THE NUMBER OF ROSS' GEESE IN CENTRAL NORTH AMERICA

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During intensive field studies of wintering Blue Geese (*Anser* [= *Chen*] *caerulescens*) in Texas and Louisiana, we found Ross' Geese (*Anser* [= *Chen*] *rossii*) to be more abundant and widespread than expected. Concurrent observations on the Hudson Bay coast showed a parallel increase in numbers of Ross' Geese nesting in colonies of Blue Geese. This documents a recent expansion in the range of the Ross' Goose, since the species has heretofore been restricted to nesting on part of the coast of Queen Maud Gulf in the central Canadian Arctic and wintering almost exclusively in the Central Valley of California (see fig. 1, derived from Ryder 1969; Dzubin 1965; Kozlik et al. 1959).

About 1960, records of Ross' Geese began to increase dramatically in the central United States (Trauger, unpubl.). At the same time, the species was discovered nesting in the Hudson Bay drainage area (Barry and Eisenhart 1958; MacInnes and Cooch 1963). Since Ross' Geese were reported at Churchill, Manitoba, in 1771 (Hearne 1795), and since there were scattered records in the Mississippi Valley since about 1900 (Smart 1960), MacInnes and Cooch concluded that the increase in sight records was due primarily to increased ornithological activity rather than a change in the abundance of the species. They further suggested that there might be a small population of Ross' Geese, breeding on the Hudson Bay coast and wintering in Texas and Louisiana, which was separate from the major concentration of the species.

Dzubin (1965) described in detail changes in the distribution of Ross' Geese from the major population as their center of fall activity moved eastward from Alberta into Saskatchewan. His observations led him to "predict that sightings, reports and recoveries of Ross' Geese through most states of the Central and Mississippi Flyways will become more numerous over the next several years." He proposed that these would stem from continued eastward wandering from the Queen Maud Gulf-California populations and reinforced the prediction with evidence from recoveries in Texas of Ross' Geese banded near Kindersley, Saskatchewan.

Our observations and results from banding studies have shown that Dzubin's prediction was correct, and that MacInnes and Cooch (1963) were wrong. In this paper we show that a real increase in the numbers of Ross' Geese is in progress in central North America, and that there is definitely interchange between the Hudson Bay breeding localities and the California wintering grounds of the nesters of Queen Maud Gulf.

We follow Cooch (1961) in referring both Blue and Lesser Snow Geese to a single species, *Anser* [= *Chen*] *caerulescens*, which we shall call the Blue Goose. All references include both blue and snow color phases unless otherwise specified.

METHODS

Sight records were accumulated during a field study of family group behavior of Blue Geese. Because the latter study required precise determination of the ratio of neckbanded to unmarked Blue Geese, every goose recorded was examined carefully, making available an unbiased estimate of the proportion of Ross' Geese in each flock.

Examination was by 16–60 × telescope, at ranges of less than 250 m. At that distance Ross' Geese were easily identified, particularly by their shorter, heavier neck, short bill, and more rounded head. Juvenile Ross' Geese were readily distinguished from young, white-phase Blue Geese by their much whiter plumage. After mid-December, it became increasingly difficult to separate adult and immature Ross' Geese in the field; therefore, all winter records were listed as adults. Hybrids of Ross' and Blue Geese were seen occasionally (Trauger et al. 1971); these could usually be distinguished only at distances of less than about 150 m. Beyond that distance most hybrids were probably called Ross' Geese.

In large flocks of wintering geese, it is normally impossible to check every individual; in such cases a sampling procedure was used (see MacInnes 1966: 541). Repeated counts taken from a single flock were averaged; this is the source of fractional numbers of Ross' Geese in the tables.

Figure 1 shows the migration and winter range of Blue Geese nesting at McConnell River, N.W.T. (60° 50′N, 94°25′W), based on 4458 recoveries of banded birds, the location of recoveries of Ross' Geese

