NOTES ON THE BLACK DUCK

in the

MARITIME PROVINCES

by

George F. Boyer

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CANADIAN WILDLIFE SERVICE

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INTRODUCTION

The Black Duck (*Anas rubripes*) is one of the most versatile of all our breeding waterfowl, nesting in most of the wetland types in eastern North America. Other more specialized forms, such as the goldeneye (*Bucephala* spp.) and Wood Duck (*Aix sponsa*) are confined to certain regions largely by their nesting habits. The Ring-necked Duck (*Aythya collaris*), which is fast becoming a major species, may now out-number the blacks in certain areas such as the lakes in southwestern Nova Scotia. However, the Black Duck is by far our most abundant species.

It is partly the purpose of this paper to point out that the fundamental behaviour of the Black Duck is very similar to that of other river ducks, particularly to its close relative, the Mallard (*Anas platyrhnchos*). In the past, not enough attention has been given to detailed study of the behaviour of the Black Duck, and particularly to its territorial behaviour. This paper is not the result of such a detailed study, but is merely an accumulation of the observations of the writer during eight years of varied waterfowl studies in the Maritimes. A serious attempt has been made to take advantage of much of the existing literature. It is hoped that the following will provide a releaser for some enthusiastic worker to carry out a detailed life history study of the Black Duck here. If this is done, the writer will be satisfied, whether the deductions in this paper are proved or disproved.

THE HABITAT

An important aspect of the study of any species is evaluation of its habitat and correlation of habitat characteristics with the species' needs.

The Maritime Provinces are in the Appalachian Region of Canada. The region as a whole consists of upland dissected by valleys and broken up lowlands developed on belts of weak rock (Alcock, 1938).

It is in the lowland regions that the areas of major waterfowl habitat occur. No attempt will be made here to give a detailed evaluation of the different localities, but a broad description pointing out a few of the characteristics is in order. Areas described are Midgic Marsh, the Grand Pre area, southwestern Nova Scotia, Yarmouth County Coastal Area, Cape Breton and Prince Edward Island.

There are five lowland regions in Nova Scotia characterized by underlying rocks such as sandstone, shale, and scattered limestone and gypsum, all of the late Carboniferous period. In that category might also be included Prince Edward Island and the Cumberland - Pictou area of Nova Scotia. Included in the eastern plain are some of the major waterfowl producing habitats, such as the Lower Saint John River Valley (in part), the New Brunswick - Nova Scotia Border Region, and the coastal areas of Prince Edward Island and northern Nova Scotia.

The uplands are areas of low waterfowl production. They are of a much earlier geological origin and although there are many lakes and waterways, the habitat is generally poor and characterized by extreme acidic conditions.

Poor drainage has reduced the habitat value of much of the lowland. The chief factors which have contributed favourably to those areas are:

1. The deposition of rich alluvial soil by the annual freshets of some of the larger rivers. That is particularly noticeable in the lower Saint John River Valley. A similar area of much less importance is the intervale land in the lower part of the Miramichi system in New Brunswick.
2. In the tidal areas, particularly at the upper end of the Bay of Fundy, sedimentation by the extreme fluctuation of the tide acting on the soft Carboniferous sandstone and by the deposition of organic matter has also played its part. The brackish influence of the sea on the upper reaches of many salt marshes has made some of those areas, though small in size, among the most important supporters of waterfowl breeding populations. Many of those marshes are directly affected by the tide only in their lower portions and in their upper reaches are quite fresh, as indicated by dense growths of cat-tail (*Typha* spp.) and the presence of frogs.
3. Scattered throughout the lowlands are formations which can be traced to the Mississippian Age. Here the presence of limestone and gypsum have greatly added to the habitat value.

The writer is most familiar with the New Brunswick - Nova Scotia Border region, where man has unwittingly carried out one of the most successful waterfowl management projects in the Maritime Provinces. Unfortunately, drainage is now reducing the value of those areas. Before the coming of the white man, the upper reaches of the Bay of Fundy

contained large areas of salt marsh. Through diking and ditching marsh areas have been made into hay producing meadows several thousand acres in extent. The two most important areas are the head of Cumberland Basin in the New Brunswick - Nova Scotia Border region, and the Grand Pre - Canard Meadows on the south shore of Minas Basin in Nova Scotia.

Midgic Marsh

Certain meadow areas at the head of Cumberland Basin were neglected during the period succeeding the first World War. The most important of those areas was Midgic Marsh, which will be frequently referred to in this paper.

Drainage ditches on Midgic Marsh were allowed to fill up and many ponds were formed. The area then became true marsh with a basic pH reaction. Certain species of plants, such as sago pondweed (*Potamogeton pectinatus*) which is usually a product of only brackish marshes, became abundant. A rich variety of aquatic life established itself. The breeding population of waterfowl built up to unusual numbers per unit area. Species of waterfowl hitherto unrecorded there, such as the Pintail (*Anas acuta*), established themselves in good numbers; and other species, such as the Northern Shoveler (*Anas clypeata*) began to put in an appearance.

Much of the fresh water habitat in the Border area is very poorly drained and no attempt has been made at reclamation. The lakes in the Missaquash area directly on the inter-provincial boundary are examples of that type. There are indications that the bog type might

have eventually become the final succession at Midgic through the natural course of events. However, management practices could no doubt keep the area in the basic marsh stage. Management in many of the coastal areas might produce surprisingly favourable results.

Midgic Marsh, at its best, contains a large number of ponds varying in size from a few feet across to several acres in area. Those ponds are separated from each other by the remains of old dikes and by growths of emergent vegetation. In the early spring there are many temporary water areas in the low spots in the surrounding hay meadows. The run-off is gradual. Later in the summer, loss of water is largely the result of evaporation. There are some fluctuations of water level due to heavy summer rains but that is after the nesting season for most species. Certain sections of the marsh show a brackish influence caused by unusually high tides in the nearby Tantramar River. However, the actions of high tides cause only a local disturbance of the vegetation, resulting in bare spots where the plant growth is largely of a halophytic type such as glasswort (*Salicornia* spp.). The effect of the salt water gradually lessens until on the upland side of the marsh a more acid type of habitat is encountered. Here the marginal vegetation contains many members of the Ericaceae family. Between the marsh and higher ground are growths of larch (*Larix laricina*) and black spruce (*Picea mariana*).

On the whole, the succession depends on many influences and no doubt proper manipulation could hold it in the most suitable stage for waterfowl production.

Grand Pre Area

The Grand Pre area includes some 4,000 acres of dikeland extensively used for growing hay and grazing cattle. On the seaward side of the dikes are salt marshes composed mainly of salt-water cord-grass (*Spartina alterniflora*), and intersected by many tidal creeks and rivers. The fluctuations of the tide expose large expanses of mud flat which are a favourite concentration area for Black Duck at all seasons of the year. Due to marsh reclamation and intensive utilization by man the region has lost much of its potential as a brood producing area.

Southwestern Nova Scotia

The lakes of southwestern Nova Scotia are typical of a great part of the upland habitat on the mainland of the province. The waterfowl composition and production is also similar to that of the upland habitat in the southwestern part of New Brunswick. Measured pH values in that type of habitat range from 5.4 to 7.0. Some of the lakes are deep and rocky and contain very little aquatic vegetation. Usually the tree growth extends very near to the shore. Waterfowl production is negligible. The best lakes in the region might be described as the boggy type. The chief aquatic vegetation is typical of acid conditions and includes pondweed (*Potamogeton epihydrus*), water-shield (*Brasenia Schreberi*), water-lily (*Nuphar* spp.), fragrant water-lily (*Nymphaea odorata*), and floating heart (*Nymphoides cordata*). Emergent plants are bur-reed (*Sparganium* spp.), spike-rush (*Eleocharis* spp.), bog-rush (*Juncus militaris*)

and pickerelweed (*Pontederia cordata*). Species of grasses and sedges are found in the bogs. Most of the marginal vegetation consists of the various species of Ericaceae commonly found in the region.

According to waterfowl surveys, Black Duck and Ring-necked Duck nest in about equal proportions on the best lakes. Both species appear to leave the lakes by early October, the blacks forming concentrations on some of the coastal mud flats and salt marsh areas. The lakes near the coast can be visited regularly until freeze-up which sometimes does not occur in southwestern Nova Scotia until mid-January. In mild years some inland waters do not freeze all winter.

Yarmouth County Coastal Area

The Yarmouth County coast, and in varying degrees, portions of all the south coast of Nova Scotia have expanses of mud flats which are exposed by low tide bordered by salt marsh. Those are the principal wintering areas for the Black Duck in the Maritimes. Eelgrass (*Zostera marina*) beds are found in many areas. The best coastal breeding habitat, as is the case in the Maritimes as a whole, is found among the small ponds and marshes on the upper reaches of the salt marsh. The upper parts are sometimes entirely fresh marsh type of habitat. The brood density per unit area is greater there than in any other natural type of habitat in the Maritime Provinces. Black Duck also rear their young in the tidal rivers where adjacent salt marsh vegetation and other cover provide protection.

Cape Breton

There are several good waterfowl breeding areas in Cape Breton along the intervale lands of the larger rivers where the habitat is similar to the Saint John River Valley. Some of the lakes in the lowland areas contain rearing cover and good marshes for food. The two principal areas of Cape Breton investigated were the Baddeck River estuary and the estuary of Middle River, both located near the town of Baddeck on the north shore of the Bras d'Or Lakes. Of those two areas, the Middle River is more important for the production of Black Duck. The water is brackish and there is practically no tidal fluctuation. The marshes themselves are covered with small ponds interspersed by the numerous branches of the rivers. Such plant species as eelgrass, widgeon grass (*Ruppia maritima*), and pondweed (*Potamogeton pectinatus*) are abundant; pondweed (*P. bupleuroides*), horned pondweed (*Zannichellia palustris*), three-square rush (*Scirpus americanus*), and rush (*S. robustus*) are common; while cat-tail (*Typha latifolia*), and soft-stem bulrush (*Scirpus valiatus*) grow in the ponds and along the river at the upper end of the marshes.

The Baddeck area contains much the same vegetation as the Middle River area, but lacks the expanse of salt marsh and ponds. In the fresh water part of the Baddeck River mouth the pH ranges from 8.5 to 7.5. Additional plants found there are bur-reed, water-lily, and bulrush (*Scirpus Olneyi*).

The principal species of breeding ducks in rough order of abundance are Black Duck, Ring-necked Duck, Blue-winged Teal (*Anas discors*),

Common Goldeneye (*Bucephala clangula*), and American Green-winged Teal (*Anas crecca carolinensis*).

Wild rice (*Zizania aquatica*) is absent from Nova Scotia except for one or two scattered patches near the New Brunswick border. The Saint John River region in New Brunswick has large wild rice beds in addition to many other waterfowl food plants.

Prince Edward Island

Most of the waterfowl habitat in northern Nova Scotia and Prince Edward Island is tidal. The greater part of the coastline of Prince Edward Island contains numerous salt marshes and the major rivers are tidal for most of their length. Small fresh ponds, many of them artificial, are scattered over the island. The largest fresh water area is Pisquid Pond which contains a good wild rice bed. The Black Duck is the principal breeding species of Prince Edward Island, followed by the Ring-necked Duck, Blue-winged Teal, Common Goldeneye, and American Green-winged Teal. A good wintering population of Black Duck and goldeneye is found along the coast and in the rivers.

THE BREEDING SEASON

A thorough knowledge of the factors affecting the breeding cycle of the Black Duck, and its response to them, is one of the major steps toward an understanding of the species and, ultimately, its management.

Pairing Behaviour

Autumn pairing has frequently been mentioned in the literature, and certainly many birds were paired at Port Joli before February 1. No aggressive contacts were seen between paired and unpaired birds. Some of the factors involved in display were perhaps concerned with social stimulation prior to pairing.

Checks of hunter bags in the Port Joli area during early winter indicated a preponderance of males over females of more than three to one. Winter banding data also showed an unbalanced sex ratio. That might have been partly due to a sexual difference on a particular wintering ground. It could help to account for the intensity of grouping of displaying birds.

Several isolated pairs were noticed at Port Joli in early February. Copulation was frequently noted, the earliest observation on February 1. The first evidence of nest selection was on February 26 when a pair was seen in a small brook about three-quarters of a mile from the harbour. A pair, or sometimes a single male was seen in that area almost daily after that date.

Copulation was witnessed frequently from February 1 onward. One instance was described in my field notes as follows: "The male swam

around the female, bobbing his head. She responded in the same manner and then lay flat with her neck outstretched. Copulation took place. Afterwards the male stood up in the water and flapped his wings several times."

Observations showed that the first arrivals on the breeding grounds in the Maritimes consisted of scattered pairs. To the writer, those first pairs had the appearance of older birds. My interpretation of "older birds" was based on the following observational criteria: A broad light line was plainly visible down each side of the centre of the back formed by the lighter colour of the folded greater coverts. The striking bright red coloration of the legs of the males was very noticeable. It was felt that those were signs of age rather than early seasonal characteristics. The bright red coloration was noticeable even in mid-May when many other birds on the marshes did not exhibit that characteristic. That was in line with Bent's (1923) description of the older birds. Observational evidence suggested that those birds were the first nesters and occupied territories soon after arrival, which in the New Brunswick - Nova Scotia Border region was in late March. Year after year the same marsh areas were occupied by the new arrivals, creating the impression that at least one member of the pair returned to familiar territory.

Courtship Behaviour

The study of the courtship and territorial behaviour of the Anatidae received a major stimulus in the work of Hochbaum (1944) on the Delta marshes, and various workers have added to our knowledge of that phase in the life of our prairie waterfowl. We still have much to

learn concerning the significance of display in the Black Duck and its relation to the factors influencing the breeding cycle.

What appear to be three phases of courtship display, exhibiting a general similarity to various published observations, have been observed by the writer.

