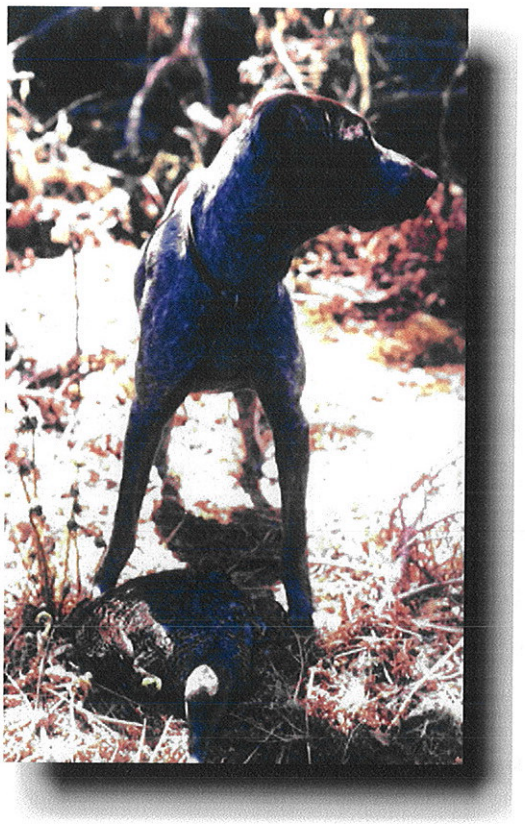
# EMBEDDED SHOT IN SEVEN POPULATIONS OF COMMON EIDER IN EASTERN CANADA



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Cover Photos :

(Top Left) Processing a King Eider on Southampton Island;
(Top Right) German Wire-haired Pointer with hen eider on Big White Island, N.S.;
(Bottom Left) Fluoroscoping male eider in the Bay of Fundy, New Brunswick;
(Bottom Right) Netting a hen eider near Baffin Island.

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## INTRODUCTION

The shotgun was developed to hit a moving target although many stationary game animals are harvested with this weapon. Unfortunately, the shotgun is a short range weapon and, considering the number of pellets, it is probably the most inefficient and least understood weapon in use today.

Millions of geese and other waterfowl are harvested each year by North American sportsmen, and additional millions of birds are unretrieved or lost due to crippling. Many birds hit by shot recover from their wounds and continue to carry shot in their tissues for the remainder of their lives. This **embedded shot** consists of lead or non toxic pellets (steel, bismuth, tungsten, etc.) fired by waterfowl hunters which, although not fatal to the bird, remains inert within the body (figure 1). Embedded body shot, visible with a fluoroscope and X-Ray techniques has been used to document its relationship to hunting pressure and crippling losses.

One of the earliest studies on embedded shot was conducted by Whitlock and Miller (1947) in Michigan. Between 1947 and 1953, American scientists, Whitlock, Elder, and Bellrose processed over 20,000 birds. Fundamental concepts on crippling losses, hunting pressure, wounding rates, hunting regulations and their impact on embedded shot were documented for the most common dabbling duck and goose species.

However, the evolution of fluoroscopic work soon stagnated in the USA and was never applied in Canada. Some of the earlier fluoroscopes were large and bulky compared to modern technology, and the cost was also a factor. There was always a concern over harmful emissions and how to interpret and/or apply the findings.

Few sea ducks were examined during this period because waterfowl, such as the Mallard (Anas platyrhynchos) or Northern Pintail (Anas acuta) were easily caught and considered the most important to the waterfowl hunter. Only limited data are available on Lesser Scaup (Aythya affinis), Ruddy Duck (Oxyura jamaicensis) and Oldsquaw (Clangula hyemalis), and to date, no work has been completed on Common Eider (Somateria mollissima).

## METHODS

Common Eiders were obtained from nesting colonies on off shore islands in Nova Scotia, New Brunswick, Labrador and Newfoundland, Québec, Baffin Island, and Southampton Island (figure 2). The Nova Scotia eider sample was captured with German Wire-haired Pointers in 1993. Eider from New Brunswick were captured in 1994 and 1995 with rocket nets and retrieving dogs. The Labrador eiders were captured in 1995 by using a German Wire-haired Pointer and nest traps. Hand nets, a German Wire-haired Pointer, and a Labrador Retriever were used to capture the Newfoundland sample in 1996. In 1997, the Quebec eider sample was caught with a hand net. Mist nets and nest traps were used to capture eider on Southampton Island and Baffin Island in 1997 and 1998.

