

Rapid increase of Double-crested Cormorants nesting in southern New England

Doubling-time has recently been about three years

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SEVERAL SEABIRDS have increased greatly in New England during recent decades from low points in the 19th century (Drury 1973–1974). The most talked-about increase has been that of the Herring Gull (*Larus argentatus*), but growth of this population seems to have ceased, at least in the north (Drury and Kadlec 1974, Erwin 1979). Cormorants, on the other hand, are now expanding fast: Great Cormorants (*Phalacrocorax carbo*) extended their nesting range south to Maine by 1983 and to Massachusetts in 1984 (Drury and Hatch, in prep.) and Double-crested Cormorants (*P. auritus*) are increasingly abundant breeders.

After being extirpated in the 19th century, Double-crested Cormorants returned to New England and by the mid 1940s they nested widely in Maine, including the Isles of Shoals, and at three locations in Massachusetts: Shag Rocks near Boston Harbor, the Weepeeket Islands in Buzzards Bay, and at least one island off Salem (Hagar 1941, Drury 1973–1974, Erwin 1979, Borrer 1980). This period of rapid growth, during which the numbers doubled every 5–7 years, ended about 1945. For the next 20 years numbers apparently changed only slowly (Drury 1973–1974). The present period of very rapid growth began about 1970. The purpose of this paper is to document the current rapid increase in numbers and southward extension of breeding range in the coastal region from the Isles of Shoals to Long Island Sound. Information for the years before 1972 is scanty, but in 1965 Drury (*in litt.*) found 385 pairs nesting in Massachusetts. The present data show a steady increase since 1972: the number of breeders doubled about every three years until 1982. The 1984 counts suggest that growth may have greatly slowed in Massachusetts and the crest of the wave is now further south.

MATERIALS AND METHODS

THE NUMBERS reported here are almost all derived from counts of occupied nests. For three localities there were near-annual counts for ten or eleven years: Boston, the Weepeekets (in Buz-

zards Bay), and the Isles of Shoals (New Hampshire/Maine) (Fig. 1). These counts were ground-based, with the exception of estimates of adults for Boston in 1972 and 1974. The Boston and Weepeeket counts were made in the period

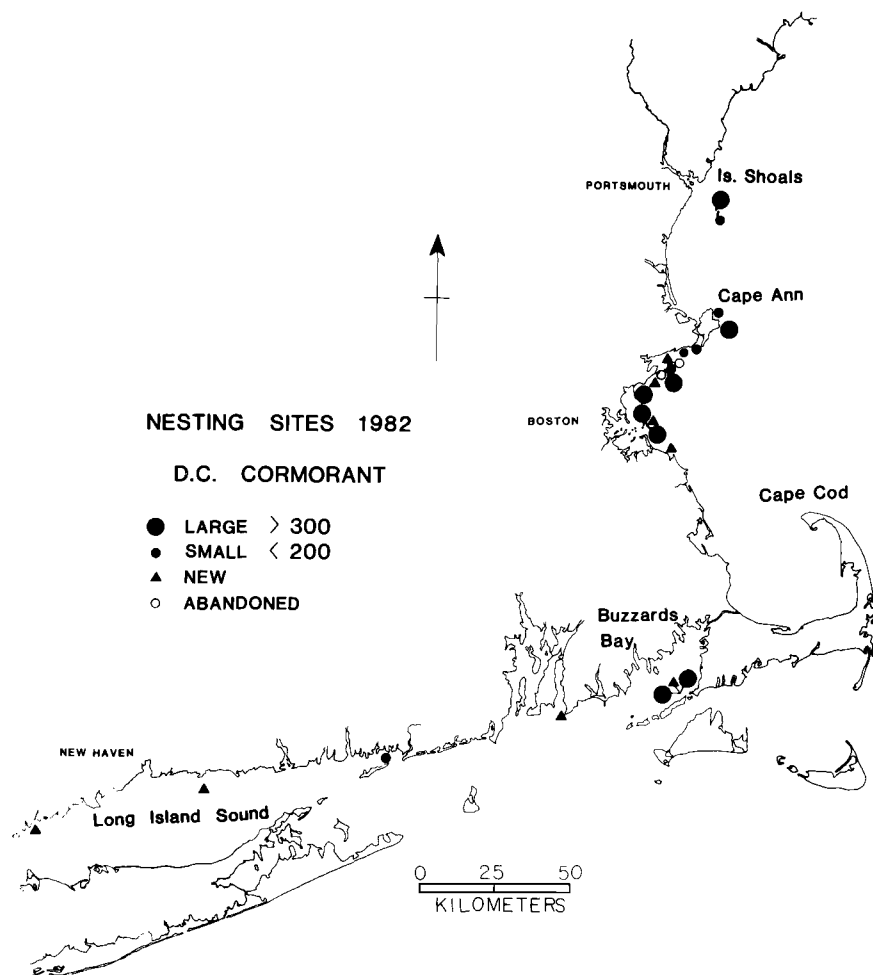


Figure 1. Map of southern New England to show colony locations for Double-crested Cormorants in 1982. The terms New and Abandoned refer to changes between 1977 and 1982. Colony sizes refer to number of active nests.