1. What might be termed as the "first phase" has been witnessed in late summer and early autumn among small groups of perhaps 15 to 20 birds. It seemed to be the result of developing excitement of various individuals (presumably males) and was of a sporadic nature. A few birds in the group flew for short distances and landed. There was frequent splashing and bathing. Armstrong (1947) stated that "displacement bathing" was associated with emotional stress. On the whole, that behaviour seemed to be an indication that certain drakes were beginning "to feel their oats" and appeared to be more of a direct aggression toward each other than activity to attract females. It might be a form of pugnacity associated with the establishment of dominance, and could have some bearing on the first pairing noticed in the autumn by several authorities such as Trautman (1947), Wright (1954), and others.
2. The "second phase" of courtship observed by the writer resembled the autumn courtship described by Trautman (1947). An observation at Amherst Point Sanctuary on October 30, 1949, involved about 30 birds in one group and took place on a fresh water pond roughly 28 acres in area. The display was as follows: (a) birds swam about with necks outstretched and parallel to the water; (b) birds stood up "on tails",

necks bowed and bills touching chests, necks stretched straight upward in a smooth, steady, but fairly swift movement. That action was sometimes accompanied by wing flapping; (c) birds returned to the swimming position, bringing the head down to normal at the same time. Head bobbing took place; (d) movements (a), (b), and (c) repeated. This "phase" had much more appearance of stereotyped ceremonial display, whereas the first seemed to entail largely individual aggressive behaviour.

3. What might be termed the "third phase" was seen on many occasions on the wintering grounds, during a period of observation lasting between February 18 and March 15, 1950 on Port Joli Harbour in southern Nova Scotia. It was during that period that the courtship display appeared to be at its height in intensity and ceremonial. Parties ranging from five to ten and totalling roughly 250 birds were scattered over the harbour. Detailed observations of one group of nine may be described as follows:

   (a) Five or six of the birds swam in a compact group, turning back and forth in unison. Sometimes they dashed at each other, with neck lowered, in an aggressive manner, accompanied by a considerable amount of splashing.

   (b) The birds then "stood up on their tails" and each threw his neck upward to its full extent, after which the head was lowered in a bowing gesture until the bill touched the chest.

   (c) The birds then settled on the water and resumed normal swimming posture, seemingly before the bow was completed.

(d) After the birds had settled on the water, head bobbing was very noticeable. The sequence was repeated several times but the behaviour described as (a) occurred at less frequent intervals.

During the display, the clear, whistle-like note described by Phillips (1923), Trautman (1947), and others, was continually heard, but since so many groups were present it was not possible to associate the note with any particular sequence. The whistle was not heard during the October observations at Amherst Point and has never been heard by the writer during the autumn.

Delacour and Mayr (1945) pointed out that the display of river ducks follows a common general pattern. It seems to the writer that the ceremonial courtship of the Black Duck is identical to that of the Mallard. Slight differences might be attributed to the difference in the observer's interpretation.

The description by Wormald of five display postures of the Mallard quoted by Jordain and Ticehaust in Witherby *et al.* (1941) is as follows:

"(1) swimming round duck with head sunk and neck drawn back,

(2) bill suddenly lowered so that the tip is in the water, bird at same time standing up in the water and then passing bill rapidly up breast, this movement being performed by a slight jerk so that a tiny jet of water is thrown forward as bill is withdrawn, accompanied by a whistling note,

(3) breast lowered and tail raised two or three times in quick succession, often followed by a repetition of (1) and (2),

(4) quick "throw-up" of head and tail with feathers of head puffed out, and,

(5) quickly following on (4), neck stretched out just over water as birds swim about in different directions; commonly followed by a return to (1). Sequence given is not invariable."

Other authors differed greatly as to sequence of posture. S.E. Brock (unknown) found a sixth posture which usually intervened between (1) and (2) of Wormald. The forefront of the body was raised rather slowly out of the water and the head and neck extended upwards at an abrupt angle. Many other variations are also described by those writers.

Members of a displaying group occasionally took to the air in unison. Such flights were brief and usually consisted of circling the general area and returning to the point of departure. There were more than one female in some of those parties. During flight female(s) uttered a continuous clucking note.

On May 14, 1948, on the Midgic Marsh, I have recorded "saw a group of six male Pintails and one female in courtship (?) flight as well as another group of two males and one female at same time." That observation occurred late in the afternoon.

Territorial Behaviour

It would seem that detailed study of the behaviour of the Black Duck would bring to light many aspects of behaviour in relation to territory. The Black Duck is the dominant pond duck in many regions

of eastern North America. Much of the habitat is of poor quality when compared with the western prairies and thus environmental conditions have a predominant effect on nesting density.

Hochbaum (1944) said the primary function of territorial defence in ducks was to establish isolation from sexually active birds of the same species during the copulation link. He also pointed out that the boundaries of territory were the boundaries of the drake's tolerance.

"The territory is associated with the copulatory stage of the breeding cycle", Armstrong (1947). Dzubin (1955) found territorial behaviour of waterfowl well developed in the pothole region near Minnedosa, Manitoba. He described territory as being the defended portion within the home range of a pair of waterfowl and that the home ranges of several pairs of the same species might overlap. More than one pair might occupy the same place for feeding or resting without showing antagonism.

Wright (1954) noted friction among male Black Duck on several occasions during the course of his studies on the lower Saint John River. He stated that paired males tolerated other pairs but not single males. He also pointed out that during the nesting season the great fluctuation of water levels had an adverse effect on the establishment of territories.

As far as is known to the writer, a detailed study of the importance of territory in relation to Black Duck has never been made in the Maritimes. The only indication of territorial behaviour is from scattered observations.

Waiting areas suitable for defence, or areas where contacts are liable to be made between pairs are found in habitat where there is a heavy nesting density, such as the Minnedosa Potholes studied by Dzubin (1955).

Frequent observations of isolated nesting pairs indicate that the male flies to the vicinity of the nest in the evening and possibly during the early morning and waits for the female to join him. Wright (1954) stated that the male was absent from his territory in the morning but was usually observed in the afternoon and early evening. The writer does not necessarily interpret territory as a "waiting area" or "that place where the male was joined by the nesting female." Possibly it would have been found that the male left the territory later in the evening, before dark, to join the female in the vicinity of the nest. Both birds then flew off to feed and rest. On the evening of May 9, 1948, a male alighted in the corner of a field about a mile from the nearest water. An investigation of the immediate area was made, and a female was flushed from a clutch of ten eggs a short distance away. Both birds circled the area, calling repeatedly. Presumably the corner of the field was the male's waiting area.

It is improbable that defensive behaviour would ever be necessary in the case of isolated nests. The foregoing and similar observations indicate, however, that even under the most isolated conditions there is a waiting spot close to the nest. The home range of a pair of ducks nesting far from water may be very great and opportunity for defence of the waiting area would, therefore, be remote. Several pairs of Black Duck sometimes come together for feeding purposes in a marsh area or on the mud flats and exhibit no antagonism, although in such aggregations individual pairs could be readily picked out.

What were considered to be territories on Midgic Marsh in spring occupied by pairs or lone males constituted the wet portions of the hay

meadow where the water was perhaps two inches deep. Lone male Black Duck were seen in several small ponds, and territorial pursuit flights involving lone drakes and trespassing pairs were noted several times. It was not noted which member of the pair was attacked, but a typical flight would involve the attempted landing of a pair of birds and aggressive action taken by the lone drake. The pursuit would usually consist of one complete circle of perhaps a quarter of a mile in diameter and the return of the waiting bird. One observation took place on April 16 in early evening. When drakes occupying the ponds were flushed, they soon returned. On April 29, 1950, a female was flushed from a nest about 30 yards from a territorial pond. There was one egg in the nest on April 29 and a clutch of eight on May 6. On both occasions a male was on "territory" in the pond and the female was on the nest.

Pursuit flights involving Pintail were described in my notes for two occasions in 1948, on the same marsh. The first occasion was some time between 6:30 and 9:39 p.m. on May 4. Five males and one female took part. "The female seemed to be in the midst of the group and all seemed to twist and turn together. First one and then another of the males flew close enough to touch her and the sound of the wings striking together could be heard. The males" note "EEE-EEEE' was heard frequently. Took place just at dusk."

The pursuit flights of the Pintail differed from those of the Black Duck in that all observations of Black Duck pursuit flights involved only a territorial male and a pair. Pursuit flights involving one drake and one pair of Black Duck were noted by me in other places in the Maritime Provinces. One such instance was on May 8, 1946, at Grand Manan

when a lone male rose from a small salt water pond and pursued a pair which was passing over.

Hochbaum (1944) stated that defence behaviour in ducks was governed by visual stimuli and the natural obstructions blocking vision were the boundaries of the territory. He pointed out that territories were mostly on large unbroken water areas. The behaviour of a drake Mallard in one such area was compared to that of another occupying a small pothole where his vision was blocked by a high growth of phragmites. In the first case all pairs coming within 200 yards were driven off; in the latter, only those which came to the small pond were seen and driven off.

Herein may be the significance of territory in relation to the Black Duck. In spite of recent statements to the contrary many references have appeared in the earlier literature concerning pursuit flights involving two males and one female. Those flights were regarded as courtship and the statement followed that one male quickly tired and returned to the marsh while the other went off with his chosen mate. As Wright (1954) has pointed out, such territorial behaviour had little chance to develop under the fluctuating conditions in the lower Saint John River, but in areas where more static conditions occur, territorial behaviour might contribute to the generally sparse Black Duck population. The behaviour at Midgic Marsh, where cat-tail as well as phragmites helped to curtail vision, seemed analogous to the pothole Mallards.

The degree of tolerance of the Black Duck and its response to different types of territory is an important point worth studying. Intolerance between brood females does not seem to be great and, therefore,

it is possible that the males territorial requirements may have a great bearing on nesting density.

Nesting Season

The versatility of the Black Duck has enabled it to continue as a nesting species where there are fluctuations of water level in some of the otherwise good breeding areas, and in generally poor habitat elsewhere. Those conditions generally are conducive to low nesting density. One form in which Black Duck versatility has shown itself is in nests out of reach of the flood waters. However, in some areas in the New Brunswick - Nova Scotia Border region, and elsewhere, there are marshes offering the necessary food, nesting cover, and territorial requirements to support a high local population.

Mendall (1949) has shown that on a 70 acre marsh the Black Duck breeding population doubled from six to twelve pairs in one year after management techniques had been carried out to improve nesting requirements. Management was in the form of controlled water levels, food planting, and the breaking up of certain portions of the habitat to create a better distribution of water areas. The last operation appeared to Mendall (1949) to be a step toward the solution of territorial requirements. Those experiments took place on two marshes on the Moosehorn Refuge in Maine which were "typical of the northern bog habitat." Those practices resulted in a heavy population increase in the managed areas while "only slight increases or even decreases were occurring throughout portions of eastern Maine."

Evidence that the male might be present during the initial selection of the nest site was indicated by the writer's observations

near his home at West Sackville, New Brunswick. Unfortunately, exact dates were not kept. Early in April of 1948 a pair of Black Duck was noted in a small creek near the head of Cumberland Basin. The ducks flew up and circled over a wooded area of mixed second growth birch (*Betula* spp.), spruce (*Picea* spp.) and fir (*Abies balsamea*) about 300 yards from the house. The distance from the creek was about one and one-quarter miles. Both birds spent much time circling around and eventually disappeared into the trees. A thorough search was made, but it was not until mid-May that the nest was found and by that time it had been destroyed. The birds were not seen again that season. The following year, the same behaviour by a pair of Black Duck was observed. On May 17 a destroyed nest was located a few hundred feet from the one of the previous year, and that time the body of the female was also found - the victim of a mammalian predator. Since then no Black Duck have been noted in that spot. It is unfortunate that the pressure of other work requiring periods of absence prevented the writer from following closely the sequence of events in both those nesting attempts.

The composition of aggregations of Black Duck during the nesting season was difficult to determine. Until mid-May migrants were still stopping over, and later the post-breeding groups of males started to form. However, an aggregation of about two dozen birds under observation for several days during May, 1955, at the head of Cumberland Basin, seemed to be entirely composed of pairs. Birds arrived and departed in pairs although the complete movements of any one pair could not be followed. From the direction of flight it was felt that the birds were isolated nesters arriving at or leaving a loafing and feeding area.

It might be well at this point to compare observations of spring population densities of the Black Duck with the Pintail, which, although relatively uncommon in the Maritimes, was well established on Midgic Marsh. Table 1 lists the population of both species between the period of March 26 and May 27, 1949, on about 500 acres of marsh. Also are included some rough brood date from June and July surveys. Detailed observations made during the same period follow:

March 26

The first three pairs of Black Duck had already arrived on the Midgic Marsh and possibly at least one had started to nest. At that time the ground was still largely covered with ice, but there were a few bare patches and water areas.

April 7

There was a large build-up of paired and unpaired birds. The three pairs previously seen were now apparently represented by lone males and early nesting was under way. The Pintail had arrived, some in pairs and some in groups of undetermined status.

April 14

The number of transient blacks had been reduced, and now 29 pairs, including four males on territory were seen. The Pintail population was the highest spring count ever recorded by the writer. A large number of birds were migrants and did not stay to nest. The "other adult" blacks consisted of four groups of three, one group of five, one group of six, and one group of seven. The sex of grouped birds was not determined, but they displayed no antagonism toward each other and little interest in the other Black Duck on the marsh. The "other adult" Pintail consisted

Table 1. A comparison of Black Duck and Pintail populations on Midgic Marsh during spring and early summer, 1949

	Black Duck				Pintail				
	Pairs	Lone males	Other adults	Broods	Pairs	Lone Males	Other adult male	Other adult female	Broods
March 26	2	1	-	-	-	-	-	-	-
April 7	84	3	42	-	24	-	15	-	-
April 14	25	4	30	-	77	9	17	9	-
April 28	15	11	9	-	20	6	8	2	-
May 27	4	7	14	1	1	26	12	2	-
June 6	(partial coverage)			1	(partial coverage)				4
July 4	-	-	4	11	-	-	14	-	24

of groups of from two to six males each containing one female. In one case there were two females and one male.

April 28

The number of territorial pairs of blacks had decreased by three and the other adults consisted of three groups of three each (non-breeders ?). The Pintail migration had passed through and the 26 apparently resident pairs included six "territorial" males. Two groups, each containing four male Pintail and one female, were engaged in pursuit flights.

