The decline and fall of the Eskimo Curlew, or Why did the curlew go extaille?[1]

by Richard C. Banks

"There is no need to look for a probable cause for the extermination of the Eskimo Curlew — the cause is painfully apparent. . . . The destruction of this bird was mainly due to unrestricted shooting, market hunting and shipment, particularly during the spring migration in the United States" (Forbush 1912:427).

"One need not look far to find the cause which led to its destruction . . . . No, there was only one cause, slaughter by human beings, slaughter in Labrador and New England in summer and fall, slaughter in South America in winter and slaughter, worst of all, from Texas to Canada in the spring" (Bent 1929:127).

The writing of the authors cited above, and similar conclusions by Swenk (1916), have led to general acceptance of the concept that excessive shooting, particularly by market hunters, was the cause of the extation[1] of the Eskimo Curlew, *Numenius borealis,* near the end of the 19th century (Greenway 1958, Vincent 1966, Bureau of Sport Fisheries and Wildlife 1973). Bent (1929) had no important information that had not been summarized by Forbush (1912) and Swenk (1916), and in essence merely echoed the beliefs expressed in their works.

As conservationists writing before the advent of effective legislation designed to protect migratory birds, both Forbush and particularly Swenk seem to have been more interested in using the Eskimo Curlew as a horrible example of the excesses of market hunters and as a prime justification for the need of protective legislation than in addressing the biology of the species. Certainly the evidence of exploitation of this and other species, as compiled by Forbush (1912) and Swenk (1916) seems overwhelming, and there can be little reasonable doubt that overkill was an important factor in the demise of the curlew and in the reduction of populations of other species. Yet, the dogmatic statements quoted above suggest that any other factors that may have been involved were ignored, and indeed these authors barely mentioned and quickly discarded other postulated causes. This paper will analyze the circumstances of the decline of the curlew, attempt to place known mortality factors into perspective, and speculate that other factors unknown to Forbush and Swenk were significant in that decline.

LIFE HISTORY

What little was learned about the biology of the Eskimo Curlew before its population was reduced virtually to nil has been summarized by Forbush (1912), Swenk (1916), Bent (1929), and Greenway (1958). The species bred in the Arctic, mainly in the Mackenzie District of the Northwest Territories of Canada, but also westward and eastward for unknown distances, perhaps to the Alaskan coast and Hudson Bay; the limits of the breeding range were never accurately determined. In late July, curlews began their migration, initially flying eastward or southeastward to the coast of Labrador where they lingered for some time feeding on berries and accumulating great fat reserves. In August and September great flocks flew southward over the Atlantic Ocean, across the Antilles and South America to Patagonian Argentina, where they wintered. The flight from Labrador to South America was apparently without a landfall under favorable weather conditions, but storms in the North Atlantic often forced an alteration of course resulting in flocks landing on the coast of New England or Bermuda.

The American Golden Plover (*Pluvialis dominica*) shared the fall migration route from the breeding grounds to Labrador and on to South America. Clark (1905), writing partic-

[1]For use of "extaille" and "extation," see Banks 1976.

ularly of the plover, noted that they were usually observed to fly on a beam wind, that is, perpendicular to the direction of the wind. He related this to the probable trans-oceanic flight course, indicating that flight from the Arctic would lead the birds naturally to Labrador, and further flight across the prevailing westerlies or southwesterlies would carry the birds past or near Bermuda, where some were known to stop. Further flight across the prevailing easterly trade winds would swing the birds back to a southerly then southwesterly course and across northern South America, whence the prevailing westerlies would lead them on to their wintering grounds.

The spring migration route is not well known, but apparently took the birds across the Andes, through Central America, and over the Gulf of Mexico to the Texas coast, whence the birds moved slowly northward through the Great Plains to the nesting grounds. Passage through the midwestern United States took place in April, and the nesting grounds were reached in May. The annual cycle of the Eskimo Curlew has been credibly, if dramatically, fictionalized by Bodsworth (1954).

