

STATE OF MICHIGAN
DEPARTMENT OF NATURAL RESOURCES
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Recovery Patterns of Banded Scaup
Harvested in Michigan, 1964-73

by

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INTRODUCTION

This paper presents recovery data for scaup (*Athya affinis* and *A. marilla*) banded outside the State of Michigan that were taken within the state during the years 1964 through 1973. (It is customary to classify this type of recovery as "foreign-banded.")

The analyses were performed for the purposes of determining: (1) the current geographic distribution of the Michigan scaup harvest, (2) the seasonal time distribution of the scaup harvest, (3) the proportion of the total scaup harvest taken during the special late season, (4) the identity of the banding areas contributing to the Michigan harvest, and (5) the differences or similarities in harvest characteristics for five state harvest zones, including Saginaw Bay, Lake St. Clair, the Lower Detroit River-Lake Erie region, the Upper Peninsula, and the remaining parts of the Lower Peninsula (hereafter referred to as the "OTHER" kill zone). Finally, (6) the current harvest distribution was compared to that determined for the 1949-62 period from a study done by Geis, et al. (1962). This was done in an attempt to substantiate or disprove allegations that there have been important changes in the distribution of recent scaup harvests within the state. In particular, substantial declines in scaup harvests on Saginaw Bay have been suggested.

It is recognized that banding data present some limitations in analyses for the stated purposes of the study because of potential deficiencies in representativeness of the banded samples. In other words, samples of banded birds are seldom perfect in truly representing the size, or age and sex composition, of the actual waterfowl population. For this reason, conclusions drawn regarding the scaup harvest in Michigan are viewed as tentative until more definitive data become available.

Appreciation is expressed to Dr. Ralph Blouch and Dr. Lawrence Ryel who reviewed the text and S. B. Mitchell who typed the final manuscript.

Methods

The data used were extracted from the federal banding printout sheets, and consisted only of foreign-banded birds (non-Michigan bandings) that were shot or found dead during the hunting season in the years between 1964 and 1973. The recovery data were tabulated chronologically and also were plotted on maps divided into ten-minute blocks of latitude and longitude within "harvest zones." The state was divided into five harvest zones (Fig. 1), based broadly on previous knowledge of the importance of the scaup harvest in Michigan or on the ecological similarity of the ten-minute latitude/longitude blocks.

Banding sites contributing birds to the state harvest were grouped into five broad geographic regions, including: (1) Gulf Coast states, (2) Southern Atlantic Seaboard, (3) Mid-Atlantic Seaboard, (4) Midwest and Southern Canada, (5) Northern Canada and Alaska. The first four banding areas were considered wintering grounds and the fifth area as a breeding/summer banding location (these areas will be shown in a later figure). No attempt was made in this report to weigh band recoveries according to the numbers of birds present in each banding area. Information on the size of scaup populations within areas and numbers of birds banded was not at hand.

RESULTS AND DISCUSSION

Background Information

The banding data analyzed included 387 total recoveries of scaup. There were 284 recoveries of lesser scaup and 103 greater scaup recoveries. The 387 recoveries include a mixture of birds banded in summer breeding areas and in wintering areas.

Since the scaup banded on the wintering grounds (including birds-of-the-year) are recovered in succeeding years as adults, the recoveries of these birds greatly outweighed recoveries from the smaller numbers of immatures banded during the summer. In fact, of 364 birds recovered whose age and sex were known, only 7 (2 percent) were from immature birds. Therefore, the results of this study are essentially based on only the adult part of the banded scaup population passing through the state.

Harvest Distribution Within the State

The numbers of banded scaup, both lesser and greater, recovered in each zone of the state during 1964-73 are shown in Table 1 and Figures 2-4. The major harvest zones in descending order of importance were: (1) Detroit River-Lake Erie (29.2 percent of the bands), (2) Other (26.4 percent), (3) Lake St. Clair (19.6 percent), (4) Upper Peninsula (12.7 percent), and (5) Saginaw Bay (12.1 percent). Together, the Lake St. Clair and Detroit River-Lake Erie zones accounted for half of the state's lesser scaup band recoveries and 46 percent of the greater scaup recoveries.

The observed variations in the distribution of lesser scaup and greater scaup band recoveries between harvest zones of the state were

Figure 1. The five Michigan scaup harvest zones cited in this report.