All eider were aged, sexed, banded, fluoroscoped and released at the capture site. The exception to this process was the Québec sample which was only fluoroscoped. The fluoroscope scan was with a XI Scan 1000, XI Tech Dow Corning portable unit. The presence or absence of embedded shot was recorded in addition to the approximate body location of the shot.

## RESULTS AND DISCUSSION

A total of 1007 eider, comprising seven populations, was captured for fluoroscopic analysis over the six year study period (Table 1). Three races of eider which may be exposed to differential rates of harvest are part of the Labrador and Baffin Island samples. Data on these races (dresseri, borealis, sedentaria) have been pooled due to small sample size. Also included in the total sample are 178 male eider which account for 17 percent of the sample. The male sample includes one bird from Québec, 48 from New Brunswick, 114 from Southampton Island, and 15 from Baffin Island. For the three comparable samples (Québec excluded), male embedded shot rates exceeded that for females (Table 2). The male embedded shot rate for the Bay of Fundy and the Baffin Island samples is 10 percent higher than that for females, and for Southampton Island is 2 percent higher. In total, male embedded shot rates exceeded that for females by 5 percent.

The likelihood that some hunters would select the more colorful trophy status male bird may contribute to a disproportionate male embedded shot ratio. Hunters may also select the larger male eider as a greater source of meat. This preference or selective hunt is well known for species such as the Wood Duck (Aix sponsa) and Mallard. Craven (1979) found that some hunters would select neck collared geese ahead of normal wild birds. Kirby et al. (1983), found that embedded shot rates for adult male Atlantic Brant (Branta bernicla hrota) was more double that for adult females. They suggest that the adult male, flight behavior as flock leaders, exposed them to a disproportionate amount of shooting and wounding.

Although the overall embedded shot rate for the total eider sample (29 %) appears excessive, several factors including an escalating sea duck hunt, might contribute to this figure. Considered the largest duck in North America, the eider is **one tough customer**. Eider skin is heavier then that for geese, and has been used by native people for winter clothing. When laminated with fat and feathering, it can withstand shotgun pellet hits. The eider is a powerful and stocky bird supported by a heavy bone and mussel structure. The total physique of this bird would contribute to excessive wounding. The eider hunt invariably occurs over water. This provides ideal escape and wound recovery medium as eiders are able to swim hundreds of feet under water. Unlike fresh water marshes, this salt water environment seldom freezes and scavengers are not a factor. Recovery from wounds is more common for sea or bay ducks where predators and ice are not a factor (pers. comm. Danny Clark, P.E.I. Taxidermist). Eider are long lived birds, and will most likely encounter hunters sometime during their life. They are also shot over water where it is difficult to judge distances. The ability of eiders to recover from injuries was documented by Mendall et al. (1981) while working on coastal eider colonies in Maine. Seven female eider had sustained wing injuries and were incapable of flight, yet three hatched successful nests. All of these factors; eider physique, salt water environment, type of hunt, and a recent increase in sea duck hunting pressure would tend to inflate wounding rates. Several of our fluoroscope records are remarkable in illustrating the resiliency of eiders to wounding by hunters. A Bay of Fundy eider had three pellets in its skull, and a Labrador bird contained eight body pellets, (2 neck, 1 head, 1 in each wing, 2 flank, 1 leg). In 1997, a Québec eider was scanned with eight body pellets, (1 head, 2 neck, 3 pectoral, 1 leg, 1 tail), and a Baffin Island bird contained a pellet near the heart which moved with each heart beat. A nesting pair, captured in June 1998 on Southampton Island each contained 5 pellets (3 neck, 3 pectoral, 2 wing, 1 leg, 1 tail).

Embedded shot characteristics were unique for each eider population. The Labrador sample was the smallest (55 birds) but had the highest embedded shot rate (53 percent). Nine islands were sampled throughout a 100 km stretch of coastline with an embedded shot range from 33-100 percent. Two confidence checks for statistical reliability support the 53 percent embedded shot percentage. During a banding operation in 1985, three of six mist net mortalities (50 percent) from Mason Island Labrador were found to have been wounded previously (pers. comm. CWS Biologists Ian Goudie and Pierre Ryan). The high wounding rate suggests excessive year round hunting pressure in a zone where sea ducks are available and an important food resource.