Early history. — The Eskimo Curlew was described in 1772, but there is at least one reference in the earlier literature that has been associated with the species (Forbush 1912:417). In 1709 or earlier, John Lawson wrote of the natural resources of Carolina, and noted that: "Of Curlews there are three sorts, and vast numbers of each. They have all long bills, and differ neither in colour nor shape, only in size. The largest is as big as a good hen, the smaller the bigness of a snipe, or something bigger" (Lawson 1966:147-8). The small species must have been *N. borealis*. In the 19th century, however, the Eskimo Curlew seems not to have occurred along the southeastern coast except as a straggler.

Forbush's (1912) earliest discussion of this species in the northeastern United States is for the early 1800s; he states, "We know nothing definite of their migrations in the early days of the colony . . . ." The literature of the period of colonization of North America includes a considerable body of information on the abundance of bird life, particularly of waterfowl and other game species. Forbush (1912) reviewed much of this, pointing out that the descriptions and nomenclature of the birds are often indefinite and confusing. The Passenger Pigeon, *Ectopistes migratorius*, seems to have attracted the most individual attention, and Forbush's (1912) account of that species includes many references to writings of the 1600s and 1700s. During the 1800s the fall flights of huge flocks of the Eskimo Curlew and the American Golden Plover after storms seem to have been well known and eagerly anticipated by New England gunners. It is difficult to believe that this phenomenon would have been overlooked or unrecorded by the earlier writers, even if the species involved were inadequately identified.

The apparent lack of mention of the huge flights of Eskimo Curlews along the northeastern coast prior to the 1800s, and the suggestion that this species did occur in the 1700s in the Carolinas (where they did not occur in the 1800s) leads to the speculation that the migratory pattern of the curlews or the pattern of storms that forced them to the coast during their overwater migration might have been somewhat different in those two centuries.

Population levels. — There is little in the literature that can lead to a firm estimate of the true original abundance of the Eskimo Curlew. Most of the comments relating the numbers of birds are subjective, and many may be exaggerated by hindsight. Terms such as "vast numbers," "immense flocks," and "enormous numbers" were used to describe the abundance of the birds in fall in eastern United States and Canada. In Labrador, in 1833, arriving flocks were so dense that they reminded Audubon of Passenger Pigeons. Packard saw a flock a mile long and nearly as broad, with an estimated 4000 or 5000 birds, in 1860 (Townsend and Allen 1907). This amounts to a density of only one bird per 400 square yards, which seems rather low. There are other reports of "millions" of birds in Newfoundland and on the Magdalen Islands in the Gulf of St. Lawrence (Forbush 1912). Flocks in spring migration in the plains also reminded settlers of Passenger Pigeons and were reported to cover 40-50 acres when they landed (Swenk 1916) but at unstated density.

It is possible that the curlew's tendency to gather into large flocks and its rather narrow migratory path led to overestimates of the total population size. One tacitly assumes that there were large numbers of such flocks, distributed spatially and temporally over the migratory front. If this is true, it seems reasonable that fall populations may have numbered in the tens of millions. The population in spring would have been substantially smaller because of mortality on the wintering grounds and during the long migratory flights, but even then it must have been very large.

Timing of the population decline. — Information on the time of the population decline is as vague and retrospective as that on original population levels. Most available references mention the last recorded specimen in a particular area, or the fact that the curlews were scarce at a particular time. There are only a few definite dates relative to changes in population levels.

J. D. Mitchell said that the curlews came to southern Texas in spring in immense flocks between 1856 and 1875, after which time they disappeared (Forbush 1912:422). In Kansas, the last time the birds were present and killed in numbers around Wichita was 1878 and 1879, according to James Howard (Forbush 1912:423). Curlews began diminishing rapidly in Nebraska in the early 1880s (*fide* Swenk in Forbush 1912:423) and disappeared during that decade. Thus, the population decline became apparent in spring throughout the plains states in 1875-1880.

Carroll (1910) indicated that curlews were very numerous in fall in Labrador up to 1889, disappearing in about 1890. Forbush (1912: 424) says that fishermen of Labrador noted a change about 1886 or 1887. W. T. Grenfell said they became scarce at the end of the 1880s, W. P. Nye placed the sudden decline at 1891, and Henry B. Bigelow said they appeared in numbers until about 1892, all with reference to Labrador (Forbush 1912). Parsons indicated that they diminished in numbers between 1876 and 1886, after which time there was a great and sudden falling off (Townsend and Allen 1907). The decline was most noticeable in Labrador, therefore, in the period 1885-1891, approximately a decade later than in the midwestern United States.