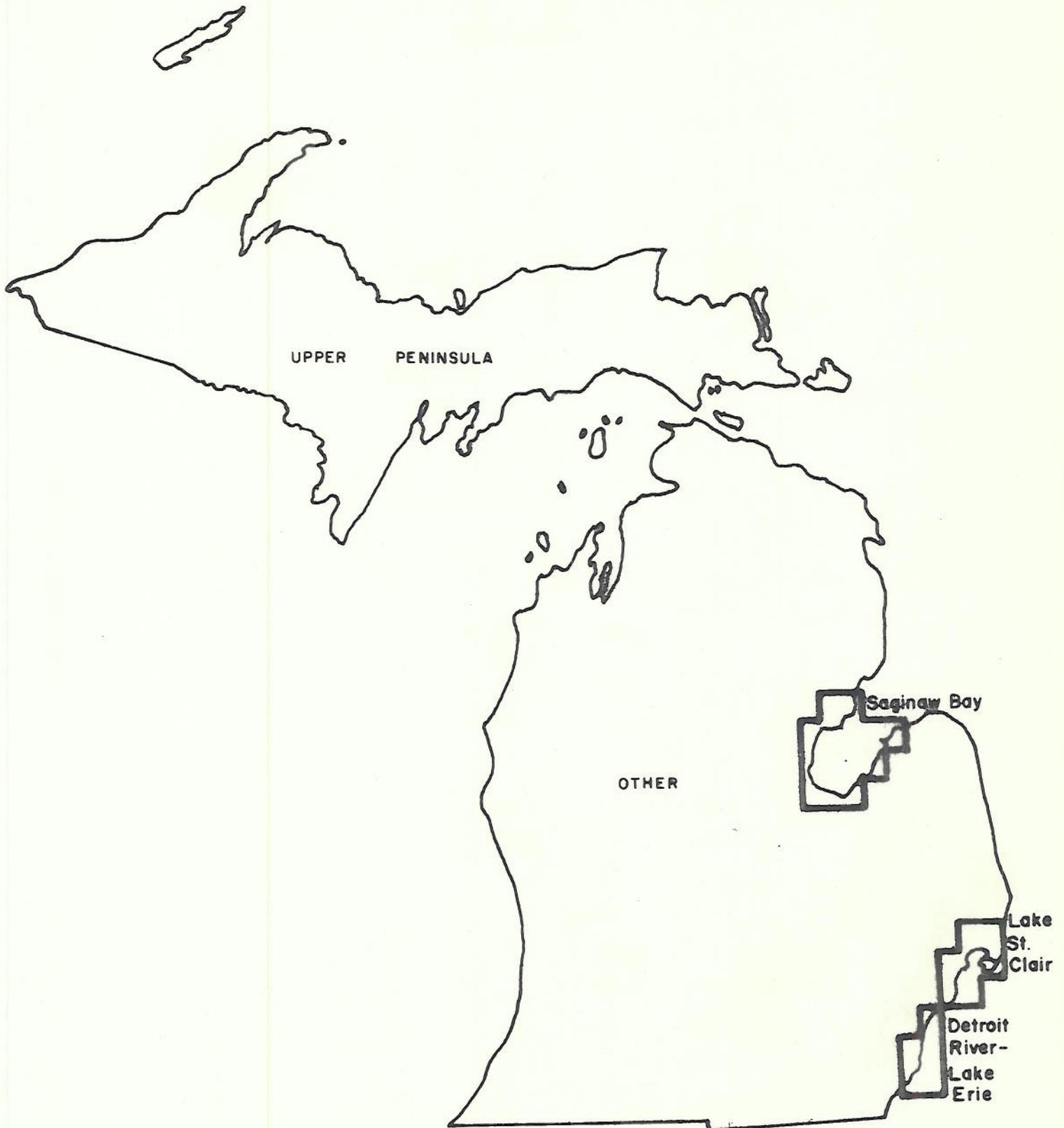
