DISTRIBUTION AND ECOLOGY OF WHISTLING SWANS IN THE CHESAPEAKE BAY REGION

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The Whistling Swan, *Olor columbianus*, is of particular significance in the Chesapeake Bay region, since major wintering and transient populations occur here regularly, constituting in some years more than half the total population of the species. Some of these concentrations are so large that they attract many bird-watchers, who often travel long distances to see them. Whistling Swans are also of concern to the local shell-fish gatherers, who claim that depredations by these birds cause considerable damage to the supply of commercially valuable long ("soft-shelled") clams. During recent years, there has been an increasing demand from some sources for an open hunting season. It has been suggested that the swan populations may be of sufficient numerical size, to withstand a limited harvest. Because of these considerations, a special effort was made to obtain more information concerning the local distribution, numerical status and ecology of Whistling Swans throughout the Chesapeake Bay region.

These investigations have involved aerial surveys (January inventories) of wintering populations, field studies of environmental relationships, and laboratory analyses of food in gullets and stomachs of collected specimens. Much of the work was cooperative in nature. The senior author was primarily responsible for field studies of environmental relationships, for the quantitative food habits analyses and for the preparation of this report. The junior author arranged for the collection of swan specimens for food habit studies, and checked and verified the identifications of invertebrate food items. Most of the swans obtained, were collected through the cooperation of the Maryland State Game and Inland Fish Commission, and in particular, by two of their employees, W. R. Nicholson and H. R. Zeller. The annual aerial surveys of wintering populations of Whistling Swans were conducted by personnel of the Branch of Game Management, Bureau of Sport Fisheries and Wildlife, in the Fish and Wildlife Service. Don P. Fankhauser assisted the senior author in the field studies, and in the preparation of the food habits material for examination and analysis.

The counts of wintering swan populations included in this report appear reasonably reliable as population indices, but probably should not be taken as dependable estimates of actual numbers, since the accuracy of the aerial survey method employed has not been evaluated. The common names of plants referred to are taken largely from Hotchkiss (1950). Mollusk names are based on Morris (1951), brought up to date