The low embedded shot rates for Southampton and Baffin Islands (24 %) may be due to low hunting pressure by sub-arctic hunters. The Inuit of this zone rely on caribou, Snow Geese (Anser caerulescens), seal, and other sea mammals which would contribute to a reduced wounding rate for the less popular eider hunt. Extremes in weather, ice conditions and the absolute remoteness of this zone also appears to reduce local harvest. Band return analysis for recent banding programs should define harvest patterns, degrees of hunting pressure, and associated embedded shot rates.

Most King Eider (Somateria spectabilis) surveys are presently suggesting population declines throughout its circumpolar range. Weather, oil spills, the aboriginal hunt, market hunting, industrial and natural toxins, and global climate changes are all thought to impact on this population. If we are to evaluate hunting pressure with fluoroscope techniques, a substantially larger sample is required. To date, 15 King Eider from Southampton Island have been processed. The wounding rate is 27% (Table IB).

Nova Scotia, Québec, and Newfoundland have respective embedded shot rates of 35, 37, and 38 percent. These populations, located on the West Atlantic coast, are exposed to heavy local hunting pressure in addition to staggered hunting seasons within their migratory range.

The eiders of New Brunswick include a small local nesting population and approximately 5000 wintering birds. Most hunting pressure is from a zone near the town of St. Andrews on the Bay of Fundy. Light hunting pressure on a somewhat resident population (80 percent of the band returns are from this area and nearby in the state of Maine) contribute to the lowest embedded shot rate (16 percent) for all eiders sampled. Common Eider harvest data from New Brunswick hunters participating in the Atlantic Provinces Species Composition Survey is traditionally very low. Over the previous three hunting seasons (1994-1996), New Brunswick hunters submitted data on only three harvested eider. For the same period, Nova Scotia and Newfoundland hunters submitted similar data on approximately 500 eider (Barrow and Hicklin 1994 – 1996).

The shot per bird ranges from 1.6 for the Nova Scotia sample to 2.1 for Isle Bicquette in the St. Lawrence River (Table 3). This range appears to be directly proportional to the physical size of the bird and deviates 0.5 % for the seven eider samples. Fluoroscopic work on slightly smaller Northern Black Ducks (Anas rubripes) from Nova Scotia and Prince Edward Island, and Mallards from New Brunswick contained respective counts of 1.4, 1.5, and 1.3 body shot (Hicklin and Barrow, 2000). Only the much larger Canada Goose (Branta canadensis) sample from Prince Edward Island with 2.3 body shot exceeded that for the eider sample.

The overall wounding rate for the total eider sample (29 %) is difficult to interpret as there are no comparative data. Whitlock and Miller (1947) found that 10 percent of a harvested sample contained no shot due to pellets passing through the body, a factor which would inflate most embedded shot rates. This 10 percent total shot penetration would probably be minimal for the tough strong body of the Common Eider. This study did not include crippling losses or those ducks which died from wounds. **American and Canadian crippling loss estimates range from 20 to 40 % (Norton et al. 1994) and appear to parallel embedded shot percentages.**

Fortunately, mortally wounded eider which die immediately, or a short time later are easily found on the open ocean. A report by Hicklin, Barrow, and Daoust (draft status, 2000) found that 72 percent of the dead dabbling ducks in a crippled bird collection died immediately but were not found due to dense freshwater aquatic vegetation. Crippling

losses of this magnitude are probably rare for the eider hunt. Between October 31 and November 10, 1998, crippling losses were recorded during a sea duck collection for toxic chemical analysis on the Belcher Islands (Barrow, 1998). Less than one bird per hunter day was lost while collecting 169 birds during this eight day hunt.

**Studies by the Co-operative North American Shotgunning Education Program (CONSEP) group suggest that to harvest a bird like the eider, four shot in lethal areas are required for a clean kill. Tables 1 and 3 show that many birds are hit but with insufficient power or pellet strikes.**

The number of shot found ranged from 1-8 pellets and is summarized by population in Table 3. Of the 294 eider with body shot, approximately 90 percent had less than four pellets and 56 percent contained a single pellet.