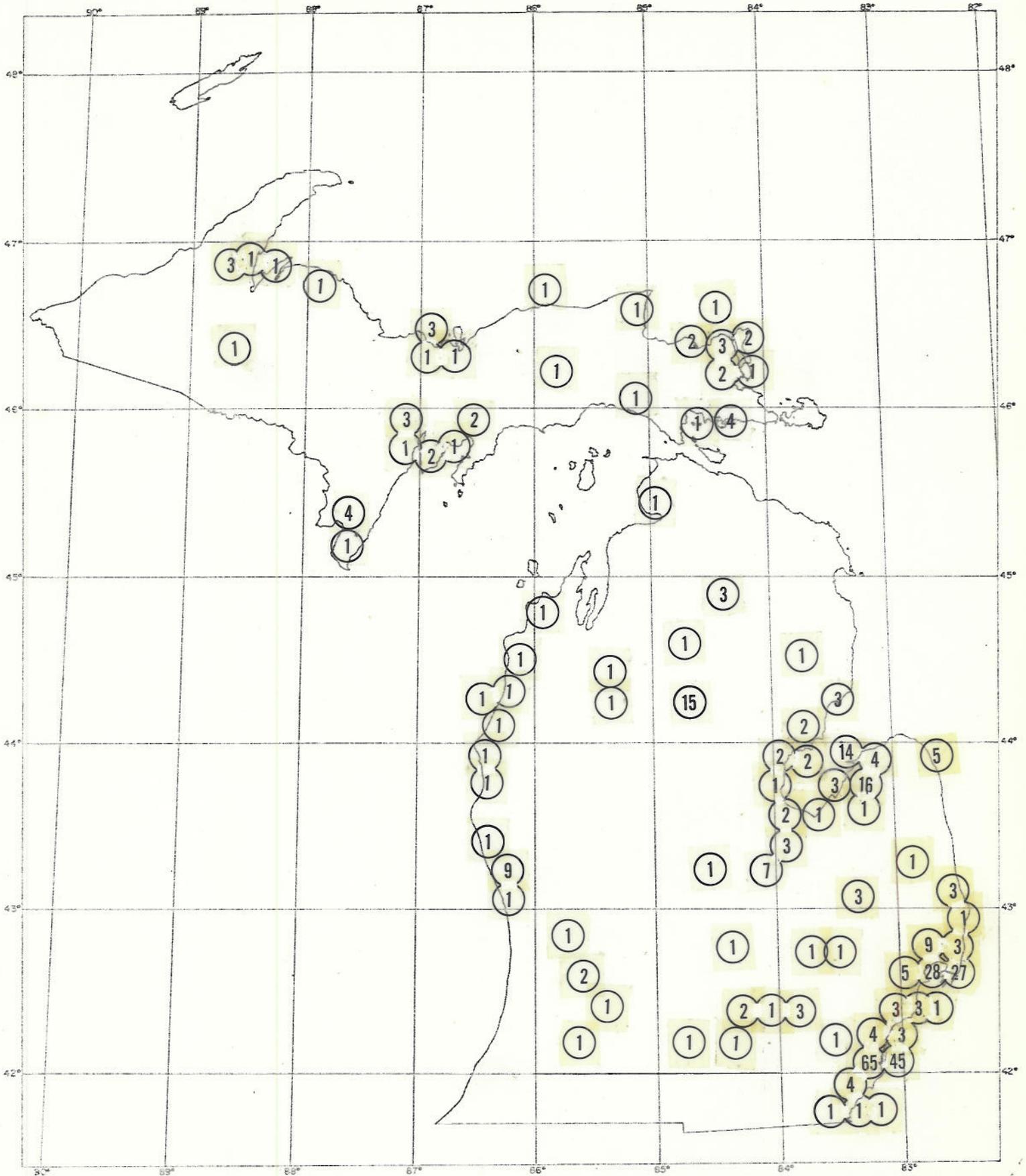


