	18 000	18 388	18 475	15 335	17 973

Table 2
Average seasonal duck hunting statistics, 1979–85

Zone	Permits sold	Hunters		Total kill	Seasonal kill per hunter		Days hunted/ active hunter	Kill/ day/ active hunter	% successful hunts	Average kill/ successful hunt	Successful %	Average season length (days)	Median date of hunting
		Active	Successful		Active	Successful					Active		
01	458	274	221	2 453	8.95	11.10	4.70	1.90	43.86	3.06	80.66	72	22 Sept.
02	45	33	27	97	2.94	3.50	6.93	0.42	54.10	2.63	81.82	36	14 Sept.
03	34	33	29	287	8.70	9.90	3.70	2.35	50.00	3.73	87.89	32	13 Sept.
04	78	129*	106	1 388	10.76	13.09	5.25	2.05	49.52	3.82	82.17	70	21 Sept.
05	654	632	567	8 189	12.96	14.47	6.71	1.93	51.27	4.04	89.72	81	25 Sept.
06	360	352	235	613	1.74	2.61	4.57	0.38	50.64	2.89	66.76	58	13 Sept.
07	309	265	216	1 605	6.06	7.43	5.69	1.07	49.46	2.92	81.51	70	23 Sept.
08	33	29	22	228	7.88	10.36	6.00	1.31	33.31	1.66	75.86	51	24 Sept.
09	41	33	21	374	11.33	17.81	6.43	1.60	44.87	3.58	63.64	91	1 Oct.
10	640	434	364	3 627	8.35	9.86	4.93	1.69	55.23	3.49	83.87	81	26 Sept.
11	2 855	2 236	1 507	16 874	7.54	11.19	6.07	1.24	53.25	3.41	67.40	100	5 Oct.
12	86	32	26	176	5.50	6.77	6.80	0.81	29.03	3.44	81.25	64	1 Oct.
13	820	542	363	2 276	4.19	6.27	5.50	0.76	47.38	3.30	66.97	92	4 Oct.
Alaska	17 973	12 251	9 841	93 110	7.60	9.46	6.11	1.24	N/A	N/A	80.33	N/A	N/A

*Indicates movement of hunters into zone from other areas.

Table 3
Average seasonal goose hunting statistics, 1979–85

Zone	Permits sold	Hunters		Total kill	Seasonal kill per hunter		Days hunted/ active hunter	Kill/ day/ active hunter	% successful hunts	Average kill/ successful hunt	Successful %	Average season length (days)	Median date of hunting
		Active	Successful		Active	Successful					Active		
01	458	274	83	322	1.18	3.90	4.67	0.25	21.80	1.94	30.29	49	18 Sept.
02	45	33	7	22	0.67	3.14	2.91	0.23	25.00	2.75	21.21	19	5 Sept.
03	34	33	11	167	5.06	15.18	1.83	2.77	54.55	6.66	33.33	17	11 Sept.
04	78	129*	31	128	1.00	4.13	3.07	0.33	24.82	2.79	24.03	64	20 Sept.
05	654	632	100	866	1.37	8.66	4.97	0.28	18.75	2.54	15.82	67	19 Sept.
06	360	352	317	3 384	9.61	10.68	4.84	1.99	64.41	3.01	90.06	64	11 Sept.
07	309	265	112	1 005	3.79	8.97	4.93	0.77	29.23	2.37	42.26	68	23 Sept.
08	33	29	—	—	—	—	—	—	—	—	—	—	—
09	41	33	6	47	1.42	7.83	5.50	0.26	18.18	2.00	18.18	28	21 Sept.
10	640	434	290	2 635	6.07	9.09	4.28	1.42	37.49	1.90	66.82	76	28 Sept.
11	2 855	2 236	1 383	10 878	4.86	7.86	5.20	0.93	42.40	2.52	61.85	100	9 Oct.
12	86	32	—	—	—	—	—	—	—	—	—	—	—
13	820	542	128	599	1.15	4.68	4.80	0.37	20.76	1.96	37.43	83	7 Oct.
Alaska	17 973	12 251	9 841	9 356	0.76	0.95	(6.11)	(0.12)	N/A	N/A	(80.33)	N/A	N/A

*Indicates movement of hunters into the zone from other areas.

