# PRELIMINARY INVESTIGATION OF THE MUSKRAT POPULATION AND HARVEST OF OLD CROW FLATS AND NORTHERN YUKON

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TABLE OF CONTENTS

## The Northwestern Muskrat

The muskrat of the Yukon Territory is the northwestern muskrat, Ondatra zibethicus spatulatus, which ranges from the eastern limits of the MacKenzie drainage basin, throughout the MacKenzie Delta in N. W. T. and Yukon, westward throughout Yukon and Alaska (south of the Brooks Range), and south to northern B. C., Alberta and Saskatchewan (Banfield 1974). The native range of the species includes most of North America (excluding the tundra zone, and the arid southwest) and it also inhabits central and northern Europe and the U.S.S.R., where it was introduced from North America in the early 1900's. It is harvested for it's commercially valuable fur throughout its range.

The northwestern muskrat is smaller and more pallid than O. z. osoyoosensis, whose range lies to the south, and darker than O. z. alba which is found eastward to Hudson Bay. It has short, heavy underfur and is valued for the fine texture and quality of its fur.

In Yukon the muskrat occupies suitable wetland habitat south of the Brooks Range and on the MacKenzie Delta. Concentrations are greatest on Old Crow Flats and most pelts are harvested from this area. (Table 1). More favorable habitat (based on climate) occurs in the southern Yukon, however, the aerial extent of wetlands there is limited. There is some evidence of a north-south cline in body size, with muskrats in the Old Crow area and MacKenzie Delta averaging smaller than those in southern parts of the Territory (Youngman 1975).

Old Crow Group Trapping Area

The Old Crow Group Trapping Area (Figure 1) is a trapping concession granted to the Old Crow Indian Band, whose council administers trapping rights on the area. The Band Council has provided a list of 131 trappers and 13 students who are eligible to trap. The number of trappers who annually obtain licences averages around 50. Most of these trap near Old Crow and on the Flats. Recently, four or five individuals have been trapping up the Porcupine at locations as far upstream as Johnson Creek. Chief Charlie Abel is the only trapper who ranges to the Dempster Highway, from which he attains the Eagle River area.

Trapping area boundares are not intended to be restrictive, however, individuals, families and partnerships tend to establish traditional trapping areas which they exclusively use. This system of allocation of trapping rights has resulted in several currently well defined trapping areas, especially on Old Crow Flats, where muskrat hunting and trapping is a significant social event.

Muskrats constitute the majority of the Old Crow fur harvest (75%) and are valued at up to $87,000 annually (Table 1). The Old Crow harvest represents 75% of the total Yukon muskrat harvest. In recent years the total harvest has been 10-20,000 animals while harvests over 30,000 were common prior to 1930. Trapper effort is probably the primary factor influencing the Old Crow muskrat harvest. For example, in 1969-70 during the construction of the Old Crow airstrip only 968 muskrats were reportedly taken. The muskrat population is assumed to be relatively stable, although this is based on knowledge of north-

Western muskrat population characteristics (see Ecology and Biology section) and no on inventory of the Old Crow population.

The majority of the muskrat furs are sold commercially while some are retained for personal use, including use for mocassin trim and other crafts. Many carcasses are eaten; some are dried for later use. The open season for muskrats (north of the Arctic Circle) is October 1 to June 30 next following. The fur is prime from approximately October 1 to April 30 and pelts taken after this time are often unprime, rubbed and torn from fighting.[1] Most of the Old Crow harvest is taken by shooting in open water in spring (May and June).

## Ecology and Biology of the Northwestern Muskrat

The northwestern muskrat has received considerable attention in two regions of abundance and economic significance; the Peace-Athabasca and MacKenzie deltas. Studies have documented a wide range of behavioral and genetically controlled adaptations to the severe subarctic environment which differ between populations inhabiting the two areas. Although the muskrat population of Old

1. A prime pelt is one in which new guard hair and underfur has reached maximum growth. Roots of new hair growth move toward the skin's outer surface and the volume of blood that nourishes hair decreases, resulting in a cream-colored hide. Primeness is of extreme importance to fur buyers and garment manufacturers and this is reflected in a higher average price being paid for prime pelts.