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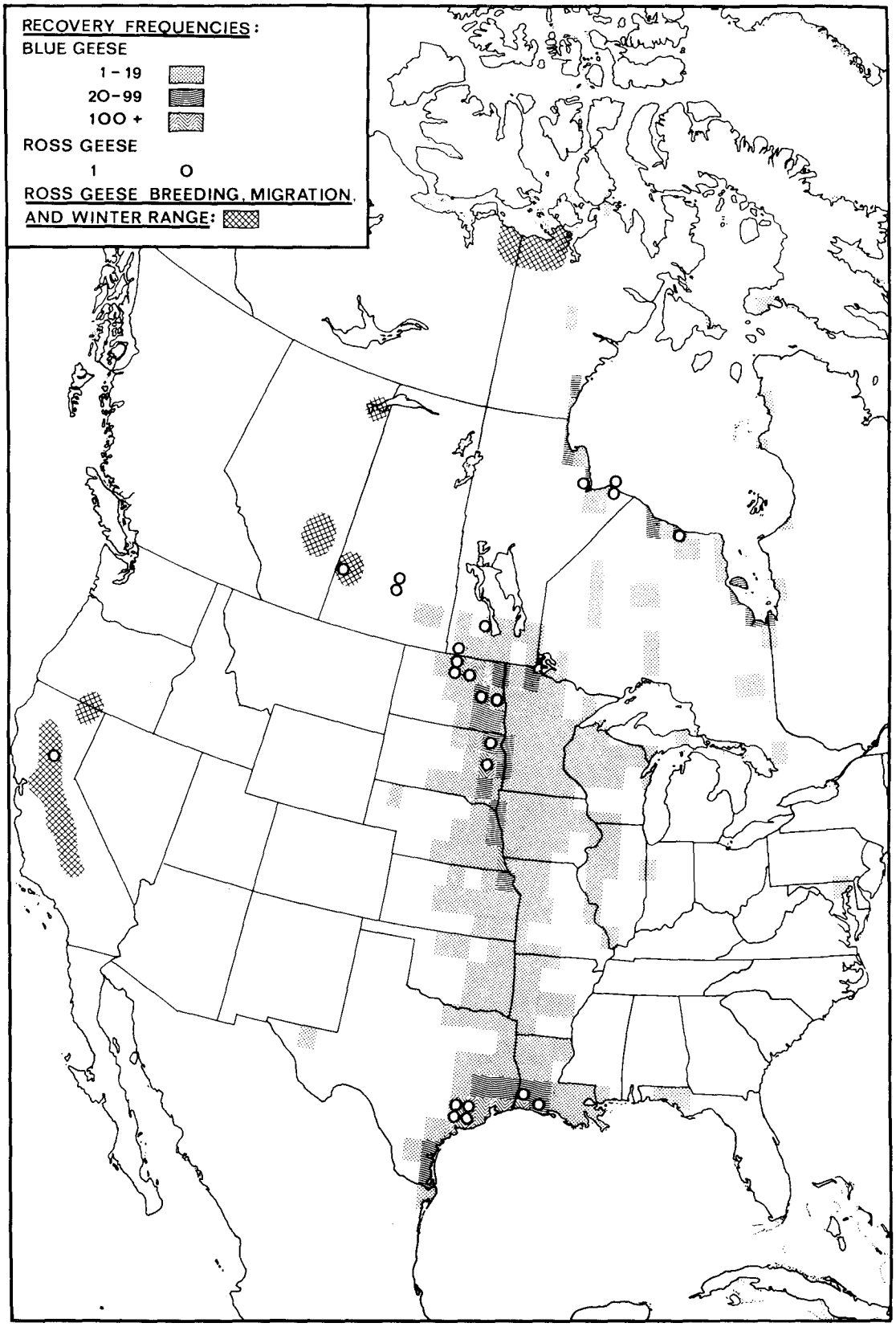

FIGURE 1. Migration and winter range of Blue Geese from McConnell River, N.W.T.; pattern of recoveries of Ross' Geese banded at McConnell River; and breeding, migration, and winter distribution of the main population of Ross' Geese.

TABLE 1. Frequencies of Ross' Geese per 1000 Blue Geese at migration stopover points. Positions of localities are shown in figure 1.