Table 4
Duck hunting activity expressed as a percentage of total seasonal hunting activity in each zone for weekly time periods beginning 1 September

	Weekly intervals from 1 September													
Zone	1	2	3	4	5	6	7	8	9	10	11	12	13	14
01	15.4	18.0	18.0	15.4	9.8	7.8	7.7	3.7	2.8	1.4	—	—	—	—
02	28.8	17.5	17.5	11.3	15.0	10.0	—	—	—	—	—	—	—	—
03	8.1	59.5	11.7	15.3	5.4	—	—	—	—	—	—	—	—	—
04	20.0	19.4	14.3	12.8	8.2	5.7	7.1	6.9	4.6	1.2	—	—	—	—
05	18.9	16.1	24.0	13.7	9.4	7.2	3.3	2.3	1.3	1.7	1.2	0.9	—	—
06	29.2	28.6	18.9	10.1	6.0	3.2	2.6	1.4	—	—	—	—	—	—
07	10.9	17.6	21.3	16.7	10.8	7.6	6.7	5.0	2.3	1.3	—	—	—	—
08	0	0	22.2	62.9	7.4	7.4	—	—	—	—	—	—	—	—
09	8.7	9.4	13.9	12.2	12.2	9.4	11.9	5.3	6.4	2.8	2.8	2.5	2.5	—
10	10.5	12.9	15.0	15.9	11.5	13.3	8.1	6.3	5.1	0.7	0.6	—	—	—
11	7.4	9.4	10.6	11.1	7.1	15.8	14.0	9.9	6.4	3.6	2.5	1.3	0.8	0.3
12	10.2	16.4	6.2	0	0	6.2	6.6	19.5	24.8	—	—	—	—	—
13	9.7	7.3	11.2	12.8	12.0	11.9	13.0	8.9	6.3	3.0	2.0	1.1	0.8	—

Table 5
Goose hunting activity expressed as a percentage of total seasonal hunting activity in each zone for weekly time periods beginning 1 September

	Weekly intervals from 1 September													
Zone	1	2	3	4	5	6	7	8	9	10	11	12	13	14
01	22.6	19.1	15.6	17.0	10.3	6.4	5.8	2.2	1.1	—	—	—	—	—
02	69.2	7.7	23.1	—	—	—	—	—	—	—	—	—	—	—
03	23.5	52.9	23.5	—	—	—	—	—	—	—	—	—	—	—
04	21.0	15.2	14.7	19.0	6.3	4.0	6.9	5.8	5.6	1.6	—	—	—	—
05	10.9	12.5	32.8	13.0	10.0	5.6	5.4	3.2	1.6	2.0	2.0	1.3	—	—
06	30.1	29.6	18.3	13.2	3.0	2.3	1.0	1.0	0.8	0.4	—	—	—	—
07	5.8	15.2	23.4	19.2	14.1	8.3	6.6	4.2	1.8	1.5	—	—	—	—
08	— no records —													
09	0	9.5	21.1	23.2	20.0	9.5	7.4	9.5	6.6	—	—	—	—	—
10	6.9	11.5	17.3	17.6	14.8	14.6	9.5	4.4	1.7	0.4	0.8	0.6	—	—
11	4.1	5.0	8.9	10.3	14.3	15.6	13.6	10.8	9.0	3.6	2.4	1.1	0.8	0.3
12	— no records —													
13	5.8	4.9	11.6	10.7	11.7	13.8	10.9	10.4	6.8	7.1	3.4	1.9	0.6	0.3

Table 6
Frequency of daily bag of ducks per zone (expressed as percentage)