May 27

There were 11 pairs of blacks including seven territorial males, and 14 "other adults" in one group. It will be noted that the 14 "other adults", if males (a point which was omitted in my notes), added to the pairs present on that day falls one short of the pairs recorded on April 28. Those birds had the appearance of the nucleus of the larger groups of post-breeding males noted during June in the same area. The first brood of blacks was seen on May 27. Twenty-seven pairs of Pintail were seen, including 26 lone males. Other adults consisted of one group of eight males engaged in a pursuit flight of one female, and a group of males and one female.

June 6

One brood of blacks and four broods of Pintail were seen. Records of other species of ducks were not kept for that day.

July 4

The number of broods of blacks had increased to eleven and of Pintail, to 24. The main nesting season of the Pintail seemed to

have gotten away to an earlier start. A few post-breeding birds were seen on July 4 but no active pairs were identified. Heavy cover may have obscured some broods of blacks.

Wright (1954) pointed out the importance of the intensity of light on spermatogenesis and suggested that the light threshold of the Black Duck was 12½ hours, as a large majority of the year's first eggs were fertilized about March 30. That deduction may well be true, though further verification should be obtained by experimental work. Full clutches of 11 eggs have been reported from Prince Edward Island (Tufts, pers. comm.) and Grand Manan (Peters, 1944) on March 3 and 15 respectively. As has already been pointed out, evidence of nest selection was noted at Port Joli on February 26. It is granted that a light duration of 12½ hours may have been reached earlier in those two places than on the Saint John River area.

However, as Armstrong (1947) pointed out, various factors are known to exercise an influence on egg laying. In an overall picture of the reproductive capacity of the species, all factors must be taken into consideration. They are outlined as follows:

Internal factors

1. The growth of the gonads, the secretion of sex hormones, and the state of the repdoductive system
2. General metabolism

Environmental factors

3. Favourable weather
4. Adequate food supply
5. The availability of a suitable nesting site and nesting material

Psychological factors

6. The possession of territory
7. The presence and display of a mate or potential mate
8. Social stimulation
9. High position in the social hierarchy
10. Self stimulation

Armstrong (1947) pointed out "the inter-connection of the factors in the first two groups has the broad effect of bringing the birds into breeding conditions. The fine adjustments which achieve the final synchronization are given by those in the third group. Posturing of one kind or another is associated with every item in that section, revealing the essential nature of display."

Those factors are interrelated and with our present knowledge of the Black Duck some of them are difficult to analyze. In the discussion on behaviour and display, the psychological factors were commented upon. The effect of light on the development of the gonads has been pointed out by Wright (1954). However, I do not think that the effect of weather and food supply can be lightly dismissed. Our knowledge of those matters is, as yet, far from complete. In this paper some preliminary work on non-breeding concentrations of Black Duck off some of the coastal areas is discussed. As yet, the true meaning of those concentrations is far from clear.

The writer expresses no difference of opinion with Wright (1954) on the influences governing the first hatch in the Saint John River area. However, the hatch did differ in various parts of the Maritimes and a rough indication of their difference is given in Figure 1.

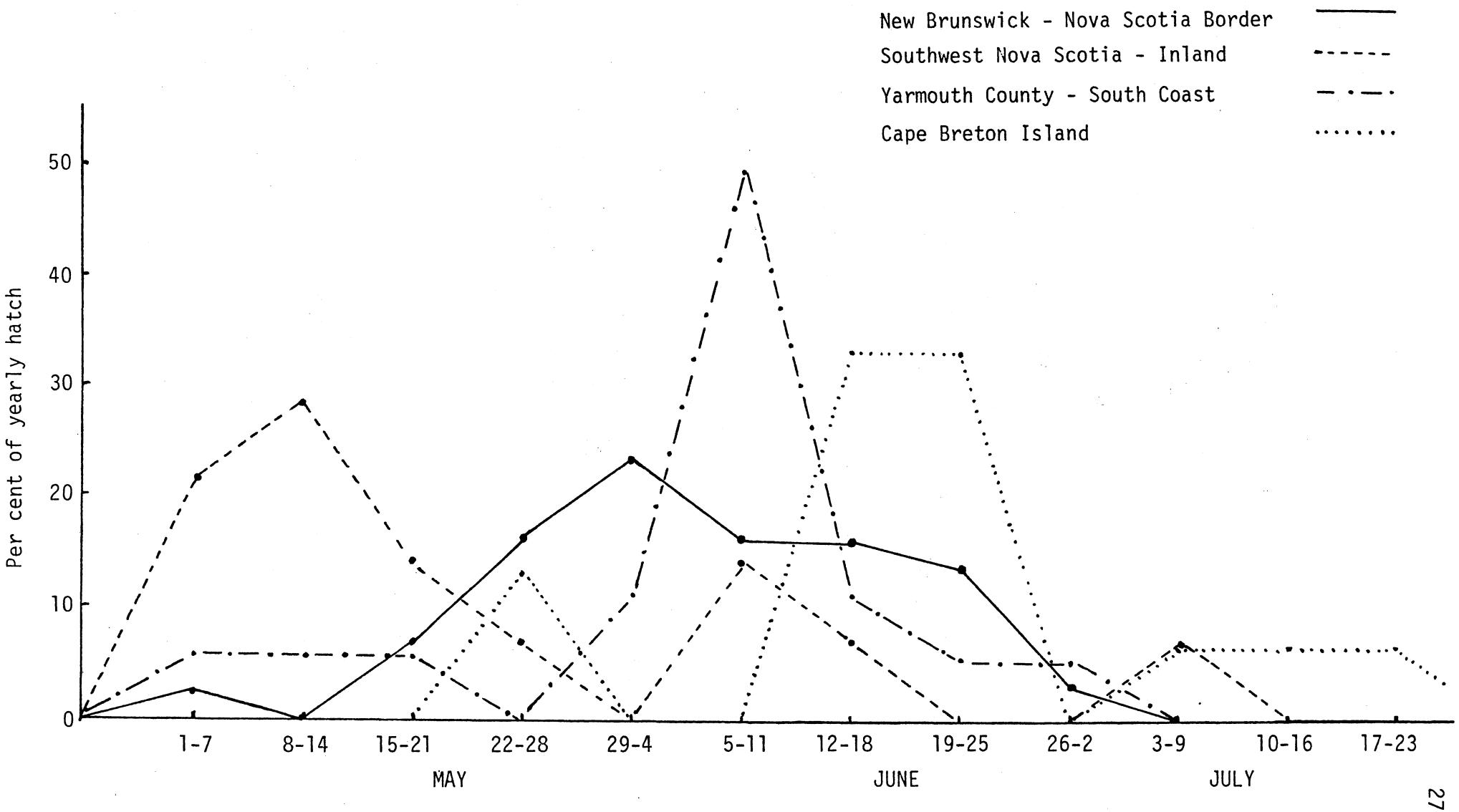

Figure 1. Weekly hatch of Black Duck during 1955 expressed as per cent of yearly total for each of four regions in the Maritimes.

Comparison of the years 1954 and 1955 for the New Brunswick - Nova Scotia Border region is given in Figure 2. The data are meagre. It can only be commented that some lines of study need further development before our knowledge of the Black Duck is adequate.

The date of hatch of the first brood seen was not as significant as the period during which the main hatch took place. It has been suggested previously in this paper that the first pairs to arrive may have been the older birds. There may be a difference of time, related to age, in which birds reach the physiological and psychological point at which ovulation takes place. Certainly, a large part of the Port Joli population was engaged in social display up to mid-March and perhaps after that date. What was the significance of that factor? The hatching period, as indicated in Figure 1 showed that the nesting season of the Black Duck was very protracted. More detailed study of the nesting period, as carried out in the New Brunswick - Nova Scotia Border region, indicates a gradual slope in the curve. A gradual slope was not evident throughout Figure 1 as the work in other areas was not carried out as intensively.

Factors like flooding (and here again we have the influence of the weather) would tend to make a sharp demarkation between the early and the late hatch. Continued flooding might affect an entire population. Flood conditions were more important in the Saint John River area than in many other parts of the Maritime Provinces. In other areas such things as physiological and psychological readiness may have played a larger part. How much of the late nesting was the result of re-nests? Not only flooding but also predation, accidents, etc. contributed toward the necessity of laying new sets of eggs.

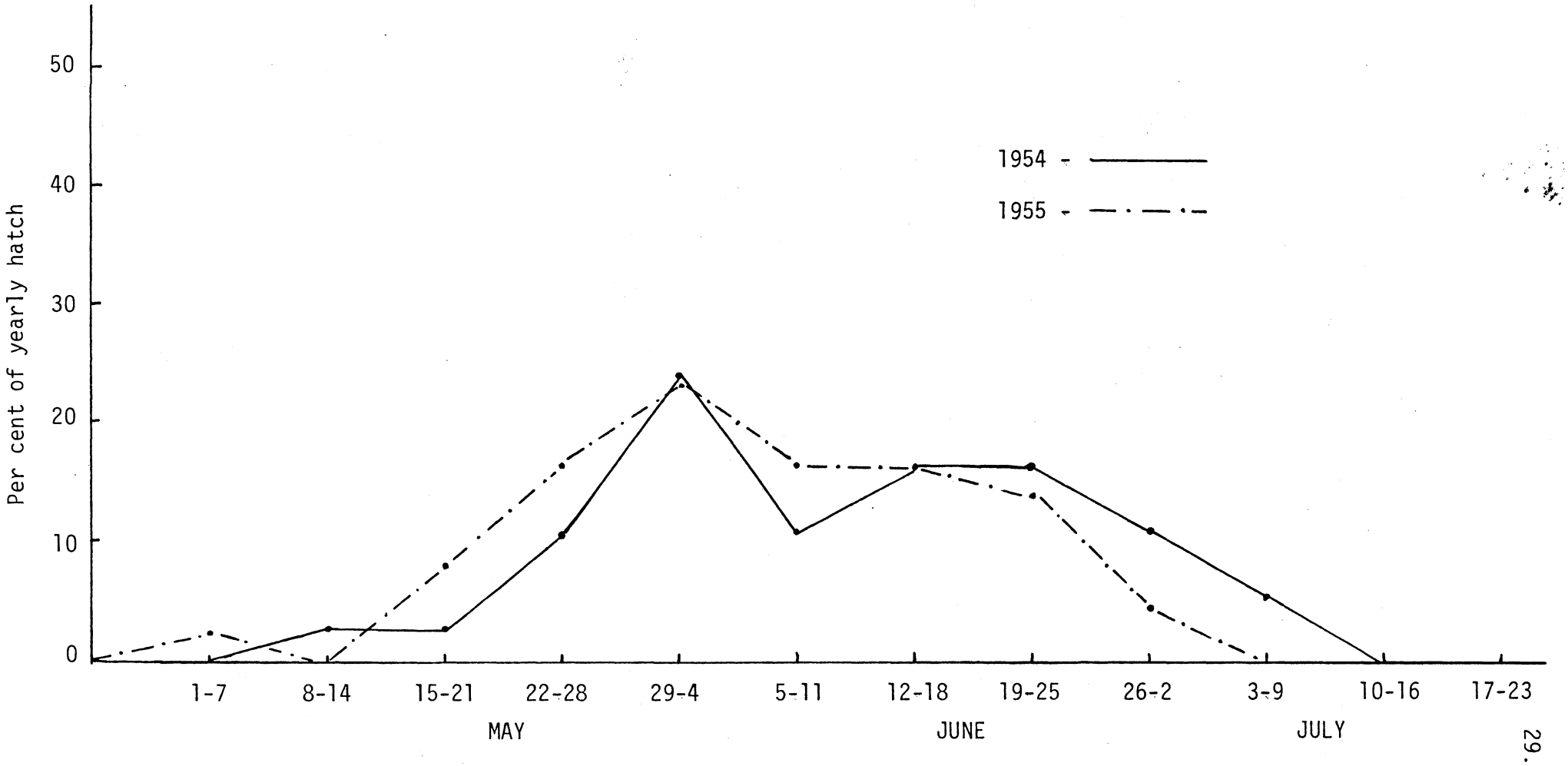

Figure 2. A comparison of the 1954 and 1955 weekly Black Duck hatch in the New Brunswick - Nova Scotia Border region.

Certain influences, such as the availability of a nesting site, the possession of territory, or an uneven sex ratio may inhibit egg laying entirely for a segment of the population.

Such then, are some of the problems which confront us and some of the answers we will have to seek. This, of course, is true in the study of any species. Such studies have been carried out in much more detail for many small passerines than for some of our important game species of waterfowl. In many ways we have been putting the cart before the horse in attempting to answer immediate problems of population fluctuations without a true understanding of the life history of the species themselves.

The concensus of opinion in the literature is that the incubation period of the Black Duck is from 26 to 28 days. The average clutch size in Maine was slightly more than nine eggs (Mendall quoted by Palmer, 1949). Available data gathered from various sources in the Maritimes showed 9.3 to be the average number here.

Clutch size varied between early and late clutches. The variation in 43 completed nests is shown in Table 2.

The well-known fact that late clutches were, on the average, smaller than early ones was usually attributed to re-nesting. It has been found in some other species that females during their first reproductive season lay smaller clutches (Nice, 1941). The same author mentioned that females past their laying prime also did this.

Wright (1954) gave the laying rate of the Black Duck as 0.75 eggs per day. That is at variance to the one personal record which I have. A nest found at Midgic on April 29, 1950 contained one egg. It

Table 2. Black Duck clutch size in relation to the advance of the nesting season. Clutches were completed in the 15 day interval prior to date shown. Parentheses indicate sample size

	Date						
	March 15	April 1	April 15	May 1	May 15	June 1	June 15
Clutch size	10.5(2)	-	11(1)	10.7(7)	9.8(14)	8.3(14)	7.2(5)

contained eight eggs on May 6, indicating a rate of one egg per day. Possibly the rate of deposition of eggs in the nest is influenced by external factors, for example, the bird being flushed from the nest while she is laying. Hochbaum (1944) stated that all species of ducks which he had observed at Delta, laid one egg per day. He pointed out that the rate of egg laying may be inhibited by cold weather. He also said that egg laying took place in the morning. That has been my experience in the case of the Black Duck.