May 6-June 10 the Isles of Shoals were counted after the end of the breeding season (Borror 1980). The nests on the Weepeckets in 1972 were counted from a boat in early July.

Three complete surveys, in 1972, 1977, and 1982, included aerial counts in addition to ground counts. The 1972 numbers were obtained during a broader coastal survey of gulls (Drury and Kadlec 1974) for which the Massachusetts numbers are from nest counts made from a boat. Details of the 1977 survey are given by Erwin (1979). In my 1982 survey the part of Massachusetts Bay north of Boston was counted from a helicopter on June 15. Information for the region west of Buzzards Bay was obtained from the literature or by correspondence. A few small nesting sites along the north shore of Long Island Sound may be unrecorded. In addition, some observations are included from an incomplete boat-based survey of Massachusetts Bay on June 16, 1981 (this excluded islands east of Manchester). This paper was completed in 1983; some subsequent additions incorporate the major results of the coastal census of 1984.

Most cormorant nests are closely spaced (often almost touching one another) but for the purpose of this paper I use the term "colony" to include nests with nearest-neighbor distances up to 300 meters.

RESULTS

THERE WERE 250 pairs at one site in the Isles of Shoals in 1972 (Dunn 1975) and Drury (1973-1974) estimated 500 breeding pairs at seven sites in Massachusetts. During an aerial survey of the north shore of Long Island Sound in 1972, Drury found small aggregations of cormorants at Potato Island, Stony Creek, and west of Rogers Island, Pine Orchard. These were evidently roosting birds. Off Sakonnet Point, Rhode Island, he counted 35 cormorants that appeared to be nesting, but the observation was not confirmed and this site was later reported as newly occupied in 1981. The 1977 survey reported more than 15,000 pairs in Maine, 24 in New Hampshire, 1760 in Massachusetts and 65 in New York (Erwin 1979, Korschgen 1979). Sixteen sites were occupied from the Isles of Shoals south (and west) to Fishers Island, New York, on the north shore of Long Island Sound (Fig. 1). By 1982 these sites had increased in number to 21 and the total population of the area had almost

Table 1. Population growth rates and doubling-times for Double-crested Cormorants nesting in New England (see text for 1984 numbers).

Region	Period	Number of counts	Increase (finite rate)	Doubling-time (years)	Nests in 1982
Isles of Shoals	1976-82	7	1.23	3.30	1099
North Shore ¹	1977-82	2	1.23	3.30	2081
Boston	1973-82	9	1.38	2.17	2029
	1976-82	6	1.28	2.77	
Weepeckets	1972-82	7	1.23	3.30	1063
	1976-82	6	1.21	3.65	

¹Massachusetts Bay excluding Boston.

tripled, from 2249 to 6290 pairs, in five years.

The population increase includes not only growth of individual colonies and occupation of neighboring sites but also longer leaps in range. In 1977 the first nests were confirmed on Fishers Island, 115 kilometers from the Weepeckets (Bull 1981), although this colony may have started some years earlier. In 1979 two pairs were first recorded nesting on East White Rock, Connecticut (M. G. Bull, *in litt.*), 120 kilometers farther along the coast. Some turnover is characteristic of small cormorant colonies (Drury 1973-1974) but it has been moderate in this area; of six sites with 50 or fewer nests in 1977 or 1981 only two had been abandoned in 1982. The causes of these abandonments were evidently storms in one case (a very low island), but unknown in the other. The colony on Milk Island moved shortly after studies of gulls were begun there (Drury, *pers. comm.*), they returned some time after the several years of work were completed.

In 1984, the total population was at least 7012 pairs. There were 1130 pairs at two sites in the Isles of Shoals, at least 4957 pairs at 14 sites in Massachusetts, 389 at two sites in Rhode Island, 43 at two sites in Connecticut and 493 at three sites in New York. These last three include not only the Fishers Island colony (off New London), but also new colonies on Gardiners Island (first nesting 1983) and on South Brother Island in New York City (first nesting 1984) reported by Buckley and Buckley (1984).