	Daily bag																		% of kill in
Zone	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16-20	21-25	No.	bags of over 6
01	22.1	26.0	16.4	14.8	9.5	5.4	1.3	2.0	0.4	0.5	0.1	0.7	0.2	0.4	0.2	0.2	—	561	6.0
02	37.1	22.9	14.3	10.0	7.1	1.4	—	2.9	—	—	—	—	1.4	—	1.4	—	—	70	5.7
03	28.3	17.4	4.4	8.7	6.5	8.7	6.5	10.9	2.2	2.2	2.2	2.2	—	—	—	—	—	92	26.2
04	28.8	29.3	17.1	8.8	9.3	5.4	1.2	2.7	0.5	2.7	0.7	1.0	0.5	0.7	2.2	2.4	0.7	410	15.3
05	25.8	24.1	14.9	12.1	9.1	5.1	2.1	1.9	0.9	1.9	0.2	0.2	0.2	0.7	0.2	0.7	0.5	431	9.5
06	22.5	28.4	13.6	11.4	13.6	10.6	—	—	—	—	—	—	—	—	—	—	—	236	—
07	21.3	29.2	15.8	14.8	7.1	11.7	—	—	—	—	—	—	—	—	—	—	—	366	—
08	58.3	16.7	25.0	—	—	—	—	—	—	—	—	—	—	—	—	—	—	24	—
09	10.2	21.2	16.9	20.3	15.3	16.1	—	—	—	—	—	—	—	—	—	—	—	236	—
10	13.6	28.2	14.7	15.0	15.5	4.8	2.5	5.6	—	—	—	—	—	—	—	—	—	354	8.1
11	16.8	27.1	15.1	14.7	9.6	6.7	2.1	7.9	—	—	—	—	—	—	—	—	—	2185	10.0
12	16.7	27.8	27.8	5.6	5.6	16.7	—	—	—	—	—	—	—	—	—	—	—	36	—
13	19.3	24.1	16.7	15.0	10.6	5.6	2.3	6.3	—	—	—	—	—	—	—	—	—	605	8.6

Table 7
Frequency of daily bag of geese per zone (expressed as percentage)

	Daily bag										
Zone	1	2	3	4	5	6	7	8	9	10	*N*
01	53.9	23.6	10.9	5.5	4.9	6.3	0.6	—	—	—	165
02	62.5	37.5	—	—	—	—	—	—	—	—	16
03	50.0	28.6	7.0	7.0	7.0	—	—	—	—	—	28
04	29.0	31.9	8.7	13.0	3.0	7.3	3.0	1.5	3.0	—	138
05	33.3	21.6	19.6	11.8	4.0	2.0	2.0	2.0	2.0	2.0	102
06	20.1	27.0	12.2	15.3	25.4	—	—	—	—	—	378
07	34.2	27.2	16.7	11.4	10.5	—	—	—	—	—	114
08	— no records —										
09	83.3	16.7	—	—	—	—	—	—	—	—	12
10	19.3	30.7	18.6	10.8	20.6	—	—	—	—	—	388
11	29.3	28.9	16.7	10.3	14.7	—	—	—	—	—	1370
12	— no records —										
13	46.3	29.3	11.6	8.2	4.8	—	—	—	—	—	147

Table 8
Sampled bag limit analysis for 1979–85 in Northwest Territories Special Zone 04