MORTALITY FACTORS

Fall harvest. — Estimates of the fall harvest of Eskimo Curlews are as vague as those of total population size. In Labrador, fishermen reportedly killed curlews by the thousands in the fall (Forbush 1912:425), and on both Labrador and Newfoundland coasts the inhabitants killed all they could and preserved them for winter use (Carroll 1910). Farther south, the curlews visited the New England coast in variable numbers depending on the weather conditions of the season. When they were present, large numbers apparently were taken. Bent (1929:133) mentions a wagon load taken in one day; a wagon 5 x 10 feet, filled uniformly to a depth of 3 feet, with 10 birds to a cubic foot, would hold approximately 1500 birds. It is not really possible from such isolated incidents to assess the annual fall harvest, but it may be estimated to have been on the order of 1.5 to 2 million birds.

Considering the apparent population of curlews, it would seem that Mackay (1892) was correct in stating that "The number killed in the great majority of years is trivial and has no effect in diminishing their numbers." To provide perspective, one might consider modern fall harvests in the United States of 40 million Mourning Doves (*Zenaida macroura*), 35 million Bobwhites (*Colinus virginianus*), 11 million Ring-necked Pheasants (*Phasianus colchicus*), or 4 million Mallards (*Anas platyrhynchos*) (Banks, in press).

Winter harvest. — Bent (1929:127) mentions excessive shooting in the Argentine wintering grounds as a contributing cause to the decline of the curlew, but no harvest estimates are possible. Consideration of the large area involved and the rather low human population density on the pampas in the 1800s suggests that winter harvest was probably not significant to such an apparently abundant bird.

Spring harvest. — There is extremely little information on the midwestern spring harvest prior to the diminution of curlew numbers. Swenk (1916) records an account of wagon loads of curlews being shot in the years 1866-1868 in the vicinity of Omaha, but concurrent accounts of the vastness of the flocks of birds suggest that even this amount of mortality could have had little effect on the overall population. Again, one assumes that many large flocks occurred throughout the prairies, hunting pressure must have been much less away from the large centers of human population.

Market hunting. — Forbush (1912:427) records that shipments of Eskimo Curlews and

American Golden Plovers from the plains and Mississippi valley to eastern markets began in the 1880s. He states: "When the Passenger Pigeon began to decrease rapidly in numbers, about 1880, the marketmen looked about for something to take its place in the market in spring. They found a new supply in the great quantities of Plover and Curlew in the Mississippi valley at that season." Townsend and Allen (1907) wrote that shipments began to come into eastern markets in numbers about 1885, and Mackay (1892) noted that shipments to the Boston markets began about 1886. This was nearly a decade after the population decline had been noticed in the plains states.

Habitat loss. — There were probably no significant changes in the physical nesting habitat of the Eskimo Curlew in the 19th century, at least none caused by human influence. Similarly, except for a moderate expansion of the human population and related land use changes, there was probably little change in Labrador, the main staging area for the fall migration.

As early as 1910, Cooke invoked settlement and cultivation both in the wintering grounds and along the spring migration route as an explanation of the curlew's decline. Wetmore (1926:147) suggested that the development of intensive cultivation and grazing had wrought such great changes in the ecological conditions of the Argentine pampas that both the curlew and the Bartramian Sandpiper (Upland Sandpiper), *Bartramia longicauda*, were unable to adjust and were crowded out. Todd (1963:308) felt that the planting of wheat in the pampas destroyed the wintering grounds and the cultivation of crops in the prairie region of the Mississippi valley destroyed the feeding grounds on the northern migration. Swenk (1916) noted that the heaviest spring flights in the midwest were at the beginning of corn planting time, but suggested that the curlews fed heavily on grubs uncovered by plowing. Forbush (1912) believed that increased hunting by settlers, rather than the cultivation that followed settlement, was the major detrimental factor. Bent (1929:98) considered the loss of the prairies to be a major factor in the decline of several species of shore birds. More recently, Rising (1974) considered that modification of grassland habitat had a profound effect on the distribution of several bird species no longer found in western Kansas.

