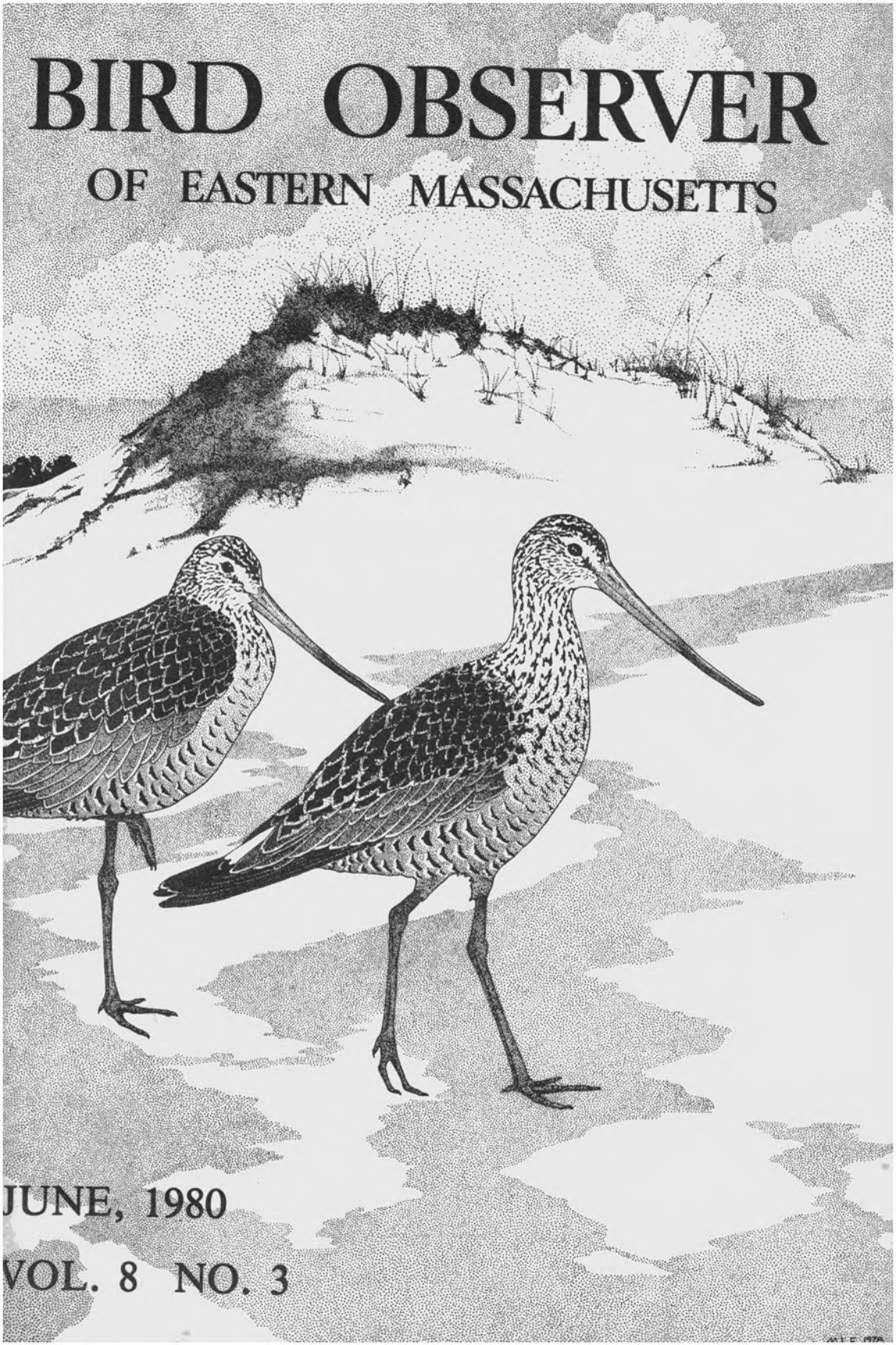
BIRD OBSERVER

OF EASTERN MASSACHUSETTS



JUNE, 1980

VOL. 8 NO. 3

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Bird Observer of Eastern Massachusetts (USPS 369-850)
A bi-monthly publication
Volume 8, No. 3 May-June 1980
$6.50 per calendar year, January-December
All correspondence should be sent to:
POSTMASTER: Send address changes to:

Bird Observer
462 Trapelo Road
Belmont, MA 02178

Second class postage is paid at Boston, MA.

Subscription to BIRD OBSERVER is based on a calendar year, from January to December, at $6.50 per year. Back issues to new subscribers are available at $6.50 per year or $1.25 per issue.

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EDITORIAL COMMENT

We hope you enjoy this special issue on the terns of Massachusetts. It should be noted that this is not a comprehensive survey of our breeding tern populations, e.g., there is no data on the Plum Island or Monomoy colonies. While the article on "non-consumptive" environmental use and the South Shore does not directly discuss terns, it raises vital questions regarding them and all other birds. Terns, with their highly social breeding systems and their propensity to choose fragile nesting areas, are particularly vulnerable to human interference, direct and indirect, as Dennis Minksy and Peter Trull illustrate in their reports. We encourage you to carefully consider the issues raised in Wayne Petersen's article.

TAKE A SECOND LOOK (TASL)

On Sunday, August 3, TASL will conduct a census of the shorebirds of Boston Harbor. Please contact one of the TASL Coordinators listed below if you would like to participate. If you have access to a motorboat that you could use for the shorebird survey, please let us know immediately.

Soheil Zendeh, 380 Broadway, Somerville 02145
(H) 628-8990; (W) 923-0941
Craig Jackson, 531 Putnam Avenue, Cambridge 02139
(H) 864-1917

MAJOR TERN COLONIES IN MASSACHUSETTS (SOUTH)

SCALE: 0 5 10 15 MILES

KEY:

C = COMMON
A = ARCTIC
R = ROSEATE
L = LEAST
} TERNS

WHERE TO SEE TERNS IN MASSACHUSETTS

Four species of tern - Arctic, Common, Least, and Roseate - breed in eastern Massachusetts. The bulk of these nest on the sandy beaches, barrier islands, and sparsely vegetated dunes of the southeast coastal plain, the Cape, and the Islands. Much smaller numbers are found breeding in Boston and Essex County.

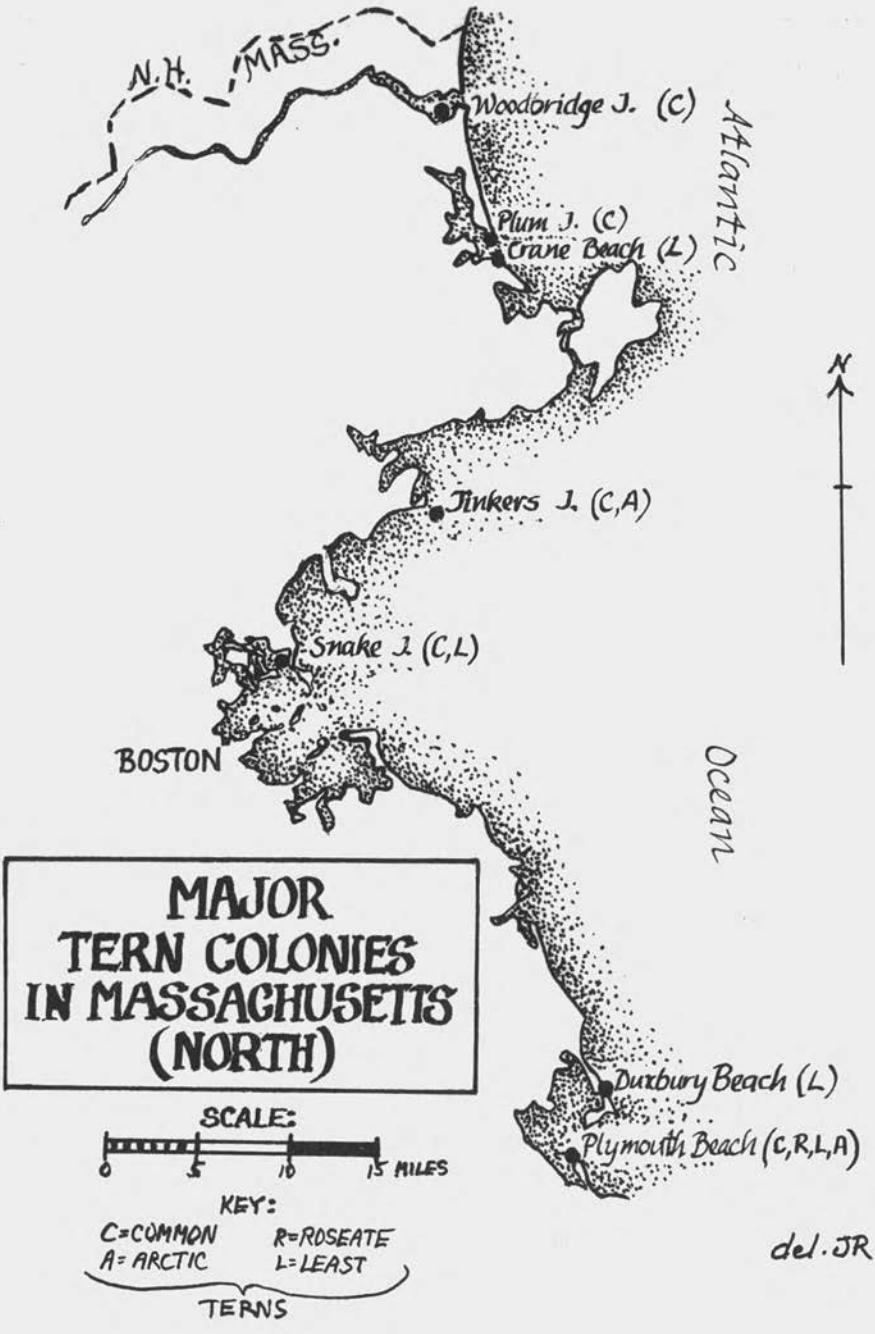
Tern breeding colonies are quite fragile. Massachusetts' tern colonies are in decline, due primarily to human pressure. Such pressure comes directly in the form of foot and vehicular traffic through or near the tern colonies, and from unleashed pet dogs. Increased numbers of gulls, rats, and foxes, whose presence is directly related to human influence, cut into the nesting territories and breeding success of the tern population. In many cases, the beleaguered birds have moved to offshore islands or other areas which are virtually inaccessible because of surrounding marshlands. In some other instances, the birds have consolidated their colonies, with potentially disastrous consequences as Dennis Minsky notes in his article. Finally, the birds are victims of natural phenomena, such as the storm tide of the spring of 1979 which wiped out the Least Tern breeding colony on Plum Island.

The accompanying maps, based on Coastal Waterbird Colonies (1979) and Coastal Waterbird Colonies, An Atlas (1979) published by the U.S. Fish and Wildlife Service, depict the major nesting areas of our four breeding tern species.

It is not our intent to promote human disturbance of these colonies. If you decide to visit a tern breeding site, we ask you to heed all posted warnings and to stay well away from the nest sites. For example, if you visit Plymouth Beach, where access is relatively easy and all four Massachusetts breeding terns may be found, please stay away from the fenced area at the tip of the beach, which is the nesting area for the three larger species. If you wish to observe terns, study those resting on the exposed lower beach.

As the breeding season draws to a close, it is easier to observe terns without potentially detrimental consequences. Flocks of terns begin to congregate at various resting and feeding areas. Adults will often have young in tow, begging for food. Black, Caspian, Forsters, Gull-billed, Royal and Sandwich Terns may be found mixing with the commoner local species (see Nikula, in this issue). Some of the best sites for observing post-breeding tern activity are:

NORTH SHORE:	Newburyport Harbor, the Plum Island Impoundments, and Crane's Beach (Ipswich)
BOSTON:	Revere Beach and Squantum
SOUTH SHORE:	Plymouth and Duxbury Beaches
CAPE COD:	Virtually the entire Outer Beach. Provincetown's Race Point and Herring Cove Beaches, and Monomoy Island are particularly recommended.
NANTUCKET:	Jetties Beach, Eel Point and Sesachacha Pond


N.H.
MASS.
Woodbridge I. (C)
Plum I. (C)
Crane Beach (L)
Atlantic
Ocean
N
Jinkers I. (C,A)
Snake I. (C,L)
BOSTON
Duxbury Beach (L)
Plymouth Beach (C,R,L,A)
MAJOR
TERN COLONIES
IN MASSACHUSETTS
(NORTH)
SCALE:
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5
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15 MILES
KEY:
C=COMMON
A=ARCTIC
R=ROSEATE
L=LEAST
TERNS
del. JR

THE IDENTIFICATION AND OCCURRENCE OF "PORTLANDICA" TYPE ARCTIC TERNS IN MASSACHUSETTS

by Richard Forster, Framingham

Massachusetts birders are fortunate to have a wide variety of terns that frequent the state on a regular basis. Four species of terns - Common (Sterna hirundo), Arctic (S. paradisaea), Roseate (S. dougalli), and Least (S. albifrons) - breed here. The Common and Least terns are numerous and fairly widespread breeders. The Roseate Tern whose population in Massachusetts is greater than anywhere else in North America is a very local breeding species with a major colony at Bird Island in Buzzards Bay. Small numbers of Roseate Terns breed on Monomoy Island, New Island in Nauset Bay, Grays Beach in Yarmouth, and at Long Beach in Plymouth. The Arctic Tern reaches its southernmost breeding station in Massachusetts. The few breeding sites include Plymouth, Nauset, Monomoy and Noman's Land with a total population of about 50 pairs. Aside from these breeding species, the Black Tern (Chlidonias niger), Forster's Tern (S. forateri), and Caspian Tern (S. caspia) are regular migrants while the Royal Tern (S. maxima) is an annual, although very uncommon, summer visitor. As if that weren't enough to make outlanders envious, there is always the possibility of a summer visitation from Gull-billed (S. nilotica) or Sandwich (S. sandvicensis) terns and a late summer northeast storm or hurricane can produce Sooty (S. fuscata) or Bridled (S. anaethetus) terns. Obviously Massachusetts birders are fortunate to enjoy such an abundance.