Area	Season	Year	Blue Geese		Ross' Geese		Frequency of Ross' Geese		
			Adult	Young	Adult	Young	Adult	Young	All ages
Sand Lake (9)	Fall	1968	18,402	5,324	19	15	1.03	2.82	1.43
	Fall	1969	48,949	20,555	61	22	1.25	1.07	1.19
	Spring	1970	6,587	2,055	18	[a]	—	—	0.08
DeSoto (10)	Fall	1968	8,972	1,551	5	4	0.56	2.58	0.86
	Fall	1969	12,930	6,350	11	5	0.85	0.79	0.83
Plattsmouth (11)	Fall	1968	5,771	934	5	5	0.87	5.35	1.49
	Fall	1969	5,650	2,603	7	2	1.24	0.77	1.09
Squaw Creek (12)	Fall	1968	17,612	4,087	6	5	0.34	1.22	0.51
	Fall	1969	25,175	17,163	15	7	0.60	0.41	0.52
	Spring	1969	7,307	1,310	24	[a]	—	—	2.79
	Spring	1970	21,193	15,477	31	[a]	—	—	0.85

[a] Adults and young not distinguished in spring.

banded at McConnell River, and the breeding, migration, and winter range of the main population of Ross' Geese. Localities visited during this study and other places referred to in the paper are shown in figure 2.

RESULTS

Ross' Goose frequencies at fall migration stopover points (expressed throughout this paper as the number of Ross' Geese per 1000 Blue Geese) appear in table 1. These ratios are difficult to interpret, since at the localities visited, Blue Geese are known to stem in varying proportions from different nesting colonies (Cooch 1961; Prevett, unpubl.).

Wintering ground frequencies of Ross' Geese are show in table 2. Clearly, fewer Ross' Geese were seen in the winter of 1967–68 than in either 1968–69 ($P < 0.001$) or 1969–70 ($P < 0.001$), although the latter two winters produced similar results ($P > 0.10$). Only 4 weeks were spent on the wintering grounds in the first winter, compared to 10–12 weeks in subsequent years, so samples were small. A particularly serious aspect was that few different goose flocks were examined in some localities in 1968. For example, in the Aransas-Calhoun area, nearly one-third of the recorded count of Blue Geese in February 1968 was from a single flock which contained no Ross' Geese. Only 1700 geese were examined near Port Lavaca, where the highest frequencies of Ross' Geese were recorded in the two following seasons. No Ross' Geese were seen in the course of the 1968 counts, but two were identified after the counts were completed. Since 1968 was the first winter of the survey, it is possible that lack of experience resulted in some Ross' Geese being missed. However, because frequencies of Ross' Geese were consistently low, even in the large Rice Prairies sample, we believe that the difference was real although it may have been smaller than indicated.

Frequencies were estimated from ground counts. However, it was impossible to estimate the total number of geese in each flock, nor could we achieve complete coverage of all flocks. Therefore, estimates of the total population of Blue Geese on the wintering grounds

TABLE 2. Frequencies (f) of Ross' Geese per 1000 Blue Geese at wintering areas on the Gulf Coast. Positions of localities are shown in figure 1.

Locality	1967–68				1968–69				1969–70			
	Blue Geese	% white[a] phase	Ross' Geese	f	Blue Geese	% white[a] phase	Ross' Geese	f	Blue Geese	% white[a] phase	Ross' Geese	f
Sabine-Lacassine (21)	3,420	21	1	0.29	9,185	16	8	0.87	12,913	24	6	0.47
Gum Cove (20)	1,954	33	2	1.02	4,279	38	3	0.70	5,810	43	5	0.86
East Texas (19)	9,239	60	6	0.65	16,234	72	23	1.42	36,308	66	34	0.94
Rice Prairies (18)	15,924	73	22	1.38	38,462	73	116	3.02	75,200	73	205	2.73
Aransas-Calhoun (16)	2,727	84	0	0.00	3,220	87	28	8.70	8,204	85	70.5	8.59
Lower Coast (15)	2,607	86	4	1.53	115	81	0	0.00	828	86	2	2.42
TOTAL	35,371		35		71,495		178		139,263		322.5	

[a] Calculated from ground counts made simultaneously with frequency counts of Ross' Geese.