An interesting nest observation is quoted from Frost (1939). "On March 10, 1938, the first migratory Black Duck appeared in the Clarence Fahnstock Memorial State Park in Putnam County (N.Y.). One pair eventually settled in a marsh not fifty feet from the parkway, laying their first egg on March 21st. The set was completed on April 2nd when the twelfth egg was laid . . . Daily visits were made to the nest and on April 27th at 6:30 p.m. the female was observed to be still brooding. At 8 a.m. the next day only a few bits of shell were found in the nest and a search of the surrounding area revealed the adult and twelve young in a wooded swamp across the parkway from the nest. The period of twenty-six days incubation was a normal one, according to data in Bent (1923), but it is interesting to note that on April 6th a heavy fall of snow occurred and on April 7th, the female was brooding surrounded by a six-inch blanket of snow . . ."

That observation indicated that even during cold weather the laying rate was roughly one egg per day. All eggs were successfully hatched in spite of very adverse weather.

Mendall (1949) found during his nest studies in Maine that roughly half the Black Duck were marsh nesters. Tree nesting has been

pointed out by Peters (1940) and Wright (1954). Frequent references in the literature show that the Black Duck has nested as far as two miles from the nearest water. Nests have been found in a wide variety of cover types and in various degrees of concealment.

Excellent material on nesting success (1938-54) has been furnished by Mendall (unknown). The Maine Co-operative Wildlife Research Unit had over six hundred nests of various waterfowl, chiefly Black Duck and Ring-necked Duck, under observation during that period.

Hatching success for the Black Duck nests averaged from 52 to 65 per cent, the average being about 59 per cent. Flooding during certain years contributed heavily to nest losses, either directly or by making the nests more susceptible to certain types of predation. Sometimes flooding necessitated the choice of inferior sites more easily found by predators.

The direct effect of flooding is heaviest during periods of prolonged freshet or when several fluctuations of water level occur. In some instances the freshet may finish early with considerable re-nesting success. In 1949 two-thirds of the Black Duck affected by the spring freshet managed to re-nest (Mendall, unknown). Loss from flooding varied with the habitat. In the Maritimes it is most serious in our major breeding area, the Saint John River region.

Mendall (1949) stated that the nest success of the Black Duck was somewhat below the average for all other waterfowl in Maine. Thus, re-nesting helped to prolong the brood period. However, since the Black Duck nests in its first year, some of the late nests might be attributed to younger birds which arrived at the laying point of the breeding cycle

a little later. There was no proof of that, except that from observational evidence alone, the first nesters appeared to be the older birds.

Nest predation during the Maine studies varied but was considered by Menall (1949) to be light in most years. The chief loss from foxes (*Vulpes fulva*) occurred during the drier years. In 1954, as an indirect effect of flooding, mink (*Mustela vison*) predation was responsible for 40 per cent of the nest loss.

Wright (1954) found predation to be light in the lower Saint John River area. Raccoons (*Procyon lotor*) were the chief predator of tree nests. Wright (1954) also pointed out the serious effect of spring muskrat (*Ondatra zibethica*) trapping on the nesting population. Other losses he mentioned were flooding and forest fires.

Kalmback (1937) found, during the course of his investigations, that poorly concealed nests, or incomplete sets of eggs, did not suffer any more from crow (*Corvus brachyrynchos*) attack than those which were well concealed, but as the season advanced there was a decided improvement in nest success. He felt that the nutritional demands of the crows themselves governed egg destruction. Peters (1939) also mentioned that poorly concealed Black Duck nests were frequently successful. One of my own observations may have some bearing. A late clutch found at Woodstock, New Brunswick on June 18, 1955, hatched successfully. It was on a small wooded island and the nest was completely in the open. When I accidentally flushed the nesting bird, I attracted a large number of crows which apparently were in the habit of roosting in the area.

During my observations I have found a high degree of vulnerability in nests placed in small wooded areas or small bushy areas surrounded by

open country. Nests placed in hedgerows in open country appear to be more subject to predation than those placed in areas where there are large expanses of grass.

Cases of mammalian predation sometimes involve the death of the incubating bird as well as destruction of the eggs and are thus doubly serious. In one case a domestic cat was believed to have been the culprit. Neither the eggs nor the parent bird was eaten. In another instance, a Pintail nest was robbed and the female found dead a short distance away. That time a strong smell of skunk (*Mephitis mephitis*) in the vicinity indicated the possibility of predation by that species. The bird bore no physical evidence of the encounter.

The intentional burning of grass areas and blueberry patches no doubt also contributes to early nest losses, although no positive evidence has come to my attention. Burnings are carried out during the period of early nesting and take place in good nesting habitat.

The Brood Season

The brood season of the Black Duck in the Maritimes occupies a considerable period of time. My records of very young broods range from May 7 in the Grand Pre area (Tufts, pers. comm.) to a brood of week old ducklings caught in a banding trap at Midgic on August 20.

First observations of broods are not always indicative of the first hatchings. The early hatch begins gradually and broods of very young ducklings are hard to find. The system of classifying age groups according to plumage characteristics gives a rough idea of the hatching date of each brood encountered in the field.

The method of classification has been outlined in Gollop and Marshall (1954). Stoudt (1955), in his studies during 1952-54 in the Redvers study area in Saskatchewan, used the following method. The mid-point of each age sub-class was determined in days and a rough hatching date was arrived at by subtracting that figure from the date of observation. That method has been used in the present paper. The mid-point of each age sub-class in days of age given by Gollop and Marshall (1954) are shown in Table 3.

Table 3. Age in days of Black Duck ducklings at mid-point of age sub-classes (from Gollop and Marshall, 1954)

	Age class							
	Class I			Class II			Class III	Flying age
	(a)	(b)	(c)	(a)	(b)	(c)		
Age in days	3	9	16	22	30	39	52	61

The calculated hatching dates by weekly periods for the five districts referred to are outlined in Table 4. The calculated extent of the 1955 brood season for those districts is expressed graphically in Figure 1 as the percentage of hatch by weekly periods. A greater fluctuation than probably occurred is indicated because of lack of data. More frequent visits to the New Brunswick - Nova Scotia Border region apparently had a tendency to reduce the contrasts between peaks. An indication of the main hatch for each district can be obtained from data in Table 5.

Except for Wright's (1954) work in the lower Saint John River area, ground surveys have been of a sporadic nature in the Maritime

Table 4. Black Duck hatching dates calculated by weekly periods for the five Maritime study regions, 1955

Weekly-period of hatch	Number of broods in sample					
	Southwest Nova Scotia	Yarmouth Co., N. S.	Cape Breton N. S.	N.B.-N.S. border	Mid.Saint John River	Total
May 1 - 7	3	1	-	1	-	5
8 - 14	4	1	-	-	1	6
15 - 21	2	1	-	3	2	8
22 - 28	1	-	2	7	3	13
May 29 - June 4	-	2	-	10	1	13
June 5 - 11	2	9	-	7	-	18
12 - 18	1	2	5	7	-	15
19 - 25	-	-	5	6	-	11
June 26 - July 2	-	1	-	2	-	3
July 3 - 9	1	1	1	-	1	4
10 - 16	-	-	1	-	-	1
17 - 23	n.d.	n.d.	1	-	-	1
Totals	14	18	15	43	8	98

Table 5. Periods of peak Black Duck hatch in the five Maritime study regions, 1955

District	Period of peak hatch
Southwest Nova Scotia (inland)	May 8 - 14
Yarmouth Co., Nova Scotia	June 5 - 11
Cape Breton, Nova Scotia	June 10 - 25
New Brunswick - Nova Scotia Border area	May 29 - June 4
Middle Saint John River, New Brunswick	May 22 - 28

Provinces. Much time has been spent in experimental work in order to arrive at an efficient survey method to ensure adequate coverage. However, in 1955 it was possible to carry out brood counts in a number of areas in New Brunswick and Nova Scotia. Those counts were made during the period early June to the end of August. The areas were covered twice and the results are shown in Table 6.

Table 6. Dates of brood counts and areas surveyed in New Brunswick and Nova Scotia, 1955

District	Dates of counts	
	First count	Second count
Southwest Nova Scotia (inland)	June 10-15	July 10-13
South coast of Yarmouth Co., N.S.	June 11-12	July 8-9
Cape Breton Island, N.S.	July 14-17	Aug. 16-21
Middle Saint John River, Woodstock, N.B.	June 18-20	July 24-25

In addition, brood counts in the New Brunswick - Nova Scotia Border region were conducted on several occasions when time and opportunity permitted from June 1 to the last week in August.

Brood counts, except for some of the lakes in southwestern Nova Scotia, were carried out by the "beat-out" method, using a dog. Age classes, for the most part, were determined by a careful examination of the birds in the hand. The illustrations in Gollop and Marshall (1954) were used as a guide.

Brood counts of the same degree of intensity were carried out in 1954 in the New Brunswick - Nova Scotia Border region only. A comparison of hatching data for those two years is given in Table 7. The calculated extent of the brood season for those two years is expressed graphically in Figure 2. The data indicate little difference in the period of peak hatch in those two years.

The early hatch got away to a better start in 1955. Apparently more re-nesting occurred in 1954 and the late hatch was considerably prolonged. The last recorded brood observation for 1954 (not shown in the Figure) was a brood of week old ducklings at Midgic on August 23.

During banding operations with a dog, young birds are frequently captured which, on release into the wind, are able to fly. Some of those first flying dates for Black Duck are shown in Table 8.

In many instances some members of a brood appeared able to fly, while others did not. Some of the later ducklings in the foregoing table were found off by themselves, and not part of any brood. In one instance a brood was banded in June and one duckling old enough to fly was recaptured by the dog on a marsh about four miles away. That was the

Table 7. A comparison of hatch data in the New Brunswick - Nova Scotia Border region for 1954 and 1955

Weekly period	Number of broods	
	1954	1955
May 1 - 7	-	1
8 - 14	1	-
15 - 21	1	3
22 - 28	4	7
May 29 - June 4	9	10
June 5 - 11	4	7
12 - 18	6	7
19 - 25	6	6
June 26 - July 2	4	2
July 3 - 9	2	-
Totals	37	43

only instance of recapture by the dog in the marsh away from a natal area. Pre-flight birds were recaptured in several areas in the immediate vicinity of the banding.

As has already been mentioned, there seems to be a lessening of parental care in relation to the moult. At least that was the case later in the summer. The brood season for the Black Duck certainly appears to be more protracted than that of any other species in the region.

Many factors play a part in determining the number of young ducks which will reach flying age. An attempt should be made to correlate the chances of survival for ducklings born during various periods of the

Table 8. Dates and locations of observations of Black Duck observed at first flying

Date	Sex	Location
July 3, 1955	Female	New Brunswick - Nova Scotia Border region
July 13, 1953	Female	New Brunswick - Nova Scotia Border region
July 28, 1954	Male	New Brunswick - Nova Scotia Border region
Aug. 5, 1954	Male	New Brunswick - Nova Scotia Border region
Aug. 20, 1955	Male	Cape Breton, Nova Scotia
Aug. 20, 1955	Female	Cape Breton, Nova Scotia
Aug. 20, 1955	Female	Cape Breton, Nova Scotia
Aug. 27, 1954	Male	New Brunswick - Nova Scotia Border region

season, so protracted in the case of the Black Duck. The results of a limited number of observations in various parts of the Maritimes are shown in Table 9. That table is based on calculated hatching dates arrived at by the observation of broods in the field at various times during the summer. Hatching dates for complete clutches were arrived at by grouping records at half-monthly intervals and assuming that the clutch on the average was half incubated (-12 days of age) at the time of observation, and then by interpolation fitting them in with the brood data. It is admitted that the figures are very rough. The calculated age from hatching date for various brood age classes were as given in Table 3. Stoudt's (1955) method for arriving at hatching dates was followed.

Unfortunately, direct observations of Class I broods are lacking for the May 12 hatch. The one Class III brood observed for that day was probably much higher than average. Therefore, most of the analysis of the

Table 9. Average number of ducklings in Black Duck broods by half-monthly advances of the nesting season. Parentheses indicate sample size

Age group	Average size of broods				
	May 12	May 27	June 12	June 27	Average
Egg	10.7(7)	9.8(14)	8.3(14)	7.2(5)	9.1(40)
Class I		8.2(6)	7.8(8)	8.0(22)	8.0(36)
Class II	7.0(5)	6.3(18)	6.2(29)	6.4(16)	6.3(68)
Class III	9.0(1)	6.1(26)	5.4(23)	5.0(4)	5.8(54)

table was based on hatch from May 27 onward. May 27 can be considered close to the average early hatch for the Maritimes as a whole, while the two later dates approximate the peak and the late hatch, based on information presently available from brood studies.

Numbers of ducklings surviving to Class I for each of those dates appear to be fairly constant. That indicates a greater rate of survival from the egg to Class I later in the nesting season. Cover and food are better later, and also various other influences help to bear out that proposition. The effect of the various influences will be dealt with later. The drop in numbers between the Class I and Class II groups appears to remain constant, possibly indicating that mortality does not change much at that stage throughout the nesting season.

The change in brood size occasioned by the advance in the nesting season is very evident for Class III broods. One explanation would indicate that progressive reduction in brood size might be brought about by the lessening of the brood bond late in the season. It must be remembered that ducklings hatched in mid or late June would be observed as Class III broods from late July to mid-August. As has already been pointed out, many ducklings are found wandering about alone during that period, and adult females are sometimes found moulting in the same general area. As the moult approaches, those females may not be very strongly influenced by parental behaviour and the tendency to keep the brood together may disappear. Although ducklings in the late Class II stage of development are sometimes found within those "orphan" groups, observations in general indicate that the parental bond is stronger with younger ducklings even at late dates in the nesting season.