Under optimum viewing conditions, identification of any of these species is routine with the aid of current field guides. However, it is obvious that field guides can not be all-inclusive when it comes to depicting all the variations that occur in nature. A case in point is the sub-adult plumages of our local nesting terns. It is widely known that the majority of our locally raised young do not return to breed on their natal beaches until at least their third year and, possibly for the majority, their fourth year. It is generally believed and substantiated to some extent by banding recoveries that non-breeding sub-adults spend their first summer on or near the wintering grounds. As a consequence, we are for the most part ignorant of their plumages during this part of their life cycle.

It appears that a small portion of these immatures returns to the northern breeding grounds with migrating adults in spring. At this time they are so strikingly different from the adults that an individual in this plumage was first described as a separate species, "Sterna portlandica." In time, researchers determined that the uniquely marked birds were in fact not a distinct species but represented non-breeding immatures of the local nesting species. Since that time, the term "portlandica" has been used to describe any sub-adult tern in that distinctive plumage. Originally it was thought that this plumage was restricted to only Arctic Terns, but recently it has been determined that most if not all Sterna terns exhibit this plumage.

IDENTIFICATION

For the unknowing, the "portlandica" Arctic Tern is a confusing but, fortunately, rarely encountered bird. Unlike breeding adults, the bill

and feet are black. The upperparts are generally gray and in this respect resemble adults, but they retain the dark carpal bar of the juvenile plumage. The underparts are clear white, unlike the underparts of adults. Although "portlandica" has a black cap, it has a white forehead, varying somewhat in extent, that clearly distinguishes it as something different. This character is not illustrated in any field guide. The familiar long tail streamers are absent in many birds, probably the result of abrasion of unmolted tail feathers. The wings are shorter and slightly more rounded than adults, giving the birds a floppy flight aspect somewhat reminiscent of the Black Tern. Finally, there is a pronounced white collar separating the black cap from the gray mantle.

The foregoing characteristics will serve to recognize a "portlandica" tern when seen but are insufficient to ascertain whether it is a Common or Arctic tern. The shorter, more rounded bill of Arctic Tern is a useful field mark only when seen in direct comparison with other adult terns. In "portlandica" terns the rump color is diagnostic - white in Arctic Terns and gray in Common Terns. The "portlandica" Arctic is identifiable overhead by the noticeable transluscence of the primaries and secondaries. Also, from below, the black at the tips of the primaries appears as a narrow black line, while in the Common Tern it is broader and more diffuse, particularly on the outer primaries.

OCCURRENCE

The average observer is likely to encounter a "portlandica" tern only if he visits a breeding colony during June or July. In the past, only occasional "portlandicas" have been encountered, but in recent years - since 1976 - they have occurred in appreciable numbers, most notably at the Monomoy Island colony off Chatham on outer Cape Cod. The first influx of "portlandica" Arctic Terns was in the summer of 1976 when "portlandicas" began to appear in early June and soon built up to a maximum in late June - 550 individuals on June 24. Shortly thereafter their numbers declined; by late July most had departed. Although "portlandicas" are normally found in association with breeding colonies, they are seldom encountered in the colonies themselves but rather in the company of other terns in loafing areas adjacent to the colonies. In these loafing areas they sometimes flock in groups comprised entirely of "portlandicas". The greatest recorded number of "portlandicas" occurred in 1979 at Monomoy when 800+ were observed on July 6.

Since 1976 the appearance of large numbers of "portlandicas" has become routine on Cape Cod. Observers are most likely to see "portlandicas" at Monomoy Island, however lesser numbers have been noted at Provincetown, Nauset, and Plymouth, with rare occurrences on the North Shore in the Newburyport/Plum Island area. They begin to appear in late May or early June, build to a peak in late June-early July, with numbers dwindling before a general departure in late July-early August.

The appearance of "portlandica" Arctic Terns in Massachusetts can not be attributed to the overwhelming breeding success of our local nesters. On the contrary, our meager breeding population of Arctic Terns experiences little success and has not produced enough young in the past decade to account for the appearance of so many immature birds. The origin of the "portlandicas" must be from a more northerly breeding site. The increase of "portlandicas" coincides with the unusual

appearance of summering Black-legged Kittiwakes (Rissa tridactyla) at Monomoy. Perhaps there is some locally abundant food source that has attracted them.

In conclusion, I would like to present a totally hypothetical situation regarding the origin of these "portlandica" Arctic Terns. It is well known that some pelagic bird species that breed in the southern hemisphere spend their austral winter (our summer) in our offshore waters. Greater (Puffinus gravis) and Sooty (P. griseus) shearwaters are well-known examples of this pattern. However, the seemingly recent appearance of supposed South Polar Skuas (Catharacta maccormicki) in our waters during summer indicates a possible change in wintering patterns of southern hemisphere species. Perhaps the recent influx of "portlandica" Arctic Terns represents a small population of non-breeding Antarctic Terns that have begun wintering in our area. No matter how preposterous this supposition, it can not be categorically dismissed in light of recent developments.

"Portlandica" Arctic Tern
Photograph courtesy of the Massachusetts Audubon Society

For further reading:

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MASSACHUSETTS' NON-RESIDENT TERNS

by Blair Nikula, Chatham

Of the 14 species of terns that have been confirmed as having occurred in Massachusetts, 4 species - the Common (Sterna hirundo), Roseate (Sterna dougallii), Arctic (Sterna paradisaea), and Least (Sterna albifrons) - nest in a number of locations along the Massachusetts coast and have been the subject of much attention over the years. Indeed, few Massachusetts birds are as well known and certainly none have been as intensively studied as these resident terns. Much published material has resulted from this interest; the reader is referred elsewhere for information on the status of these species (see Nisbet, 1973).

The intention of this article is to summarize and update the status of the 10 species of non-resident terns that occur or have occurred in the state. These can be divided into three general categories based on their presumed origins:

1. The Black Tern (Chlidonias niger), Forster's Tern (Sterna forsteri), and Caspian Tern (Sterna caspia) are regular migrants primarily from interior breeding locations to the north and west of Massachusetts.
2. The Gull-billed Tern (Sterna nilotica), Sandwich Tern (Sterna sandvicensis), Royal Tern (Sterna maxima), Sooty Tern (Sterna fuscata), Bridled Tern (Sterna anaethetus), and Brown Noddy (Anous stolidous) are vagrants originating from coastal breeding colonies south of New England. Probably a few individuals of Forster's and Caspian Terns belong in this category as well.
3. One species, the White-winged Black Tern (Chlidonias leucopterus), is a vagrant from Europe.

The breeding ranges described for each species below include only those areas which are in eastern North America and consequently of significance when speculating on the origins of a particular species seen in Massachusetts.

Migrant Terns

The Black Tern nests on marshy freshwater ponds and lakes from southern Canada into the north-central United States, eastward to northwestern Pennsylvania, northwestern New York, northern Vermont and northern Maine. It is a regular migrant through Massachusetts, occurring primarily in coastal localities. Spring migrants tend to be rather scarce, although most inland reports seem to be during this season. The second week of May generally marks the arrival of this species in our area, with the migration continuing into early June. The earliest date for the state is 4/27/56 and the spring maximum of 13 comes from Newburyport on 5/19/73. Occasional individuals are reported in late June and early July, but it is normally mid-July before any pronounced southbound influx is detected. Migrants are far more numerous in the fall, with peak counts in late August and early September. Numbers vary considerably from year to year, with highest daily counts ranging from only a few in some years to an impressive 500 on Monomoy on 9/1/48. Numbers decline rapidly through September, and October records are rare with the latest being 10/21/76. Astonishing is an individual reported from Wellfleet Harbor on the incredible date of 12/11/66 (W. Bailey, et. al.).

The Caspian Tern nests in widely disjunct locations in North America and in two distinct habitat types: (1) inland freshwater lakes of central Canada east to southeastern Ontario, and (2) saltwater coastlines of southeastern Quebec and coastal South Carolina and Virginia. It is a rare spring migrant, very rare summer visitor and a rare to uncommon fall migrant in Massachusetts. Reports are concentrated along the coast but inland records, although scarce, are not unknown and are about evenly divided between spring and fall. The earliest spring dates are of single birds in Sagamore on 4/19/38 and Plum Island on 4/19/58, with most sightings occurring in May, including the high count of six in Marshfield on 5/1/76. Infrequent summer reports may, on occasion, involve wanderers from the Virginia population. A good illustration of the enigmas one encounters when speculating on the origins of certain individuals of this species (as well as Forster's Terns) is a total of 10 statewide immediately following the 100 mph southerly winds generated by Hurricane Carol's inland passage on 8/31/54. Were these grounded southbound migrants from Canada or storm-blown vagrants from the mid-Atlantic?

The first southbound individuals apparently show up in late August, with most reports falling from mid-September to early October. Seldom is the species seen after mid-October, with the latest noted from Plum Island on 11/5/77. High counts of 16 have occurred in Ipswich on 10/3/55 and at Monomoy on 10/12/76. Caspian Terns pass through our area very rapidly. Most sightings are of singles or small groups flying straight through without lingering. Seeing this "king of the sterninae" is often simply a matter of fortuity.

The Forster's Tern nests in three widely disjunct areas in North America: marshy freshwater ponds in the western and north-central United States and south-central Canada (presumably most Massachusetts records originate from this population); the mid-Atlantic coast of Virginia, Maryland, and southern New Jersey; and the western Gulf coast. This tern occurs in our area primarily as a regular fall migrant in varying numbers. Spring occurrences are very rare with only three satisfactory reports, the earliest of which is of a basic-plumaged bird in Chatham on the surprising date of 3/30/78. There is one record each from April and May, both from the Newburyport-Plum Island area and both also in basic plumage. Although breeding-plumaged birds have been reported at this season and certainly are not unlikely, identification can be very difficult. This plumage has yet to be substantiated in our area. June and early July sightings are also rare with the first southbound (?) individuals not normally appearing until the very end of July. From early August through October, singles and small groups can usually be found wherever terns congregate, although numbers fluctuate from year to year. Highest concentrations have consistently been noted along the southeastern coast, with Nauset being a particularly favored locality. Prior to 1979 the best flight years were in 1945 and 1973, with high counts of 24 (9/23/45) and 52 (10/12/73), both from Nauset. 1979 saw an unprecedented number of this handsome, black-eyed sternid passing through the state with a number of counts in the 30-50 range during August and September. This flight culminated in a startling assemblage of approximately 200 birds in Wellfleet on 10/29, far eclipsing all previous maxima for the state. This species is apparently quite hardy and regularly lingers well into November. There is now a total of six December records. One particularly hearty individual was found on Martha's Vineyard on the incredible date of 1/21/79. This tern has now been recorded in every month except February!

As with the Caspian Tern, it is assumed that the vast majority of these birds is from the inland populations. Several inland appearances in this state, occasionally in numbers, would tend to support this supposition. Most notable are counts of 34 in Longmeadow on 10/4/64 and up to 20 in the same location on 8/31/53 to 10/31/53. On the other hand, a dead immature picked up on the coast of New Hampshire on 7/20/68 was found to have been banded in Maryland the previous May, confirming that at least an occasional bird wanders northward from the mid-Atlantic coast. Unlike the Caspian, I can find no evidence of any pronounced influxes related to the passage of tropical disturbances, although such occurrences have been noted on Long Island (Bull, 1978).

Southern Terns

This group includes the six species whose North American breeding ranges lie entirely to the south of New England. All are rarely found away from marine habitats and only the Sooty Tern has occurred inland in Massachusetts, and then only following hurricanes. Their occurrences in this area fit into four very general categories:

1. Spring "Overshoots" - To date, only a handful of records can be ascribed to this phenomenon, involving primarily Royal and Gull-billed Terns. However, sightings at this season have been noted with a sharply increasing frequency in recent years, apparently in conjunction with very modest northward range expansions by these two species. Which, if any, of the spring Forster's and Caspian Terns belong in this category is problematical.

2. Non-Breeding Wanderers - Most June and early July records would seem to fit here. What percentage of these birds is sub-adult is unknown, although it is probably high. It may be that many of the spring overshoots are non-breeders as well.