Poisoning. — Townsend and Allen (1907) reported that Labrador fishermen blamed declines in the curlew population on poisoning by midwestern farmers who were attempting to control blackbird damage to corn. Forbush (1912) correctly points out that curlews were not known to eat corn and suggests that such poisoning had no effect. The poison most likely in use at that time, and which was used on corn prepared as poison bait for Common Crows (*Corvus brachyrhynchos*) was strychnine (Kalmbach 1918), which would not have had an effect on species that did not directly consume the grain.

Storms. — Townsend and Allen (1970) suggested that the sudden falling off of curlew numbers might have been the result of their being overwhelmed by a storm during migration. Storms certainly did have an effect on the fall migration, as acknowledged by Forbush (1912) and others in describing the occurrence of Eskimo Curlews and American Golden Plovers on the New England coast. Greenway (1958:267) correlated three occurrences of the curlew in Britain with the presence of hurricanes in the Atlantic. However, Forbush (1912:429) was probably correct in stating: "No storm ever blew that was far-reaching, severe or continuous enough to have threatened the extinction of these birds when they were numerous . . . ." Once the population had declined greatly, a severe storm might have caused the death of a large proportion of the remaining birds. Greenway (1958) noted that eight hurricanes crossed the curlew's probable fall migration route in August and September, 1900-21.

Nesting failure. — Reproductive failure was not postulated as a cause of the curlew's decline by early authors, but in view of recent information on the effects of poor breeding success in local populations of other species it might be considered at least for years after the initial decline. Barry (1962) showed that a delay in the nesting season of Brant (*Branta bernicla*) caused by bad weather resulted in lowered productivity. A smaller proportion of adults nested in a bad year than in a normal year and clutches of those that nested were smaller than in normal years. There was no renesting by birds that lost broods, and some young from late nests were unable to migrate. Reduced breeding was also reported for Snow Geese (*Chen caerulescens*) and Canada Geese (*Branta canadensis*) in the area with an estimated 85% of the adults of these species failing to nest in a late year. Lack (1933) suggested that late availability of nest sites because of a delayed snow melt might make reproduction by some populations of Arctic Terns (*Sterna paradisaea*) impossible in some years. Holmes (1966) reported nest losses by Dunlins (*Calidris alpina*) as the result of bad weather, and related poor survival of young in one year to the combined effects of predation and adverse weather conditions. Further, Sealy (1975) has shown that delayed snow melt caused some reproductive failure in a population of Crested (*Aethia cristatella*) and Least (*A. pusilla*) Auklets.

CLIMATIC FACTORS

The period of time since the retreat of the Pleistocene glaciation has been marked by a series of epochs with differing climatic conditions (Lamb 1966:5). The two periods immediately preceding the present, and the climatic factors involved in the transition between them, may be important relative to the decline of the Eskimo Curlew.

A cold period often referred to as the Little Ice Age occurred from about 1500 to 1800, or perhaps from 1430 to 1850 (Lamb 1965, 1966; U.S. Committee for the Global Atmospheric Research Program 1975). During this time the glaciers of Europe reached their most advanced positions in the past 10,000 years and the pack ice in the North Atlantic was extensive. Winters in the northern hemisphere were severe and the shortened growing season resulted in the abandonment of farmland in parts of northern Europe. In central England the average January temperature in the 1780s was 2½°C lower than in the 1920s. Detailed information on this cold period and its effects are provided by Lamb (1965, 1966) and Bryson (1974).

The Little Ice Age ended with a nearly worldwide climatic amelioration. Lamb (1965:50) writes as follows:

> "It seems likely that at the present epoch a small increase in the available solar radiation would increase the melting of the world's greatest ice-cap in the Antarctic, spreading cold melt-water of low salinity over a wider zone of the Southern Ocean and cooling the sub-Antarctic regions. This would tend to carry the belt of southern westerlies a degree or two nearer the equator and intensify the atmospheric circulation, pushing the meterological equator a little farther north and increasing the supply of warm equatorial water to the Gulf Stream. In the northern hemisphere, and especially in the North Atlantic, this would reinforce the warming and northward shift of the climatic zones to be expected from milder winters and melting of the ice on the Arctic Ocean.[39] This is probably a fair description of the changes from the culmination of the 'Little Ice Age' around 1800 to 1940. In these 140 years world temperatures rose by between 1 and 2°C."