Also, in dry years, rearing conditions deteriorate on some of the smaller marshes as the season advances. Danger from varying sources may increase and ducklings left on their own may have less chance of survival than those under parental care. Thus mortality may play a larger part later in the brood season. That is difficult to measure at present.

In order to get an idea of yearly variations in survival rate and to see how the average brood fares during the peak of the brood season, all available brood data during the period 1952 to 1955 have been arranged in Table 10. Figures prior to 1955 are a combination of the published material from the Saint John area (Wright, 1954), the rest of the Maritimes (unpublished CWS reports), and Maine (Mendall, unknown). Since the 1955 sample includes only Canadian Wildlife Service data, the figures may not be in line with the averages for other years.

Table 10. Black Duck brood survival for the Maritime Provinces and Maine, U.S.A. during the period 1952 to 1955. Information from Wright (1954), Mendall (unknown), and unpublished CWS reports

Year	Clutch size	Average brood size			Total number of broods
		Class I	Class II	Class III	
1955	-	8.0(29)	7.0(26)	6.7(6)	(61)
1954	-	7.1(71)	6.4(53)	6.1(31)	(155)
1953	-	7.2(14)	5.6(48)	5.4(31)	(93)
1952	-	7.2(23)	7.0(46)	5.8(39)	(108)
Average	9.3(43)	7.3(137)	6.4(173)	5.8(107)	(417)

There is a yearly variation in survival rates to flying age, as well as in the survival rates of the lower age group. However, it should be borne in mind that the survey dates are fairly constant from year to year and no account is taken of hatching dates in the broods concerned.

The higher number per brood in Class I observed by the Canadian Wildlife Service alone was probably a phenomenon related to other parts of the Maritimes. The mortality from egg to Class I is probably greater in the Lower Saint John River and parts of Maine, where high water results in a heavy loss of early marsh nests, and a greater percentage of very young ducklings are found to cover long distances from upland nests. Tree nests in the Saint John River area may be over water in the stages of laying or incubation, but are also far from water when the brood is hatched.

Wright's (1954) data indicated very little loss between Class II and Class III. In fact, his average brood size seemed to increase in the older age group. His explanation was that many broods broke up before reaching the flying age and ducklings from those broods were integrated into other broods of the same age class. That may be correct, but in other areas, including Maine, there is usually an observed reduction in size as the brood age advances. Part of the explanation might lie in the validity of the sample, and part in the fact that most, if not all, Class III broods observed during surveys were the products of much earlier nestings. The apparent lack of difference in size was clearly borne out in Table 10 except that the average was thrown out because a larger number of Class II were seen during the survey. It has been indicated in Table 9 that the size of Class II broods remained fairly constant throughout the

season, whereas later Class III broods, which were not seen during surveys, were smaller in size.

It is quite reasonable to assume that mortality decreases with age in the Saint John River area due to improved habitat conditions caused by reduced water levels later in the season. In many of our small areas the advance of the season has the opposite effect. It is difficult to obtain a sample large enough so that the representative survey data reflects the condition of all types of habitat. Much of our data on complete broods comes from areas like the Saint John River. That is the largest single area of waterfowl habitat in the Maritimes, but much further study is needed before the writer will be convinced that the major part of the ducks produced in the Maritimes comes from there. We should not let our thinking be swayed too strongly by conditions of one type of habitat in spite of its obvious importance. We have been gathering information on trends from other areas but the important and very difficult work of even rough assessment of total production has been neglected. It is in many of those other areas where hope of management by other means than control of legal hunting pressure lies. Factors concerned in mortality of young Black Duck:

1. Nest loss
2. Infertility of eggs
3. Accidents
4. Drought
5. Predation
6. Disease
7. Loss of habitat

1. Nest loss - As has already been pointed out, the Black Duck suffers heavily from nest loss, but considerable re-nesting occurs. Nicholson (1953) stated only 51 out of 161 nests studied in Maryland were successful. He also pointed out that re-nesting may occur as many as three or four times. In one instance a nest was destroyed by crows after the eggs were pipped, and the female laid another clutch. Nest loss from flooding is most serious if the flooding is prolonged or occurs at intervals during the nesting season. Nest loss from predation is apparently greatest during the early part of the season.
2. Infertility of eggs - There is no evidence that infertility is of consequence in the case of the Black Duck.
3. Accidents - Ducklings may be lost on the journey from the nest to the water if long distances are involved.
4. Drought - In many of the small marshes drought may well be a serious problem. In dry years some small marshes may become practically dessicated by mid-July. Six broods of Black Duck were observed on one such marsh on June 23. The marsh was visited again on July 20, but by that time, where there had been plenty of water before, there was only one small pond. No ducks were found by the dog on the second visit, although three of the broods would not have reached flying age by then. Experience indicates that Black Duck broods have a strong affinity for the rearing area. Ducklings have frequently been recaptured in the same general spot where they had been banded a month before.
5. Predation - The effect of predators on nests has been discussed in a previous section. The evidence concerning predation of young ducklings

is scant but one or two important studies have been carried out. Wright (1954) established conclusively that Bald Eagles (*Haliaeetus leucocephalus*) did little or no damage to broods in the lower Saint John River area. He also pointed out that the diet of that raptor is largely fish during the summer months. The same author found no ducklings in the prey remains of 367 pickerel (*Esox riger*) stomachs in the region. He pointed out, however, that a duckling was observed to be pulled under the water and killed by a large unidentified fish.

Potential duckling predators occurring commonly in most parts of the Maritimes are crows, red foxes, raccoons, skunks, and possibly Herring Gulls (*Larus argentatus*). Ravens (*Corvus corax*) are found in most of the coastal areas. Crows and Ravens spend much of their time patrolling back and forth on the marshes during the spring. Later in the summer they frequent the fields, and pellets found at that time of year were made up almost entirely of grasshoppers.

Peters (1939) mentioned seeing a Crow carry away and partially devour a very young duckling.

A detailed food study of the raccoon should be carried out because it is possible that it is our most serious mammalian predator. It is more aquatic in habit than the red fox and every observed marsh supported a coon population.

On the whole, it would seem that loss from predation is mainly the by-product of loss of habitat through drought, drainage, or some adverse condition.

6. Disease - Our knowledge concerning disease of waterfowl in the area is limited.

7. Loss of habitat - With the partial exception of drought, all items discussed so far are normal occurrences which the breeding potential of the Black Duck has well under control. Some of the mortality factors might be beneficial to the species as a whole. Their significance is not great enough to warrant any control measures which would be, for the most part, both useless and costly.

Permanent loss of habitat is the greatest single factor in duckling mortality. It is a factor that cannot be readily measured, as its results do not show up in decreased brood sizes or even in numbers of broods in the present survey techniques. The potential loss from drainage is especially noticeable when the operation is going on during the summer. When all the broods from the marsh get crowded into the few remaining ponds, the former importance of the area cannot help but be noticed. A marsh near Truro, Nova Scotia was drained during 1952. Nineteen broods of various species of ducks were counted during the summer by H.R. Webster of the Canadian Wildlife Service. His notes for July 4 read "The fact that drainage of the marshes was well under way and the birds were concentrated on the few remaining water areas facilitated the count. Another year there will be little, if any, water on the marsh." Needless to say the observation made in Mr. Webster's last sentence is correct. Thirteen of the broods observed were blacks.

The Truro marsh was drained for local mosquito control. There will probably be continuing pressure for that type of drainage in other areas, and many small but highly productive marshes will be lost. Drainage and other reclamation work is being carried out on a large

scale throughout the Maritime Provinces. Typical examples of this are presently occurring at Memramcook Lake and Midgic Marsh, New Brunswick. Not even the farmers themselves can give a logical explanation as to why those areas are being drained.

By the same token that loss of habitat has an adverse effect, the building up of habitat is beneficial. Knowledge of the habitat and territorial requirements of the species will aid us considerably.

Distraction Display and Escape Behaviour

Armstrong (1947) stated "The two main drives responsible for the behaviour of a bird are those associated with self-preservation and reproduction, the one permanent, the other cyclic." He further states "Most forms of distraction display are the product of those drives."

In many species of birds the product of those two drives takes the form of "injury feigning."

I have never seen "injury feigning" in the Black Duck when flushed from the nest. My observations agree with those of Mousley, quoted by Wright (1954). Invariably, the female flew swiftly and quietly away, in a straight line, at a very low height. On the other hand, Blue-winged Teal were frequently observed to engage in a form of display, usually consisting of short spasmodic flights in the vicinity of the nest. Black Duck sometimes returned and circled the nest at a fair height.

The distraction display when with the brood probably varies among individuals. During brood banding with a dog on the Middle River marshes near Baddeck, Cape Breton, several young birds, from one-half to nearly full grown, were captured. There was no evidence of any distraction

display by an adult female. Several birds of flying age were flushed and three flightless adult females were banded in the same general area.

Many of my brood observations have been made while banding with a dog on marshes where the water areas are shallow, and separated either by growths of emergent vegetation or comparatively dry stretches of grass-covered meadow. Broods were trailed for some distance by the dog before the female took flight. Her behaviour usually consisted of short, strong flights accompanied by sporadic quacking. Sometimes after alighting she walked for a short distance. If followed she kept that behaviour up until a considerable distance separated her from the brood, and then she usually flew away altogether. The dog soon became trained not to follow female Black Duck. In contrast to that, female Green-winged Teal and Pintail engaged in a form of display much more closely resembling "injury feigning." No amount of training was entirely successful in keeping the dog's mind away from her and consequently his brood-finding ability was less efficient for those species.

Again it would seem that stealthy departure plays a part in the Black Duck's parental behaviour. The habit of heading for land and travelling for long distances increased the difficulties of counting complete Black Duck broods during survey work.

In the marshes of the New Brunswick - Nova Scotia Border region, and in various salt marshes, the available cover is used by all age classes. It has been my experience that ducklings will not take to water if pursued from a landward direction, but will head rapidly for the shore and hide in the vegetation. In wooded areas, well grown birds have been pursued for several hundred yards before finally being captured. That

escape behaviour is also shown by moulting adults. When pursued in the water they will dive and not reappear until they have reached the shore.

The behaviour of broody females caught on open water during canoe surveys is much more consistent with the "injury feigning" and "wing dragging" types of display. The display is continued until the ducklings are safely ashore.

Post-breeding Behaviour of the Male

Wright (1954) stated that the maximum period a male Black Duck was observed to defend an area in New Brunswick was 13 days, and that was observed only once in four breeding seasons. Presumably, the fluctuating water levels were largely responsible for the length of time spent in one area and the territories moved with the birds themselves. In the Border region certain small areas were occupied by pairs or lone males for a considerable period. Whether they were always the same individuals was not determined.

The length of time which the male remains with the incubating female is not known. Dzubin (1955) has commonly observed Mallards in the vicinity of the waiting area up to the 14th day of incubation, and less commonly afterwards until hatching. Dzubin (1955) also observed several cases where drakes accompanied females with broods but he was unable to ascertain whether or not the drake belonged to that particular family.

An interesting reference was made by Bent (1923) in his life history of the Florida Duck (*Anas fulvigula fulvigula*), now considered

to be a supspecies of the black. Mr. N.R. Moore observed a pair of ducks in early April, and from the behaviour of both birds he suspected a nest in the vicinity. The next day he returned and the birds behaved as before. The nest was found and the eggs hatched six days later after being placed in an incubator. That indicates that the pair bond still held after at least the 20th day of incubation.

I have one observation of a male Black Duck engaged in distraction display on the Kentville Bird Sanctuary in Nova Scotia, on May 20, 1954. The drake and female were both on a small pond and the display took place on and in the vicinity of the pond. Display was typical of the type already described for the brood female. The young birds, about a week old, were found hiding along the margin of the pond. The motivation on the part of the male cannot, of course, be explained here. Perhaps he was sexually interested in the female and the twin pulls of preservation and the breeding cycle were governing his behaviour.

On June 30, 1955, at Midgic, a male Green-winged Teal in full breeding plumage, engaged in distraction display near a place where a female of the same species was flushed with a brood of ten downy young. That display on the part of the male was over water and was not continued, because in a short time he disappeared. I saw a male ring-neck swimming with a female and brood of five downy young in a small lake in southwestern Nova Scotia on June 23. The birds were close to shore and I frightened them to see what would happen. The female displayed and the young dived. The male merely swam away and when one of the young birds surfaced near him he gave it a sharp peck on the head, which either stunned it or killed it. Whether that behaviour had previously reduced the size of the brood, is a matter for conjecture.

Wright (1954) pointed out that the post-breeding males in the lower Saint John River did not moult on the area where they nested, but wandered about the country in groups until the flightless period arrived.

It is interesting to note that I have banded no post-breeding male Pintail at Midgic marsh since trapping operations began in 1948. No adult male Pintail were found in bag checks there, nor were any banded males recovered as indirect adult recoveries. The small Maritime breeding population has its headquarters at Midgic marsh and, therefore, there is no influx of moulting males from other areas. The last adult males and non-breeding females are usually seen in post-breeding flocks in early June.

Adult male Black Duck have been trapped and have been seen moulting on Midgic, but there is no evidence that those birds were local nesters. Some re-traps of previous years' banding and indirect recoveries of banded males have been made, but there is no indication that those birds nested there. No moulting males were captured during banding operations with the dog, but one was trapped in flightless condition on August 21, 1954 on Midgic marsh. Flightless males have been seen in the area in mid-June.

Post-breeding Behaviour of the Female

Females have been observed in non-breeding concentrations of Black Duck during the late spring and early summer. Mosher (1950) estimated that in early June about 10 or 15 per cent of a concentration of roughly 780 non-breeding blacks were females. That large concentration of non-breeders was present every summer in the Grand Pre area.

During banding operations moulting females have been captured in various parts of the Maritimes by a dog. The dates and places of those occurrences are shown in Table 11.

The June moulters were obviously non-breeders and the early July ones may have been, although the brood season was early in southwest Nova Scotia and young birds could have been well a-wing by that time.