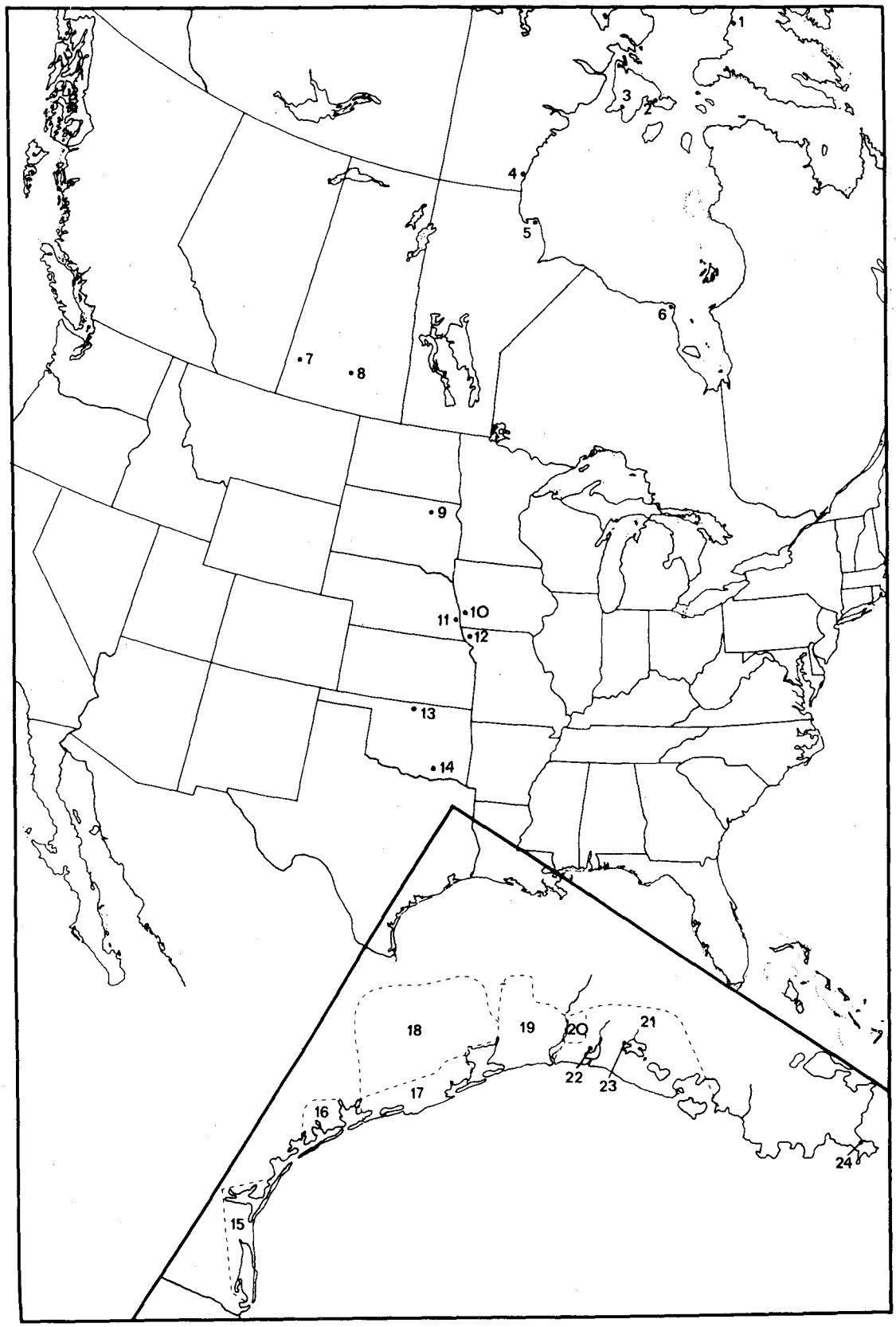

FIGURE 2. Locations where geese were observed during this study and other places referred to in the paper. Localities: 1 Koukdjuak River; 2 East Bay; 3 Boas River; 4 McConnell River; 5 Cape Churchill; 6 Cape Henrietta Maria; 7 Kindersley; 8 Last Mountain Lake; 9 Sand Lake N.W.R.; 10 DeSoto N.W.R.;

TABLE 3. Estimates of total Blue Geese for selected parts of the central United States, taken from the annual Mid-Winter Waterfowl Inventory, and estimated numbers of Ross' Geese, calculated by applying the ratio of Ross' to Blue Geese from detailed field counts.