The warming trend may have begun as early as the 1700s; it was most noticeable from the late 1800s to 1940 (Lamb 1965). There was a rapid warming of the Arctic and a recession of the sea ice from about 1830 to 1930. The greater strength of North Atlantic westerly winds markedly increased the number of days for which British weather was classified as "westerly" from 1880 to 1920. The average length of the growing season in Britain increased from 255-265 days in 1870-95 to 270-275 days in 1920-39 (Lamb 1966). Comparable changes presumably occurred in other parts of the northern hemisphere during the same time (U.S. Committee for the Global Atmospheric Research Program 1975:149).

A major factor in the warming trend of 1800-1940 was the intensification and northward shift of the general atmospheric circulation in the northern hemisphere. The position and speed of belts of prevailing winds are determined by pressure gradients that are related to land and water surface temperatures. In the period 1780-1820 the Gulf Stream was farther south than in the present century. Low pressure troughs in the upper westerlies that affect the western North Atlantic were farther west 100 years ago than at present (Lamb 1966:15). The northward shift of pressure zones and intensification of circulation was most prominent from about 1880 on. From the 1890s to the 1920s the mean value of sea surface temperatures rose by over 2°C south of

Newfoundland. In the same time period pressure rose over the subtropical anticyclone belt of the North Atlantic and fell over Iceland, Greenland, and Labrador. These changes indicated an intensification of the westerlies between these pressure areas and northward displacement of the entire system (Lamb 1972 393).

Volcanic action. — The presence of an atmospheric dust veil as the result of a volcanic eruption can have important effects on the amount of solar radiation reaching the earth. Lamb (1972:47, 418) has graphed measurements of the strength of the direct solar beam from 1883 to 1954 and has shown a reduction in solar beam intensity of 20-30% in some months following great volcanic eruptions of 1883 and 1902 and a lesser reduction after 1888 and 1907. There was a marked lowering of prevailing surface temperature in years after major volcanic eruptions, as much as 0.5-1.0°C in middle latitudes. The duration of lowered temperatures is greater at higher latitudes than in middle or tropical latitudes (Lamb 1972.421).

Drought. — Severe droughts affected the midwestern portion of North America during the 1870s and 1890s (U.S. Committee for the Global Atmospheric Research Program (1975: 127). Information published by the U.S. Department of Agriculture (1941:692) shows that precipitation was more than 10% below average in 1886 (the first year graphed), 1893, and 1894, and approximately 2-5% below average in 1887, 1889, and 1890 in the area between the Rocky Mountains and the Mississippi River. Bryson (1974) suggested that the great Bison (*Bison bison*) herds of the plains states would have diminished by 50-75% as a result of decreased precipitation in the late 19th century, even without increased hunting pressure.

DISCUSSION

A new look at the information gathered by Forbush (1912) and Swenk (1916) has yielded two facts of chronology that those authors seem to have overlooked. First, the population decline of the Eskimo Curlew was noted in the spring populations in the midwest approximately a decade before a decline became apparent in fall populations in Labrador and New England. Second, market hunting sufficient to put excessive pressure on the spring migrants did not begin until several years after the spring population decline had been noted. These points, and other information on the timing of the population decline, when considered with the more recent knowledge of phenomena associated with the changing climate of the 19th century, permit the construction of the following highly speculative but plausible history of the curlew's fate.

In the early 1700s, the Eskimo Curlew fed and fattened in Labrador, before striking out across the North Atlantic for its wintering grounds. Some of the flocks met with storms severe enough to force a return to the North American coast, and a landfall was made in the Carolinas. During the 1700s and on into the 1800s a warming trend in the northern hemisphere was initiated with the slow northward shift of warmer waters and winds, resulting in a northward movement and intensification of storm patterns. In the late 1700s and early 1800s the migrating curlews (and plovers) met storms more quickly after their departure from Labrador, and when forced to shore landed along the New England coast. Those flocks that landed were subjected to rather severe hunting pressure, but since many flocks were not struck by storms and continued on a non-stop flight to South America the impact on the total population was not significant. By the mid-1800s the northward shift and intensification of atmospheric circulation had increased the number and severity of storms and a larger proportion of birds were forced to the coast, where the gunners took large tolls, marketing some birds to meet the needs of the increasing human population. Still, good wintering conditions and successful nesting permitted the curlew to maintain its large population.