Table 11. Dates and locations of capture of moulting females

Date	Number of birds	Location of capture
June 23, 1952	1	Midgic marsh, N.B. (nearly complete)
June 25, 1955	1	Amherst - N.B. - N.S. Border region (Nearly complete)
July 10, 1949	2	Grand Pre, N.S.
July 14, 1949	1	Harmony Lake, southwest Nova Scotia
July 17, 1953	3	Red Head Marsh, Saint John, N. B.
July 31, 1954	1	Midgic marsh, N.B.
August 8, 1955	1	Midgic marsh, N.B.
August 12, 1954	1	Amherst - N.B. - N.S. Border region
August 20, 1955	3	Cape Breton, N.S.
August 22, 1949	1	Midgic marsh, N.B. (almost complete)
August 27, 1954	1	Midgic marsh, N. B.
August 29, 1955	1	Amherst - N.B. - N.S. Border region
Total	17	

BLACK DUCK FOODS

Mendall (1949) has given us a detailed account of the food habits of the Black Duck in Maine under different seasons, habitat, and age conditions. Much of what he said can be applied to the Maritimes. Data used in the present study consist of 25 stomachs collected during summer surveys and in the hunting season. Six stomachs were collected in Yarmouth County, Nova Scotia; one in Prince Edward Island; and the remainder in the marshes adjacent to Sackville, New Brunswick. In accordance with the usual findings, food of the downy young consisted almost entirely of insects and other animal life. The stomach of one nearly grown young taken in late July contained about 50 per cent animal and 50 per cent vegetable matter. Fall birds were taken between October 6 and December 1. Although not shown in the tabulation, the food habits varied as the season progressed. That was mainly due to change of feeding grounds from fresh water areas to nearby salt marshes and mud flats. Snails (Gastropoda) were prominent in the diet throughout the fall period, but later on a gammarid (*Orchestia* spp., probably *platensis*) became a major item. It was noted that considerable quantities of gammarids were available and were probably taken as the birds fed along the edge of the rising tide. Hundreds of gammarids were found in the pools and ditches after the tide had fallen.

Food of Downy Young

Five stomachs were available. Of those, two ducklings had access to fresh water habitat only, one to salt marsh only, and the other two were taken on a marsh where a variety of conditions was available, from brackish through meadow land to fresh cat-tail marsh. Because of the small number of stomachs involved, they were treated individually (Table 12).

Table 12. Stomach analysis of five downy young Black Duck

			Animal food	Vegetable food
1.	Fresh water habitat - near Sackville, N. B.			
	sex ?	June 6, 1955	Odonata (larvae) 2 c.c.	*Scirpus* (seed) present
			Odonata (adult) present	*Carex* (seed) present
			Coleoptera (adult) present	
	female	June 23, 1955	Hemiptera Water strider 1.0 c.c.	*Scirpus* (seed) present
			Coleoptera (larvae) 1.0 c.c.	
2.	Salt marsh habitat - Sackville, N. B.			
	female	June, 1955	Diptera	
			Culicidae (larvae) 2.5 c.c.	
			Tabanidae (larvae) present	
			Unidentified (larvae) present	

Table 12. Stomach analysis of five downy young Black Duck (continued)

			Animal food	Vegetable food
3.	Brackish-meadow - fresh marsh - Argyle, Yarmouth County, Nova Scotia			
	male	June 12, 1955	Arachnida 2.0 c.c. Coleoptera (adult) present Tabanidae (larvae) present Unidentified insect present	
	female	June 12, 1955	Formicidae several Culicidae (larvae) present Coleoptera (adult) present	*Scirpus* (seed) present

Fall and Early Winter Food of Adults

During the fall and winter large flocks of Black Duck commute daily between the mud flats and nearby lakes, particularly in southwestern Nova Scotia. Apparently the birds are not attracted by food. Four stomachs examined in mid-October in Yarmouth County contained no food but in each case quantities of gravel were found in the oesophagus and proventriculus. The birds had been in the lake for about two hours and were observed resting and apparently washing themselves.

Of 14 stomachs taken between October 6 and December 1 in the Sackville area, two were empty. Analyses of the remainder are listed below (Table 13). Because fresh and salt water conditions are both equally accessible in that region, all specimens have been grouped together. Where possible, the probable source of the food item is listed in Table 13.

Table 13. Stomach analysis of adult Black Duck taken from the Sackville area between October 6 and December 1

Food item	Probable source	Per cent by vol.	Occurrence by number of stomachs
VEGETABLE FOOD			
Najadaceae			
Potamogeton pectinatus	Fresh marsh	1.2	2
Gramineae			
Spartina alterniflora	Salt marsh	65.0	3
Cultivated grain (oats, wheat, barley)	Bird sanctuary	25.0	1

Table 13. Stomach analysis of adult Black Duck taken from the Sackville area between October 6 and December 1 (continued)

Food item	Probable source	Per cent by vol.	Occurrence by number of stomachs
Cyperaceae			
Scirpus paludosus	Brackish-fresh	2.0	4
Scirpus spp.	Brackish-fresh	1.7	3
Carex spp.	Brackish-fresh	2.5	4
Compositae			
Bidens spp.	Brackish-fresh	1.6	1
Miscellaneous			
Unidentified seeds	Brackish-fresh	1.0	1
ANIMAL FOOD			
Snails			
Littorina sexitalis	Salt mud flats	34.5	1
Unidentified Snail spp.	Salt mud flats	12.2	1
Physa spp.	Fresh marsh	0.5	1
Lymnia spp.	Fresh marsh	0.9	1
Snail, miscellaneous unidentified	Fresh marsh	1.4	2
Beetles			
Chrysomelidae	Salt marsh	trace	1
Flies			
Tabanidae (Larvae)	Salt marsh	3.0	2

Table 13. Stomach analysis of adult Black Duck taken from the Sackville area between October 6 and December 1 (continued)

Food item	Probable source	Per cent by vol.	Occurrence by number of stomachs
Stratiomyidae	Salt marsh	5.4	2
Unidentified Diptera (larvae)	Fresh marsh	0.5	1
Unidentified insect (larvae)	Salt marsh	3.4	2
Insect pupae	Fresh marsh	1.9	1
Amphipods (Gammarids)			
Orchestia	Salt marsh	36.2	4

Plantings of oats, wheat, and barley made by the Nova Scotia Department of Lands and Forests at the Amherst Point Sanctuary, are extensively utilized by waterfowl each fall. It is interesting to note that the one duck examined with grain in its stomach was shot about nine miles from the Sanctuary on an evening flight into a salt marsh.

Diving by Black Duck while feeding was observed on one occasion. Two were watched at the mouth of a small brook in three or four feet of water at Port Joli, Nova Scotia in mid-March.

On November 22, 1953, while checking hunters at Musquash, New Brunswick, the writer was shown a Black Duck which had gorged itself on small fish about 1½ inches in length. When the bird was shaken several fish fell from its mouth. Unfortunately, a sample of the fish was mislaid before more than a cursory identification could be made.

Instances of Black Duck feeding freely on blueberries (*Vaccinium* spp.) were reported to the writer but were not verified. However, there seems no reason to doubt it.

DISPERSAL OF LATE SUMMER CONCENTRATIONS

During late July and throughout August, concentrations begin to build up in favourable habitats. Those concentrations are composed of birds raised on the marshes themselves (verified by banding), and from other areas, possibly broods raised under isolated conditions or marshes where the habitat has deteriorated during the summer. There is little evidence that the birds move very far. One bird banded at Memramcook, New Brunswick near the Border area was shot on October 1 near Fredericton, about 100 miles away. That bird had left a marsh which dried up during the summer.

Considerable banding of flightless young has been carried out on the more favourable marshes of the Border area. Recoveries during the hunting season indicated that many of those birds retained a strong attachment to the natal marsh. Very few were re-trapped at the Midgic Banding Station after reaching flying age. A sample of flightless birds banded on two New Brunswick Border region marshes helped to illustrate that attachment (Table 14).

Table 14. Distance to recovery area of flightless young banded in the New Brunswick - Nova Scotia Border region

Where banded	Number banded	Recovery distance			
		Local[1]		Distant[2]	
		Re-trap	Dead recovery	Re-trap	Dead recovery
Coles Island	47		7	1	3
Midgic Marsh	45	10	12		2

[1] Less than one mile

[2] Over eight miles

Of the Coles Island birds, only one was re-trapped at Midgic after reaching flight age. Of ten hunting season recoveries, two were from the natal marsh, three were from nearby areas where they could have been driven by opening day shooting, two were from unidentified local areas and three were from distant points. Of the latter, there was one October 1 recovery from about 100 miles away and two from greater distances during November.

The Midgic bandings of flightless birds were carried out in an area of about two and one-half square miles. It is interesting to note that of the ten birds later picked up in the traps, many were trapped at almost the exact location of the original banding. Flightless birds were also recaptured during dog banding operations and appeared to be confined to relatively small areas. A road and a railroad track transect Midgic Marsh and in no case were flightless birds known to have crossed those barriers.

Ten birds were recaptured at the Midgic traps and two at traps about two miles away. One of the latter birds was subsequently shot at Midgic and the other apparently became attached to the new area, since it was shot there in late November.

Of 14 shooting recoveries of Midgic-raised birds, ten were from the natal marsh, two were from nearby areas, and the other two from distant points in late November.

Hunting season recoveries of 94 birds banded in this region during the period 1948-54 show a strong tendency towards a sedentary disposition early in the season. Little variation was found in the behaviour between bait-trapped birds and those banded with the dog. Both

groups have been combined and Table 15 gives some evidence of movements in regions where the hunting season opened on October 1.

Table 15 indicates a strong affinity for the natal marsh or the original place of concentration after reaching flying age. That affinity remained for the first two weeks, after which the effect of shooting dispersal was noted. There seems no doubt that shooting was a prime factor in the dispersal. Cases where pre-hunting season movement occurred were usually accompanied by unusual fluctuations of water levels and then, if the dispersal was local, it did not seem to be permanent, although preliminary local dispersal caused some birds to continue wandering. Under normal conditions such natural causes of dispersal as the freeze-up or shortage of food supply happened much later than mid-October.

In this analysis no account has been taken of birds which may have wandered during late summer or early autumn to regions having a late opening date for the shooting season. It should also be pointed out that there are regular daily movements prior to the local hunting season, but the concentration points have daily use.

Table 15. Direct recoveries, 1948-54, of 94 birds banded on Midgic Marsh

Recovery dates	Distance of recovery from point of banding							
	Same marsh	1 - 2 miles	5 - 10 miles	50 miles	100 miles	200 miles	300 miles	More than 300 miles
Oct. 1	31	5	-	2	2	-	-	-
Oct. 2 - 8	9	3	6	1	-	-	-	-
Oct. 9 -16	3	2	1	1	-	2	1	-
Oct.17 -24	2	3	1	-	1	-	-	1
Oct.25 - Nov. 1	-	-	3	1	1	-	-	-
Nov. 2 - 9	-	-	1	-	-	-	1	-
Nov.10 -17	-	2	1	-	1	-	1	-
Nov.18 -25	-	-	1	1	1	-	-	-
Nov.26 - Dec. 3	-	-	1	-	1	-	-	-
Dec. 4 - 9	-	-	-	-	-	-	-	-
Totals	45	15	15	6	7	2	3	1

THE FALL MIGRATION

Information about the fall migration is derived, for the most part, from banding data. Banding results, at present rather scanty, are presented here with some tentative conclusions.

New Brunswick - Nova Scotia Border Summer Bandings

Direct recoveries of banded blacks have been plotted in Figure 3. All available data for summer bandings in the area since 1940 are included. There were 38 recoveries from points more than 50 miles away ("distant" recoveries) and 124 from points within 50 miles ("local" recoveries). An examination of Figure 3 will show that dispersal appears to be in three ways:

(1) Southwestward, more or less following the Fundy coastline of New Brunswick and down along the Atlantic coastal states.

(2) Northeastward into Prince Edward Island.

(3) Eastward and southeastward into Nova Scotia.

Most of the recoveries were from New Jersey northward. There was one from Delaware and one from Florida. Shooting dates do not preclude the possibility of wintering as far north as the Grand Manan Archipelago in New Brunswick.

Prince Edward Island recoveries were from October 1 to November 25, roughly coinciding with the hunting season for that province. Most of the birds were shot in late October and November. The hunting season dates definitely preclude any evidence of wintering. As Prince Edward Island has a relatively large winter population, no doubt some birds remain. There is also the possibility that birds reaching the eastern tip of the Island might have gone on to Nova Scotia.