Table 1. The distribution of scaup recoveries in Michigan by harvest zones, 1964-73. *

SPECIES	Number (and percent) of recoveries					
	Detroit River/ Lake Erie	Lake St. Clair	Saginaw Bay	Upper Peninsula	Other Areas	The Whole State
Lesser Scaup	99 (34.9)	42 (14.8)	31 (10.9)	39 (13.7)	73 (25.7)	284 (100.0)
Greater Scaup	14 (13.6)	34 (33.0)	16 (15.5)	10 (9.7)	29 (28.2)	103 (100.0)
Total Scaup	113 (29.2)	76 (19.6)	47 (12.1)	49 (12.7)	102 (26.4)	387 (100.0)

*See Appendix I which reports the 1961-70 distribution of the lesser and greater scaup harvest based on receipts of duck wings from hunters. The pattern is similar though not exactly the same as that reported for bandings.

Figure 2. The recovery locations of banded scaup (lesser and greater) taken in Michigan, 1964-73.



significant (Table 1, $p < .01$). A higher than expected number of lesser scaup bands was reported from the Detroit River-Lake Erie zone, while Lake St. Clair accounted for a disproportionately large number of the greater scaup band recoveries. Considering the small size of these habitats, these data suggest that Lake St. Clair is a focal point for the greater scaup migration and harvest in Michigan, while the Detroit River and adjacent Lake Erie is the state's major concentration site and harvest area for lesser scaup. A larger proportion of banded adult males was recovered in the Detroit River-Lake Erie zone than in other parts of the state, while the Other Zone had the highest proportion of banded adult females in the kill (Table 2).

Two changes occurred in the distribution of the banded scaup harvest during 1964-73 as compared to the 1949-62 period (Table 3). In the earlier period 189 scaup bands were returned from Saginaw Bay and only 28 from the Detroit River-Lake Erie, while for the 1964-73 period, 47 bands and 111 bands, respectively, were recovered in these zones. This represents a 72 percent drop in the proportion of scaup bands taken on Saginaw Bay in comparison to the rest of the state ($p < .01$) and a 396 percent increase in the banded scaup take in the Detroit River-Lake Erie zone. No important change in the proportion of the bands recovered in other parts of the state was detected.

Hunting pressure data from the DNR survey files were examined for the two areas. An increase in the proportion of hunting effort has occurred on Saginaw Bay while there has been a slight decrease in the proportion of the state's duck hunter effort on the Detroit River-Lake Erie (Table 4). This is the opposite of what would be expected based on the change in the recovery pattern. However, for the latter area, there has been an increase in the use of layout boats which have proven to be an efficient method of hunting scaup.

DNR personnel and hunters have reported a major disappearance of submerged aquatics on the east side of Saginaw Bay, which have been major diving duck food resources, and a subsequent decline in diving duck use. This reduction in aquatic macrophytes can probably be attributed to an overwhelming turbidity problem (Rogers, et al. 1975). Penetration of light, an element vital to aquatic plant growth, is reduced in turbid water. Thus it seems that changes in habitat and hunting techniques are plausible reasons for the observed change in the pattern of scaup band recoveries within the state in recent years. There have been no major regulation changes between areas of the state that can account for the differences in recovery patterns.

Timing of the Michigan Harvest of Banded Scaup

Table 5 shows the accumulated harvest of banded scaup in Michigan by 5-day periods during the 1964-73 seasons. Fifty-five percent of the recoveries in Michigan were made by October 30. In comparing the state's kill zones by the timing of this harvest, the zones can be divided into two groups: those where most of the banded harvest occurred in October and those where the major take of banded scaup occurred in November. The Upper Peninsula, Saginaw Bay, and the Other Kill Zones took the bulk of their band recoveries in October (82, 80 and 67 percent, respectively).

Table 2. Age and sex composition of banded lesser and greater scaup recovered in Michigan during 1964-73.

Age and Sex Group	Number (and percent) of recoveries					
	Detroit River-Lake Erie	Lake St. Clair	Saginaw Bay	Upper Peninsula	Other Areas	The Whole State
Adult Male	94 (83.2)	50 (65.8)	27 (57.5)	33 (67.4)	57 (55.9)	261 (67.4)
Adult Female	11 (9.7)	23 (30.3)	14 (29.8)	13 (26.6)	37 (36.3)	98 (25.3)
Other*	8 (7.1)	3 (4.0)	6 (12.8)	3 (6.1)	8 (7.8)	28 (7.2)
Total	113 (100.0)	76 (100.1)	47 (100.1)	49 (100.1)	102 (100.0)	387 (99.9)

*Immatures and unknown age and/or sex

Table 3. Banded scaup (lesser and greater) harvest distribution compared among zones, 1964-73 (this study) vs. 1949-62 (Geis, et al. 1962).

PERIOD	Number (and percent) of recoveries					
	Detroit River/Lake Erie	Lake St. Clair	Saginaw Bay	Upper Peninsula	Other Areas	The Whole State
1964-73	113 (29.2)	76 (19.6)	47 (12.1)	49 (12.7)	102 (26.4)	387 (100.0)
1949-62	28 (6.5)	83 (19.4)	189 (44.2)	24 (5.6)	104 (24.3)	428 (100.0)

Table 4. A comparison of waterfowl hunting effort in Michigan harvest zones, 1964-73 vs. 1949-62 (based on DNR hunter surveys).