Crow Flats has not been studied, climatic (temperature and seasonality) habitat and hydrological (presence and spring flood) similarities between the Flats and the MacKenzie Delta, about 200 km to the east, make possible an extrapolation of findings to the Flats.

The major stuides of interest are Steven's (1955) doctoral dissertation on "The adjustments of the northwestern muskrat (Ondatra zibethicus spatulatus) to a northern environment", and Hawley's Canadian Wildlife Service work summarized in 1968 and 1975. Preliminary and contributing works are listed in the bibliography. Major comparative studies from the Peace-Athabasca Delta are Fuller (1951) and Westworth (1974).

The unique characteristics and adaptations of the muskrat of the MacKenzie Delta, and hence the Old Crow Flats, are:

1. A small body size (smallest of its race), possibly due to limited availability and poor quality of food supplies.

2. The occupancy of bank burrows, rather than houses which are used in more temperate regions (including the Peace-Athabasca Delta) due to a lack of emergent vegetation needed for construction materials, and great ice thickness.

3. The extensive use of 'pushups' (hollow feeding stations constructed on the ice surface, accessible through a 'plunge hole' in the ice, and used to extend their foraging range). Pushups are discussed in detail in the next section.

4. Open water beyond the common ice depth of 1 m. (4.5 feet) is required for winter foraging. Therefore lakes less than 1 m deep are too shallow to support wintering populations.

5. There are two periods of dispersal, one in the spring when summer breeding and rearing territories are established in nearly all shallow water bodies and another in the fall when drought and freezeout threaten shallow water bodies and animals move back to the deeper lakes. Animals which fail to make this move due to habitat saturation die early in the winter. Hawley (1968) reported 60-80% mortality in the population at this time. Stevens (1955) estimated that juveniles were affected the most and that 50% died during freezup. Normal movements of individual muskrats were up to 300 yards in summer and 100 yards in winter (Stevens 1955).

6. Reproductive adaptations to a relatively short ice free period (4 months):

   a. Breeding season and number of litters

      Adult females begin breeding in mid-April and begin having litters in early June. Second litters are born from mid to end of July, with the last born in August. Juveniles have one litter between mid June and mid July (Stevens 1955).

      The breeding season is longer farther south with 4 or 5 litters produced in the southern U.S.A. (Errington 1963) and 2 or 3 being produced in the Peace-Athabasca Delta (Westworth 1974).

6. b. Litter size

Errington (1963) gives a mean figure of 4.0/litter for the U.S.A. while 7.25 to 9.0 young are produced in MacKenzie Delta litters (Hawley and Hawley 1975; Stevens 1955, gives mean of 8.3).

7. Lower population densities are associated with reduced interspecific intolerance (Stevens, 1955) predation, disease, and parasitism.

Muskrat Pushups

A pushup is a dome of frozen vegetation covering a plunge-hole in the ice, in which the muskrat feeds in winter. The muskrat starts building pushups by chewing holes in the thin autumn ice. Air bubbles, cracks or locations of escaping marsh gases, (which may be at the site of old decaying pushups) may be used for this purpose. Submerged vegetation is then pushed up to construct a dome over the hole. In the MacKenzie Delta, stems and leaves of pondweeds, milfoil as well as any other plant materials available and mud and sticks are often used for this purpose. The vegetation eventually freezes and becomes covered with snow, becoming a predator-safe, insulated feeding shelter. Constant use by the muskrat circulates the water and keeps the hole open through ice which may freeze to depths of 1 m. The pushups are constructed in front of the bank dens about 10 m apart.

The number of active pushups diminishes through the winter months as musk-

rats die or are trapped, or as pushups are abandoned. Muskrats may be forced to live in pushups when extended periods of low temperatures, removal of snow cover on the ice by wind or when seasons of low snowfall freeze entrances to dens.

In 1948, Cowan described the possibility of using a conversion factor whereby the number of pushups could be used as an indicator of population and consequently desireable harvest. In the Aklavik area, Stevens (1955) found that groups of 3 to 16 rats (average of 6) used each pushup and that overwintering groups, which are not necessarily family units, used 2 or 3 pushups each. Figures reported for the proportion of total pushups active in March/April for the MacKenzie Delta vary from 33% to 56% of the total that were constructed before ice depths become prohibitive in October/November (Stevens 1955, Westworth 1977).