3. Post-Breeding Dispersal - The greatest number of records - though not of individuals - belong in this category. Many terns are known to disperse northward upon completion of their nesting cycle or if nesting is disrupted. Most Royal, Sandwich, Gull-billed, and probably some Forster's and Caspian Tern sightings in Massachusetts are the result of these wanderings.

4. Tropical Storms - Hurricanes are responsible for the largest numbers of individuals of the southern species in our area. Most of the Sooty and Bridled Tern records, and the highest counts for Royal and Gull-billed Terns, can be attributed to disturbances of tropical origins which pass to the west of coastal Massachusetts. That these southern terns (as well as other tropical waterbirds) are carried northward by the strong southerly winds on the east side of a hurricane is readily apparent when you correlate avian and meteorological records. A classic illustration of this occurred in the back-to-back hurricanes of 1954. On 8/31/54, powerful Hurricane Carol moved across Long Island, through central Connecticut and Massachusetts, and into New Hampshire. Among the terns noted during and following Carol were: 1 Noddy, 12 Sooty, 12 Gull-billed and 2 Sandwich. Twelve days later, on 9/11/54, equally powerful Hurricane Edna moved northeastward over Martha's

Vineyard and Cape Cod. No notable tern records resulted from this storm - although an impressive list of southern warblers was noted in Chatham the following day.

Several other generalizations can be made about this group. They are highly mobile when in our area - rarely is an individual seen on more than one day in the same location and often they are present for only a matter of hours or even minutes. Also, as would be expected, the preponderance of records comes from southeastern coastal locales (i.e., Cape Cod, Nantucket and Martha's Vineyard).

The Gull-billed Tern nests locally along the Atlantic coast north to Maryland and occasionally Delaware. A few also nest in southern New Jersey. Nesting was confirmed on Long Island in 1975 and 1978, and suspected in other years. This tern is a regular visitor to our coast, there being a total of 41 records involving 53 individuals. Prior to 1973 it was unknown in the spring, but has since been recorded in May with increasing frequency, perhaps as a result of its modest northward range expansion. There are now five May reports (7 individuals), with an early date of 5/1/79. The majority of sightings has been in August and early September. Storm-related influxes were noted following Hurricane Carol in 1954 (12 individuals, including a count of 6 on Nantucket) and 6 following Hurricane Donna in 1960. Unlike most other members of this southern group, the Gull-billed Tern has been fairly regular north of Cape Cod (16 reports). An individual noted in Wollaston on 10/6/56 represents the latest date for the state. In basic plumage this species is rather similar to the much commoner Forster's Tern and should be identified with care.

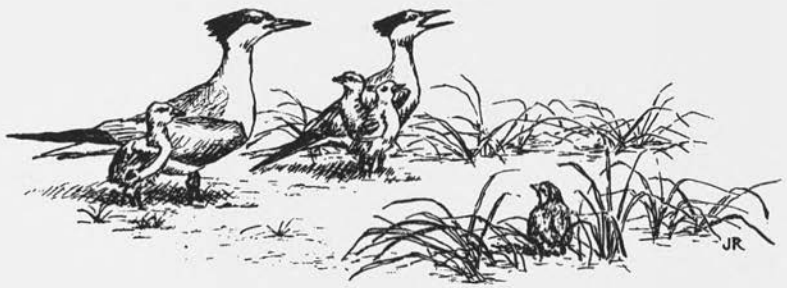
The Sooty Tern breeds on islands in the Caribbean, northward to the Bahamas and Dry Tortugas. This fascinating species is renowned as a wanderer. Its surprisingly frequent occurrence in this area certainly lends credence to this reputation. Indeed, it has been recorded more than any other strictly southern tern except the Royal - a total of 73+ reports totaling 183+ individuals! Not surprisingly, the bulk of these has been connected with tropical storms. Hurricane Carol in 1954 blew up 12 birds. Hurricane Donna in 1960 resulted in 13 reports totaling 46 individuals (including an astonishing flock of 25 in Swansea on 9/12 during the height of the storm!), and Hurricane David in 1979 produced no less than 87 individuals, almost doubling the state total up to that date. In keeping with this species' unique character, it is the only southern tern to be recorded from inland localities in the state - a total of 13 reports, most, if not all, of which were storm-blown. The vast majority of sightings has been in August and September, which correlates with the peak hurricane season. Only eight reports have fallen outside these two months - one in June, five in July and two in October. Although dead birds have been found later than October, they were most likely individuals which had arrived earlier in the season.

The Bridled Tern nests on islands in the Caribbean north to the Bahamas. In late summer some individuals regularly wander northward in the Gulf Stream to waters off the mid-Atlantic coast. There is now a total of eight state records (10 individuals) for this handsome sternid, most, if not all, of which are storm-related, including 5 birds as a result of Hurricane Donna in 1960. All of the records have fallen in a very narrow

range of dates, 8/12 - 9/16, dates which fit in very nicely with the species' occurrence in the Gulf Stream to our south.

The Sandwich Tern breeds on coastal beaches in the Caribbean, the Gulf of Mexico, and along the coast of North and South Carolina, occasionally north to Virginia. It is a rare but fairly regular vagrant in this state, with a total of 24 records involving 27 individuals. All but 5 of the sightings have occurred between the dates of 6/22 and 9/1, with the earliest found in Chatham on 5/31/79 and the latest on Nantucket on 10/2/79. This species shows little proclivity to storm-related wanderings exhibited by other members of this group, 2 reports on 9/1/54 following Hurricane Carol being the only obvious such records. None were noted following the ornithologically infamous Hurricane Donna in 1960, when almost all the other southern terns were found in numbers. The increased detection of southern terns along our coast is well illustrated by the records for this species; prior to 1950 there were but 4 sightings, 3 were seen in the 50's, 5 in the 60's, and 12 in the 70's. This sternid has wandered north of Cape Cod on only three occasions including, oddly, two of the first four state records, both from Ipswich, and more recently a 6/28/72 Newburyport sighting. The latter apparently represents the northernmost occurrence for this species on the Atlantic seaboard of North America.

The Royal Tern nests on sandy beaches along the Gulf coast of Texas and Louisiana, the West Indies and the Atlantic coast from Georgia to Maryland. In 1975 nesting occurred in southern New Jersey and more recently has been suspected, but unconfirmed, on Long Island. This large sternid is a regular visitor to the Massachusetts coast, particularly Cape Cod and the islands, where several or more per year are to be expected, although they are not unusual even north of Cape Cod. Spring occurrences are quite rare but increasing (six reports), with the earliest at Sandwich on 5/3/75. More typically, individuals arrive in Mid-June and are noted throughout the summer into early September, after which they become quite rare. As with most members of this group, greatest concentrations have been noted



Royal Tern pen and ink by Julie S. Roberts

following tropical disturbances. Hurricane Donna in 1960 produced by far the largest totals, with counts of 50 from Nantucket, 22 on Martha's Vineyard and 17 on Monomoy. The highest count unrelated to any storm is nine from Monomoy of 7/11/71. Late lingerers include five November birds, with the latest in Eastham on 11/27/79.

The Brown Noddy nests on islands in the Caribbean and is among the rarest of tropical vagrants in the Northeast. It has graced Massachusetts' shores but twice. The first was a dead bird found on Martha's Vineyard on 9/1/54 following Hurricane Carol. The second bird was discovered on Nantucket where it remained from 8/27/57 until 9/2 and was reportedly photographed.

European Vagrants

Although the White-winged Black Tern is the only species definitely of European origin, it is interesting to note that Gull-billed, Caspian and Sandwich Terns all occur along the west coast of Europe in varying numbers. It is not inconceivable that an individual from one of these populations could wander across the Atlantic. However, the paucity of sightings from the Canadian maritimes tends to discourage further speculation in this vein.

The White-winged Black Tern has been confirmed but once in Massachusetts. On 5/25/54, two individuals were found in Scituate, where they lingered until 5/27, giving a number of observers the opportunity to become acquainted with this striking species. Published records from Nauset and Monomoy on 7/18 and 8/4/60, respectively, should be considered hypothetical as some uncertainty has been expressed by the observers (pers. comm.).

Although this species' occurrence in North America is difficult to explain - it nests in extreme eastern Europe and is very scarce as far west as the west coast of Europe - it has been recorded with some regularity on the eastern seaboard in recent years. Future state records seem likely.

My thanks to Richard Forster and Richard Veit, both of whom supplied records at their disposal as well as many valuable comments, and to Seth Kellogg for providing records from western and central Massachusetts.

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REPORT OF THE NORTH DISTRICT TERN WARDEN: SEASON OF 1979

by Dennis Minsky, Cambridge

This report presents a summation of all data concerning the nesting activities of Least (Sterna albifrons) and Common (S. Hirundo) terns in the North District of the Cape Cod National Seashore for the season of 1979. An account of the protection program employed this season is included.

Each season is unique. This season will most certainly be remembered for its overall intensity and for the unprecedented productivity of the colonies.

Never has there been a greater effort made on behalf of these beleaguered birds: long hours, nights as well as days, spent on the beaches, and hard labor - hauling and planting signs, cedar posts, and electric fences. Moreover, there were compromises forged out of the needs of beach-goers, human and tern alike - and such things are never easy.

How good it is, then, to report the best season ever for the terns of the North District, and how gratifying it is to know we contributed to this success.

METHODS AND MATERIALS

In regard to methods, I quote from the 1978 Report of the Tern Warden a list compiled from the official position description:

1) Surveying and patrolling, establishing locations of all tern colonies and nesting terns.
2) Posting all tern colonies, as well as extra-colony posting.
3) Monitoring of posted areas to prevent intrusion.
4) Censusing of nesting terns.
5) Contact with the public and various media sources regarding interpretive and educational aspects of tern nesting.
6) Evaluation of productivity, including all relevant factors.

Additional detail and background information may be obtained in Report of the Tern Warden: 1976; Report of the Tern Warden: 1977, Report of the Tern Warden: 1978 (Minsky), and Guidelines for the Protection and Management of Colonially Nesting Waterbirds (Buckley and Buckley). All should be available at Cape Cod National Seashore headquarters, South Wellfleet, Mass.

This season, however, there has been considerable change in the methods employed due entirely to the division of the tern program into the two constituent districts of the Seashore, North and South. Each district has a tern warden and three assistants who are Student Conservation Aides.

This division allowed us to narrow our focus and concentrate our energies on a smaller number of colonies. The effect is apparent in the greater number of data sheets completed (each representing a visit to a colony - up 32% over last season), and by the larger number of visitor contacts on the beaches - roughly double last season's.

CENSUSING PROCEDURES

Each nest was marked with a shingle placed approximately four feet away

(always forward and to the left). On the shingle was marked a number or correlate, the number of eggs, and the date of discovery. The data could be read through binoculars for nest watches from the observation blind or vehicle.

All data collected was entered on a data sheet - one for each census - and then transferred to a master sheet for future compilation. This master sheet was for the most part composed and maintained by SCA Mark Ashton.

It cannot be denied that direct nest counts have some impact on nesting terns. For this reason we refrained from using this technique in past seasons. This year, however, we felt that we had gone such a long way towards eliminating other disturbances that our controlled incursions (i.e., only during morning hours, only under proper weather conditions) into the colonies could be justified. In addition, we saw that for the first time we had an opportunity to accurately assess the effect of our protective program. For these reasons, we went ahead with this method. I must emphasize that we do not recommend direct censusing for all colonies under all circumstances.

The direct nest counts were complemented by nest watches from a blind or vehicle. These watches determined whether nests were active (i.e., being tended). They also allowed us to make observations on nesting behavior. We attempted to determine the number of fish brought into the incubator per hour, the number of times the incubator was relieved per hour, and the number of minutes clutches were left exposed per hour. It is hoped that some day this information can be correlated with food supply and nesting success.

POSTING

Posting operations, too, were intensified this season. Each colony, of course, was posted with signs and twine; there was also at least one large interpretive sign (with picture and text) posted near each colony. As chicks began to appear, CAUTION: YOUNG BIRDS IN TRACKS signs were positioned at either approach to a colony.

At this point, however, it was decided that the CAUTION signs were not adequate to prevent the destruction of tern chicks by vehicles. Approximately 2.2 miles of beach, comprising 3 of the 4 Least Tern colonies in the North District, were closed to vehicles (by means of cedar posts and wire cable), and remained so for the next 32 days.

Since this closure represents an abrupt departure from normal posting operations, and since its effect on chick survival was so dramatic, I will describe in some detail the ramifications of this effort.

On July 5, after initial losses of chicks on the beach below the High Head tern colony, we began to post the area. Posting was the same as last season: cedar posts were spaced four feet apart, running from the rear dune to the high water mark. This allowed traffic by at low tides but not at high tide.

By the night of July 6 this posting was still incomplete because we ran out of cedar posts. Also, some time that evening the northside barrier was dismantled and some posts taken.

After a meeting on July 7 with Head Ranger Irving Tubbs, it was decided that complete (but temporary) closure of the High Head area would best answer the needs of drivers and terns there. (Many drivers had been confused by the earlier posting; some had experienced difficulty negotiating the lower beach.) It was hoped that this would be the only place such action would bv necessary.