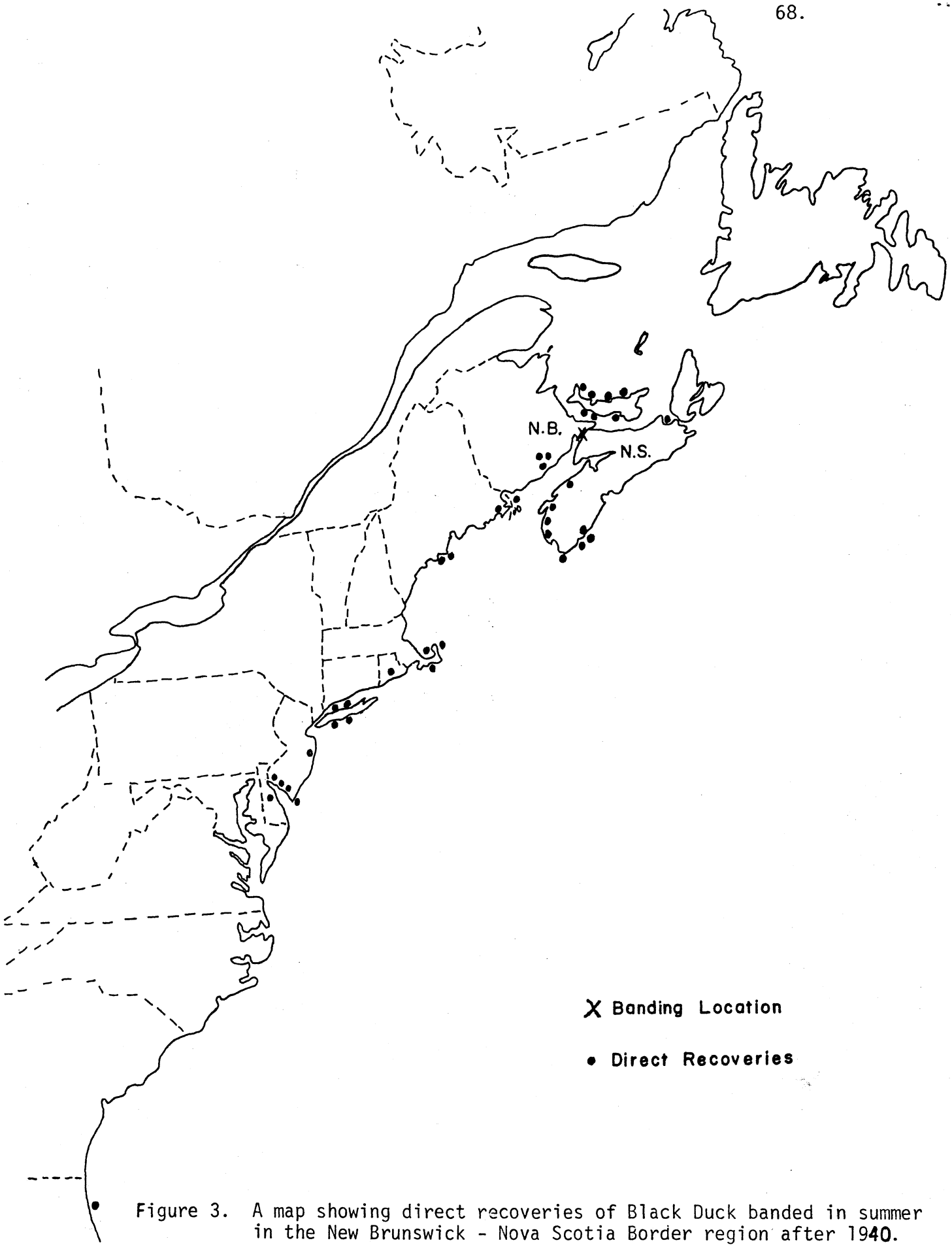

Figure 3. A map showing direct recoveries of Black Duck banded in summer in the New Brunswick - Nova Scotia Border region after 1940.

Nova Scotia recoveries from Annapolis, Digby, and Shelburne Counties were late enough to indicate wintering, but hunting season dates did not permit an estimate of early arrival dates. Recovery data shown in Figure 3 are tabulated in Table 16.

Birds Banded Elsewhere in the Maritimes in Summer

All summer bandings done elsewhere in the Maritimes and referred to in this paper were flightless young banded between 1927 and 1954. The banding areas are shown in Figure 4.

It has been difficult to band enough birds in any one place to make recovery data reliable. However, the material which is on hand will give some idea of the diversified conditions in the Maritime Provinces. As has been frequently pointed out, a very careful analysis of material is necessary when recoveries depend largely on the hunting season. Some of the following material is factual and some is based on assumptions of what could happen. Recoveries from 42 locally banded birds out of an unknown number of bandings (Table 17) are plotted in Figure 5. The Musquash birds show a tendency to migrate, but there was one local recovery (Table 17). The hunting season opened there in late November. In Grand Manan, well within the wintering area, none of the recoveries were from other places.

The Prince Edward Island recoveries did not tell much except that migration took place. That area was also in an early hunting zone.

In Nova Scotia, Grand Pre showed signs of some birds wintering. In the remaining counties, there was strong evidence that many locally-raised birds stayed all winter.

Indirect recoveries (at least one year after banding) show much the same migratory pattern for birds banded in the New Brunswick - Nova

Table 16. Location and dates of direct recoveries of Black Duck banded in summer in the New Brunswick - Nova Scotia Border region after 1940

Place of recovery	Number of recoveries	Recovery period
(1) Coastal mainland		
Queens Co., N.B.	1	October 1
Kings Co., N.B.	1	October 1
Saint John Co., N.B.	1	November
Charlotte Co. (Grand Manan I.)	1	December 12
Maine	1	Date not available
Lincoln Co., Maine	1	October 9
Washington Co., Maine	1	November 19
Cape Cod, Mass.	3	December 12 (only one date available)
Newport Co., R.I.	1	December 21
Long Island, N.Y.	4	October 23 to January 17
Port Elizabeth, N.J.	1	November 3
Collin's Meadows, N.J.	1	December 21
Cape Mary County, N.J.	3	November 15 to December 12
Newcastle Co., Delaware	1	December 23
Peery, Florida	1	December 12
Total	22	
(2) Nova Scotia		
Pictou Co.	1	October 15
Annapolis Co.	2	January 1 (one date only)
Digby Co.	2	January 15 (one date only)
Yarmouth Co.	1	October 16*
Shelburne Co.	3	December 14 to January 15
Total	9	
(3) Prince Edward Island		
Prince Co.	6	October 1 to November 25
Queens Co.	1	October 9 to November 12
Total	7	

*probably should be November 16 to coincide with hunting season

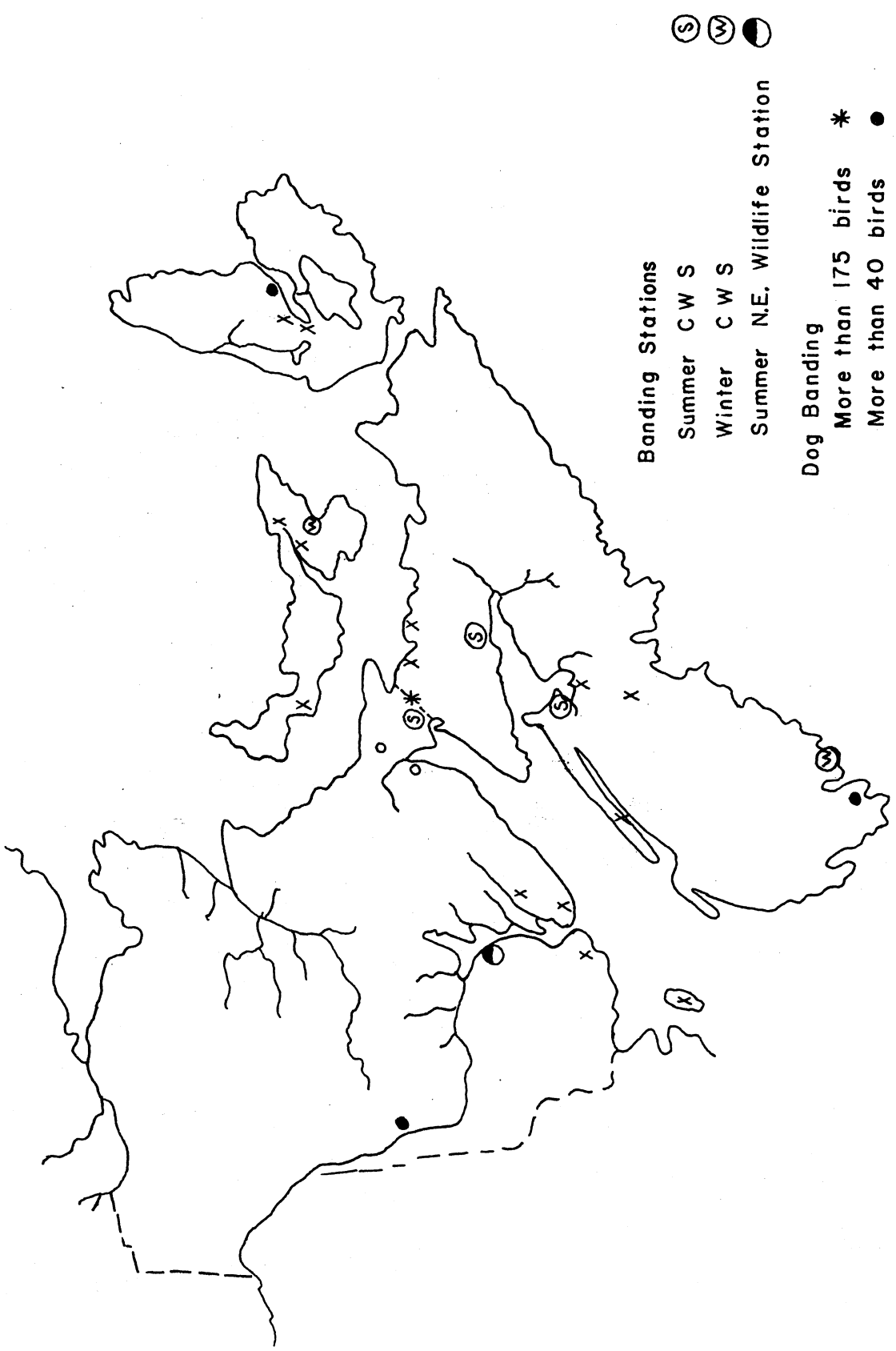

Figure 4. Waterfowl banding stations in the Maritime Provinces used between 1927 and 1954.

Table 17. Direct recoveries of Black Duck banded as flightless young in localities other than the New Brunswick - Nova Scotia Border region - 1927-54

Banding station	Recovery data				
	Local[1]		Distant[2]		
	Number	Time period	Number	Time period	Location
(1) New Brunswick (14)					
Woodstock	1	October	1	December 1	Essex Co., Mass.
			1	December 15	New York
			1	after November 12	Maryland
Memramcook	1	October 1	1	October 20	Queens Co., N.B.
Musquash	1	December 26	1	between October 1 and Nov. 5	Mass.
			1	December 1	Virginia
			1	December 4	Virginia
Grand Manan Island	4	October 17 to December 14			
(2) Prince Edward Island (10)					
Dunk River	3	October 1 to October 20	1	December 13	New York
Hillsborough River	4	October 1 to November 13	1	December 12	Rhode Island
			1	December 16	New Jersey
(3) Nova Scotia (18)					
Grand Pre	6	October 6 to December 14	2	January 14-23	Mass.
			1	October 30	Mass.
Annapolis Co.	2	December 8			
Yarmouth Co.	7	October 2 to January 20			

[1] Less than 50 miles
[2] Over 50 miles

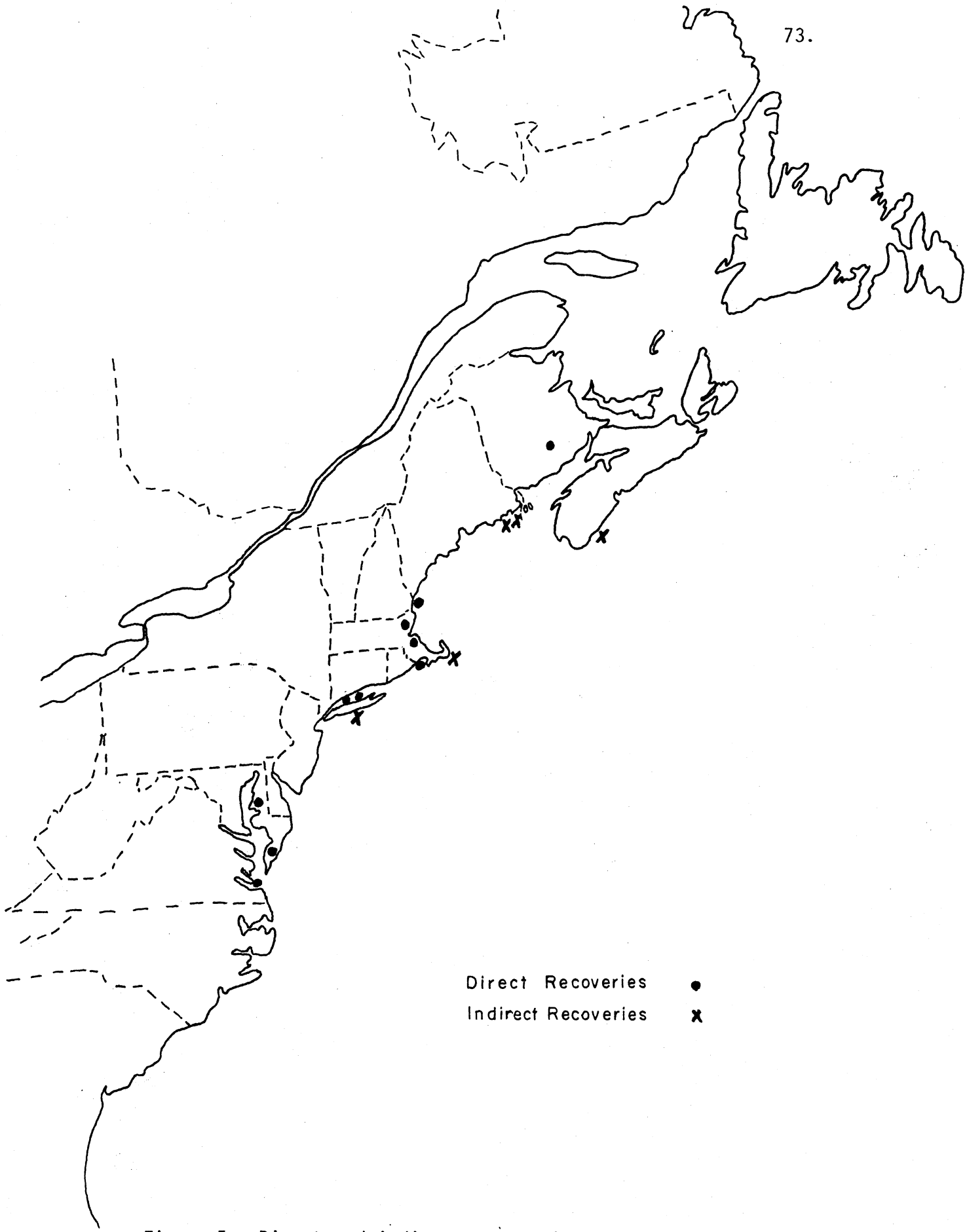

Figure 5. Direct and indirect recoveries from Maritime summer banding between 1927 and 1954, excluding New Brunswick - Nova Scotia Border region.