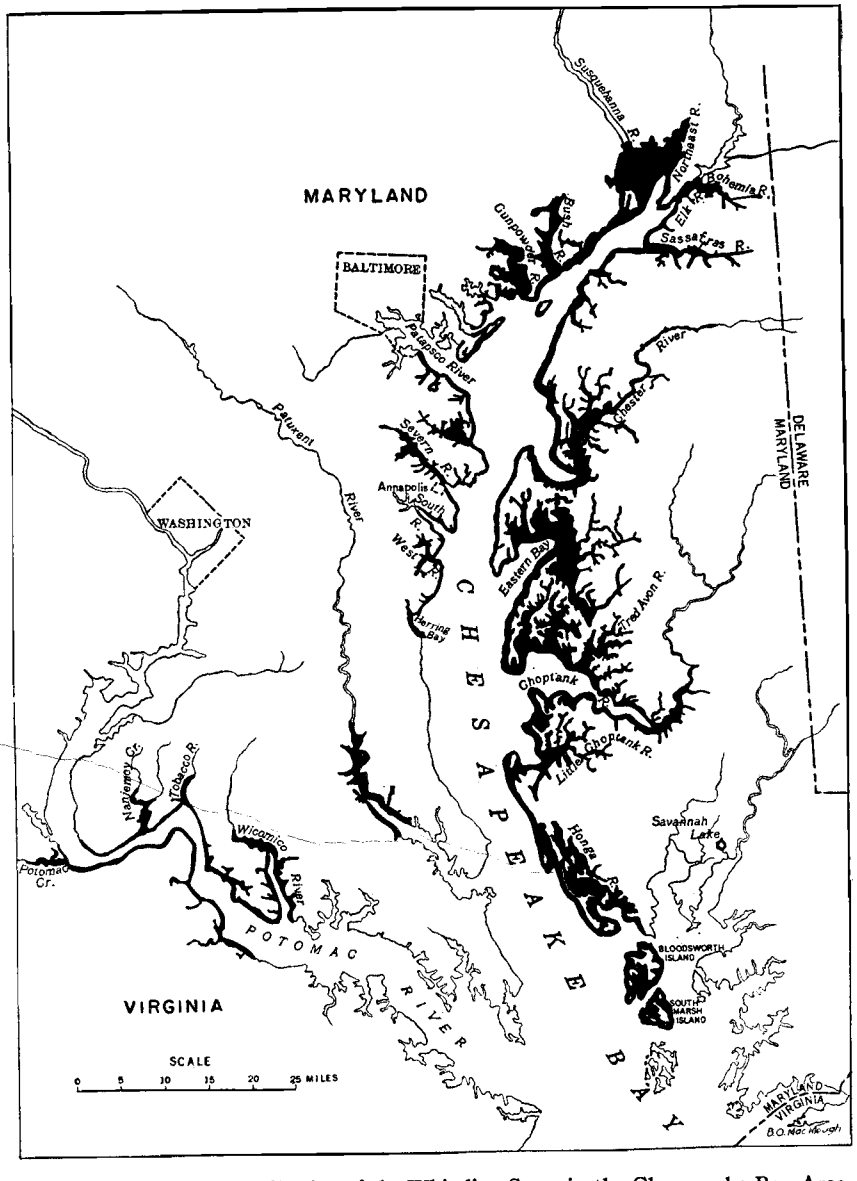

FIGURE 1. Winter Distribution of the Whistling Swan in the Chesapeake Bay Area.

by Dr. Harold Rehder, Curator of Mollusks, U. S. National Museum. Lists of the common and scientific names of these species will be found in the appendix.

DISTRIBUTION AND POPULATIONS

Spectacular concentrations of transient and wintering Whistling Swans occur in the Chesapeake Bay region. The extensive areas of shallow, fresh and brackish estuarine waters that occur in the upper portions of the bay are apparently ideal habitats. Here, great beds of submerged aquatic plants, as well as an abundance of certain species of thin-shelled mollusks, furnish an ample food supply. This region is undoubtedly the most important wintering ground for this species.

During the five year period, 1952–56, the average wintering population of Whistling Swans in Chesapeake Bay constituted nearly one-half of the total continental population, and about three-fourths of the Atlantic coastal population (Table I). The only other important wintering

TABLE I

COMPARISON OF MAJOR WINTERING POPULATIONS OF WHISTLING SWANS*

	Average	*Yearly Totals*				
	1952–1956	*1952*	*1953*	*1954*	*1955*	*1956*
Chesapeake Population	41,000	22,900	44,900	45,400	71,600	20,000
Additional Atlantic Population	13,400	13,200	10,800	7,900	16,600	18,700
Western Population	31,300	19,400	28,200	27,100	35,000	46,600
Total Continental Population	85,700	55,500	83,900	80,400	123,200	85,300

* All population figures are rounded out to the nearest 100.

ground along the Atlantic coast is in the tidewater area extending from Back Bay, Virginia to the north shore of Pamlico Sound (Hyde County) in North Carolina. Other important wintering populations are all western, occurring in lakes, marshes and rivers of the San Joaquin-Sacramento Valley of California, and the Great Basin of southern Oregon, northeastern California, Nevada, and Utah.

Apparently wintering Whistling Swan populations in the Chesapeake Bay region, fluctuate greatly from year to year. During the period 1952–56, the average population was approximately 41,000, while the extremes ranged from 20,000 in 1956, to 71,600 in 1955. These represent from 23% to 58% (average, 48%) of the continental population, and from 52% to 85% (average, 75%) of the Atlantic population. The reasons for the unusually high Chesapeake population in 1955, and its

drastic reduction in 1956, are not known. Possibly, various factors are involved including: (a) extreme yearly variation in production rate on the breeding grounds, (b) major geographical shifts of large segments of the wintering population, (c) variation in intensity of physical or biological controls affecting the mortality of the adult breeding stock during migration or on the nesting grounds, and (d) variability in the winter survey data, due to changes in personnel and to the inherent inaccuracies of the method. It is of interest to note, that coincident with the very pronounced decrease in the Chesapeake population, in 1956, a marked increase was recorded for the western populations, and a moderate increase for the remainder of the Atlantic population.