On July 8, after further evidence that significant numbers of chicks were being lost at two other colonies, the decision was made to expand the total (but temporary) closure.

On July 9, the barriers went up. At the same time, a circular was distributed to all fee booths and the oversand booth in the North District. Everv oversand driver received a copy.

July 10. A group of night-fisherman came to the High Head Ranger Station to register their displeasure. At that time, a meeting was set up for the following day to discuss the matter.

Only 11 individuals showed up, but they assured us that they could have mustered many more... "over 150 buggies up here within an hour" one promised. Of the 11, one man assumed the role of spokesman though it should be emphasized that the fishermen are in no way sufficiently organized as to be represented or spoken for by a single individual or group.

The meeting lasted four hours in which time the fishermen presented their arguments against the closure. They maintained, first of all, that the north end of the closed area represented the best fishing on the Backshore. Further, they said many people, unaware of the recent closure, had travelled great distances to fish the full-moon tides in this area. They continually stressed their financial investment in equipment, in vehicles one individual even referred to his $35,000 condominium here. No mention was made of the economic aspect of their catches.

Initially, some concern for the terns was voiced: "The terns are the fishermen's friends. . . . We have coexisted with them for years." But from the start, the group was defensive: "As a surfcaster, I'm beginning to feel like an endangered species myself . . ."

Our response to the fishermen was at all times sympathetic. I explained, however, that while working nights dealing with the fox situation, we had discovered how widespread was the phenomenon of chicks spending the night on the lower beach. Also, we were finding these chicks crushed in vehicle tracks. I pointed out that it was our obligation under the law to prevent such losses and that complete closure of the beach was the only way to guarantee this.

As the meeting continued, the fishermen's feelings for the terns dramatically diminished: ". . . losing 7 birds a day won't cause them to go extinct. . ." ". . . vehicles might hurt them somewhat, but won't wipe them out . . ." "If a couple of chicks are lost, so what?"

At this point we realized the situation was beginning to deteriorate. We were "winning the battle, but losing the war," as Ranger Tubbs said. Our

firm resolve was polarizing the group, and this seemed to be a potentially harmful situation.

Ultimately, we presented the group with a compromise plan: each night, two hours before high tide, park personnel would remove one post from the barrier at Exit #9 and escort the fishermen's vehicles along a designated trail making certain that no young birds were in the track. This compromise plan was to be operated on a trial basis only for the next five nights at which time an assessment of its success would be made. A log follows.

July 12. Twelve vehicles were escorted through the area; a total of 18 chicks were safely removed from the track. The fishermen seemed to be impressed that the park would actually go to such lengths. Many realized for the first time that young terns were on the beach at night and they learned to recognize and look out for them. On the negative side of the ledger, a check the next day revealed that one vehicle drove beyond the protected area and one chick was found crushed in its tracks.

July 13. Only four vehicles were escorted but many people fished on foot. Twelve chicks were saved. A check the next day revealed no losses.

July 14. No vehicles showed up for escort, however tracks indicated that a vehicle had gone around the barrier earlier. The next day we found a dead chick in these tracks. It was almost fledged.

July 15. No vehicles showed up for escort. There was evidence that a single vehicle had gone through, but no dead chicks were found.

July 16. No vehicles showed up for escort, and there were no losses.

The concensus was that no appreciable night-fishing would occur again until the next full moon in August. The escort was suspended. Barriers were removed on August 10.

OTHER POSTINGS

Electric fences were installed at two colonies in response to fox predation. The High Head (N) colony fence was charged; the Exit #9 colony fence was not. In neither case, from the day they were put up until they were partially dismantled later in the season, did fox tracks ever cross these fences. Fox tracks abounded elsewhere on the beach.

The two fenced colonies were within two miles of each other, so it is thought that the one charger sufficed for the two fences; that is, the foxes learned their lesson on the charged fence (put up first) and avoided the uncharged one as a result. These fences greatly enhanced the productivity at these two colonies.

Another posting operation was the placement of shelter boxes to provide shade and protection from the elements for young tern chicks. These were wooden pint-sized strawberry boxes with openings cut out which were upturned and staked in the sand with shards of shingles. They were immediately accepted by the young birds and had a positive effect on their survival and fledging.

Table 1: Number of Censuses (Data Sheets Completed), Season of 1979

Colony		Also:	
High Head (N)	70		25 nest watches
Charlies	55		5 fox watches (night)
Exit #9	62		5 vehicle escorts (night)
Wood End Inside	25		
Wood End Outside	43		
Total	255		

Table 2: Number of Recorded Visitor Contacts, Season of 1979

POSITIVE*: 219
NEGATIVE: 164
Negative Breakdown re cause: Dog 15 (9%)
Vehicle 91 (56%)
People 57 (35%)
*does not include organized interpretive activities (walks, talks, etc.)

RESULTS AND DISCUSSION

The justification of, and rationale for, all our monitoring and censusing is the accumulation of data. This information enables us to assess the well-being of tern populations within the district, to discern trends from year to year, and to gauge the effects of our protection program.

This season's increased efforts have provided us with the most precise census data ever. We are now at the point of attempting to upgrade our abilities to analyze this more sophisticated data so as to properly evaluate all the complex factors involved in nesting success or failure. It is hoped that this report may elicit comments and suggestions for improvement from the scientific community.

The conclusions we are able to make are heartening. Indeed, 1979 has been a "bumper year" for Least Terns in the North District. Not only has there been a significant increase in the number of breeding pairs (see table 3), but the productivity of these birds is the best on record (see table 4).

Table 3: A Survey of the Base Number of Least Tern Nests (= Pairs) in the North District (Excluding Renesters), Seasons of 1976 - 1979.

1976	1977	1978	1979
107	124	90	163

Table 4: Comparison of North District Least Tern Data, Seasons of 1976, 1977, 1978, 1979

	1976	1977	1978	1979
initiated nesting	5/20	5/21 (storm)	6/4	5/26
first hatch	6/23	7/1	7/1	6/22
peak hatch	7/14	7/15	7/21	7/2
productivity	84	55	74	195

It is tempting to ascribe these increases to the effects of the Seashore's protection program, and certainly there is some correlation. Are we finally beginning to see the fruits of our efforts? The work of future seasons will tell us. At the same time it must be recognized that 1976 was the last productive year for Least Terns in the Seashore (largely at one enormous colony at North Beach, Orleans). The young from that year would only now, three years later, be returning as mature breeding adults. The possibility that this year's increase is a short-term one-time phenomenon can not be overlooked.

Also, this season there was an abundance of the small bait-fish which constitute the Least Tern's food supply. Although this factor was not quantified, the surf-fishermen of the Backshore were unanimous in their reports of increased numbers of these fish. Too, many of these fish were found discarded in all the tern colonies we visited, something not observed in past seasons. Dr. Ian Nisbet of the Massachusetts Audubon Society has repeatedly correlated nesting success with food supply. Certainly, this abundance was a major factor in this season's success. Since fluctuations of these fish are cyclic and beyond our control, we may not expect or rely on them for future seasons.

Least Terns this season were most fortunate in that they were largely spared a major storm. This season's single storm occurred after the vast majority of birds had finished nesting (on August 11). Loss of nests due to washout is estimated to be about 2% (see table 5). This storm also caused some nests to be abandoned (less than 11%), but in both cases the affected nests had little hope of producing young. These percentages are in vast contradiction to those of past seasons. Storms and attendant high tides are perhaps the single greatest mortality factor for nests, eggs and chicks in normal years. Once again, this is a factor over which we have no control and on which we cannot depend.

Another cautionary note to temper our elation over this season's success is this: while the numbers of breeding pairs of Least Terns did expand this season, the numbers of their nesting colonies continued to contract. There were 12 North District Least Tern colonies in 1976 and only 4 this season. While it is not possible to pinpoint the causes of this contraction, I continue to believe that the effects of human recreation constitute the chief potential factor. The fact that almost half of the district's Least Terns nested in one large colony (Wood End Outside), relatively isolated from beachgoers and vehicles by the Wood End Cut, supports this argument. This trend, i.e., the Least Tern population concentrating in fewer, larger colonies, presents a potentially negative situation for their future. Not only do these larger colonies theoretically present a more attractive target for predators, their losses are proportionately higher than those of smaller, dispersed colonies. The same principle applies to storm and high-tide damage. Predation is always a significant mortality factor.

Predation certainly was in evidence this season. Over 29% (see table 5) of the total nests are taken by predators, almost exclusively Red Fox (Vulpes fulva); the Great Horned Owl (Bubo virginianus) was present only early in the season with little overall impact. But the effect of this predation was lessened through a combination of good fortune and protective efforts. Fortunately the largest colony (once again, Wood End Outside) experienced almost no predation--just 2%, and this due to ants

killing newly hatched chicks. It may be that the parent birds did not protect their young in these few cases. The other three colonies were severely affected by fox predation. Red Fox, whose presence was barely noticed last season, was common in the dunes and on the Backshore. Fox tracks were everywhere. Individuals were consistently seen foraging during the day, evidence that their numbers have risen. Many of these were in poor condition.

On the night of June 16, the foxes struck the High Head (N) colony. Nineteen nests were lost in that single raid. For the next five nights we patrolled with flashlights, preventing further losses while we mobilized the electric fence. The fence was erected on June 22. For the remainder of the season, losses due to fox only occurred outside the fence. The fourth colony, Charlies, was not afforded this protection and it continued to lose nests (74% of the total nests) to the foxes throughout the season. It was not our intent to use this colony as a control; we simply did not have the resources for another fence.

The other important factor in tern nesting success is human disturbance. It is frustrating that there is little we can say, quantitatively, about this pressure. Obviously, it would be very difficult to measure the negative impact of adults being kept off their eggs and young in the mid-day sun.

Because of our intense patrolling this season, we did find many more chicks crushed in vehicle tracks this year, but here, too, quantification is difficult since most of the evidence is ground into the sand, picked up by foraging gulls, or lost to intervening tides. The best evidence we have to support the argument that human pressure is significant is a comparison, once again, of the relatively isolated Wood End Outside colony with the three other more accessible colonies.

The parameter being compared here is Survival Rate (see table 5), that is, the total number of chicks fledged in relation to the total number of eggs hatched. This comparison for the most part eliminates the effects of predation and washouts, both of which are more significant at the egg-stage.

Wood End Outside's rate of 0.81 greatly exceeds the rates of the others: High Head = 0.42, Charlies = 0.08, and Exit #9 = 0.36. Part of the explanation for this disparity must lie in the relative absence of the human factor beyond the Cut. The fact that Wood End Outside exhibits the highest rate of abandoned eggs, greater than 15% as compared with 9%, 4%, and 4% for High Head, Charlies, and Exit #9, respectively, may be simply because there were more eggs to abandon; that is, in the absence of losses due to predation, vehicles, etc., a certain rate of abandonment is natural. All of the above data applies to Least Terns only. Common Terns, nesting in grassy areas, are more difficult to observe without undue disturbance; hence, we know less about them.

The only North District Common Tern colony, Wood End Inside, consisted of 18 nests on June 29. We estimate that 8 young fledged there. But on August 6 there were still 13 nests with eggs, indicating earlier failure or many late-nesting birds. This colony remains a mystery. A single Common Tern nest amid the Least Tern nests at Wood End Outside apparently produced two fledged young.

Table 5: Fate of Least Tern Nest and Eggs, Season of 1979

COLONY:	High Head (N)	Charlies	Exit #9	Wood End Out*	District Total
Original Nests:					
hatched	19.66 - 36%	2 - 13%	9 - 75%	59.5 - 74%	
predation	34 - 61%	13 - 87%	3 - 25%	0.5 - 1%	
abandoned	1.33 - 2%	-	-	16.5 - 20%	
washed out	1 - 2%	-	-	1 1%	
Renests:					
hatched	11 - 52%	4 - 33%	18 - 51%	37 - 77%	
predation	4 - 19%	7 - 58%	15 - 43%	2.5 5%	
abandoned	5 - 24%	1 - 4%	2 - 6%	4 8%	
washed out	1 - 5%	-	-	3 - 6%	
Total Nests:					
hatched	30.66 - 40%	6 - 22%	27 - 58%	96.5 - 78%	160.16 - 58%
predation	38 - 49%	20 - 74%	18 - 38%	3 - 2%	79 - 29%
abandoned	6.33 - 8%	1 - 4%	2 - 4%	20.5 - 17%	29.83 - 11%
washed out	2 - 3%	-	-	4 3%	6 - 2%
Eggs from Original Nests:					
hatched	40 - 40%	4 - 15%	19 - 76%	117 - 75%	
predation	55 - 55%	23 - 85%	6 - 24%	1 - 1%	
abandoned	3 - 3%	-	-	30 - 19%	
washed out	2 - 2%	-	-	2 - 1%	
Eggs from Renests:					
hatched	20 - 54%	8 - 35%	34 - 49%	69 - 77%	
predation	6 - 16%	13 - 57%	31 - 45%	4 - 4%	
abandoned	9 - 24%	2 - 9%	4 - 6%	7 - 7%	
washed out	2 - 5%	-	-	6 - 6%	
Eggs from Total Nests:					
hatched	60 - 44%	12 - 24%	53 - 57%	186 - 76%	311 - 60%
predation	61 - 45%	36 - 72%	37 - 40%	5 - 2%	139 - 27%
abandoned	12 - 9%	2 - 4%	4 - 4%	37 - 15%	55 - 11%
washed out	4 - 3%	-	-	8 - 3%	12 - 2%
Survival Rate: total chicks fledged per total eggs hatched:	0.42	0.08	0.36	0.81	0.63

* 4 nests outcome unknown, not included

ACKNOWLEDGEMENTS:

I must certainly acknowledge the excellent work of the program's three Student Conservation Aides, Mark Ashton, Brian Moss, and Theresa Schaefer. Their talents and skills enhanced the program. I only hope they gained as much as they contributed. I would also like to express my deepest appreciation to Irving Tubbs, North District Ranger. Relatively new to the district and to the problems of the terns, he nonetheless quickly became one of their most effective defenders. It is a privilege to work with him.