Typical sites for this population are rocky islands, including both those consisting of bedrock and also eroding glacial deposits with boulders on the periphery. Sites with sand or soil are not preferred, and tree nests are very unusual—in Massachusetts only one island in one year (Hatch 1982), but the two most recent colonies in New York are in trees (Buckley and Buckley 1984) as are some

coastal colonies in Canada and many inland colonies. The cormorants nest on several of the outer islands of Boston Harbor, notably on Little Calf (and nearby parts of Middle Brewster and Outer Brewster) and on Shag Rocks. This last group of rocks has been so named for at least 100 years. On these islands the cormorants show no signs that nest-sites are limiting; some apparently suitable areas remain unoccupied within the present colonies or there are unused sites nearby. For the Weepeckets, on the other hand, the rate of increase has slowed, possibly because of such a limit. On the two smaller islands almost all space is occupied, and nests at the edges have been damaged even by relatively minor storms. The current expansion is onto a sandy part of the third island crowded with nesting gulls and subject to human disturbance. There are no unoccupied typical sites nearby.

The population growth until 1982 has been steady. For two areas the results of censuses are shown in Figure 2, (and a similar series of records is available for the Isles of Shoals from 1972, in Borror 1980). The annual growth of about 20% has been similar for all parts of the study areas. Table 1 shows the finite growth rate (λ) and doubling time for several subsets of the population. The growth rates range from 1.19 to 1.26, equivalent to doubling times of 2.77 to 3.85 years.

The numbers reported in 1984 for the Isles of Shoals and Massachusetts suggest that growth in this area may have virtually ceased, at least temporarily. However, it is not clear how much of this change reflects differences in dates and methods of counting. For example, for nine islands on the north shore of Massachusetts Bay the numbers in 1984 were down by 21 per cent. In 1982 these cormorants were counted from a helicopter (with photo counts of large colonies) on June 15. In 1984, these colonies were counted from a boat on May 15-22, at a