In the Chesapeake Bay region, transient and wintering Whistling Swans are largely restricted to the marginal areas along the upper portion of the bay and its adjoining estuaries (Figure 1). Along the eastern shore they regularly range southward to South Marsh Island in Somerset County, Maryland, while along the western shore they occur southward to Herring Bay in Anne Arundel County, Maryland. Disjunct populations are also found along the Patuxent River between Hunting Creek and Broomes Island, and along the Potomac River, between Aquia Creek and the Wicomico River. In addition, small numbers occur regularly on Savannah Lake and occasionally on other large, estuarine marsh ponds in Dorchester County, Maryland. Elsewhere in the Chesapeake

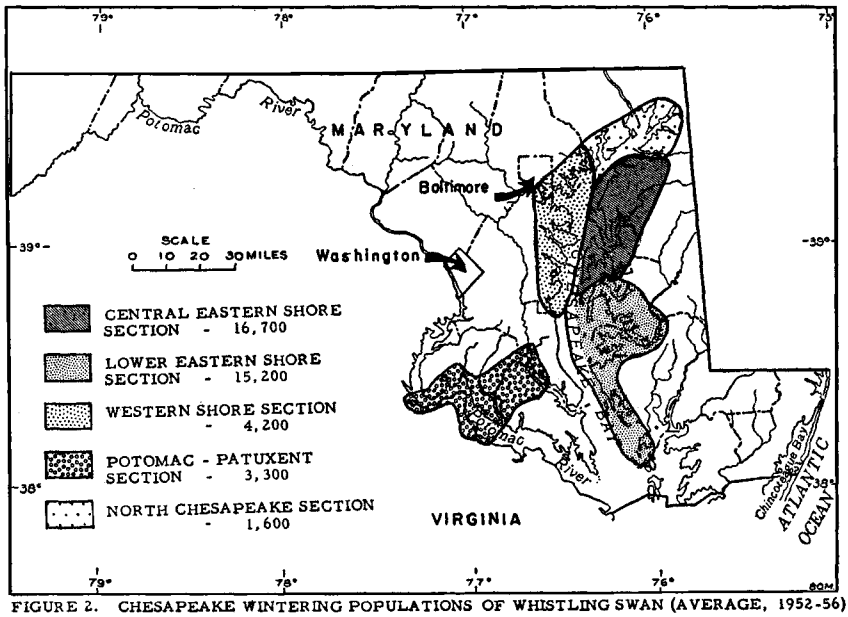

FIGURE 2. CHESAPEAKE WINTERING POPULATIONS OF WHISTLING SWAN (AVERAGE, 1952-56)

Bay region, Whistling Swans are usually of irregular occurrence, involving scattered individuals or occasional small flocks.

In order to show the numerical distribution of wintering populations of Whistling Swans, the Chesapeake Bay region has been divided into five major sections (Figure 2). These were segregated on the basis of differences in population densities and general habitat conditions. During the period, 1952–56, over three-fourths of the average population were found in the lower eastern shore and central eastern shore sections, while fair numbers also occurred in the western shore, Potomac-Patuxent, and north Chesapeake sections. Yearly variation in population is considerable in all sections (Table II), although it would aomar that the population of the lower eastern shore section is somewhat epre constant than any of the others.