A SYNOPSIS OF THE MASSACHUSETTS AUDUBON SOCIETY'S TERN WARDEN'S REPORT FOR 1979

(Based on the report by Tern Warden Peter Trull)

During 1979, the Massachusetts Audubon Society's Tern Warden, Peter Trull, regularly visited twelve tern colonies (see table). Only three of these colonies enjoyed good reproductive success. These were the Least Tern colonies in Duxbury, Nauset, and West Dennis. Trull speculates that these colonies were successful because there was no significant predation, no storm-related damage, and minimal human disturbance at the three sites. Furthermore, the Bass River at West Dennis and Nauset Inlet were good sources of food for the birds.

The nine unsuccessful tern colonies were the victims of predation and human disturbance. The New Island (Eastham) and Gray's Beach (Yarmouthport) colonies were constantly disturbed by Great Horned Owl attacks, the effects of which are manifold. Not only do owls take adult terns and chicks, but also many young chicks die of exposure as well. When an owl attacks a colony, the adults usually take wing to protect themselves, abandoning their nests. If the attack occurs on a cool or wet night, the temporarily abandoned chicks may die of exposure if they are not taken by the owl. Renesting took place throughout the season, with an average incubation period of 29 days.

The Plymouth Beach tern colony also suffered Great Horned Owl predation. However, there is evidence that the terns' incubation period was normal, indicating that many adults did not desert the nests at night. Trull believes that starvation may have been responsible for the poor productivity here. In mid-July, hundreds of Blue-backed Herring (Alosa aestivalis), including one pile of 43 which were four to five inches long, and Butterfish (Poronotus tricanthus) were found scattered throughout the colony. These fish were clearly too big for young or nearly fledged chicks to swallow. When Trull found ten dead chicks within a short distance of each other, he concluded they must have starved to death.

At Scortons Beach (Sandwich) and Hardings Beach (Chatham), Striped Skunk (Mephistis mephistis) took many nesting Least Terns. Skunk tracks, frequently leading from nest to nest, were found regularly in both colonies. The Leasts at Scortons Creek deserted by June 18; the 60 nesting pairs at Hardings Beach produced only two fledglings.

The Common Tern colony at West Dennis, which lies separate from the Least Tern colony there, suffered from Norway Rat (Rattus norvegicus) predation, as did the Long Beach (Centerville) colony. At both sites Trull found that eggs had been rolled from the nests, nests with eggs had been deserted, and freshly laid eggs had been removed from the nest. At West Dennis, where the Common Terns have had no breeding success for four consecutive years, partially eaten eggs, chicks, and adult terns were found under pieces of plywood.

The Kalmus Park (Hyannis) Least Tern colony was disturbed constantly by beachgoers and vandals, in spite of which the terns enjoyed fair nesting success. Fortunately, unless nests and chicks are literally stepped on or driven over, Least Terns often calm down quickly, settling back onto their nests soon after the intruders have passed.

TERN CENSUS AND PRODUCTION RESULTS - 1979
(in pairs)

COLONY	COMMON	LEAST	ROSEATE	ARCTIC	PRODUCTION	REMARKS
Duxbury Beach		185		1	Approx. 1.4 c/pr; good	Leasts--syncronized nesting; Arctics--deserted.
Plymouth Beach	385	15	3	8	Leasts-good; C,R,A-fair	C,R,A--Great Horned Owl predation.
North Sandwich	25	25			Leasts-fair; Common-none	Possible Red Fox predation; one Great Horned Owl kill found.
Scortons Creek, Sandwich		5			None	Deserted by 6/18.
Grays Beach, Yarmouthport	715		15		.75 c/pr.; fair	Great Horned Owl predation, night desertion; 29-day incubation.
New Island, Eastham	400		10		.25 c/pr.; poor	Great Horned Owl predation, night desertion; 29-day incubation; much renesting.
Nauset, Orleans	6	230		9	All good	No disruption; good food source.
Hardings Beach, Chatham		60			Poor	Skunk predation.
West Dennis Beach	90	56			Leasts--good; Commons--poor	Rat predation in Common Tern colony.
Kalmus Park (Lewis Bay), Hyannis		70			Lots of disturbance; Leasts-fair.	Human disturbance, vandalism, broken signs.
Long Beach, Centerville	35	40			Leasts--poor; Commons--none	Rats.
South Cape Beach Mashpee		70			Fair	Synchronized nesting until 7/19, then fox predation.

The South Cape Beach Least Tern colony (Mashpee), which had been abandoned following Red Fox (Vulpes fulva) predation in 1977 and 1978, enjoyed fair nesting success in 1979. On July 12, 49 fledglings were tallied. However, a fox did make an appearance after this date, causing terns to abandon the area once again. By July 27, no Least Terns remained at the site.

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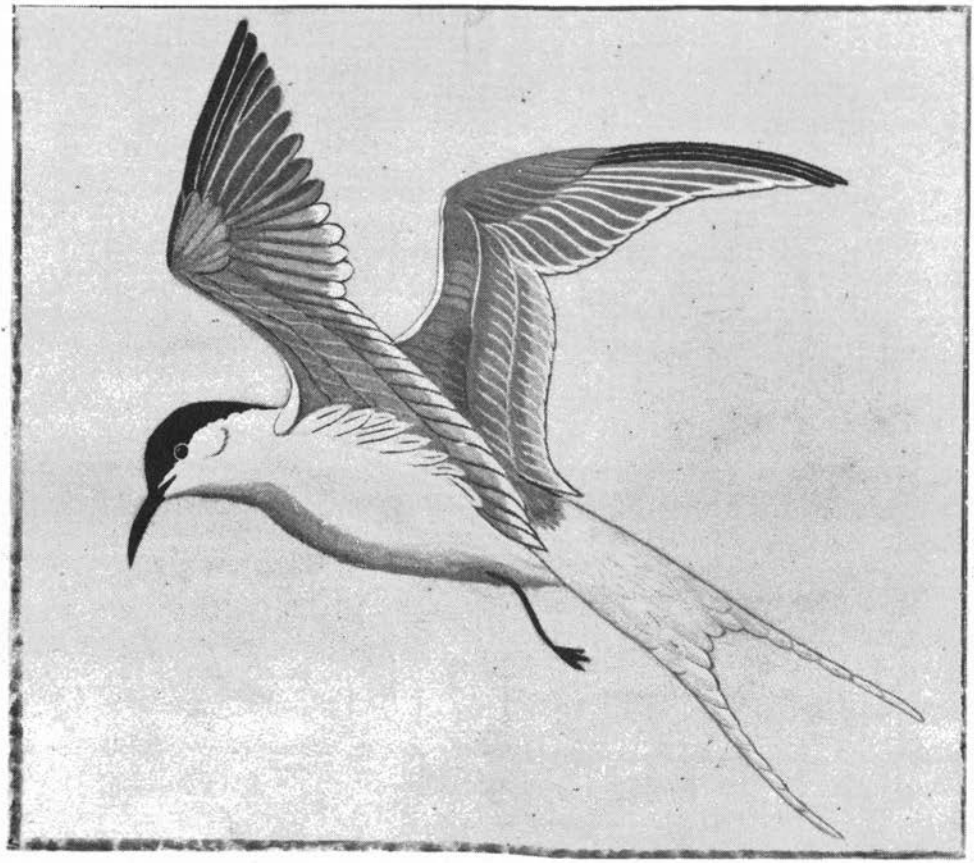
The complete fifteen-page report by Peter Trull contains extensive details on each tern colony. For more information, direct inquiries to Natural History Services, Massachusetts Audubon Society, Lincoln, MA 01773.



Tern painting by Maggie Taylor, Weston, Mass.

A NATURALIST REFLECTS ON THE MYTH OF NON-CONSUMPTIVE ENVIRONMENTAL USE AND THE SOUTH SHORE

by Wayne R. Petersen, Whitman

In reviewing the results of an information poll sent to members of the South Shore Bird Club, I noticed one particular comment: a member asked why the South Shore area lacked extensive coverage in the recent publication, Where to Find Birds in Eastern Massachusetts (1978), published by Bird Observer of Eastern Massachusetts. Obviously, the explanation is manifold, but, as I considered certain of the best South Shore natural areas, I was struck by what seemed to be a common denominator for many of them - limited extent or accessibility. This, in turn, led me to the subject of public responsibility for local ecology.

In 1945, Dr. John B. May, in reference to the South Shore, wrote, "The newcomer in the gentle art of bird-watching quickly recognizes that birds are to be found here in all kinds of surroundings and under diverse conditions. As he wanders about, bird glasses in hand and field guide and checklist in a convenient pocket, he begins to associate certain species of birds or groups of species, with certain very definite types of habitat. This is his introduction to the fascinating study of Ecology, the consideration of the interrelationships between definite groups of plants and animals in definite types of surroundings."

Indeed, Dr. May was ahead of his time. Only within the last decade has ecology become a household word. And yet, for many people ecology remains only a word, not an internalized, applied, and cherished ideology. I am continually surprised by the lack of awareness of ecological relationships, not only in my students, but also in the birding community. While I do not wish to imply any condemnation of birders who are not also "ecologists," it does seem paradoxical that many of us who are addicted to birding have little feeling for the environment beyond the objects of our quest. How often do carloads of observers arrive at a location to see some vagrant species, yet remain totally oblivious to the bird's surroundings, as well as to the impact that the observers' presence may have on both the bird and its environment?

In recent years, several leading ornithological journals have carried articles on "birding etiquette," and even the New York Times recently published an article entitled, "Birds and Environs Reported Harmed by Overzealous Throngs of Watchers." A very relevant paper, entitled, "The Myth of the Non-Consumptive User," appeared in Canadian Field-Naturalist, Vol. 91, No. 4, (1977). This stimulating article by Brian Wilkes addresses the issue of how nature-students, nature photographers, hikers, campers, and other seemingly innocuous outdoor groups are, in fact, major consumers of our natural resource base. The author builds a disturbing case arguing that the notion of non-consumptive use of our natural resources is invalid. By Wilkes' standards, the non-consumptive user can be categorized in a number of ways. Each category is based on the frequency and duration of participation in conventional non-consumptive activities. One category is the naturalist (or bird) club which organizes a specific roster of regular outings and field trips. Others are campers, wilderness users, and summer camps.

Non-consumptive use may affect spatial, visual, and physical dimensions. Spatial consumption simply means that outdoor recreation consumes space (e.g., Salisbury Beach State Reservation's camping area). Visual consumption, by Wilkes' definition, means that large numbers of people consume solitude. Parallel to this notion is the visual impact that humans may have on birds and other wildlife. Obviously, there are many species for which direct human harassment means serious disruption of one or more phases of the annual cycle. For certain rare or localized species, or for colonially nesting waterbirds, habitat options may be limited. Thus, sustained human pressure may force the species to move or to abandon the area, the net effect being consumptive use by a "non-consumptive" segment of society. The persistent use of tape recorders on local specialties or the regular disturbance of roosting waterbirds or owls for observation or photographs are familiar illustrations.

The final problem of direct physical impact is possibly the most obvious, even to the non-ecologist. While most birders do not dig up unusual plants or deliberately trample attractive flowers, they can adversely affect vegetation by tramping unchecked over the countryside, often in large groups. In fragile areas, such as sand dunes, salt marshes, the edges of freshwater marshes, or narrow trails in specialized habitat areas like bogs, the physical consumption of the environment is often conspicuous. Certain areas at Parker River Refuge or at the Cape Cod National Seashore clearly reflect this problem, and, fortunately, the managing authorities have reacted appropriately by installing boardwalks or wood-chip trails. Even in more remote forested areas, the establishment of campground facilities can provide habitat requirements for such "undesirable" species as the Brown-headed Cowbird (Molothrus ater) and House Sparrow (Passer domesticus), which might otherwise be absent.

There is an increasing need for awareness of the problem of non-consumptive use of the environment. All Americans should be cognizant of the fact that we, the "non-consumers," and not big business or overt resource abusers, are potentially the most destructive of all groups of recreationalists. With the recent emphasis on ecology and the benefits to be derived from enjoying our natural environment, we are, by virtue of numbers alone, partly responsible for the increasing scarcity of unimpaired open spaces.