Scotia Border region. Here, however, the proportion of distant recoveries to local was much greater - 12:8 as opposed to 38:124. The difference, of course, is largely due to the high initial kill of young birds during their first year near the point of banding.

There is also the possibility that migrants may have returned to other areas to breed. One September recovery from Newfoundland indicates northward movement. Several instances of northward movement of Black Duck were mentioned by Hagar (1946) for birds raised in Massachusetts. Three locally-raised Black Duck were re-trapped during summer bandings at Midgic - one, a female, the following year; a male one year later; and another male two years after banding. All re-traps were in early August.

An interesting indirect recovery is a male banded at Midgic September 5, 1948. That bird was re-trapped and released at Long Island, N.Y. on October 8, 1949 and shot approximately December 17, 1951 in the same area of Long Island, N.Y. The indirect recoveries are shown in Table 18 and Figure 6.

There were four indirect recoveries during the period 1950 to the winter of 1954-55, for birds raised in other areas of the Maritimes. They are shown in Table 19.

The only recovery here of any special interest was the one for the Yarmouth County banding. That was the first "distant" recovery for a Yarmouth County bird.

A Black Duck recovery worthy of note was that of an immature male banded at McElmon's Pond, Colchester County, Nova Scotia by Mr. H.R. Webster on September 26, 1950. It was recovered between August 13 and

Table 18. Indirect recoveries of Black Duck banded as flightless young in the New Brunswick - Nova Scotia Border region 1927-54

Banding details			Recovery details	
Date	Age*	Sex	Date	Location
(a) Coastal mainland (7)				
August 21, 1949	A	F	November 23, 1951	Maine
September 1, 1949	I	F	October 28, 1954	Maine
August 26, 1950	A	F	December 8, 1954	Maine
September 20, 1953	I	F	December 6, 1954	Maine
September 5, 1948	I	M	December 17, 1951	New York
August 31, 1949	I	M	December 8, 1950	New York
July 25, 1953	I	M	December 11, 1954	New York
(b) Prince Edward Island (1)				
July 11, 1952	L	F	November 10, 1954	Queens Co., P.E.I.
(c) Nova Scotia (3)				
September 18, 1951	I	F	between November 1 and 31, 1954	Hants Co., N.S.
September 2, 1948	I	F	between November 15 and December 1, 1952	Queens Co., N.S.
July 14, 1953	L	M	January 10, 1955	Yarmouth Co., N.S.
(d) Newfoundland (1)				
August 28, 1951	I	F	late September, year unknown	Burgeo, Nfld.

*Age - L = Locally raised; I = Immature; A = Adult

Figure 6. Indirect recoveries of birds banded in the New Brunswick - Nova Scotia Border region, 1927 - 1954.

Table 19. Indirect recoveries between 1950 and the winter of 1954-55 of Black Duck banded in areas other than the New Brunswick - Nova Scotia Border region

Banding details			Recovery details	
Banding location	Sex	Year	Date recovered	Location
Musquash, N.B.	M	1949	between October 5 and November 5, 1951	Maine
Musquash, N.B.	F	1949	between October 19 and December 24, 1951	New York
Dunk River, P.E.I.	F	1949	November 26, 1950	Shelburne Co., N.S.
Yarmouth Co., N.S.	M	1953	November 26, 1954	Massachusetts

18 the following year at Adloyik Fjord in Northeastern Ungava. The bird may have been banded as a migrant as it has been shown that birds from the Labrador region start arriving in the Maritimes before October 1. Three other recoveries from the same group of bandings were all from the same general area as the banding station and range in date from October 2 to October 21, 1950.

Addy (1953) dealt very thoroughly with the northern birds banded at Tinker Harbour in Labrador, Baie Johan Beetz on the North Shore of the St. Lawrence River, and at Grand Codroy River in Newfoundland. He showed the close affinity of migratory behaviour of birds banded at the first two stations and pointed out that those birds follow a well-defined coastal route. Therefore, it can be assumed they are closely associated with the Maritime Provinces.

The migration through New Brunswick was well under way by October 1, the opening date of the hunting season, and birds had reached Nova Scotia by that time. The arrival in Prince Edward Island was somewhat later, around the first half of November with a peak during the second half. That peak coincided with a similar one in Nova Scotia and evidence indicates that some of those birds winter in Nova Scotia. Most of those birds did not migrate farther south than New Jersey.

Addy's (1953) analysis of the Newfoundland Black Duck shows that Newfoundland birds exhibit an even stronger relationship with the Maritime Provinces. He pointed out that they do not exhibit the strong migrational characteristic of the mainland Black Duck, and they move later in the season. Their movements appear to be through Nova Scotia and Prince Edward Island since there are few New Brunswick recoveries. There

is certainly more evidence of their wintering in Nova Scotia than there is for the mainland black.

Winter Banding in the Maritimes

Several hundred Black Duck have been banded during the winter at Port Joli Sanctuary in southern Nova Scotia and on Prince Edward Island. Recoveries from those bandings are few. There was a total of 25 at Port Joli, where operations began in 1949, and 12 for Prince Edward Island where banding started in 1953.

Recoveries from winter bandings in the Maritimes theoretically should be low for the following reasons:

(1) We are dealing with birds that have already passed through one shooting season.

(2) Birds wintering in the Maritimes, if they continue to do so in later years, are under lighter shooting pressure than birds which go all the way down to the middle Atlantic States.

(3) Winter banded birds in the Maritimes have so far been banded in bird sanctuaries or other protected areas. There is some evidence that many of those birds winter for several years in the same place. Those wintering in sanctuaries would be under less shooting pressure than birds in other areas. As the hunting season in Nova Scotia continues into the winter, it is not feasible to band birds in unprotected areas.

(4) From the above it seems that the main shooting pressure is on the journey through the Maritimes to the wintering grounds. Shooting pressure in the northern breeding areas is very light.

Since we know that winter banded birds have spent at least one winter in the Maritimes, further Maritime recoveries would be mainly of value to show a repetition of that habit. Recoveries farther south would indicate vagaries in the habits of the birds. So far the evidence is mostly in favour of a strong attraction to a particular wintering ground, although there are exceptions.

The Port Joli recoveries showed a strong tendency for wintering in the same general area each year (Table 20). The two southern recoveries from New Jersey and North Carolina (Figure 7) were both of birds banded in mid-March, which of course may have been on their northward migration when banded.

All recoveries from the Prince Edward Island winter banding station were for the year after banding (Table 21). Those recoveries and the preceding ones give some evidence of the origin of those birds. There were three summer and fall recoveries from Newfoundland, one from Labrador and a spring recovery from eastern Quebec.

In the Port Joli bandings, five birds were re-trapped and released at the place of banding. Three were captured the first year after banding and two during the second winter.

Evidence from coloured leg bands pointed to several birds returning to winter at the Prince Edward Island station for the second year.

Finally, it should be pointed out that observations have sometimes led to the belief that there may be late winter movement from Maritime wintering areas to Cape Cod or the southern Atlantic States. Such movements would be difficult to detect as the hunting season in those areas might well be over at the time.

Table 20. Dates and locations of recoveries from Port Joli winter bandings

Year after banding	Number of local[1] recoveries	Date of recovery	Number of distant[2] recoveries	Date of recovery	Location
first	4	Dec. 23	5	Dec. 12	Pictou Co., N.S.
		Dec. 12		Nov. 24	Westmorland Co., N.B.
		Nov. 26		Oct. 19	Cape Breton, N.S.
		Jan. 3		Dec. 28	Halifax Co., N.S.
				Nov. 3	Morell, P.E.I.
second	3	Nov. 15	3	June 6	Cape Onion, Nfld.
		Dec. 26		Oct. 5	St. Peter's Island, P.E.I.
		Nov. 11		Nov. 22	Cape May Co., N.J.
third	5	Jan. 10	1	Nov. 13	Charlottetown, P.E.I.
		Dec. 19			
		Winter ?			
		Dec. 19			
		Jan. 16			
fourth			2	Dec. 13	Canutuck Co., N.C.
				Dec. 16	Halifax Co., N.S.
fifth	1	Jan. 29	1	Sept. 9	St. Mary's River, Nfld.

[1] Less than 50 miles

[2] Over 50 miles

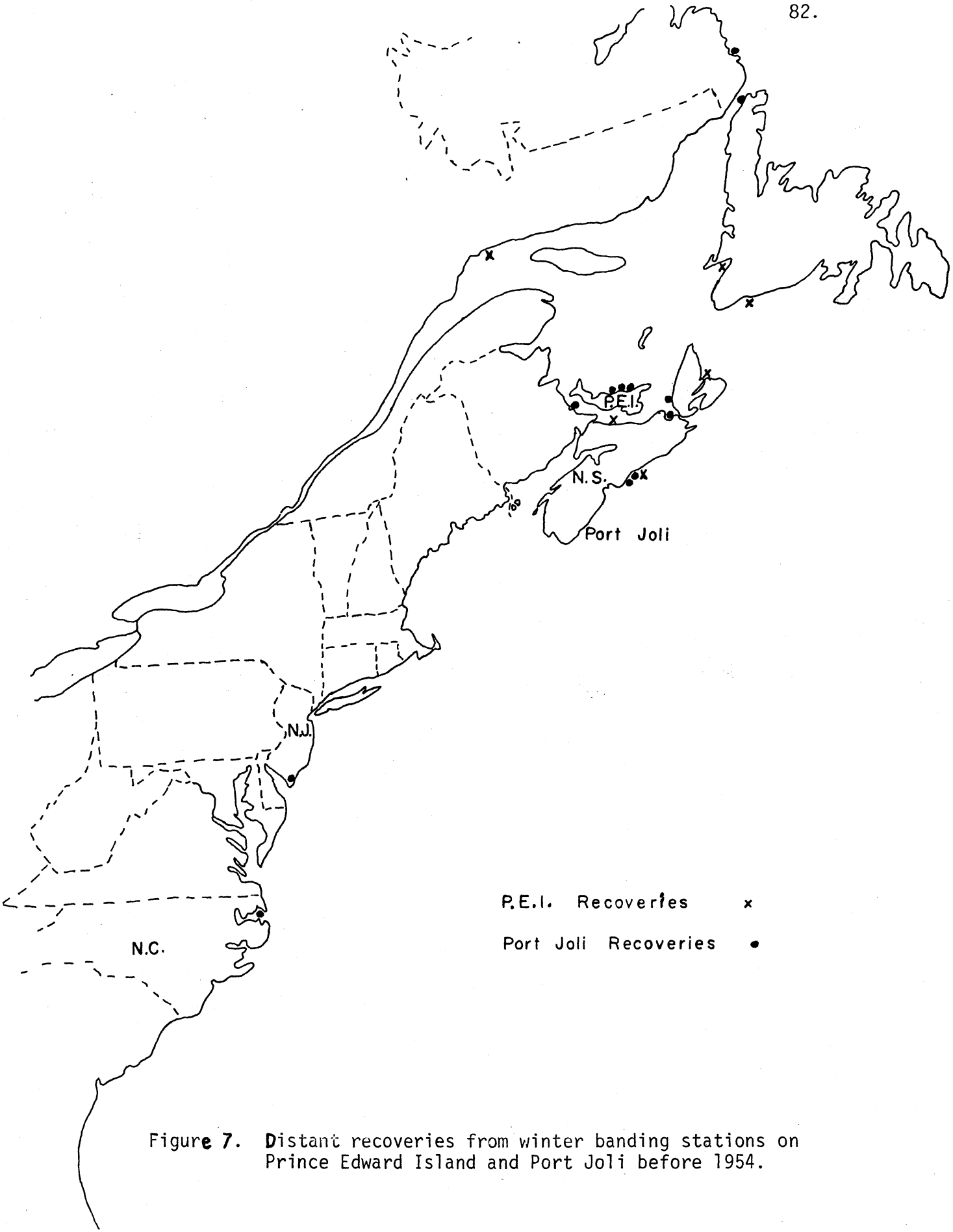

Figure 7. Distant recoveries from winter banding stations on Prince Edward Island and Port Joli before 1954.

Table 21. Dates and locations of indirect recoveries from Prince Edward Island winter bandings

Year after banding	Number of local[1] recoveries	Date of recovery	Number of distant[2] recoveries	Date of recovery	Location
first	6	Oct. 11	6	Dec. 14	Cumberland Co., N.S.
				Jan. 1	Halifax Co., N.S.
		to		between Oct. 15 and	
				Dec. 13	Richmond Co., N.S.
		Nov. 22		May 8	Saguenay Co., Quebec
				Oct. 1	Burgeo, Nfld.
				Sept. 13	East Harmon Air Base, Nfld.

[1] Less than 50 miles

[2] Over 50 miles

THE HUNTING SEASON

The Black Duck was the most abundant single species found in the hunter's bag over the whole of the Maritimes. The kill of Black Duck is more constant throughout the season than that of other species, because it usually occupies the hunting areas for a longer period of time. Thus, in the early part of the season, in the more northern areas, Blue-winged Teal and Ring-necked Duck might climb into first place but that condition is temporary. In the New Brunswick - Nova Scotia Border region Pintail assume an importance which belies their overall scarcity. Later in the season, in many areas, the bag of goldeneye and scaup goes up. In some years, especially in Nova Scotia, a good flight of geese will lower the percentage of the Black Duck.

It is difficult to show the true position of the Black Duck using data on hand. Table 22 is designed to indicate the opening day occurrence of the black in the hunter's bag.

Table 22. Black Duck composition of hunter bags as a percentage of total birds checked on opening day

Locality	Per cent of blacks in hunter bags				
	1950	1951	1952	1953	1954
Early zones (Oct. 1 -)					
N.B. - N.S. Border Area	33	38	-	-	67
Albert Co. (Southeast N.B.)	-	60	-	-	31
Lower Saint John (Northeast Wildlife Station)	-	53	53	-	65
P.E.I., Pisquid Pond	-	21	-	-	40
Mid Zones (Oct. 15 -)					
Grand Pre, N.S.coastal	75	66	81	-	70
Late Zones (late Nov.)					
Musquash (Southwest N.S.)	-	82	80	-	-
Port Joli, N.S.	61	60	25	-	69

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