Ducks Killed	Time period (7-day intervals)														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	Total
0	18	82	101	74	49	39	39	43	15	8	2	2	1	1	474
1	5	17	23	18	21	11	16	1	5	1	0	0	0	0	118
2	11	19	28	14	13	11	12	6	5	1	0	0	0	0	120
3	2	18	11	8	8	9	4	5	3	1	0	1	0	0	70
4	4	9	6	5	3	4	1	2	2	0	0	0	0	0	36
5	2	9	6	8	6	4	2	0	0	0	0	0	1	0	38
6	2	3	7	6	3	0	0	1	0	0	0	0	0	0	22
7	0	2	1	1	0	1	0	0	0	0	0	0	0	0	5
8	2	1	4	2	1	0	1	0	0	0	0	0	0	0	11
9	0	0	2	0	0	0	0	0	0	0	0	0	0	0	2
10	0	3	3	2	0	1	0	1	1	0	0	0	0	0	11
11	0	2	1	0	0	0	0	0	0	0	0	0	0	0	3
12	0	2	1	1	0	0	0	0	0	0	0	0	0	0	4
13	0	1	0	1	0	0	0	0	0	0	0	0	0	0	2
14	0	1	1	0	1	0	0	0	0	0	0	0	0	0	3
15	1	6	1	0	0	1	0	0	0	0	0	0	0	0	9
16	1	0	1	0	0	0	0	0	0	0	0	0	0	0	2
17	1	0	1	0	1	0	0	0	0	0	0	0	0	0	3
18	0	0	1	1	0	0	0	0	0	0	0	0	0	0	2
20	1	1	0	0	0	0	0	0	0	0	0	0	0	0	2
25	1	1	0	0	0	0	0	0	0	0	0	0	0	0	2
Total active hunter-days	51	177	199	141	106	81	75	59	31	11	2	3	2	1	939
Total ducks	180	468	398	252	170	128	74	52	42	6	0	3	5	0	1778
Ducks per active hunter-day per time period	3.52	2.64	2.00	1.78	1.60	1.58	0.98	0.88	1.35	0.54	0.00	1.00	2.50	0.00	1.89
Total successful hunter-days	33	95	98	67	57	42	36	16	16	3	0	1	1	0	465
Ducks per successful hunter-day per time period	5.45	4.92	4.06	3.76	2.98	3.04	2.05	3.25	2.62	2.00	0.00	3.00	5.00	0.00	3.82
% successful days	64.7	53.6	49.2	47.5	53.7	51.8	48.0	27.1	51.6	27.2	0.0	33.3	50.0	0.0	49.5

Table 9
Average kills of ducks and geese in northwestern Canada and in Alaska 1979–85

Area		Successful hunters		Total kill		Seasonal bag/successful hunter	
		Ducks	Geese	Ducks	Geese	Ducks	Geese
Yukon	Zone 01	221	83	2 453	322	11.10	3.90
NWT	Zones 04 & 05	673	131	9 577	994	14.23	7.59
Manitoba	NHS Zone 02	7 150	5 581	87 517	39 677	12.24	7.11
Saskatchewan	NHS Zone 02	6 269	3 518	90 854	20 784	14.49	5.91
Alberta	NHS Zone 02	27 491	9 989	338 971	63 496	12.33	6.36
British Columbia	NHS Zone 01	5 869	2 369	60 153	9 151	10.25	3.86
Canada		268 886	114 836	2 583 755	656 063	9.61	5.71
Alaska		9 841	N/A	93 110	9 356	9.46	0.95

Table 10
Species composition of duck bag by weekly intervals, MacKenzie District, Northwest Territories, 1979–85

Species	Weekly intervals											
	September					October						
	1–7	8–14	15–21	22–28	29–5	6–13	14–20	21–27	28–3	Unknown	Total	%
Mallard	57	20	19	10	16	2	3	1	1	5	134	50.2
Wigeon	14	4	-1	7	3	—	3	—	—	1	33	12.4
Pintail	10	3	1	1	—	—	—	—	—	—	15	5.6
Green-winged Teal	6	4	1	1	2	1	—	—	—	—	15	5.6
Other dabblers	2	4	3	—	—	—	—	—	—	1	10	3.7
Lesser Scaup	9	1	2	5	2	4	—	—	—	1	24	9.0
Other divers	13	3	7	6	9	1	1	—	—	—	40	14.9
Total ducks	110	39	32	32	28	8	7	1	3	8	268	
% Mallard	51.8	51.3	59.4	31.3	57.1	25.0	42.9	50.0	25.0	62.5		