The lethal hits shown in Table 4 were those diagnosed as potentially lethal if located in the head, neck, or next to the heart. It is minimal because lethal hits on other less dense body organs were difficult to diagnose. The exception was pellets embedded next to the heart which moved with each heart beat. In total, 10 percent of the sample were hit (many with multiple strikes) in vital organs.

**The lack of energy for shot penetration and low numbers of body shot indicate shooting at excessive range. For most eider in this sample, a fifteen yard decrease in shooting range would make the difference in ethical harvest, or an injured or lost bird (pers. comm. Tom Roster CONSEP consultant).**

## CONCLUSION

Information on the impact of hunting pressure on waterfowl populations is a fundamental management requirement, yet X-Ray technology has been for the most part, overlooked for over fifty years. The first fluoroscopes were huge devices which couldn't be transported by plane, boat, or backpack. Although the application and utility of fluoroscopic techniques in waterfowl management has been debated, this technique provides a record of hunter impact upon waterfowl. Most waterfowl hunting is a series of events which require a dedicated effort by hunters to minimize crippling losses. At the very least, this work can be used in hunter education to reduce crippling losses through awareness and subsequent improved shooting skills.

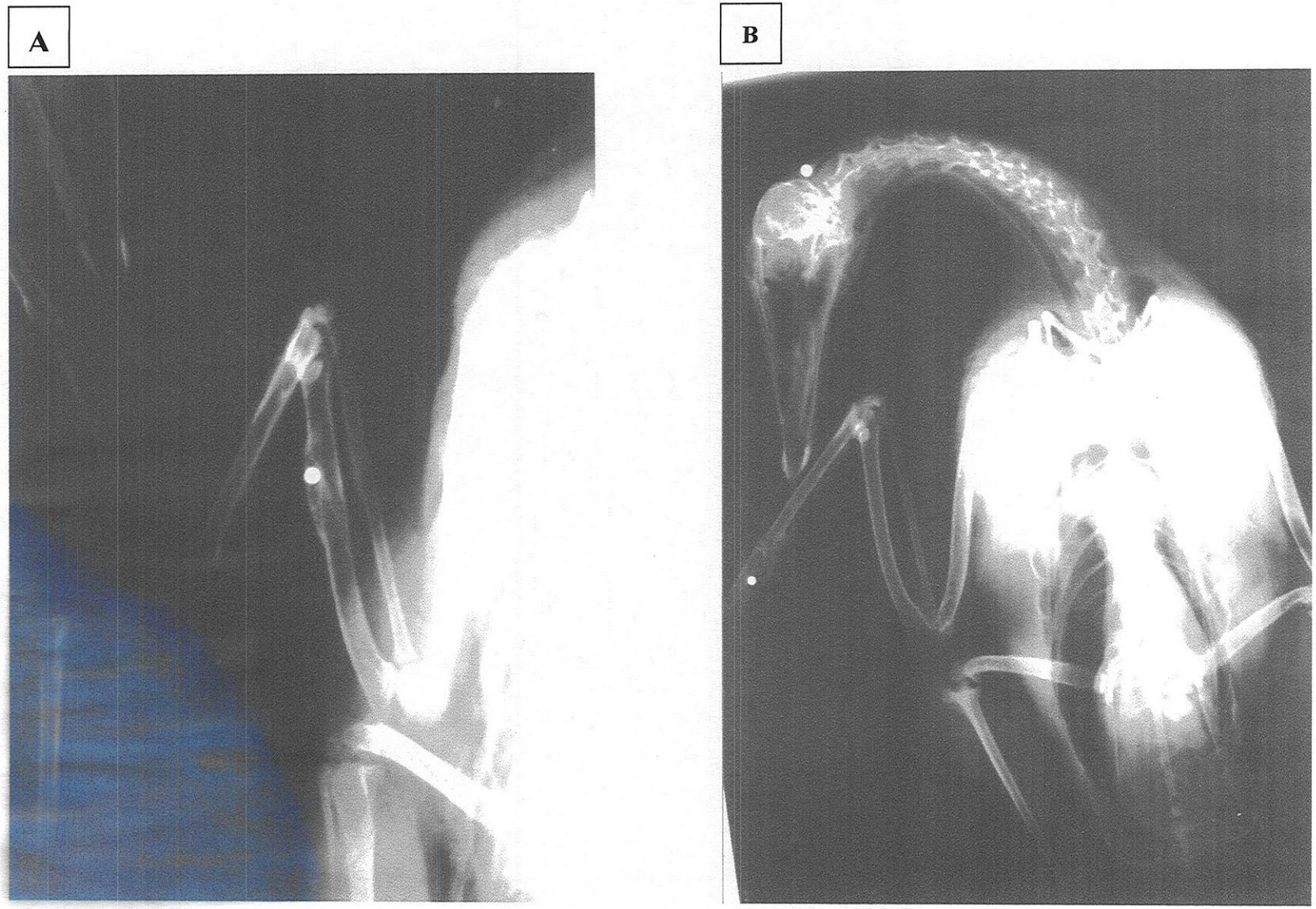


Figure 1 Embedded shot in Common Eider: (A) female eider with wing pellet and mended broken wing; (B) female eider with single pellets in the head and wing area.