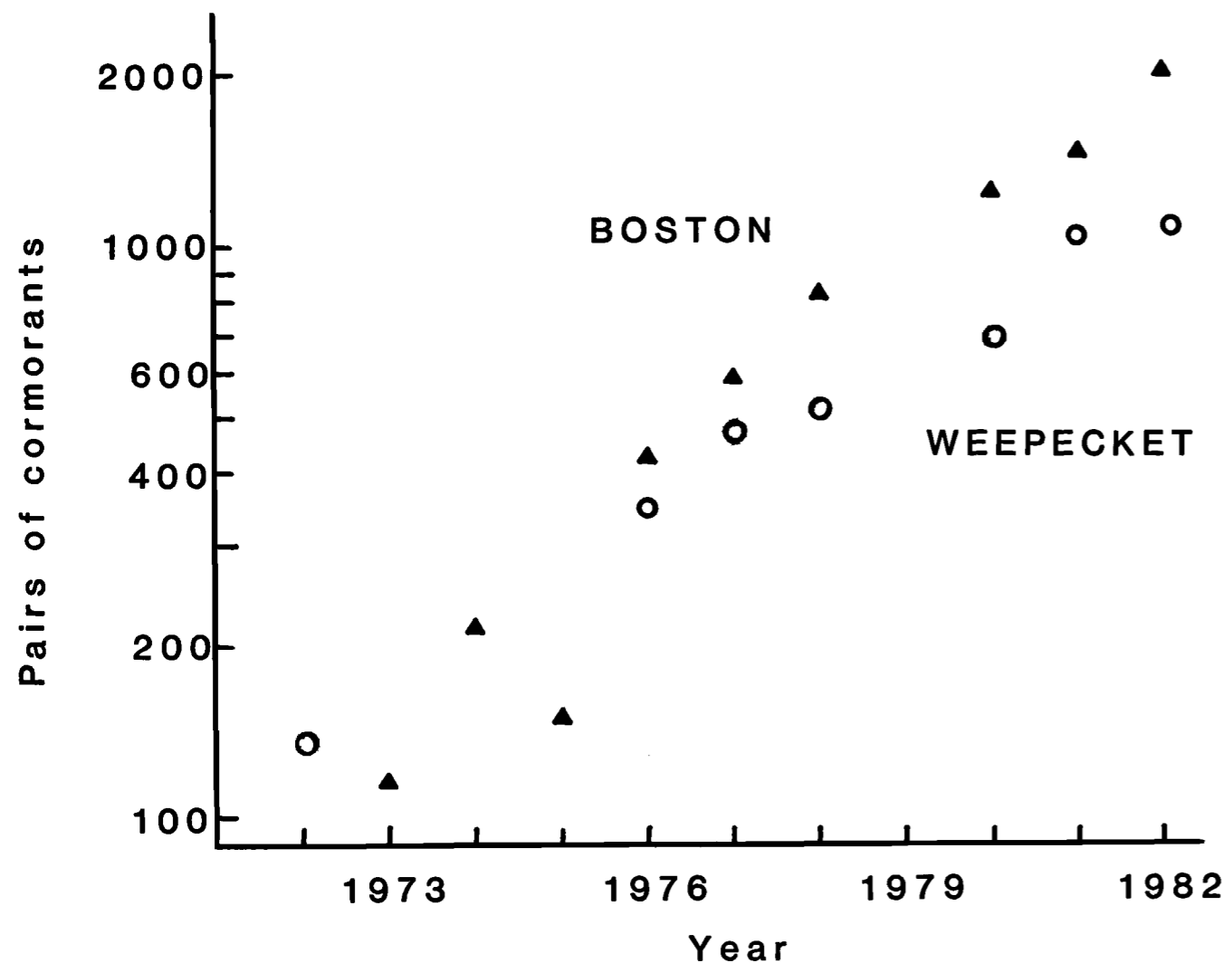


Figure 2. Breeding pairs of Double-crested Cormorants at Boston (△) and Weepecket Islands in Buzzards Bay (○).

time when some cormorants have not yet begun to nest.

DISCUSSION

IT IS NOT POSSIBLE at the present to apportion for the southern area the relative importance of locally produced young and of immigrants, presumably from Maine and the Maritime Provinces. The expansion in southern New England is part of a widespread increase along not only the Atlantic coast but also inland, for example on Lake Champlain, where the first pair nested in 1982, there were 30 pairs in 1983 and 84 in 1984 (D. Capen, *pers. comm.*), and in each of the Canadian prairie provinces (Vermeer and Rankin 1984).

Other populations have fared differently, with continued low numbers in California (Ainley and Lewis 1974), although more recent evidence indicates an increase between 1970 and 1980 (Sowls *et al.* 1980). In 1972 the species was Blue-Listed and concern persisted, because of low numbers in the western

Great Lakes (Tate 1981). Numbers in Lake Superior and elsewhere are now increasing (Matteson 1983, cited by Vermeer and Rankin 1984).

The annual increase of 19-26% is about twice that of another cormorant population, that of the Shag (*P. aristotelis*) in northeastern Britain (Potts 1969). From 1905 to 1965 this nonmigratory population grew steadily at 11% per year. Immigration from within the population unit was important for one colony studied in detail (Potts *et al.* 1980).

The causes of the expansion are presumably manifold, and its consequences unclear. A reduction of direct human effects is a major part of the story, so that the expansion may represent a return to earlier ranges about which little is known, although *P. auritus* nested near what is now Boston in about 1500 A.D. (Luedtke 1980, Hatch 1982). At that time the birds were used as food by the Indians in their seasonal encampments on the islands (Josselyn 1674). Although numerous present-day birders expect cormo-

rants to taste unpleasant (*pers. obs.*) they are apparently quite palatable (Cott 1946). Their eggs are quite another matter and have been widely reviled (Cott 1954). However, inhabitants of the north shore of the St. Lawrence do consume cormorant eggs but, perhaps because the albumen is not white and hard after cooking, they only use them in baking (T.W. French, *pers. comm.*). Killing for food probably persisted, and could explain a massive reduction in the population. It may have been coupled with indiscriminate slaughter fueled by a more general dislike that is reflected in John Milton's choice of a cormorant as one of Satan's transmutations (1674, *Paradise Lost*, 2nd ed., Book I). The market gunners of the late 19th century may have shot cormorants for food, but presumably not for millinery. However, by then the breeding range had retreated northeastward beyond all parts of New England. At the same time, fishermen viewed cormorants as undesirable competitors and engaged in frequent depredations in nesting colo-



Figure 3. Immature Double-crested Cormorants in Boston, 1982/Photo J. J. Hatch.

nies. In Maine there was an extensive official program of control by spraying eggs from 1944 to 1953. In recent years such official control has been confined to the proximity of fish hatcheries, and includes a program of killing adults at the mouths of Salmon Rivers in eastern Maine.

The major control program coincided with a halt in population growth, but the rate of increase continued to be very slow for another 15 years after the end of the program. This led Drury (1973–1974) to suggest that DDE contamination might have contributed to the slowdown. Similar contamination was implicated by Weseloh *et al.* (1983) for the Great Lakes population, which continued to decline in the 1960s after persecution ceased, but which is now increasing. With one exception, all populations of Double-crested Cormorants reported by Vermeer and Rankin (1984) are increasing. The exception is on the north shore of the St. Lawrence, where the population is decreasing apparently because of continued eggging and vandalism.