TABLE II

WINTERING POPULATIONS OF WHISTLING SWANS IN FIVE SECTIONS OF THE CHESAPEAKE BAY REGION DURING THE PERIOD, 1952–56

Sections	*Average 1952–56*	*Yearly Totals 1952*	*1953*	*1954*	*1955*	*1956*
Lower Eastern Shore	15,200	12,900	19,400	18,500	17,300	7,900
Central Eastern Shore	16,700	5,400	21,200	14,800	33,800	8,400
North Chesapeake	1,600	2,400	1,400	200	2,900	900
Western Shore	4,200	1,900	1,300	2,600	14,700	400
Potomac-Patuxent	3,300	300	1,600	9,300	2,900	2,400

HABITAT

Four principal types of open estuarine waters in the Chesapeake Bay region may be designated as fresh, slightly brackish, moderately brackish, and salt. An orderly succession of these types may be noted, beginning with fresh waters in the extreme upper portions of Chesapeake Bay and extending down to salt waters of the lower Chesapeake. Similar successions are present on many of the larger estuaries that adjoin the bay. Transient and wintering Whistling Swans are found regularly in shallow areas of fresh, slightly brackish, and moderately brackish estuarine waters, but do not normally occur in salt estuarine waters. Distribution of Whistling Swans in these four types in relation to the prominent occurrence of certain key species of aquatic plants and mollusks is shown in Table III. It would appear that the presence of a considerable variety of submerged aquatic plants, or the occurrence of certain species of thin-shelled mollusks, such as the long clam and Baltic macoma, may be important as limiting factors.

TABLE III

ECOLOGICAL DISTRIBUTION OF WHISTLING SWANS, IN THE CHESAPEAKE BAY REGION, AS RELATED TO THE PROMINENT OCCURRENCE OF CERTAIN KEY SPECIES OF PLANTS AND MOLLUSKS

(Each × represents prominent occurrence for species indicated)

	Chesapeake Estuarine Waters			
	Fresh	*Slightly Brackish*	*Moderately Brackish*	*Salt*
Whistling Swan	×	×	×	
Submerged Aquatic Plants				
Wild celery	×			
Waterweed	×			
Longleaf Pondweed	×			
Southern Naiad	×			
Potamogeton pusillus	×			
Claspingleaf Pondweed	×	×		
Sago Pondweed	×	×	×	
Widgeongrass		×	×	×
Eelgrass			×	×
Sea-lettuce			×	×
*Enteromorpha sp.**			×	×
*Agardhiella tenera***			×	×
Mollusks				
River Clam	×			
Long Clam		×	×	
Baltic Macoma		×	×	
Little Surf Clam		×	×	
Oyster			×	×
Stout Razor			×	×
Quahog				×

* *Enteromorpha* sp. (Chlorophyceae).

** *Agardhiella tenera* (Rhodophyceae).

During spring and fall, Whistling Swans are common in shallow, marginal areas throughout the upper portions of Chesapeake Bay, including the estuarine fresh waters of the Susquehanna Flats, and the Middle, Gunpowder, Bush, Northeast, Elk, Bohemia, and Sassafras Rivers. With the advent of winter, the fresh water areas often freeze over, causing large numbers of swans to leave and join others in the brackish waters farther south. The greatest wintering concentrations along the eastern shore of the Bay, on the Chester River, Eastern Bay, and Choptank River. Shallow, brackish estuarine waters are much more extensive in these areas than elsewhere, and this undoubtedly accounts for the occurrence of such large numbers.

In Dorchester County, Maryland, the large, shallow estuarine marsh ponds, that are inhabited by this species, are ordinarily fringed by a considerable variety of emergent marsh plants. The more common of these include Olney's three-square, common three-square, and saltgrass. Widgeongrass is the predominant submerged aquatic plant in most of these ponds, although locally sago pondweed and muskgrass are common.