FIGURE 2. PROJECT LOCATIONS FOR THE COMMON EIDER EMBEDDED SHOT STUDY

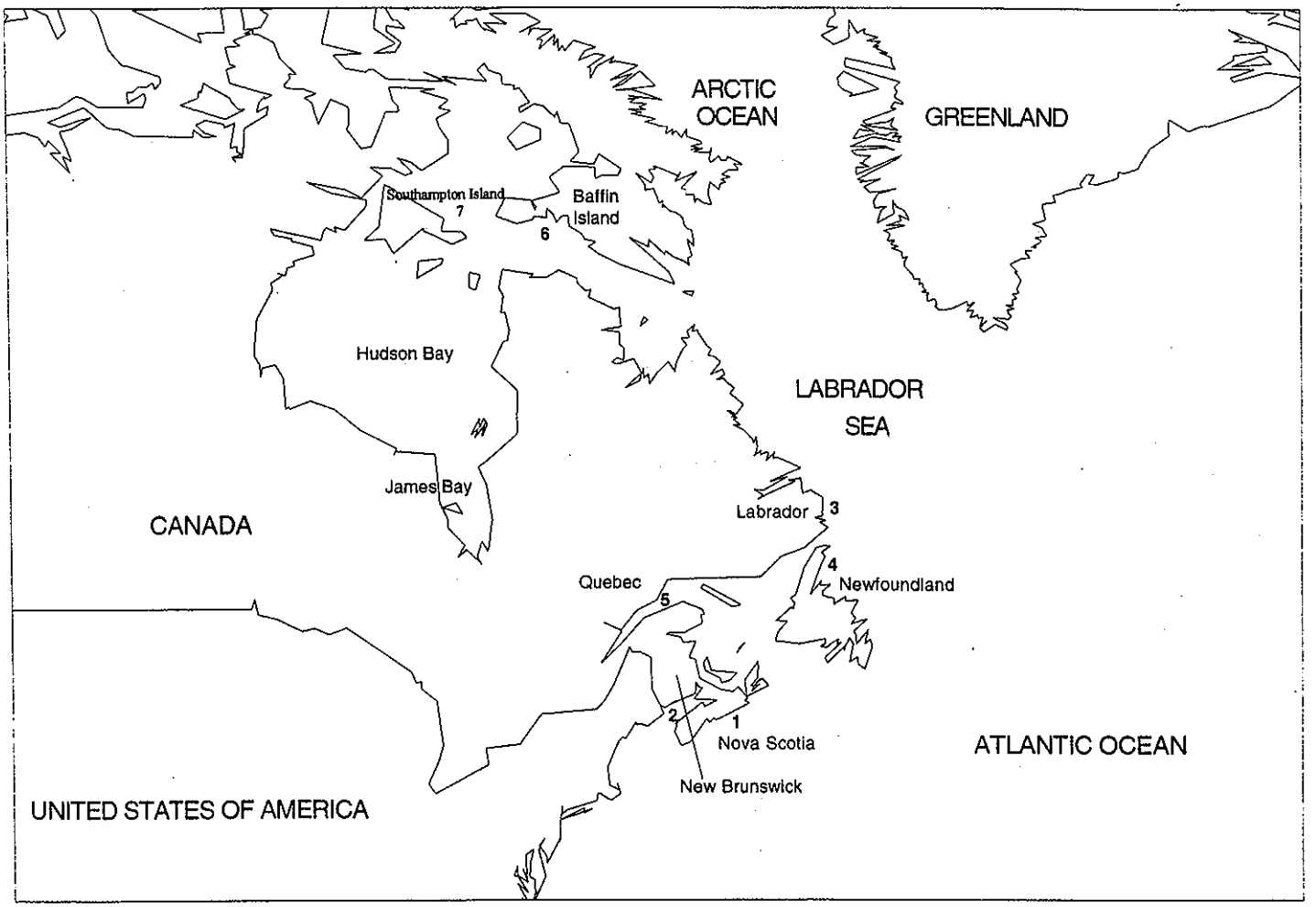

**Table 1** **Embedded shot rate for seven populations of Common Eider**

| Eider Population | Sample | + Scan | Embedded Shot Rate |
|---|---|---|---|
| Nova Scotia Common Eider | 108 | 38 | 35% |
| New Brunswick Bay of Fundy Common Eider | 166 | 26 | 16% |
| Labrador Common Eider | 55 | 29 | 53% |
| Newfoundland Common Eider | 172 | 66 | 38% |
| St. Lawrence River Common Eider | 100 | 37 | 37% |
| Baffin Island Common Eider | 154 | 37 | 24% |
| Southampton Island Common Eider | 252 | 61 | 24% |
| Total | 1,007 | 294 | 29% |

**Table 1B** **Fluoroscopic data for King Eider captured on Southampton Island**

| Eider Population | Sample | + Scan | Embedded Shot Rate |
|---|---|---|---|
| Southampton Island King Eider | 15 | 4 | 27% |

**Table 2 Comparative male and female embedded shot rates for three populations of Common Eider**

| Eider Population | Female Eider Sample | | | Male Eider Sample | | |
|---|---|---|---|---|---|---|
| | Total | + Scan | Rate | Total | + Scan | Rate |
| N.B. Bay of Fundy | 118 | 15 | 13% | 48 | 11 | 23% |
| Baffin Island | 139 | 32 | 23% | 15 | 5 | 33% |
| Southampton Island | 138 | 32 | 23% | 114 | 29 | 25% |