Another factor could be changes in food availability or diet. Most fish species eaten by cormorants are of no commercial interest, are rarely caught, and do not appear in the fisheries statistics, so that information on their availability is scanty and it is difficult to evaluate the indirect effects that commercial fishing may have had on cormorant prey. The results of a recent study of cormorant regurgitations in Massachusetts (Hatch, *in*

prep.) when compared with earlier reports from Maine (Mendall 1936), the Isles of Shoals (Dunn 1975), and Nova Scotia (Ross 1977), suggest no dietary differences that could account for the population growth. The recent widespread increase in sand lance (*Ammodytes*) is reflected in the diet of cormorants at the Weepeckets but not Boston.

Information from outside the breeding area, either about human effects on survival or about food supply, is virtually nonexistent. The comprehensive review of the literature through 1981 by Clapp *et al.* (1982) covers the geographic area where most of the New England birds winter. This review indicates no reports that evaluate factors affecting cormorant numbers in winter.

The broad patterns of colony distribution seem to be determined by the presence of preferred nesting sites; thus breeding colonies are absent from the long sandy shores of Cape Cod. However, future growth of the population may not be constrained by the choice of rocky substrates alluded to earlier because this preference is not absolute, since some nest on sand on the Weepeckets. Nesting is often preceded by several years of roosting at a site by non-breeding birds. The range of coastal sites used for nesting can be expected to expand to include not only sandy bluffs free of terrestrial predators but also artificial sites such as ship wrecks or abandoned wharves, as in some California colonies, as well as trees, as in most interior colonies. Within

colonies, growth seems to be limited by availability of suitable nest-sites safe from waves.

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DISTRIBUTION

First records for the Philadelphia Vireo in Alaska

Ralph R. Moldenhauer and Theodore G. Tobish

THE KNOWN breeding range of the Philadelphia Vireo (*Vireo philadelphicus*) extends across Canada from New Brunswick, Quebec and southwestern Newfoundland west to central-eastern British Columbia. The northernmost and westernmost breeding records come from the Peace River Parklands in north-central British Columbia (Godfrey 1966). There are no published records for the Yukon Territory (Godfrey, *op. cit.*) or Alaska (Kessel and Gibson 1978). During 1982 this species was observed at two different localities in Alaska.

On June 27, 1982, the song of a Philadelphia Vireo was recorded on tape at Eagle, 20 kilometers west of the Alaska-Yukon border. The bird was in stands of second growth Quaking Aspen (*Populus tremuloides*) and Balsam Poplar (*Populus balsamifera*) along the roads and near cabins. There were adjacent grassy-weedy fields.

The bird sang continuously from the upper canopy of the trees. Moldenhauer watched it for about an hour and recorded its song with a Uher 4000 reel-to-reel tape recorder fitted with a Dan Gibson parabolic microphone (Texas Bird Sound

Library #58-10; copy at University of Alaska Museum). Playback of the songs brought the vireo to within four meters, where the light eye stripe, the lack of wing bars, and the yellowish breast were observed in good light with 7 × 35 mm binoculars. Eventually a second bird in similar plumage approached the area and was chased by the first bird. The taped songs were analyzed independently by Jon C. Barlow (Royal Ontario Museum, Toronto) and Donald J. Borror (Borror Bioacoustics Laboratory, Ohio State University) and verified as *Vireo philadelphicus*. On subsequent days, attempts to locate the bird were unsuccessful.

On September 14, 1982, a second Philadelphia Vireo was discovered by Tobish on Middleton Island in the northern Gulf of Alaska, about 113 kilometers south of nearest mainland and 129 kilometers south-southwest of Cordova. This bird was observed for about six minutes at less than 10 meters, foraging slowly and deliberately along branches of willow thickets. Dense thickets, mostly of *Salix* and *Rubus*, are the primary passerine habitat on Middleton Island. The bird was loosely associated with Orange-

crowned Warblers (*Vermivora celata*) and Yellow Warblers (*Dendroica petechia*). Detailed field descriptions of the bird are on file at the University of Alaska Museum.

These sightings extend the known occurrence of the species some 1450 kilometers to the northwest and west. Kessel and Gibson (1978) suggest that many Alaska accidental or casual species are those that during migration "overshoot" their normal breeding ranges located in the interior of Canada. This may be the case for the Philadelphia Vireos at Eagle, Alaska.

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