Table 11
Species composition of duck bag by weekly intervals, Yukon 1979–85

Species	Weekly intervals											
	September					October						
	1–7	8–14	15–21	22–28	29–5	6–13	14–20	21–27	28–3	Unknown	Total	%
Mallard	36	24	9	13	1	18	10	10	1	13	135	39.1
Wigeon	20	7	5	3	1	—	—	—	—	13	49	15.3
Pintail	11	6	8	6	3	—	—	—	—	6	40	12.5
Green-winged Teal	7	3	9	1	3	—	—	—	—	2	27	8.4
Other dabblers	8	3	1	—	—	5	—	1	—	2	20	6.2
Lesser Scaup	3	5	2	2	—	1	—	—	—	2	15	4.7
Other divers	2	0	4	4	5	9	4	4	0	5	37	11.5
Total ducks	87	48	38	29	13	33	14	15	1	43	321	
% Mallard	41.4	50.0	23.7	44.8	7.7	54.5	71.4	66.6	100	30.2		

Figure 1
Special sampling zones

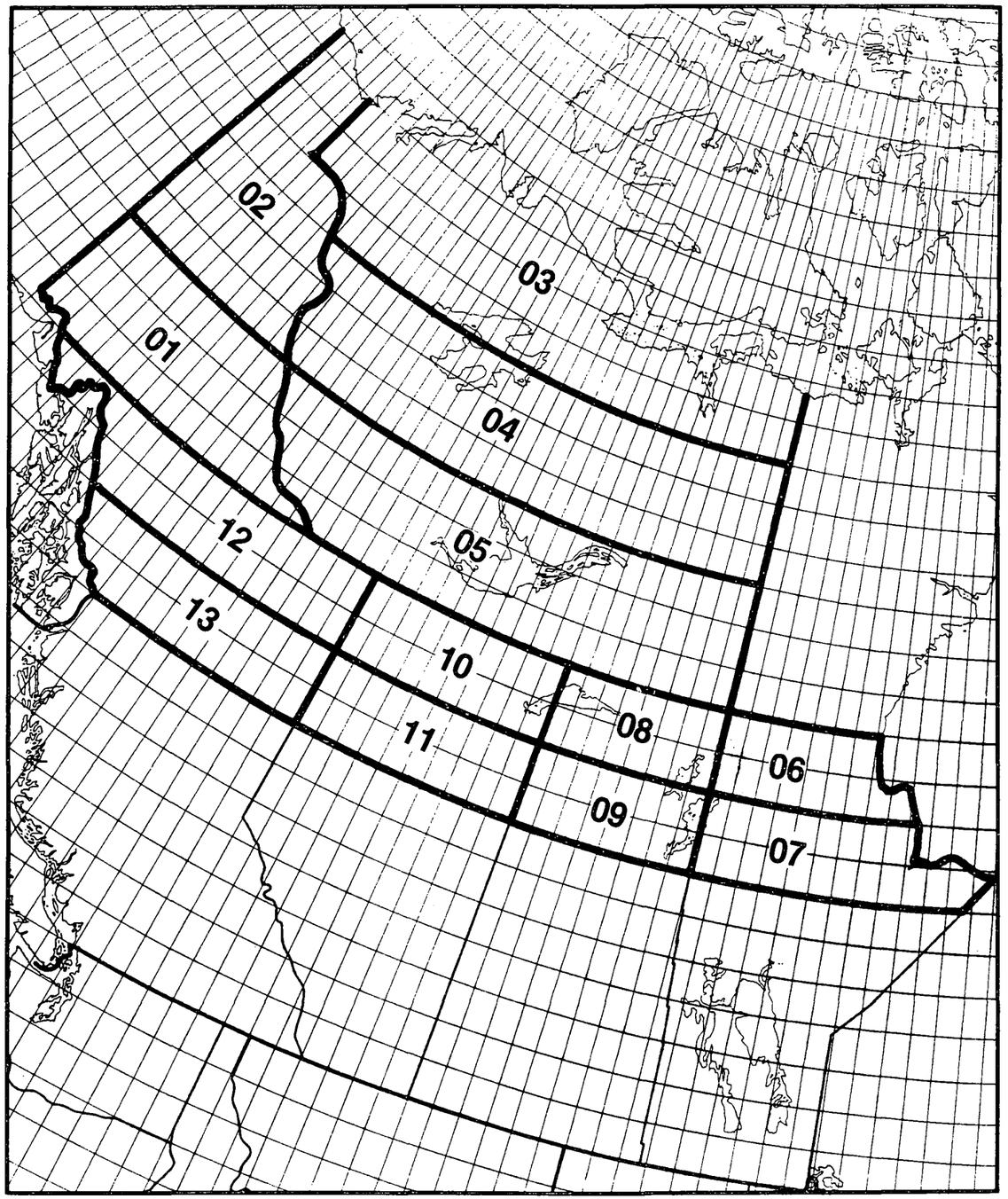


Figure 2
Season lengths for ducks (1) and geese (2), showing median date of hunting activity

Zone	September	October	November	December	Total days available
01	1				72
	2				49
02	1				36
	2				19
03	1				32
	2				17
04	1				70
	2				64
05	1				81
	2				67
06	1				58
	2				64
07	1				70
	2				68
08	1				51
	2				—
09	1				91
	2				28
10	1				81
	2				76
11	1				100
	2				100
12	1				64
					—
13	1				92
	2				83

Figure 3
Phenology of three species of waterfowl (1) nest initiation, (2) egg laying, (3) incubation, (4) hatching and fledging