Area	1968		1969		1970	
	Blue Geese (× 1000)	Estimated Ross' Geese	Blue Geese (× 1000)	Estimated Ross' Geese	Blue Geese (× 1000)	Estimated Ross' Geese
Sabine-Lacassine (21)	227.6[b]	66	156.6	136	243.8	115
Gum Cove (20)	60.0[c]	61	60.0	42	60.0	52
East Texas (19)	33.2	22	67.0	95	54.1	51
Rice Prairies (18)	74.4	103	216.8	655	198.3	541
Brazoria-San Bernard (17)	121.9[d]	168[e]	10.7	81[e]	43.7	119[e]
Aransas-Calhoun (16)	12.8	0	6.8	59	8.8	75
Lower Coast (15)	7.1	11	4.2	0	6.7	16
Kansas	1.8	1[f]	127.4	64[f]	40.5	20[f]
Missouri	7.0	4	1.4	1	50.2	25
Mid-Continent[a]	9.9	5[f]	5.2	2[f]	35.0	18[f]
Total	555.7	441	656.1	1,135	741.1	1,032

[a] Includes Alabama, Illinois, Indiana, Iowa, Kentucky, New Mexico, Oklahoma.
[b] Derived by substracting c from midwinter waterfowl inventory figures for southwestern Louisiana.
[c] Rough estimates of Blue Geese in this area by J. J. Lynch (pers. comm.).
[d] In 1968 figures include counts from part of East Texas.
[e] Calculated from the frequency of Ross' Geese at Rice Prairies.
[f] Calculated from the frequency of Ross' Geese at Squaw Creek in the fall.

were taken from Mid-Winter Waterfowl Inventories compiled by the U.S. Bureau of Sport Fisheries and Wildlife from aerial censuses taken in January. Using these totals, and our calculated frequencies of Ross' Geese, we estimated the total number of Ross' Geese in each area (table 3). We did not calculate confidence intervals for these estimates because there was no measure of either the precision or accuracy of the Mid-Winter Inventories.

Substantial numbers of Blue Geese wintered east of the Sabine-Lacassine sample area, but were not included in this analysis because we had no estimate of the frequency of Ross' Geese in those areas. In view of the decline in the frequency of Ross' Geese as we moved eastward, few Ross' would be expected in the eastern flocks of Blue Geese, although the species has been reported as far east as Delta National Wildlife Refuge in eastern Louisiana (Trauger, unpubl.; Lynch, pers. comm.). Also, flocks of Blue Geese in the Gum Cove area of western Louisiana appeared to contain a higher proportion of white-phase Blue Geese and more Ross' than those encountered eastward from Sabine National Wildlife Refuge. Thus, to avoid pooling frequencies, the number of Blue Geese frequenting the Gum Cove area was estimated (Lynch, pers. comm.) and subtracted from the total for southwestern Louisiana. We were unable to approach flocks of Blue Geese on the ground in the Brazoria-San Bernard area. However, since the reported blue:snow color phase ratio was the same as on the Rice Prairies, and since local residents reported considerable movement of geese between these two adjacent areas, we applied the Rice Prairie frequency to calculate the number of Ross' Geese in this region. Similarly, we used the fall migration frequency of Ross' Geese at Squaw Creek National Wildlife Refuge to estimate the number of Ross' Geese wintering in Kansas, Missouri, and the mid-continent states, although we have no evidence on whether the fall ratio remained constant into the winter.

Comparing the estimates of Ross' Geese wintering in the central states with the Mid-Winter Inventory for the species on the California wintering ground, 1–6% of the world's population may winter in the region we examined (table 4). The California data were supplied by J. E. Chattin and F. M. Kozlik, both of whom commented (pers. comm.) that the 1969 and 1970 inventories probably underestimated the population by a large margin due to a change in personnel making the observations and a reduction in the area censused. An additional source of error is lack of knowledge about numbers of Ross' Geese wintering in México.

What is the breeding ground of the Ross' Geese wintering in the central states? Vir-

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11 Plattsmouth W.M.A.; 12 Squaw Creek N.W.R.; 13 Salt Plains N.W.R.; 14 Tishomingo N.W.R.; 15 Lower Coast; 16 Aransas-Calhoun; 17 Brazoria-San Bernard; 18 Katy, Lissie, Garwood Prairie; 19 East Texas; 20 Gum Cove; 21 Sabine-Lacassine; 22 Sabine N.W.R. headquarters; 23 Lacassine N.W.R.; 24 Delta N.W.R.

TABLE 4. Comparison of estimated Mississippi and Central Flyway population of Ross' Geese with numbers in the Pacific Flyway.