PERIOD	Number (and percent) of Waterfowl Hunters*					
	Detroit River/ Lake Erie	Lake St. Clair	Saginaw Bay	Upper Peninsula	Other Areas	The Whole State
1964-73	60,298 (5.70)	75,358 (7.12)	138,746 (13.11)	105,940 (10.01)	677,958 (64.06)	1,058,300 (100.00)
1949-62	92,003 (6.71)	93,909 (6.85)	155,209 (11.32)	118,002 (8.61)	911,416 (66.50)	1,370,539 (99.99)

*Data based on counties rather than band recovery degree blocks

Table 5. Cumulative Scaup Harvest (lesser and greater) in Michigan by 5-day periods, based on recoveries of foreign-banded birds (mostly adults) during 1964-73.

DATE	Percentages					
	Detroit River/ Lake Erie	Lake St. Clair	Saginaw Bay	Upper Peninsula	Other Areas	The Whole State
Oct. 1-5	0.0	0.0	0.0	0.0	0.0	0.0
6-10	3.1	2.9	7.7	12.8	6.8	5.8
11-15	9.4	10.3	17.9	35.9	19.3	16.4
16-20	17.7	14.7	53.8	56.4	38.6	31.5
21-25	28.1	25.0	74.4	71.8	54.5	45.2
26-30	32.3	41.2	79.5	82.1	67.0	54.8
Nov. 31-5	53.1	58.8	87.2	87.2	83.0	70.3
6-10	65.6	80.9	97.4	89.7	92.0	82.4
11-15	78.1	89.7	97.4	94.9	96.6	89.7
16-20	87.5	95.6	100.0	100.0	97.7	94.8
21-25	92.7	97.1	--	--	98.9	97.0
26-30	97.9	100.0	--	--	100.0	99.4
Dec. 1-5	99.0	--	--	--	--	99.7
6-10	100.0	--	--	--	--	100.0
No. of bands in sample	96	68	39	39	88	330*

*Precise dates were not available for an additional 57 recoveries covered in this analysis

These three zones accounted for 67 percent of the 209 scaup recoveries in October. The southeastern part of the state, but primarily Lake St. Clair and the Detroit River-Lake Erie kill zones, took most of their banded scaup in November, 59 and 68 percent, respectively.

For the state as a whole, almost two-thirds of the greater scaup bands were recovered in October while 57 percent of lesser scaup bands were taken in that month. This difference is not significant.

Special Late Scaup Seasons

There were special late scaup seasons in Michigan in 1968, 1971, 1972, and 1973. There were only 8 reported band recoveries during those late seasons. This number is 6.4 percent ($8 \div 125$) of the state's total take of banded scaup during those four years. All but one of those special season recoveries occurred in the Detroit River-Lake Erie kill zone. That one recovery also occurred in Lake Erie, but in a ten-minute block south of the defined harvest zone.

Banding Areas and State Harvest Zones

Figure 5 shows the scaup banding areas, and the migration corridors (Bellrose, 1968) used by diving ducks (including scaup), harvested in Michigan. There were 56 sites which contributed to the band recoveries obtained in Michigan from the four winter banding areas and 17 Canadian or Alaskan sites from the summer banding area. The Gulf Coast and Southern Atlantic Seaboard banding areas contributed mostly lesser scaup to the state's harvest. The Mid-Atlantic Seaboard, including Chesapeake Bay, which is a major congregation area for all diving ducks (Bellrose, *ibid*), contributed both greater and lesser scaup. The Midwest and Southern Canada banding area, and the New England Coast, are the northern-most wintering grounds for scaup in the east, with greater scaup the primary species (Bellrose, 1976:338 and 347).