With this in mind, bird and nature clubs, naturalists, indeed everyone, must pay heed to rules and standards of conduct in the outdoors. Agencies, too, must fulfill their commitment to preserve an already marred environment. Tremors of public dissatisfaction aimed at certain management efforts can readily be felt at some natural areas, such as Parker River Refuge, Monomoy Wilderness Area, the Cape Cod National Seashore, and several of the Nature Conservancy's land holdings. Yet, agencies responsible for these refuges are fighting for the preservation of the very areas the "non-consumptive" users wish to consume! As Brian Wilkes stated, "The recreation we have been discussing is not a right any more; it is a privilege."

The ultimate solutions to the concerns reflected here should not lie solely in the hands of politicians, but must be sought at the grass-roots level. For years birders and other naturalists have enjoyed these areas as if they were ours alone. It is our responsibility to prevent damage to these areas so that they are preserved for future generations.

With these considerations in mind, I realize that I have resisted describing the abundant attractions of the area that I most cherish - the South Shore. While the South Shore offers many easily reached and accessible birding spots, it is also true that certain areas are private or otherwise inaccessible. But with a little discretion, many of these areas can be readily explored without generating animosity from the natives and without stumbling into the ecological pitfalls described earlier.

As the size of this region precludes its description in a single article, I will depict the area in the broadest terms. For clarity, the region should be defined at the outset, since few maps identify the South Shore as such. For my purposes, the South Shore is Plymouth County, including the geographical appendage of Cohasset, which, by a quirk of political gerrymandering, lies in Norfolk County.

Most of the coastal South Shore region is characterized by features typical of what geologists call a coastal plain. The whole region, however, is part of a great glacial outwash plain, left behind as the last continental ice sheet retreated ages ago. The outer coast is formed mainly of sand beaches between low bluffs and partially eroded drumlins, though in the northern sectors of Cohasset and Scituate, granite headlands, offshore ledges, and tiny islets are reminiscent of Essex County's Cape Ann region. In the southern part of the county, Plymouth's Manomet Hills are all that remain of a terminal moraine where it met the sea.

Water is abundant on the South Shore. Inland from the coast, numerous swamps and ponds exist, some with tiny out-flow streams, all meandering coastward, either as small streams or via the larger Taunton River (to Narragansett Bay) or the Indian Head-North River (to Massachusetts Bay). Ponds ranging in size from mighty Lake Assawompsett (the largest natural lake in the Commonwealth) to tiny kettle ponds provide a key component that influences much of the biota of the region. In fact, some of the most biologically productive habitats are the many man-made cranberry bog reservoir ponds. Often closely associated with the cranberry bogs are swamps of Coast White Cedar (Chamaecyparis thyoides). These areas, like the more numerous Red Maple (Acer rubrum) swamps, provide habitat for some of Plymouth County's most interesting plant and animal life. Extensive freshwater marshes are scarce on the South Shore and occur mainly as occasional pockets along the river edges or in quiet corners of certain cranberry bog reservoirs. Good examples exist in the towns of Marshfield, South Hanson, and West Bridgewater.

South Shore woodlands are primarily second-growth, clearly a reflection of the agricultural past. The major tree communities in the more mature woodlands are either oak-hickory, pine-oak, or beech-hemlock. The previously mentioned cedar and maple swamps represent two distinctive local biotic communities. In the extreme southern sections of Plymouth County, a northward extension of true pine barren habitat occurs, which is epitomized by the extensive Pitch Pine (Pinus rigida) - Scrub Oak (Quercus ilicifolia) barrens of Plymouth's Myles Standish State Forest.

Farmland and open country are two of the major features of interior southeastern Massachusetts. In the towns of Halifax, Bridgewater, and Middleboro, several large dairy operations exist, with their associated hay fields,

corn fields, and pastureland.

Other important habitats include two modest barrier beaches, Duxbury Beach and Plymouth Beach, each backed by varying acreage of salt marsh and enclosing fine saltwater bays with extensive mud flats and mussel beds. Other salt marsh habitat is to be found at the mouths of the North and South Rivers in Marshfield and Scituate.

Finally, the influence of Massachusetts and Buzzards Bays should not be overlooked. The proximity of saltwater not only attracts large numbers of vertebrate and invertebrate forms, but also serves to moderate the local climate in such a way that the coastal areas tend to be cooler in the summer and milder in the winter than more inland areas. This often dramatically affects local bird populations.

I hope that future articles will provide more specific descriptions of South Shore habitats. The interested reader is also referred to articles appearing in Where to Find Birds in Eastern Massachusetts (1978) published by Bird Observer of Eastern Massachusetts. This publication covers the Bridgewater-Lakeville area, Plymouth, and Plymouth Beach.

THE FALL HAWK WATCH

This fall, the Eastern Massachusetts Hawk Watch will conduct coordinated watches on the following weekend dates:

September 13 & 14
September 20 & 21
October 4 & 5
October 25 & 26

We will also conduct our fourth annual consecutive-day watch on Mt. Wachusett, in Princeton, from September 6 through October 13.

Each year the Eastern Massachusetts Hawk Watch attempts to place in the field as many hawk watchers as possible to observe the migration through the eastern half of the Commonwealth. The success of the watch depends on its site leaders, people who volunteer to work at a specific site on a set date and who are responsible for completing the report form and returning it to the coordinator.

This year our need for additional site leaders and other volunteer observers is greater than ever. In 1979, significant new fall observation sites were discovered in Fitchburg and West Newbury. And we need better, longer coverage at Mt. Wachusett. Four people provided much of the coverage at Wachusett in recent years, but they will not be able to assume as much responsibility this year.

The most important responsibility of a site leader is to be at the site on the date scheduled, weather permitting. Site leaders don't need to be hawk experts, although there is no better way to become an expert than to spend time on site. Even if you are unable to identify many of the hawks you see, merely reporting the numbers of unidentifieds provides valuable data. And site leaders are usually not alone, especially at Wachusett. Many hawk watchers come up to visit for part of a day. In 1979, Wachusett averaged 5 observers a day until the last week of September. But we need at least one observer to assume responsibility for each site: for Mt. Wachusett on every day from September 6 through October 13, and for the other sites on the four coordinated weekend watches.

Some prospective site leaders may be discouraged by the thought of committing themselves far in advance to watch on a specific day, especially a weekday at Mt. Wachusett. They worry that the weather and hawk flight might be poor. Actually, the consecutive-day watch on Mt. Wachusett needs coverage on days when the winds and weather may not be the best. In order to understand hawk migration, we need to know the days on which relatively few hawks are flying. Furthermore, at Mt. Wachusett some of our best views of hawks are on days when the weather does not seem to favor massive migration. In 1979, two of our most exciting flights, yielding eyeball views of Sharpshins, Broadwings, and Marsh Hawks, and a spectacular view of a Golden Eagle, occurred on strong southwest winds, when many people wouldn't anticipate an interesting hawk flight.

With regard to inclement weather, this year we have a phone number all Wachusett site leaders can call to receive an accurate weather report from

the mountain. Site leaders are not expected to cover on days of persistent rain.

This year we will also have a special workshop for interested site leaders. The workshop, scheduled for September 4, from 7:30 to 9:30 p.m., will be held in the Cambridge-Somerville area. Discussion will focus on what we have learned about hawk migration through eastern Massachusetts and about hawk watching at Mt. Wachusett. We will also have a refresher discussion on hawk identification, using numerous slides. Due to limited space, the workshop must be confined to site leaders already committed by September 3.

Of course, we also need more volunteer observers this fall. If you haven't participated before, don't hesitate to volunteer because you don't feel confident about your ability to identify hawks. We attempt to station two or more observers at each site. And, if you wish, you can be stationed with more experienced observers who will be able to teach you some of the techniques of field identification while you help spot the birds. Studying hawks during migration is the best way to become familiar with them! The New England Hawk Watch also sells a handy six-page silhouette guide to hawk identification. The guide is obtainable from Paul Roberts at the address below for $1.00 + $.25 postage.

Some of the sites we intend to cover this fall are West Newbury, Andover, North Andover, Haverhill, Chelmsford, Groton, Sudbury, Ashburnham, Fitchburg, Mt. Wachusett, Harvard, Littleton, and parts of the Outer Cape.

We need <u>your</u> help this fall. If you've not hawk watched before, devote one day, or even a half-day, to it this fall. Write to:

Paul M. Roberts
24 Pearson Road
Somerville, MA 02144
(617) 776-8566

indicating the date(s) on which you'd like to observe. Please note if you have specific site preferences and if you want to be stationed with more experienced observers. Paul will provide you with a report form, instructions sheet, and directions to the site. If you've not hawk watched before, he can also provide you with a brief introduction to hawk watching and a 1979 New England Hawk Watch Report. Mt. Wachusett site leaders will also receive a Mt. Wachusett horizon map.

Zoomscope for sale: Swift Mark II Telemaster, Model 841 (15X-60X), top of the line, NEW in August 1976. List price now $385; will sell at 40% off current discount price of $308. <u>$185 or best offer</u> (without tripod). Has shown birds clearly round the world: Rockport-Norway-Spain-Kenya-Australia-Pt.Reyes-S.A.-Everglades. Owner must reduce expenses from impulsive bidding at BBC auction. References required. 734-1862.

RESULTS OF THE 1979 CHRISTMAS BIRD COUNTS

IN EASTERN MASSACHUSETTS

by Robert Stymeist, Brookline

During the 1979 Christmas Bird Count (CBC), a total of 189 species were recorded on 19 eastern Massachusetts CBCs; this was augmented by two additional races: Ipswich Sparrow and Oregon Junco. We would like to thank Dave Emerson of Taunton for providing us with the results for the Massachusetts section of the Westport-Tiverton Rhode Island CBC. In 1978 172 species were recorded; the warmer and almost snowless winter of 1979 accounted for the increase in species and the number of individuals reported in many species. Outstanding among the reports were Arctic Loon, Western Grebe, Cory's Shearwater, White-rumped Sandpiper, Ash-throated Flycatcher, Short-billed Marsh Wren, Swainson's Thrush, White-eyed Vireo, Prairie and Wilson's warblers, Brewer's Blackbird, Western Tanager, Green-tailed Towhee, and Harris's Sparrow.

The warmer weather certainly can be held responsible for higher counts such as 446 Common Flickers, 5 House Wrens, 55 Gray Catbirds, 20 Ruby-crowned Kinglets, 22 Common Yellowthroats, 417 Eastern Meadowlarks, 100 Rufous-sided Towhees, and 26 Chipping Sparrows.

Of boreal eruptive species, only the Northern Shrike was reported in any numbers. There are reported in the summary some winter finch records that must be looked at very critically as such finches, with the exception of Evening Grosbeak, simply were not very much in evidence this winter.

B.O.E.M. has listed in the following tabulation of the eastern Massachusetts CBCs all the species that were recorded by the compilers of the counts. We have not edited for any questionable species of which there may be some; such editing will be up to the regional editor of American Birds who, with all the supporting detail, can pass the final judgment.

The complete results of the 1979-80 Christmas Bird Count can be ontained by sending a check for $5.50, payable to American Birds, 950 Third Avenue, New York, New York, 10022. This mammoth issue contains the results of all the counts in North America as well as several in Central America and many of the islands in the Caribbean. It is usually available after September 1.

Species	Athol	Buz.Bay	C. Ann	C. Cod	Concord	Gr.Bos.	Marsh.	M.V.
Common Loon	2	31	21	44		1	26	55
Arctic Loon								
Red-throated Loon		2	2	30		4	2	33
Red-necked Grebe		3		1		2	9	5
Horned Grebe		655	22	11		52	3	7
Western Grebe								
Pied-billed Grebe		17	1	46	4	15		3
Cory's Shearwater				1				
Gannet			20	1850			2	3
Great Cormorant		130	126	115		116	2	29
Double-crested Cormorant				2		3		
Great Blue Heron		38	2	70	1	7	3	19
Green Heron					1	1		1
Great Egret		1						
Black-crowned Night Heron		12		6		1		1
American Bittern			2	1	1			
Mute Swan		26	4					356
Whistling Swan								
Canada Goose	33	674	1618	3100	1649	83	1835	1100
Brant		60	2	1070		170	2373	28
Snow Goose		1	2	2				
Mallard		266	623	298	1223	1682	87	299
Black Duck	9	1096	1027	3507	281	1802	2009	584
Gadwall			5			1		3
Pintail			3	5	6	4	1	4
Green-winged Teal				26	1	18		6
European Wigeon		1	1					
American Wigeon		58	34	29		81		53
Wood Duck		1	1	1				2
Redhead		70		2				1
Ring-necked Duck		75	8	100	20	4		
Canvasback		288		614	1	6		176
Greater Scaup		3411	281	59		2233	23	53
Lesser Scaup						6		
Common Goldeneye	4	1295	339	237	3	415	300	128
Barrow's Goldeneye				1		1		
Bufflehead		1449	255	1287	3	594	72	291
Oldsquaw		632	7	96		2	33	8
Harlequin Duck			2	1			1	
Common Eider		458	2145	22256		1931	7380	2552
White-winged Scoter		314	269	33		105	197	282
Surf Scoter		646	6			1	11	6
Black Scoter		22	2	71			38	20
Ruddy Duck		6	12	38		66		64
Hooded Merganser	13	231	6	67	1	24		21
Common Merganser	11	48	3	415	15	87	1	103
Red-breasted Merganser		1430	209	459		892	288	6120
Goshawk					2	1		
Sharp-shinned Hawk	3	4		13	5	2		3
Cooper's Hawk	1			1				
Red-tailed Hawk	1	7	5	6	49	22		13
Red-shouldered Hawk						1		
Broad-winged Hawk								
Rough-legged Hawk					1	2		6
Bald Eagle								
Marsh Hawk		1		12		2	3	16
Osprey						1		
Peregrine Falcon						1		
Merlin				3				2
American Kestrel		12	8	14	12	22	11	12
Ruffed Grouse	4	3	3		4			
Bobwhite		47		48				9
Ring-necked Pheasant	4	6	28	2	139	211		8
Clapper Rail								
Virginia Rail				10	2		2	
Common Gallinule								
American Coot		65	13	90	13	45		33