Northwestern Muskrat Inventory Studies

The 1982 density of pushups in the Old Crow area is given in Table 2. The density varied from 1 to 20 pushups/$km^2$ on transects up to 70 km in length (140 $km^2$ in area). On the MacKenzie Delta, Hawley (1968) reports densities ranging from 9 to 39 pushups/$km^2$ on poor habitat in the northwest to the best habitat in the southeast. In May of 1982, a similar density gradient was observed by the writer on a reconnaisance flight from Shingle Point, Yukon on the Arctic coast in the northwest, to Inuvik, N. W. T. in the southeast (although density figures were not kept). The first pushups were noted on the MacKenzie Delta east of Shingle Point (10 or less on each pothole, zero

on most). None were noted in the tundra lakes bordering the Delta. Stevens (1983) stated, "Most of the tundra lakes..., especially those connected with the delta by small streams have signs of muskrat use. There are very few muskrats in the lakes and streams bordering the Arctic Coast from the vicinity of Herschel Island in the west to at least Darnley Bay in the east.

The MacKenzie delta has somewhat the same character as the delta of the Old Crow River in Yukon Territory. The latter area, known locally as 'Old Crow Flats', .... shares with the MacKenzie Delta the distinction of having a high fur return per small unit area - a unique occurrence in such northerly latitudes".

Canadian Wildlife Service biologist J. E. Bryant, stationed in Aklavik, conducted an investigation of the muskrats in the Old Crow Flats in the spring of 1957, acting on an R.C.M.Police report that the muskrats were dying off in serious proportions (Bryant, 1957). He found cysticercosis (tapeworm larvae infection) in 21% of 190 specimens examined. The only pathological condition observed was apparent weakness exhibited by a few of the more severely infested animals. The muskrats probably became infected after ingesting eggs contained in the feces of canids or mustelids. A die-off was not observed and the reduced take of muskrats in 1956-57 was attributed to the late construction of pushups, due to an abnormal amount of overflow on top of the ice in November and early December, which made pushup "staking" difficult, and a quick thaw in April, which altered the mating habits of the muskrats and consequently reduced the take by hunting on open water. The effect of these factors on the harvestability of muskrats in-

fluenced the opinion of trappers on population levels.

The 1971 Arctic Gas Pipeline route study of furbearers associated with proposed pipeline routes in the Yukon Territory and MacKenzie River valley (Ruttan and Wooley, 1974) merely commented on the presence of muskrat habitat and noted an abundance of bank runs on the southern lakes, west of the Old Crow River.

In 1971-72 the Canadian Wildlife Service Special Habitat Evaluation Group conducted a preliminary inventory of muskrat habitat on areas within and adjacent to proposed oil and gas pipeline corridors in the northern Yukon and MacKenzie District, N. W. T. (Dennington et al, 1973). Spring counts of muskrat pushups were conducted on selected aquatic habitat units including Old Crow Flats, flats south of Old Crow and the Porcupine River valley from Old Crow to the Bell and Eagle Rivers. Unfortunately, the pushup counts are not available (Dennington, 1982, pers. comm.). However a habitat map rating the relative quality of habitat units was presented in the report. Optimum environmental requirements include an abundant supply of emergent and submergent plants, good shoreline or bank development with rapid drop-off to depths below normal ice formation levels, and preferably some shoreline cover that will aid in trapping and holding a thick insulating layer of snow. The best habitat on the Flats is the thermokarst lakes on the northern and western periphery. Small lakes with irregular and abrupt shorelines are preferred over the larger, directionally oriented lakes.

Summary

The northwestern muskrat ranges over the entire Yukon Territory, being absent only from arctic and alpine tundra zones. Optimum environmental requirements include an abundant supply of emergent and submergent plants, water bodies with good shoreline or bank development and depths below normal ice-formation levels. The better muskrat habitat in Yukon is found in the south where the climate is less severe than in the north, however suitable wetlands are nowhere more concentrated than they are on the Old Crow Flats resulting in the highest population of muskrats in the Territory.

Biological and ecological studies of muskrats on the MacKenzie Delta have revealed a range of behavioral and genetically controlled adaptations to the severe subarctic environment.