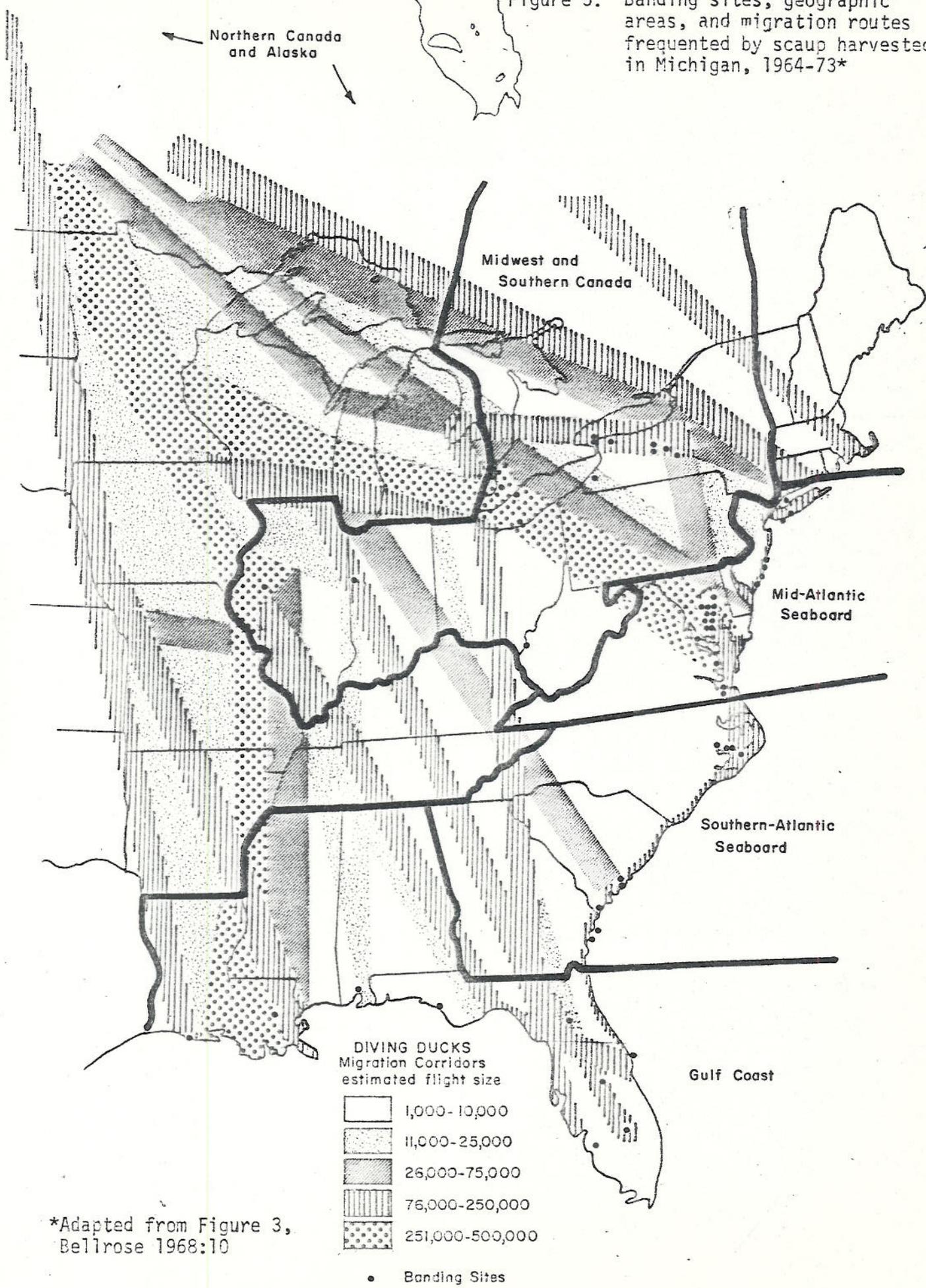
Table 6 is a summary of the number of recoveries contributed by each banding area to each harvest zone. All five banding areas contributed to the kill in each of the state's harvest zones. The proportions of the banded take contributed by each of the banding areas did not vary significantly between harvest zones (contingency test; chi-square = $22.42 < p < .05 @ 16 \text{ d.f.}$).

The data are suggestive, however, that the Detroit River-Lake Erie scaup kill was more broadly based than that of the other four harvest zones. This zone took a high proportion of bands from all of the banding areas but especially from the Southern Atlantic Seaboard bandings as compared to the state's other four harvest zones.

Saginaw Bay scaup band recoveries had a low association with Southern Atlantic wintering populations.