| Total | 395 | 79 | 20% | 177 | 45 | 25% |

**Table 3 Frequency of body shot found in the eider sample**

| Eider Population | Number of body shot | | | | | | | | Total Pellets | Shot Per bird |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | | |
| Nova Scotia | 20 | 14 | 4 | - | - | - | - | - | 60 | 1.6 |
| New Brunswick | 14 | 6 | 5 | 1 | 1 | - | - | - | 50 | 1.9 |
| Labrador | 17 | 4 | 5 | 1 | - | - | 1 | 1 | 59 | 2.0 |
| Newfoundland | 37 | 16 | 4 | 6 | 3 | - | - | - | 120 | 1.8 |
| Québec | 17 | 11 | 1 | 7 | - | - | - | 1 | 78 | 2.1 |
| Baffin Island | 22 | 8 | 4 | 2 | - | - | 1 | - | 65 | 1.8 |
| Southampton Island | 40 | 9 | 8 | 1 | 3 | - | - | - | 101 | 1.7 |
| Total | 166 | 68 | 31 | 18 | 7 | - | 2 | 2 | 533 | 1.8 |

**Table 4** **Frequency of lethal hits on the Common Eider sample**

| Total Sample | Lethal Hits | Multiple Lethal Hits | Percentage |
|---|---|---|---|
| Nova Scotia - 108 | 10 | - | 9% |
| New Brunswick - 166 | 12 | 2 | 7% |
| Labrador - 55 | 11 | 1 | 20% |
| Newfoundland – 172 | 22 | 4 | 13% |
| Québec - 100 | 12 | 1 | 12% |
| Baffin Island - 154 | 15 | 3 | 10% |
| Southampton Island - 252 | 21 | 2 | 8% |
| 1,007 | 103 | 13 | 10% |

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