The Old Crow Flats muskrat population is harvested by natives from the community of Old Crow. The Old Crow harvest represents 75% of the total muskrat harvest from Yukon and is a locally significant social activity and economic enterprise. The Old Crow muskrat harvest has been highly variable over the years, probably reflecting trapper effort rather than fluctuations in numbers. A considerable portion of the harvest is taken by shooting in the late spring when natural overwinter mortality has already occurred and pelts may be rubbed and unprime.

The northwestern muskrat is best inventoried (indexed) with spring pushup counts from fixed-wing aircraft. The ideal time for censusing pushups is

when the snow has melted sufficiently to reveal the pushups and before the ice has melted (mid to late May on Old Crow Flats). The first detailed inventory on the Flats was conducted in late May 1982, using a strip-census sampling technique.

## Recommendations

The following recommendations should be implemented:

1. The Old Crow Flats muskrat population should be indexed biennially from 1982 with spring pushup counts.

2. The biology and ecology of the muskrat population should be documented through field studies to determine annual allowable harvest levels and preferred temporal and spatial harvest strategies.

3. The Old Crow Indian Band should be encouraged to harvest muskrats from the Flats, both to maintain the social fabric and cultural heritage of the community and to provide a local economy. This could be realized through an education program which could also stress optimal harvest strategies, harvest methods and pelt handling techniques.

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FIG.1-OLD CROW GROUP TRAPPING AREA