By about 1870, those birds that left Labrador and did not meet storms flew with a beam wind that had been slightly altered in direction over the years by the northward shift of the atmospheric circulation, and flew with winds that were stronger than they had been a century ago. The slightly altered angle of departure from Labrador, caused by the altered wind, and the increased drift imposed on the birds by the stronger beam winds (Matthews 1955:5) led the birds along a flight line with a more easterly component than in previous decades, and some flocks missed South America and perished in the South Atlantic. Those that reached the pampas were met with increasingly altered habitat and perhaps with a greater amount of predation from the increasing human population. By the mid-1870s significantly fewer birds were available for the northward migration, and those that reached Texas and moved on through Kansas and Nebraska found that the grubs and grasshoppers had been greatly reduced in numbers by drought. Large numbers of the declining population of curlews were taken by the increasing human population. Still, those that reached the breeding grounds had little difficulty finding territories and food, and a high level of reproductive success resulted in the reestablishment of large fall populations. Nonetheless, increasing difficulty during the fall migration because of the winds resulted in marked declines in the spring populations, of which human observers became aware about 1875-1880.

Perhaps a greater incidence of storms forced a higher proportion of flocks to the New England coasts, so that observers and recorders of the birds in that area were unaware of a decline. Large numbers of an increasing proportion of flocks were killed in the fall, and dwindling numbers reached an altered Argentine wintering habitat. Now hunting pressure increased in the spring migration with the advent of market hunting in the 1880s; an ever-decreasing number of birds reached the nesting grounds.

From about 1884, a dust veil placed in the atmosphere by erupting volcanos reduced the amount of solar radiation reaching the nesting grounds of the curlew. Surface temperatures were only slightly lowered, but the snow lingered and nesting was late. Many birds were unable to complete a nesting cycle and raise young. Reproductive success could no longer match losses at sea and to hunters during the fall migration and losses due to hunting and poor habitat during the winter and the spring migration. A decline in the fall population was finally recognized by the gunners, who continued to harvest what they could. By about 1900 so few birds successfully completed migration and were able to raise broods that finding mates may have become difficult. A final hurricane could have wiped out the only remaining large flock.

The preceding section may be considered by some to be fantasy rather than speculation Certainly a large proportion of it is, at this point, untestable as a hypothesis. Admittedly there are no data to support parts of the speculation, and data relating to other parts have been stretched. The lack of mention of an orientation or navigation system other than the wind may be the greatest shortcoming of the idea; the fact that we do not know whether the Eskimo Curlew utilized celestial navigation or some other method of orientation does not permit the assumption that there was no mechanism that might have countered the effects of changing wind conditions. Similarly, conjecture that the presence of volcanic ash in the atmosphere reduced the nesting season sufficiently to reduce reproductive success, particularly over a period of several years, may be extreme. The climatological books and papers that I have consulted are not specific for years in which important biological observations were reported and I may have erred in details of interpretation or extrapolation.

The American Golden Plover was a companion of the Eskimo Curlew in migration, and was subjected to similar pressure from hunters and would have been subjected to similar climatic factors influencing migration. The plover also suffered a severe population decline near the end of the 19th century (Forbush 1912). There was an inland component of fall migration of the plover population, however (Bent 1929), and greater survival of this subgroup may have tempered the overall decline of that species and permitted a rebuilding of the population of the species when protection from hunters became effective.

Similarly, the Hudsonian Godwit, *Limosa haemastica*, followed the same general migration route to South American wintering grounds. This species apparently was not as abundant as the Eskimo Curlew or American Golden Plover (Bent 1927) and presumably was not subjected to as severe hunting pressure. A less extensive population decline was noted near the end of the 19th century (Forbush 1912:298).

The facts that the climate was changing rather rapidly in the same period of time in which the Eskimo Curlew population was rapıdly declining, and that several aspects of the climatic change involved important factors in the curlew's life history demand that a correlation be sought. It is simplistic to continue to blame the present plight of the curlew solely on the shortsightedness, ignorance, or greed of the market hunters, and the recognition that other factors may have played a part in its decline ındicates that it is simplistic to believe that protection alone can, or could have, halted or reversed that decline.

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