Sp.	Millis	Nant.	N.B.	Newbpt.	Plym.	Quin.	Tau-Mb.	Tuck.	Westpt.	Wilm.	Worc.
CL		103	1	60	48	4		7	26		2
AL				1							
R-tL		260		9	7	8		4	27		
R-nG		19	16	15	1						
HG	14	17	47	105	10	116			47		7
WG		1									
P-bG	7	24		1	23	2	8		1	2	1
CS										2	1
G		107			8						
GC		14	100	6	30	6002	1	18	34		
D-cC	1				2	3					
GBH		41	3	2	5	14	1	6	20		
GH											
GE											
B-cNH		8				6		8			
AB		3	1	1		1					
MS		80	35	2	109				83		
WS		1							1		
CG	593	698	77	2380	346	109	77	149	2260	261	537
B		55			400	1623		41			
SG					2						
M	513	47	417	162	434	419	135		233	197	415
BD	331	561	481	6850	1081	1516	104	145	781	28	176
G		6		47	19	4					
P				70	4	1			24		
G-wT		6			1				16		
EW											
AW		230		19	1	11	3	8	122		
WD		1		1	1	1					
R		140			7						
R-nD	14	74			51		1				
C	22	160	22		21	2	178		400		
GS		607	85	22	3	2426	93		4		
LS		14 ?	2766		10						
CG	2	1240	311	538	340	995	141	324	636	10	54
BG		6		2	3	1	1				
B	2	530	500	318	161	467	10	21	125		8
O		65080	322	156	61	22		17600			1
HD											
CE		8815	19	45	3428	4292		5328			
W-wS		512	274	48	264	460		34	8		
SS		96	53	5	32	3		6	4		
BS		51	9	2	16	4		8	2		1
RD	22	10			2		1		1		15
HD	21	10		2	18	6	26		4	1	11
CM	33	23	11	178	336	43	40	9	1		307
R-bM	6	3376	41	91	661	2197		242	702		
G	1					1					
S-sH	1	7		2	2	2	2		1		1
CH											
R-tH	16	25	2	28	9		7	1	7	4	10
R-sH	1										
B-wH			1								
R-lH	1	4		6			1	3			
BE				1							
MH		34		4			1	5	4		
O											
PF			1					1			
M		5		1	1	2	1				
AK	19	25	14	17	9	16	18	1	9		2
RG	18			1	33	8	4			1	5
B				14	15		12				1
R-nP	20	43		32		8	4		3	8	19
CR					1						
VR		3		3	1	3		1			
CG		1									
AC	65	108	4		110	2	66		179		

Species	Athol	Buz.Bay	C. Ann	C. Cod	Concord	Gr.Bos.	Marsh.	M.V.
Killdeer			14		1	5	1	6
Black-bellied Plover			1	7		6		
Ruddy Turnstone								
American Woodcock				1		1		1
Common Snipe		14		14	2	2	1	5
Greater Yellowlegs		25	2	15		1		2
Red Knot							50	
Purple Sandpiper		2	33			12	1	7
White-rumped Sandpiper								
Dunlin		7	134	990		28	85	22
Long-billed Dowitcher				1		2		
Marbled Godwit								
Sanderling		4	32	314		40	4	18
Pomarine Jaeger				1				
Glaucous Gull								1
Iceland Gull		1				1		
Great Black-backed Gull		212	5053	1278	209	716	507	505
Lesser Black-backed Gull								
Herring Gull	1	3113	11384	12196	1407	8786	3651	4150
Ring-billed Gull	5	192	336	403		815	91	955
Black-headed Gull				6				1
Laughing Gull		1				3		1
Bonaparte's Gull		261	509	157		601	126	1482
Little Gull								
Black-legged Kittiwake				16000			7	1
Common Tern				1				
Razorbill		1		18			10	
Thick-billed Murre			1					
Dovekie							3	
Black Guillemot								
Rock Dove	153	261	414	65	678	2529	222	46
Mourning Dove	160	293	419	197	1098	322	79	193
Barn Owl				2				4
Screech Owl		13	2		24	21	1	1
Great Horned Owl		3	2	6	7	8	1	
Snowy Owl	1							
Barred Owl								
Long-eared Owl					2			
Short-eared Owl								
Saw-Whet Owl								
Belted Kingfisher		27	11	22	9	11		9
Common Flicker		45	3	91	7	27		50
Pileated Woodpecker	1		1		5			
Red-headed Woodpecker						1		
Red-bellied Woodpecker					1			1
Hairy Woodpecker	17	6	11	10	106	22	1	6
Downy Woodpecker	37	34	37	29	377	163	19	17
Ash-throated Flycatcher								
Eastern Phoebe								1
Horned Lark	22	32	78	45		29	25	70
Tree Swallow				1				2
Blue Jay	405	455	173	520	1174	357	49	137
Common Crow	78	389	500	498	1599	1085	219	225
Fish Crow					6	7		
Black-capped Chickadee	535	735	548	892	2578	921	224	496
Tufted Titmouse	53	72	37	30	497	150	48	
White-breasted Nuthatch	75	36	37	10	364	107	20	68
Red-breasted Nuthatch	9	5			10	2		1
Brown Creeper	7	11	6	7	43	28		4
House Wren				1		1	1	
Winter Wren		2	1	3	2	1		4
Carolina Wren		22		5		1	3	36
Long-billed Marsh Wren				12	2	1		
Short-billed Marsh Wren				1				
Mockingbird	6	146	43	81	144	141	20	10
Gray Catbird		11		9		4	1	5
Brown Thrasher		2		5		4		
American Robin	7	408	34	95	219	183	4	6

Sp.	Millis.	Nant.	N.B.	Newbpt.	Plym.	Quin.	Tau-Mb.	Tuck.	Westpt.	Wilm.	Worc.
K				1	7	5				1	
B-bP		15				10		8	8		
RT		1	2			7					
AW	1			1							
CS	1	5		8	3		1				1
GY			3								
RK											
PS		24	8	1	225			43			
W-rS				1							
D		14	55	120	78	162		5	175		
L-bD											
MG								1			
S		119	32	10	22	12		69	3		
PJ											
GC		4		1							
IG		21		7			1			1	
GB-bG	456	5646	51	355	606	647	341	239	65	25	105
LB-bG		4									
HG	3089	16483	1790	3367	4113	7731	1650	1958	1700	3550	805
R-bG	24	32	503	37	448	1644	105	3	291	3	6
B-hG				1							
LG			2			1					
BG		2651	70	169	17	922		573	253		
LG				5							
B-lK		819		4	14			28			
CT											
R		7			19				1		
T-bM											
D											
BG		3			3						
RD	538	99	478	385	181	423	488		11	457	474
MD	121	136	223	840	200	135	427		139	96	417
BO											
SO	3			28	7	1	7		3		
GHO	4		1	15		1	6		10		2
SO		1		1		1					
BO				3		1	3				
L-eO							2				
S-eO		4		1			1	1			
S-WO		5									
BK	3	4	8	6	2		2		2	2	5
CF	3	147	5	11	16		7	25	6	2	1
PW							1				1
R-hW	1										
R-bW	2						1				
HW	26		3	47		12	20		1	15	15
DW	83	5	28	80	22	89	59	6	10	31	69
A-tF									1		
EP					1						
HL		41		119	41	25	200		65	1	
TS											
BJ	348	69	272	405	331	318	471	23	65	201	482
CC	1014	305	249	567	149	350	260	9	31	61	223
FC	65										
B-cC	873	143	269	770	639	324	385	15	77	227	608
TT	179		81	41	45	108	182		18	104	50
W-bN	93	1	28	82	23	110	69	1	8	30	63
R-bN	1		2	3	14	1	1			9	14
BC	15		1	11	7	4	6		1	7	6
HW	1		1								
WW					2	1					
CW	1	1	10				2		12		
L-bMW		1						1			
S-bMW											
M	46	31	38	57	33	67	46		14	13	23
GC	1	7	1	1	1			5	8		1
BT					1				1	1	
AR	36	32	27	41	75	15	4	2	22	27	64

Species	Athol	Buz.Bay	C. Ann	C. Cod	Concord	Gr.Bos.	Marsh.	M.V.
Hermit Thrush		6		1	1	1	1	
Swainson's Thrush		1						
Eastern Bluebird				4				
Golden-crowned Kinglet		38	12	26	14	5	5	2
Ruby-crowned Kinglet		6	1	3	1	1	1	
Water Pipit								
Cedar Waxwing		40	25	45	36	10		
Northern Shrike	2		1		2	2		
Starling	922	1883	5335	4092	3668	98700	3090	3900
White-eyed Vireo		1						
Orange-crowned Warbler		1	1	4		1		
Yellow-rumped Warbler		387	161	1579	12	73	88	1015
Pine Warbler		1						
Prairie Warbler								
Palm Warbler		2		7		2		6
Common Yellowthroat		1		8	2	8		
Yellow-breasted Chat		3		2		3		
Wilson's Warbler						1		
House Sparrow	441	545	626	401	2855	953	295	140
Eastern Meadowlark		6	3	138	8	13	8	49
Red-winged Blackbird		8		25	58	175	1	4
Northern Oriole				4				
Rusty Blackbird	1				4			
Brewer's Blackbird								1
Common Grackle		4	2		8	1		205
Brown-headed Cowbird	5	3	1	1	153	28	6	50
Western Tanager				1				
Cardinal	34	180	45	142	232	149	19	32
Dickcissel				1		1	1	
Evening Grosbeak	555	18	48	6	676		12	
Purple Finch	15	15	6	2	97	6		2
House Finch	10	419	181	280	44	172	70	178
Common Redpoll								
Pine Siskin	2					2		
American Goldfinch	34	146	84	49	702	356	41	48
Red Crossbill			9					
White-winged Crossbill						34		
Green-tailed Towhee				1				
Rufous-sided Towhee		50		6	1	1	1	13
Savannah Sparrow		11	15	20	1	11	4	4
"Ipswich" Sparrow								
Sharp-tailed Sparrow				3		2		
Seaside Sparrow								
Vesper Sparrow								
Lark Sparrow								
Dark-eyed Junco	543	224	126	27	749	751	68	19
"Oregon" Junco						1		
Tree Sparrow	26	45	94	13	551	339	33	9
Chipping Sparrow		16		1			4	1
Field Sparrow		65	3	34	23	51	1	
Harris' Sparrow		1						
White-crowned Sparrow		1			1	2		
White-throated Sparrow	8	365	53	210	192	213	48	147
Fox Sparrow		3	2	1	2	11	1	
Swamp Sparrow		22	2	28	34	24	4	9
Song Sparrow		352	109	193	195	767	51	80
Lapland Longspur			3	6		10		
Snow Bunting		11	47	87			2	1

Sp.	Millis	Nant.	N.B.	Newbpt.	Plym.	Quin.	Tau-Mb.	Tuck.	Westpt.	Wilm.	Worc.
HT	3	1			2	4					
ST	1										
EB											
G-cK	19	6		11	34		3		1		19
R-cK			1	2	1		1	2			
Wp			7								
CW	13	2		154	22	100					6
NS	1	1		1	4						2
S	3539	3036	2077	10732	520	90000	12008	120	330	527	2068
W-eV											
O-cW											
Y-rW	1	3128	351	54	699	101	89	333	80		4
PW					1						
PW		1									
PW	1	48	8		1	1					
CW		2							1		
Y-bC		1	1						1		
WW											
HS	558	151	431	729	229	285	376		61	201	487
EM	2	34	3	33		4	43	28	45		
R-wB	1	11	4	6		52	5		1		19
NO		4			1						1
RB	3	2		1		10					
BB											
G	5	4	4			4	2	1	3		2
B-hC			29	5		15	12		55	56	
WT											
C	86	38	148	40	51	89	39	3	18	26	50
D				1							
EG	13	2	58	161	26	2	140			7	161
PF	12		6	12		13	28		2	2	5
HF	9	77	200	67	103	110	94		19	6	98
CR						4					
PS											
AG	131	7	99	130	86	155	150	16	24	77	109
RC											3
W-wC						2					
G-tT											
R-sT		3	10	1	1	4	2	5	2		
SS	3	27		3		2	1	4	7		
"I"S		4		1	4			1	2		
S-tS					1				1		
SS		1		3							
VS				1							
LS						1					
D-eT	387	10	98	138	181	410	160		23	50	317
"O"J											
TS	182	2	23	390	67	330	107		13	67	120
CS						4					
FS	5	3	20	2	15	68	25		18		1
HS											
W-cS			11	4		3		1			1
W-tS	19	37	154	65	62	111	33	9	36	5	53
FS	1			1		2		1	3		1
SS	15	5		22	18	38	3	4	7		1
SS	54	84	60	134	108	228	33	54	59	30	71
LL				15			2				
SB		3		225	28		43	3	7		3

TIDE CHART

Tide Table for Boston Harbor.
Add one hour for Daylight Savings Time.