FOOD HABITS

The food habits of Whistling Swans in the Chesapeake Bay region were studied by analyzing the contents of gullets and stomachs of 49 birds. Forty-one were collected on brackish estuarine waters, including both slightly brackish and moderately brackish types. Thirty-three of these were taken on the Chester River in the vicinity of Pioneer Point, Queen Annes County, during the period, January 17 to March 5, 1955; 7 were taken on the upper portion of Miles River, Talbot County, during the period December 16–20, 1954; and 1 was collected in the Choptank River area, Dorchester County, on November 15, 1955. In addition, 4 swans were collected on fresh estuarine waters; and 4 on estuarine marsh ponds. Those from the fresh estuarine waters include 2 that were taken on the Susquehanna Flats on March 10, 1911; 1 taken on the Gunpowder River on March 2, 1927; and 1 that was collected on the Upper Potomac estuary, near Marshall Hall, on November 16, 1900. The estuarine marsh birds were all collected in Dorchester County on January 8, 1955, and on March 21, 1956. Tabulations of the various types of foods consumed by these series of specimens are shown in Table IV.

In comparing food habits data from the various habitat types, considerable contrast may be noted. In the series studied, submerged aquatic plants furnished 100% of the food in fresh estuarine waters, 60% in brackish waters and 47% in estuarine marsh ponds. Mollusks, although comprising 31% of the food in brackish estuarine waters, were not listed for the other types, while rootstalks and stems of emergent marsh plants, were important only in the estuarine marsh ponds. As would be expected, the species that are represented also differ markedly. Wild celery is all-important in fresh estuarine waters, while widgeongrass, sago pondweed, long clams, and Baltic macomas are apparently the most important foods in brackish areas. In the estuarine marsh ponds, small numbers of swans show their adaptability by taking not only widgeongrass but other entirely different types of foods, including rootstalks and stems of certain emergent marsh plants.

The presence of large numbers of transient and wintering Whistling Swans in the fresh, slightly brackish, and moderately brackish estuarine

TABLE IV

FOOD OF WHISTLING SWANS IN THE CHESAPEAKE BAY REGION

(Quantities of Food taken are indicated as average volumetric percentages, while occurrence, i.e. number of birds taking each food, is shown in parentheses)

	Fresh Estuarine Waters 4 birds	*Brackish Estuarine Waters 41 birds*	*Estuarine Marsh Ponds 4 birds*
Leaves, Stems, Rootstalks, Shoots and Buds of Submerged Aquatic Plants.			
Wild celery	99% (4)		
Widgeongrass		50% (28)	47% (2)
Sago Pondweed		8% (11)	
Claspingleaf Pondweed	1% (1)	2% (2)	
Mollusks			
Long Clam		8% (14)	
Baltic Macoma		21% (17)	
Macoma phenax		2% (1)	
Rootstalks and tesms of Emergent Marsh Plants			
Three-square			24% (1)
Grass (probably Saltgrass)			13% (1)
Miscellaneous Foods			
Corn (Illegal Bait)		8% (5)	
Galls on Muskgrass			10% (1)
Other species*	+	1%	6%

* Other species include fragments of coontail, red algae, and *Enteromorpha* sp. (Chlorophyceae); seeds of widegeongrass, claspingleaf pondweed, common three-square, Olney's three-square, saltmarsh bulrush, dotted smartweed, bayberry, and blackgum; and fragments of stout razor (Pelecypoda), polychaetes (chiefly *Nereis* sp.), isopod crustaceans (Isopoda), decapod crustaceans (Decapoda), and amphipod crustaceans (Amphipoda).

waters may be correlated with the common occurrence of at least two important species of aquatic plant or molluskan foods in each type (Table III). The important plant foods include wild celery, sago pondweed and widgeongrass, while the important molluskan food species are represented by the thin-shelled long clam, and Baltic macoma. Although Whistling Swans do not normally occur in salt estuarine waters, one important plant food, widgeongrass, does occur commonly in this type. Possibly, intolerance of certain physical factors, such as increased

salinity, may be more directly involved in the ecological limitations of Whistling Swans than the presence or absence of certain foods.