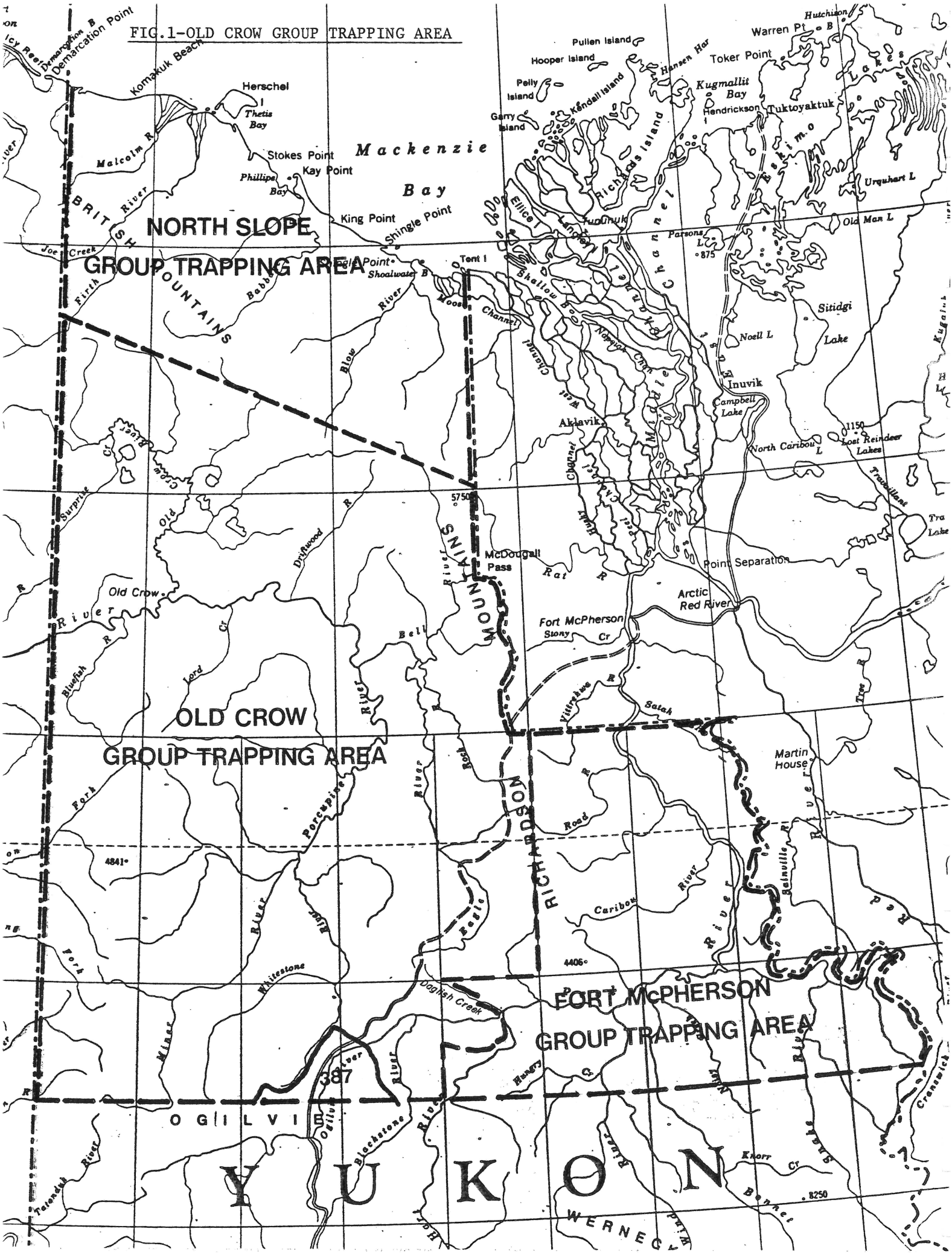

Table 1. Yukon and Old Crow Muskrat Harvest and Value

| Year | Yukon Harvest[1] | Yukon Value[1] | Old Crow Harvest | Old Crow Value |
|---|---|---|---|---|
| 1920-21 | 12,765 | $12,765 | | |
| 1921-22 | 59,491 | 79,123 | | |
| 1922-23 | 39,960 | 51,005 | | |
| 1923-24 | 34,904 | 45,724 | | |
| 1924-25 | 20,929 | 20,929 | | |
| 1925-26 | 18,067 | 23,487 | | |
| 1926-27 | - | | | |
| 1927-28 | 46,315 | 61,136 | | |
| 1928-29 | 19,284 | 23,141 | | |
| 1929-30 | 92,953 | 28,815 | | |
| 1930-31 | 52,158 | 55,989 | | |
| 1931-32 | 41,545 | 18,695 | | |
| 1932-33 | 34,902 | 19,196 | | |
| 1933-34 | 30,386 | 27,347 | | |
| 1934-35 | 24,471 | 28,142 | | |
| 1935-36 | 25,337 | 29,138 | | |
| 1936-37 | 34,419 | 43,024 | | |
| 1937-38 | 48,445 | 28,583 | | |
| 1938-39 | 62,385 | 49,284 | | |
| 1939-40 | 63,880 | 54,937 | | |
| 1940-41 | 55,332 | 81,338 | | |
| 1941-42 | 51,288 | 101,037 | | |
| 1942-43 | 41,260 | 90,772 | | |
| 1943-44 | 65,188 | 122,553 | | |
| 1944-45 | 68,076 | 153,171 | | |
| 1945-46 | 91,817 | 252,497 | | |
| 1946-47 | 44,933 | 71,893 | | |
| 1947-48 | 30,686 | 73,646 | | |
| 1948-49 | 27,681 | 35,985 | | |
| 1949-50 | 54,634 | 68,293 | | |
| 1950-51 | 70,786 | 127,415 | | |
| 1951-52 | 23,899 | 26,289 | 22,431 | $ 24,674 |
| 1952-53 | - | | 26,900 | - |
| 1953-54 | 49,683 | 44,715 | 33,635 | 30,272 |
| 1954-55 | - | | 32,855 | - |
| 1955-56 | 49,947 | 47,450 | | |
| 1956-57 | 30,003 | 22,502 | | |
| 1957-58 | 29,999 | 21,899 | | |
| 1958-59 | - | | | |
| 1959-60 | 42,248 | 30,419 | | |
| 1960-61 | 32,248 | 17,736 | | |
| 1961-62 | 24,316 | 21,884 | 12,361 | 11,125 |
| 1962-63 | 17,466 | 17,291 | 17,411 | 17,237 |
| 1963-64 | 24,165 | 30,206 | 13,997 | 17,496 |
| 1964-65 | 16,245 | 17,545 | 7,860 | 8,489 |
| 1965-66 | 9,346 | 12,711 | 9,688 | 13,176 |
| 1966-67 | 12,633 | 5,053 | 13,324 | 5,329 |