1980 JULY - AUG. 1980

Morning	BOSTON	Afternoon
High 10 41 Height 9.5 Low 4.31 Height −0.8 Sunrise 4.31	SUNDAY 27	High 10 58 Height 11.0 Low 4.43 Height −0.1 Sunset 7.09
High 11 28 Height 9.9 Low 5.17 Height −1.2 Sunrise 4.31	MONDAY 28	High 11 43 Height 11.2 Low 5.31 Height −0.5 Sunset 7.09
High — Height — Low 6.04 Height −1.5 Sunrise 4.32	TUESDAY 29	High 12 17 Height 10.2 Low 6.18 Height −0.2 Sunset 7.08
High 12 32 Height 11.3 Low 6.51 Height −1.6 Sunrise 4.33	WEDNESDAY 30	High 13.04 Height 10.5 Low 7.10 Height −0.8 Sunset 7.07
High 1 22 Height 11.2 Low 7.39 Height −1.5 Sunrise 4.34	THURSDAY 31	High 1 55 Height 10.6 Low 8.01 Height −0.8 Sunset 7.07
High 2.15 Height 10.9 Low 8.30 Height −1.3 Sunrise 4.36	FRIDAY 1	High 2.46 Height 10.7 Low 8.56 Height −0.7 Sunset 7.05
High 3.09 Height 10.5 Low 9.22 Height −0.9 Sunrise 4.37	SATURDAY 2	High 3.41 Height 10.6 Low 9.56 Height −0.5 Sunset 7.04
BOSTON		BOSTON

1980 AUGUST 1980

Morning	BOSTON	Afternoon
High 10 52 Height 9.4 Low 4.37 Height −0.6 Sunrise 4.46	SUNDAY 10	High 11 04 Height 10.5 Low 4.46 Height 0.1 Sunset 6.51
High 11 35 Height 9.4 Low 5.20 Height −0.6 Sunrise 4.47	MONDAY 11	High 11 46 Height 10.3 Low 5.31 Height 0.1 Sunset 6.50
High — Height — Low 6.00 Height −0.5 Sunrise 4.47	TUESDAY 12	High 12 13 Height 9.5 Low 6.13 Height 0.1 Sunset 6.50
High 12.27 Height 10.2 Low 6.40 Height −0.4 Sunrise 4.48	WEDNESDAY 13	High 12 53 Height 9.4 Low 6.55 Height 0.2 Sunset 6.49
High 1.08 Height 9.9 Low 7.19 Height −0.1 Sunrise 4.48	THURSDAY 14	High 1.34 Height 9.4 Low 7.37 Height 0.4 Sunset 6.48
High 1.50 Height 9.6 Low 7.59 Height 0.1 Sunrise 4.50	FRIDAY 15	High 2.14 Height 9.3 Low 8.20 Height 0.6 Sunset 6.46
High 2.32 Height 9.2 Low 8.41 Height 0.5 Sunrise 4.51	SATURDAY 16	High 2.56 Height 9.1 Low 9.05 Height 0.8 Sunset 6.44
BOSTON		BOSTON

Eastern Standard Times - Add 1 Hour For Daylight Savings Time.

1980 JULY - AUG. 1980

Morning	BOSTON	Afternoon
High 4 06 Height 10.0 Low 10 18 Height −0.5 Sunrise 4.37	SUNDAY 3	High 4 38 Height 10.5 Low 10 56 Height −0.3 Sunset 7.02
High 5 07 Height 9.5 Low 11 16 Height −0.1 Sunrise 4.38	MONDAY 4	High 5 36 Height 10.4 Low 11 59 Height −0.2 Sunset 7.02
High 6 11 Height 9.2 Low — Height — Sunrise 4.38	TUESDAY 5	High 6 38 Height 10.3 Low 12 17 Height 0.2 Sunset 7.01
High 7 15 Height 9.0 Low 1 02 Height −0.2 Sunrise 4.40	WEDNESDAY 6	High 7 38 Height 10.3 Low 1 17 Height 0.4 Sunset 7.00
High 8 17 Height 9.0 Low 2 03 Height −0.3 Sunrise 4.41	THURSDAY 7	High 8 36 Height 10.4 Low 2 18 Height 0.4 Sunset 6.57
High 9 14 Height 9.1 Low 3 00 Height −0.4 Sunrise 4.42	FRIDAY 8	High 9 30 Height 10.5 Low 3 11 Height 0.3 Sunset 6.56
High 10 04 Height 9.2 Low 3 50 Height −0.6 Sunrise 4.45	SATURDAY 9	High 10 18 Height 10.6 Low 4 01 Height 0.2 Sunset 6.54
BOSTON		BOSTON

1980 AUGUST 1980

Morning	BOSTON	Afternoon
High 3 18 Height 8.8 Low 9 26 Height 0.8 Sunrise 4.52	SUNDAY 17	High 3 42 Height 9.0 Low 9 53 Height 1.0 Sunset 6.43
High 4 05 Height 8.9 Low 10 14 Height 1.1 Sunrise 4.53	MONDAY 18	High 4 29 Height 8.9 Low 10 46 Height 1.1 Sunset 6.41
High 4 56 Height 8.7 Low 11 04 Height 1.4 Sunrise 4.55	TUESDAY 19	High 5 19 Height 8.9 Low 1 42 Height 1.1 Sunset 6.40
High 5 50 Height 8.1 Low 11 57 Height 1.4 Sunrise 4.56	WEDNESDAY 20	High 6 12 Height 9.1 Low — Height — Sunset 6.38
High 6 45 Height 8.2 Low 12 38 Height 0.9 Sunrise 4.57	THURSDAY 21	High 7 06 Height 9.3 Low 12 52 Height 1.3 Sunset 6.37
High 7 40 Height 8.4 Low 1 33 Height 0.5 Sunrise 4.58	FRIDAY 22	High 8 00 Height 9.8 Low 1 47 Height 1.0 Sunset 6.35
High 8 34 Height 8.8 Low 2 24 Height 0.1 Sunrise 4.59	SATURDAY 23	High 8 52 Height 10.3 Low 2 39 Height 0.5 Sunset 6.34
BOSTON		BOSTON

Eastern Standard Times - Add 1 Hour For Daylight Savings Time

1980 AUG. - SEPT. 1980

Morning	BOSTON	Afternoon
High 9 24 Height 9.4 Low 3 16 Height −0.5 Sunrise 5.00	SUNDAY 24	High 9 43 Height 10.8 Low 3 30 Height −0.1 Sunset 6.32
High 10 15 Height 9.9 Low 4 04 Height −1.0 Sunrise 5.01	MONDAY 25	High 10 33 Height 11.2 Low 4 20 Height −0.6 Sunset 6.30
High 11 02 Height 10.5 Low 4 52 Height −1.5 Sunrise 5.02	TUESDAY 26	High 11 22 Height 11.5 Low 5 09 Height 1.1 Su-set 6.29
High 11 51 Height 10.9 Low 5 39 Height −1.8 Sunrise 5.03	WEDNESDAY 27	High — Height — Low 5 59 Height −1.5 Sunset 6.27
High 12 11 Height 11.6 Low 6 26 Height 1.6 Sunrise 5.04	THURSDAY 28	High 12 40 Height 11.2 Low 6 50 Height 1.6 Sunset 6.26
High 1 03 Height 11.4 Low 7 16 Height 1.7 Sunrise 5.06	FRIDAY 29	High 1 30 Height 11.1 Low 7 42 Height 1.6 Sunset 6.22
High 1 56 Height 11.0 Low 8 07 Height 1.3 Sunrise 5.07	SATURDAY 30	High 2 23 Height 11.1 Low 8 36 Height 1.2 Sunset 6.21
BOSTON		BOSTON

1980 SEPTEMBER 1980

Morning	BOSTON	Afternoon
High 9 48 Height 9.2 Low 3 30 Height 0.1 Sunrise 5.15	SUNDAY 7	High 10 01 Height 11.3 Low 3 44 Height 0.3 Sunset 6.07
High 10 30 Height 9.4 Low 4 15 Height −0.2 Sunrise 5.18	MONDAY 8	High 10 44 Height 10.1 Low 4 28 Height 0.2 Sunset 6.03
High 11 07 Height 9.5 Low 4 54 Height −0.3 Sunrise 5.18	TUESDAY 9	High 11 25 Height 10.0 Low 5 09 Height 0.0 Sunset 6.01
High 11 45 Height 9.6 Low 5 53 Height −0.2 Sunrise 5.19	WEDNESDAY 10	High — Height — Low 5 48 Height 0.0 Sunset 6.01
High 12 02 Height 9.9 Low 6 10 Height −0.1 Sunrise 5.21	THURSDAY 11	High 12 21 Height 9.6 Low 6 28 Height 0.0 Sunset 5.58
High 12 39 Height 9.7 Low 6 47 Height 0.1 Sunrise 5.22	FRIDAY 12	High 12 58 Height 9.6 Low 6 58 Height 0.1 Sunset 5.56
High 1 19 Height 9.5 Low 7 25 Height 0.3 Sunrise 5.23	SATURDAY 13	High 1 37 Height 9.5 Low 7 48 Height 0.2 Sunset 5.54
BOSTON		BOSTON

Eastern Standard Times - Add 1 Hour For Daylight Savings Time

1980 AUG. - SEPT. 1980

Morning	BOSTON	Afternoon
High 2 51 Height 10.5 Low 9 00 Height −0.8 Sunrise 5.06	SUNDAY 31	High 3 17 Height 10.9 Low 9 34 Height −0.8 Sunset 6.19
High 3 49 Height 9.9 Low 9 55 Height −0.2 Sunrise 5.10	MONDAY 1	High 4 14 Height 10.6 Low 10 35 Height −0.4 Sunset 6.17
High 4 50 Height 9.4 Low 10 56 Height 0.3 Sunrise 5.11	TUESDAY 2	High 5 15 Height 10.2 Low 11 40 Height −0.1 Sunset 6.15
High 5 55 Height 9.0 Low 11 57 Height 0.6 Sunrise 5.12	WEDNESDAY 3	High 6 18 Height 10.0 Low — Height — Sunset 6.13
High 7 01 Height 8.8 Low 12 43 Height 0.9 Sunrise 5.13	THURSDAY 4	High 7 21 Height 9.9 Low 1 02 Height 0.8 Sunset 6.12
High 8 05 Height 8.8 Low 1 46 Height 0.9 Sunrise 5.14	FRIDAY 5	High 8 21 Height 9.9 Low 2 02 Height 0.7 Sunset 6.10
High 8 58 Height 9.0 Low 2 43 Height 0.9 Sunrise 5.15	SATURDAY 6	High 9 14 Height 10.0 Low 2 56 Height 0.5 Sunset 6.09
BOSTON		BOSTON

1980 SEPTEMBER 1980

Morning	BOSTON	Afternoon
High 1 59 Height 9.1 Low 8 06 Height 0.6 Sunrise 5.24	SUNDAY 14	High 2 17 Height 9.3 Low 8 32 Height 0.5 Sunset 5.53
High 2 43 Height 8.8 Low 8 49 Height 1.0 Sunrise 5.26	MONDAY 15	High 3 00 Height 9.2 Low 9 18 Height 0.7 Sunset 5.51
High 3 29 Height 8.5 Low 9 36 Height 1.3 Sunrise 5.27	TUESDAY 16	High 3 49 Height 9.0 Low 10 08 Height 0.8 Sunset 5.49
High 4 19 Height 8.2 Low 10 25 Height 1.5 Sunrise 5.28	WEDNESDAY 17	High 4 40 Height 9.0 Low 11 04 Height 0.9 Sunset 5.47
High 5 14 Height 8.2 Low 11 22 Height 1.5 Sunrise 5.28	THURSDAY 18	High 5 36 Height 9.1 Low — Height — Sunset 5.47
High 6 13 Height 8.3 Low 12 01 Height 0.8 Sunrise 5.29	FRIDAY 19	High 6 32 Height 9.4 Low 12 19 Height 1.3 Sunset 5.45
High 7 09 Height 8.6 Low 12 59 Height 0.4 Sunrise 5.30	SATURDAY 20	High 7 28 Height 9.8 Low 1 18 Height 0.9 Sunset 5.44
BOSTON		BOSTON

Eastern Standard Times - Add 1 Hour For Daylight Savings Time

Tidal differences from Boston High Tide

Newburyport	31 minutes later
Scituate	5 minutes earlier
Plymouth	5 minutes later
Chatham (outside)	30 minutes later
(inside)	1 hr, 54 minutes later
New Bedford	3 hrs, 15 minutes earlier

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