	California	Estimated central U.S.	% of continental pop. in central U.S.
1968	38,980	495	1.1
1969	18,950[a]	1,135	6.0
1970	21,690[a]	1,032	4.7

[a] Probably substantially underestimated—see text.

tually all Blue Geese in that region stem from colonies in the Hudson Bay drainage (Cooch 1961, 1963). Ross' Geese have been reported from only three of these: McConnell River, and both Boas River and East Bay on Southampton Island (summarized in MacInnes and Cooch 1963). In 1961, 10,863 Blue Geese were banded at the Koukjuak River on southwestern Baffin Island (Lemieux and Heyland 1967) and in 1967 and 1968 a further 9779 were banded about 80 miles south of the earlier site (Kerbes 1969). No Ross' Geese were seen. At Cape Henrietta Maria, Ontario, H. G. Lumsden (pers. comm.) banded a total of 10,000 Blue Geese in 1969 and 1970 without finding any Ross', although a nest of Ross' Geese was reported in the area by a reliable Indian. F. Cooke (pers. comm.), after careful examination during incubation of a newly established colony of Blue Geese on Cape Churchill, Manitoba, reported no Ross' Geese among an estimated 6100 Blue Geese in 1970.

At McConnell River, field-frequency counts of nesting geese showed 1.22 Ross' per 1000 Blue Geese (35/28,816) in 1969 and 2.01 (53/26,418) in 1970. Another measure of abundance of Ross' Geese was derived from birds caught for banding by mass drives during the flightless period of the summer molt (table 5). Unfortunately, exact records of the number of young Blue Geese handled were not available for all years, so we were able to calculate frequencies for adults only. A major increase in the abundance of Ross' Geese occurred in 1966, and, after a decrease in 1967, there was a further increase in 1968. It is unlikely that the discrepancy between field counts and banding-drive ratios in 1969 and 1970 was due to failure to identify Ross' Geese in the field. We consider it more likely that Ross' Geese differed from Blue Geese in their movements to posthatch feeding grounds, and that our mass drives were, therefore, biased in favor of Ross' Geese. B. C. Lieff (unpubl.) has clearly demonstrated that Canada Geese have restrictive preferences for summer feeding areas. Since studies at the McConnell River

TABLE 5. Ross' and Blue Geese captured for banding at the McConnell River, N.W.T.

Year	Blue Geese adults	Ross' Geese adults	Ross' Geese young	Frequency ad. Ross'/1000 ad. blue
1954	520	0	0	0.00
1959	1,600	3	[a]	1.87
1960	2,660	3	[a]	1.13
1964	1,530	3	4	1.96
1965	4,297	6	3	1.40
1966	4,266	22	17	5.16
1967	3,142	8	6	2.55
1968	1,804	14	18	7.76
1969	2,102	14	9	6.66
1970	1,793	13	28	7.25

[a] Young Ross' Geese were not identified.

covered Canada as well as Blue Geese, we made special efforts to drive the banks and deltas of the river where the Canada Geese concentrated. Ross' Geese were more apt to be caught in drives including Canada Geese and Blue Geese than when Blue Geese were caught alone ($P < 0.05$). Since the former drives usually caught enough Blue Geese for our purposes, we made fewer attempts to catch Blue Geese in other places although we knew of several large concentrations containing no Canada Geese. Because the banding drives may have been biased, estimates of numbers of Ross' Geese were calculated from the field count ratios. Since the latter included sample counts made over almost the entire area of the colony of Blue Geese, they should have been more representative of the correct ratio.

We had no exact estimate of the number of Blue Geese in the McConnell River colony although there has been a large increase since Cooch (1963) estimated 35,000 breeding birds based on his 1961 survey. In 1970, the colony covered approximately 50 square miles, with an estimated density of 1000 nests per square mile. Adding 25% for the nonbreeding component, there should have been 125,000 Blue Geese in the area. Using this figure for both 1969 and 1970, we obtained estimates of 153 (1969) and 251 (1970) Ross' Geese in the McConnell River colony of Blue Geese of which approximately 122 and 201, respectively, were breeders.

The number of young produced at McConnell River might be estimated by using the adult:young ratios obtained at banding. However, since we could not safely distinguish breeding and nonbreeding adults, and since we frequently caught only one adult with each brood, we doubt the reliability of such estimates. Therefore, we applied a figure of 2.9 young per pair (Ryder 1964) to the total breed-

ing population. This provided an estimate of the maximum number of young which could have been produced: 177 in 1969 and 291 in 1970. Appyling 15% mortality to adults and subadults and 30% to young for losses between the breeding grounds and wintering grounds, the McConnell River colony might have contributed about 254 individuals to the winter population of Ross' Geese in January 1970 and 417 in January 1971. The 1970 figure represents 25% of the total estimated to be wintering in the central United States in January 1970 (table 4).