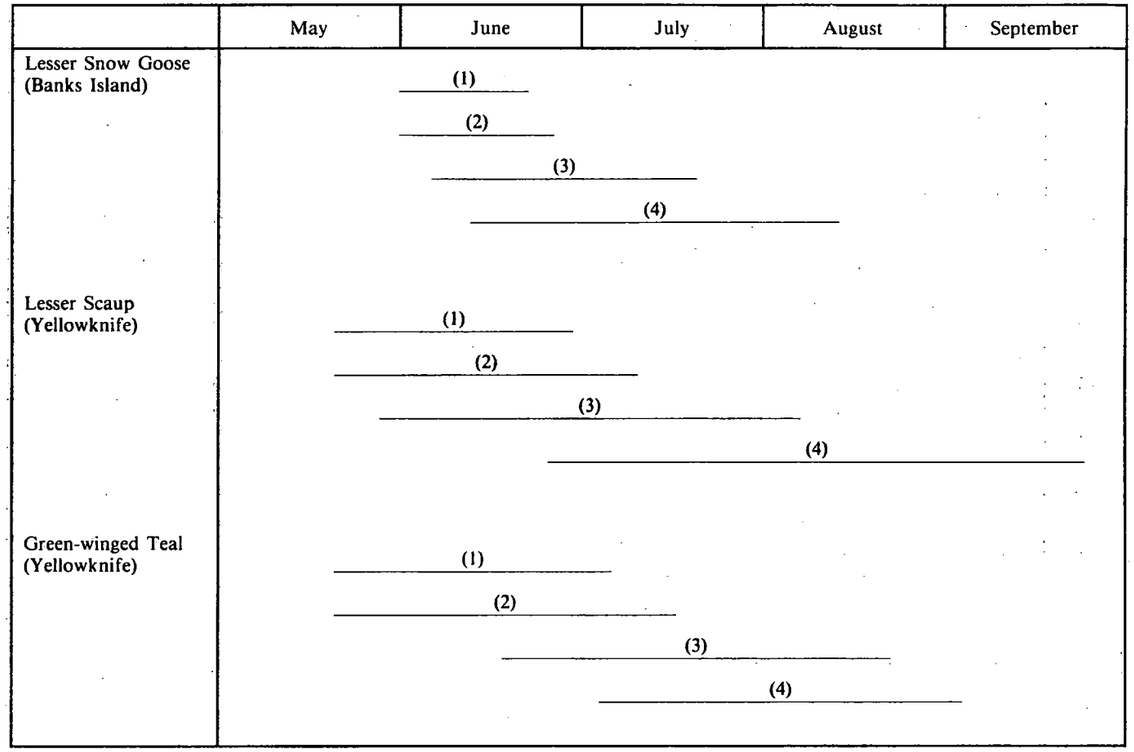
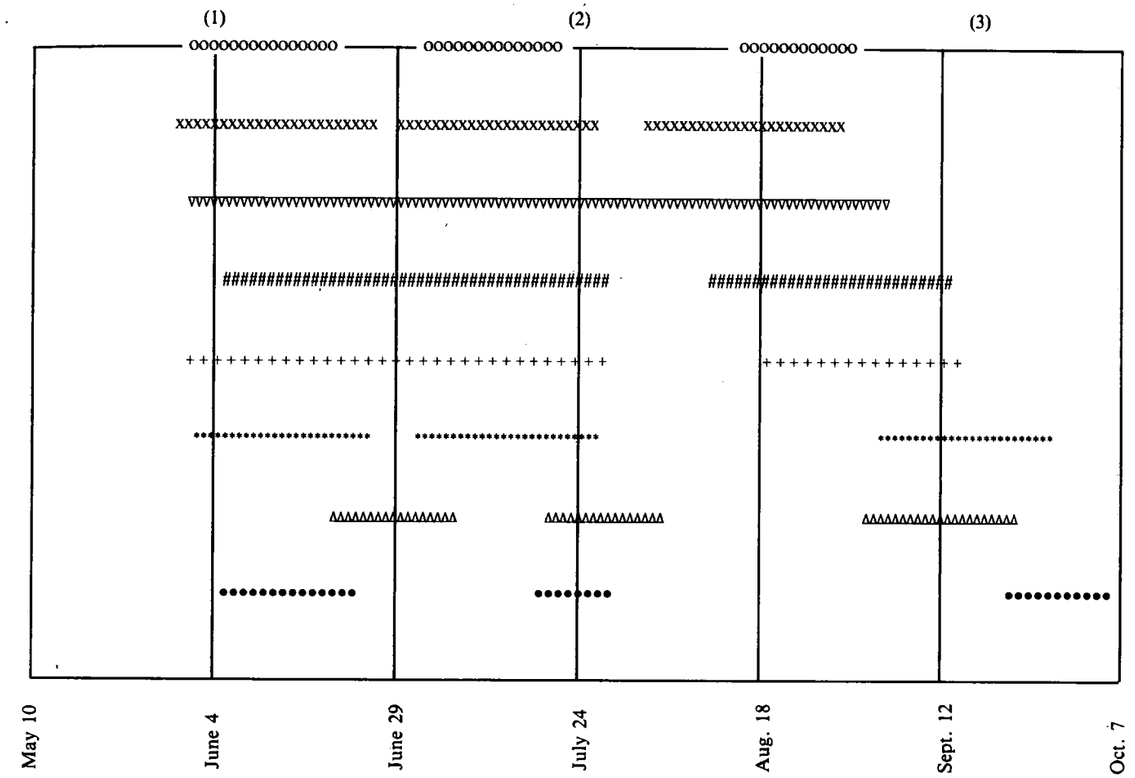


Figure 4
Breeding chronology of waterfowl species in the MacKenzie Delta in 1982. The three indicated breeding activities are nesting (1), incubation (2), and rearing (3) (data from Alliston 1984).



o Mallard
x Pintail
v Green-winged Teal
Wigeon
+ Shoveler
* Canvasback
Δ Scaup
• White-winged Scoter