Table 1. Contd. Yukon and Old Crow Muskrat Harvest and Value

| | Yukon | | Old Crow | |
|---|---|---|---|---|
| Year | Harvest | Value | Harvest[2] | Value |
| 1967-68 | 12,459 | 9,344 | 11,273 | 7,553 |
| 1968-69 | 15,401 | 17,711 | 9,461 | 10,880 |
| 1969-70 | 5,603 | 4,763 | 968 | 823 |
| 1970-71 | 3,925 | 2,669 | 5,225 | 3,919 |
| 1971-72 | 11,857 | 22,528 | 9,798 | 18,616 |
| 1972-73 | 23,701 | 47,402 | 13,725 | 27,450 |
| 1973-74 | 12,245 | 42,490 | 11,084 | 38,461 |
| 1974-75 | 11,392 | 36,227 | 19,878 | 63,212 |
| 1975-76 | 17,262 | 85,620 | 14,053 | 69,703 |
| 1976-77 | 20,407 | 101,627 | 12,728 | 63,385 |
| 1977-78 | 13,348 | 54,593 | 9,192 | 37,595 |
| 1978-79 | 19,431 | 110,757 | 15,277[3] | 87,079 |
| 1979-80 | 9,489[2] | 59,116[2] | 7,218[3] | 44,968 |
| 1980-81 | 13,743[2] | 83,695[2] | 9,696 | 59,049 |

Data Sources:

1. Statistics Canada, Agriculture Statistics Division. Annual Fur Production Reports. 1920-21 to 1979-80 inclusive. Published by Minister of Supply and Services, Canada.

2. Various internal Yukon Government Reports. Historical data is incomplete as many of the sources have been lost.

3. Estimated.

Table 2. Muskrat Pushup Density on Old Crow Flats and South Flats

Old Crow Flats (survey mapsheets 1160-N(E½), Old Crow; 117A, Blow River; 117B Davidson Mountains)

| Flightline* | Transect Length (km) | Area Surveyed ($km^2$) | No.** Pushup | Pushup Density ($km^2$) |
|---|---|---|---|---|
| 11 | 22.5 | 45 | 698 | 9.3 |
| 10 | 37.5 | 75 | 622 | 8.3 |
| 9 | 56 | 112 | 1092(869) | 9.8(7.8) |
| 8 | 54 | 101 | 802(709) | 7.9(7.0) |
| 7 | 67.5 | 135 | 488 | 3.6 |
| 6 | 67.5 | 135 | 1133 | 8.4 |
| 5 | 70 | 140 | 2064 | 14.7 |
| 4 | 64 | 128 | 2276 | 17.8 |
| 3 | 62.5 | 125 | 2120(2197) | 17.0(17.6) |
| 2 | 62.5 | 125 | 1652(1977) | 13.2(15.8) |
| 17 | 67.5 | 135 | 2545 | 18.9 |
| 18 | 65 | 130 | 2635 | 20.3 |
| 19 | 65 | 130 | 1880 | 14.5 |
| 20 | 51 | 102 | 1372 | 13.5 |
| 21 | 51 | 102 | 1688 | 16.5 |
| 22 | 51 | 102 | 1792 | 17.6 |
| 23 | 40 | 80 | 1091 | 13.6 |
| 24 | 35 | 70 | 869 | 12.4 |
| 25 | 27.5 | 55 | 273 | 5.0 |
| 26 | 15 | 30 | 34 | 1.1 |

*Transects flown north-south, ordered east to west in table.
Trapping activity concentrated in central flats, transects 5 to 2 and 17 to 20 in table.
**Accuracy check data in parentheses

South Flats (mapsheet 1160-N(E½) Old Crow)

| Flightline* | Transect Length (km) | Area Surveyed ($km^2$) | No. Pushup | Pushup Density ($km^2$) |
|---|---|---|---|---|
| 12 | 17.5 | 35 | 135 | 3.9 |
| 13 | 29 | 58 | 384 | 6.6 |
| 14 | 21 | 42 | 769 | 18.3 |
| 15 | 24 | 48 | 493 | 10.3 |
| 16 | 15 | 30 | 385 | 12.8 |

*Transects flown east-west, ordered south to north