Frequency counts of Ross' Geese were not made at the McConnell River in 1967 and 1968 so estimates of total numbers could not be compared to January 1968 and 1969 wintering-ground figures. Also, an estimate of the numbers of Ross' Geese in the central United States was not available for 1971. There is no recent information on the numbers of Blue and Ross' Geese in the Southampton Island colonies (since Cooch 1963), but since total numbers of Blue Geese and frequency of Ross' Geese are probably no greater than at McConnell River, it is unlikely that these colonies produced substantially more Ross' Geese than the McConnell River colony.

Close to 2.5% of the recoveries of Ross' Geese banded in the Queen Maud Gulf region since 1962 came from areas within the migration pathway and winter range of Blue Geese from the Hudson Bay colonies (J. P. Ryder, pers. comm.; MacInnes, unpubl.). Exchange of this magnitude from the main population could have accounted for the Ross' Geese wintering in the central United States in excess of those we have estimated to originate from around Hudson Bay. In 1967, 10% of the recoveries of Ross' Geese banded at Perry River were from outside the normal range of Ross' Geese and 6% overlapped the distribution of Blue Geese recovered at McConnell River (fig. 1). This corresponds to the increase in the frequency of Ross' Geese caught for banding at the McConnell River in 1968 (table 5).

DISCUSSION

Since 1960, large numbers of Ross' Geese have migrated through western Saskatchewan east of the former traditional migration route of the major population (Dzubin 1965). Occurrences of Ross' Geese east of the eastern limit (108°W) shown by Dzubin have also increased, particularly in the vicinity of Last Mountain Lake in central Saskatchewan (Lahrman 1970; Dzubin, pers. comm.). Dzubin further noted that in western Saskatchewan Ross' Geese mingled freely with White-fronted Geese (*Anser albifrons*) which were known to migrate to the Gulf Coast of Texas and Louisiana. We observed Ross' Geese in flocks of White-fronted and small Canada Geese at Salt Plains and Tishomingo National Wildlife Refuges in Oklahoma, localities which are visited by few Blue Geese. Also, any Ross' Geese migrating with Blue Geese which nested in the Queen Maud Gulf area would deviate from the traditional route to California. According to J. P. Ryder (pers. comm.), of 36 recoveries from Blue Geese banded near Queen Maud Gulf only one was taken in California, while 11 (31%) overlapped those recovered at McConnell River (fig. 1). The remainder of the Central Arctic Blue Geese were taken in mid-continent, with a large proportion (54% of the remainder) shot in north-central México.

On the Gulf Coast, Ross' Geese were usually associated with large flocks of Blue Geese. Table 2 indicates a trend toward Ross' Geese occurring in highest frequency where the proportion of white-phase *A. caerulescens* was also high. Most Blue Geese on the western portion of the Texas winter range originate from the McConnell and Southampton colonies (Cooch 1961). Mixing in winter has apparently led to continued association during northward migration and thus, in turn, produced sudden changes in abundance of Ross' Geese in the Hudson Bay nesting colonies, as occurred at McConnell River in 1968. There is considerable mixing on the winter range of Blue Geese from different Hudson Bay nesting colonies (Prevett, unpubl.), so it is reasonable to assume that Ross' Geese will ultimately nest in all the colonies of Blue Geese at Hudson Bay, although the observed association of greater numbers of Ross' with predominantly white-phase Blue Geese will impose limitations (cf. Cooch 1963).

Further evidence for the interchange was derived from the fate of Ross' Geese banded at the McConnell River. Four of 23 recoveries were taken west of the normal range of Blue Geese at McConnell River, including two within the Perry River to California route. Three of these four recoveries were made during the fall or winter immediately following banding, indicating that the birds had moved westward directly upon leaving the McConnell. We have recaptured several Ross' Geese previously banded at the McConnell River. One pair of banded Ross' Geese have been trapped together in 3 consecutive years. Thus, although active interchange between Central and Eastern Arctic nesting grounds has been

demonstrated, some of the Ross' Geese nesting at Hudson Bay return to the same colony year after year.