The Lake St. Clair recoveries had a greater association with Midwest and Southern Canada banding sites than did the state's other harvest zones and a particularly low association with wintering scaup banded on the Gulf Coast.

Figure 5. Banding sites, geographic areas, and migration routes frequented by scaup harvested in Michigan, 1964-73*



*Adapted from Figure 3, Bellrose 1968:10

Table 6. The relationship of North American scaup banding areas and Michigan recovery zones, 1964-73.

SCAUP BANDING AREAS	Number (and percent) of Recoveries					
	Detroit River- Lake Erie	Lake St. Clair	Saginaw Bay	Upper Peninsula	Other Areas	The Whole State
1) Gulf Coast States	14 (34.1)	4 (9.8)	5 (12.2)	7 (17.1)	11 (26.8)	41 (100.0)
2) Southern Atlantic Seaboard	16 (48.5)	4 (12.1)	1 (3.0)	3 (9.1)	9 (27.3)	33 (100.0)
3) Mid-Atlantic Seaboard	43 (23.1)	39 (21.0)	25 (13.4)	25 (13.4)	54 (29.0)	186 (99.9)
4) Midwest & Lower Canada	19 (30.6)	18 (29.0)	8 (12.9)	3 (4.8)	14 (22.6)	62 (99.9)
5) Northern Canada & Alaska	21 (32.3)	11 (16.9)	8 (12.3)	11 (16.9)	14 (21.5)	65 (99.9)
TOTAL	113 (29.2)	76 (19.6)	47 (12.1)	49 (12.7)	102 (26.4)	387 (100.0)

There is a suggestion that the Upper Peninsula banded scaup harvest is not strongly associated with Midwest and Southern Canada winter bandings.

Additional recoveries will be required and other analyses must be performed in the future to determine just how diverse the origins and destinations of the scaup flight through Michigan are.

SUMMARY

The results of this banding study are based on 387 scaup recoveries (lesser and greater scaup combined). Ninety-eight percent of the recoveries studied were from adult birds. The greatest proportion of the scaup recovered had been banded on their wintering grounds.

The greatest number of scaup recoveries within the state occurred in the Detroit River-Lake Erie and Other Kill Zones, respectively, followed by the Lake St. Clair zone, the Upper Peninsula and Saginaw Bay.

In comparing the results of this analysis (1964-73) with an earlier study (1949-62), a major shift in the harvest of banded scaup between zones of the state has been detected. A 72 percent reduction in the harvest of banded scaup has occurred in Saginaw Bay while that in the Detroit River-Lake Erie has increased greatly (396 percent). The suggestion is made that this is the result of two factors: (1) use of a more efficient hunting method (layout boats) on the Detroit River-Lake Erie and (2) a serious decline in water quality in Saginaw Bay leading to reduction of choice diving duck foods.

The harvest of banded scaup occurred earlier in the season in the Upper Peninsula, Saginaw Bay and Other parts of the state than did the harvest in the Detroit River-Lake Erie and Lake St. Clair. Only 6.4 percent of all scaup recoveries during 1968 and 1971-73 (8 of 125) were taken during the special late scaup seasons. All of these recoveries came from the Detroit River or Lake Erie. Lake St. Clair and the Detroit River-Lake Erie zones took larger than expected proportions of banded greater and lesser scaup, respectively, than the rest of the state's harvest zones.

No significant differences were detected in the contribution of various North American banding zones to the scaup kill in the five Michigan harvest zones. However, additional recovery data and analyses should shed light on the apparent diversity in origins and migrational characteristics of the scaup flocks passing through the state.

References

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Appendix I. The distribution of the scaup harvest in Michigan during 1961-70 based on weighted receipts of duck wings from hunters.

Species	Number (and percent) of scaup harvested					
	Detroit River/ Lake Erie	Lake St. Clair	Saginaw Bay	Upper Peninsula	Other Areas	The Whole State
Lesser Scaup	5,336 (23.2)	2,900 (12.6)	3,765 (16.3)	4,255 (18.4)	6,824 (29.5)	23,080 (100.0)
Greater Scaup	1,713 (17.4)	2,456 (25.0)	1,769 (17.9)	1,215 (12.3)	2,705 (27.4)	9,858 (100.0)
Total Scaup	7,049 (21.4)	5,356 (16.3)	5,534 (16.8)	5,470 (16.6)	9,529 (28.9)	32,938 (100.0)