Previous stomach content analyses of 10 birds in the east and 5 in the west, summarized by Martin, Zim and Nelson (1951: 49–50) did not report widgeongrass or mollusks. Bent (1925: 286) does mention freshwater snails and "shell-fish" among the foods eaten by this largely vegetarian species. The rather generalized data in these works are not correlated with the habitat types here treated, so it is difficult to compare them with the data of this study.

SUMMARY

The Chesapeake Bay Region is the most important wintering ground for Whistling Swans, and during spring and fall it is also inhabited by large numbers of transients of this species. Average wintering populations during 1952–56, show that nearly half of the continental population and about three-fourths of the Atlantic population are found here. However, the numbers present fluctuate greatly from year to year. Both transient and wintering Whistling Swans are largely restricted to shallow marginal areas along the upper portion of the bay and its adjoining estuaries, occurring in fresh, slightly brackish, and moderately brackish estuarine waters. Small numbers also occur regularly in estuarine marsh ponds in Dorchester County, Maryland. The greatest wintering concentrations are found in brackish estuarine waters along the eastern shore of the bay, particularly on the Chester River, Eastern Bay, and the Choptank River. Fair numbers are also present along the western shore and in the extreme northern portion of the bay, and on the Patuxent and Potomac Rivers. Wild celery is the principal food of Whistling Swans in fresh estuarine waters, while in brackish estuarine waters, the more important foods are represented by widgeongrass and sago pondweed, and two species of thin-shelled mollusks, the long clam and Baltic macoma.

APPENDIX

Common and Scientific Names of Plants referred to in text

Bayberry (*Myrica carolinensis*)
Blackgum (*Nyssa sylvatica*)
Claspingleaf Pondweed (*Potamogeton perfoliatus*)
Common Three-square (*Scirpus americanus*)
Coontail (*Ceratophyllum demersum*)
Dotted Smartweed (*Polygonum punctatum*)
Eelgrass (*Zostera marina*)
Longleaf Pondweed (*Potamogeton americanus*)
Muskgrass (*Chara spp.*)
Olney's Three-square (*Scirpus olneyi*)

Sago Pondweed (*Potamogeton pectinatus*)
Saltgrass (*Distichlis spicata*)
Saltmarsh Bulrush (*Scirpus robustus*)
Sea-lettuce (*Ulva lactuca*)
Southern Naiad (*Najas guadalupensis*)
Three-square (*Scirpus* spp.)
Waterweed (*Anacharis canadensis*)
Widgeongrass (*Ruppia maritima*)
Wild celery (*Vallisneria spiralis*)

Common and Scientific names of Mollusks referred to in Text

Baltic Macoma (*Macoma balthica*)
Little Surf Clam (*Mulinia lateralis*)
Long Clam (*Mya arenaria*)
Oyster (*Crassostrea virginica*)
Quahog (*Mercenaria mercenaria*)
River Clam (*Elliptio complanatus*)
Stout Razor (*Tagelus plebeius*)

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Bureau of Sport Fisheries and Wildlife, Patuxent Research Refuge, Laurel, Maryland, and Maryland Department of Research and Education, Solomon's Island, Maryland.

A Reminder: 75th Anniversary Meeting of the A. O. U.

The 1958 meeting of the A.O.U. will be held in New York on October 14–19. Because of the anniversary character of the occasion, a number of distinguished foreign ornithologists are expected to attend and participate.

"Wonderful World"

Harriet Bergtold Woolfenden is generously donating to the Josselyn Van Tyne Memorial Research Fund of the A.O.U. the proceeds from the sale of her booklet of twenty poems, called "Wonderful World," most of which mention birds and deal with the outdoor world. The booklet, dedicated to her late father, Dr. William Bergtold, may be obtained for $1.00 from Mrs. Woolfenden, Terrace 6, 4600 Firestone Avenue, Dearborn 2, Michigan.