Another mechanism which may have enhanced interchange is an increase in incidence of mixed pairs of Blue and Ross' Geese. Such pairs and hybrid offspring encompassing at least two generations have been observed in several places since 1965 (Trauger et al. 1971). The first hybrids at McConnell River were noticed in 1968 and by 1970, 17 of 55 "Ross' " Geese caught for banding showed signs of hybrid origin.

We conclude that the number of Ross' Geese wintering in Texas and Louisiana has increased in the decade 1960-70. Part of this increase is due to interchange with the larger Queen Maud Gulf-California population. If the observed trend continues, we predict further increases, unless some ecological condition not presently manifest limits Ross' Geese when they occur in sympatry with Blue Geese. Continued increase in hybridization could halt or reverse the increase.

SUMMARY

The numbers of Ross' Geese observed in the central United States have increased dramatically since 1960. We estimate that 441 (in 1967–68), 1135 (1968–69), and 1030 (1969–70) Ross' Geese wintered along the Gulf Coast of Texas and Louisiana and in the central states. This represents between 1 and 6% of the estimated world population of the species. These estimates were prepared by multiplying precise measurements of the ratio of Ross' to Blue Geese by total numbers of Blue Geese recorded in the Mid-Winter Waterfowl Inventories compiled by the U.S. Bureau of Sport Fisheries and Wildlife. We estimate that approximately half of these Ross' Geese might have originated from known nesting areas in the Hudson Bay drainage in 1970, while the remainder must have come from the traditional nesting grounds of Ross' Geese in the Queen Maud Gulf region. Banding records clearly show migration from Queen Maud Gulf to Texas, as well as from the McConnell River nesting ground on Hudson Bay to the traditional winter range of Ross' Geese in California. Changes in abundance of Ross' Geese in Texas and Louisiana, and subsequently at McConnell River, coincide with an increase in Texas recoveries of Ross' Geese banded on Queen Maud Gulf.

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LITERATURE CITED

BARRY, T. W., AND J. EISENHART. 1958. Ross' Geese nesting at Southampton Island, N.W.T., Canada. Auk 75:89–90.

COOCH, F. G. 1961. Ecological aspects of the Blue-Snow Goose complex. Auk 78:73–89.

COOCH, F. G. 1963. Recent changes in distribution of colour phases of *Chen caerulescens*. Proc. XIII Int. Ornithol. Congr., Ithaca (1962). p. 1182–1194.

DZUBIN, A. 1965. A study of migrating Ross' Geese in western Saskatchewan. Condor 67:511–534.

HEARNE, S. 1795. A journey from Prince of Wales Fort in Hudson's Bay to the northern ocean in the years 1769, 1770, 1771, 1772 and 1773. Cited from new edition, J. B. Tyrell [Ed.].

KERBES, R. H. 1969. Biology and distribution of nesting Blue Geese on Koukdjuak Plain, Baffin Island, N.W.T. Unpubl. M.Sc. Thesis, Univ. of Western Ontario, London, Ontario.

KOZLIK, F. G., AND A. W. MILLER, AND W. C. RIENECKER. 1959. Colour-marking White Geese for determining migration routes. California Fish and Game 45:69–82.

LAHRMAN, F. W. 1970. Unusually large numbers of Ross' Geese observed at Last Mountain Lake. Blue Jay 28:169–170.

LEMIEUX, L., AND J. M. HEYLAND. 1967. Fall migration of Blue Geese (*Chen caerulescens*) and lesser Snow Geese (*Chen hyperborea hyperborea*) from the Koukdjuak River, Baffin Island, N.W.T. Naturaliste Can. 94:677–694.

MACINNES, C. D. 1966. Population behaviour of eastern arctic Canada Geese. J. Wildl. Mgmt. 30:536–553.

MACINNES, C. D., AND F. G. COOCH. 1963. Additional eastern records of Ross' Goose (*Chen rossii*). Auk 80:77–79.

RYDER, J. P. 1964. A preliminary study of the breeding biology of Ross' Goose. Ann. Rept. Wildfowl Trust 15:127–137.

RYDER, J. P. 1969. Nesting colonies of Ross' Goose. Auk 86:282–292.

SMART, G. 1960. Ross' Goose taken at Horseshoe Lake, Illinois. Wilson Bull. 72:288–289.

TRAUGER, D. L., A. DZUBIN, AND J. P. RYDER. 1971. White Geese intermediate between Ross' Geese and Lesser Snow Geese. Auk 88:856–875.

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