

# OBSERVATIONS OF RIGHT WHALES, *EUBALAENA GLACIALIS*, IN CAPE COD WATERS<sup>1</sup>

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## ABSTRACT

Sightings of right whales, *Eubalaena glacialis*, in waters within 30 km of Cape Cod, Massachusetts, are reported for 1955-80. Aerial and shipboard observations indicate the occurrence of right whales in this area during most of the year. Sightings peaked during April and May. There were 641 sightings of individual right whales with 117 seen more than 1 day during a year (758 total sightings). Up to 165 whales were seen each year with a maximum 1-day sighting of more than 70 right whales. Behaviors and activities of these inshore whales are described. During the peak period these whales were often found feeding within 5 m of the surface. In other seasons the whales spent less time near the surface and were less visible. These observations do not represent a census because emphasis was placed on the study of the whales found and not on searching to find all the whales in the area.

Observations of northern right whales, *Eubalaena glacialis* Borowski 1781, made in nearshore waters of Cape Cod over a span of 25 yr are reported here, along with characteristic activities, groupings, and differences in visibility of these whales. These sightings (listed in Table 1 and in Schevill et al. 1981) indicated the occurrence of right whales in this area during most of the year and allowed repeated observations of their behavior. Although these sightings were not systematic enough to provide a census of the nearshore whales, they do indicate general patterns that complement more recent efforts to assess the right whale populations and distributions.

Right whales were found in large numbers in the Cape Cod area until about 1730 (Allen 1916), but this stock was systematically reduced by shore whaling that took all that could be caught, including cows and calves. Although heavy harvesting greatly reduced the population, right whales probably have never been totally absent from our waters, even though there seem to have been no published sightings between 1913 and 1955. A review of the historic data was given by Reeves et al. (1978) along with some recent observations.

Since 1955 we have recorded observations of these whales as encountered in Cape Cod waters.

Attempts were made to assess their local occurrence, study their behavior, analyze their acoustic activity, and recognize individuals. We have described typical sounds (Schevill et al. 1962; Schevill and Watkins 1962), underwater activity extrapolated from recorded sounds (Watkins and Schevill 1971, 1972), feeding behavior (Watkins and Schevill 1976), and comparison of surface feeding activity with that of three other baleen whale species (Watkins and Schevill 1979).

## METHODS

Right whales were observed in Cape Cod waters (Cape Cod Bay, Massachusetts Bay, Nantucket and Vineyard Sounds, Nantucket Shoals, and adjacent waters within about 30 km of the coast, roughly bounded by lat. 41°-43°N and long. 69°-72°W) both from the air and from the water, and occasionally at the same time. The whales were usually within 15 km of the beach, but sometimes were found 30 km or more from shore. Aerial observation allowed assessment of distinctive markings, size (by comparison with the shadow of the fuselage), and activity (feeding, social interaction, etc.). Surface observations from boats drifting quietly alongside the animals permitted photography, underwater sound recording, and behavioral observation. Sometimes contact could be maintained with the same individuals for up to 6 h. Most observations were in daylight, but some nighttime studies were made. In both aerial and shipboard work,

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TABLE 1.—Summary of sightings of northern right whales, *Eubalaena glacialis*, (from Schevill et al. 1981). Repeaters (the same whales seen on more than 1 d during the year) have been subtracted from column D. Searches took place during all months, and there was equivalent search effort during the years 1959-66 and 1972-79. Roman numerals I through XII (Col. A) represent the months January through December.

Year	A	B	C	D	E	F
	Months in which whales were seen	No. days whales seen	Total no. whales seen	Total no. reduced by repeaters	Max. no. seen in one group	Max. no. seen on 1 day
1955	I	1	2	2	2	2
1956	IV	4	24	6	6	6
1957						
1958	IV,V	2	9	9	6	6
1959	III,IV,VIII	16	73	51	7	30
1960	IV,V	6	76	61	16	21
1961	III,IV, V	18	165	131	8	32
1962	I,IV,V	5	15	15	6	6
1963	IV,V	2	5	5	2	4
1964	II,IV,V	8	50	50	4	17
1965	IV,V	6	21	20	3	5
1966	IV,V	5	25	25	4	8
1967						
1968						
1969						
1970	IV	1	70+	70+	30+	70+
1971						
1972	V	2	4	4	2	2
1973	III,IV,V	6	18	18	5	8
1974	IV,V	9	59	58	16	16
1975	I,II,III,IV,V,VI,VII	14	33	28	5	7
1976	III,IV,V,X	8	16	9	2	4
1977	III,IV,VIII,X	10	21	16	7	7
1978	III,IV,VII	10	39	39	9	9
1979	I,III,IV,V,VI	9	20	13	3	4
1980	II,IV,V	7	13	11	4	4
Total		149	758	641		

we customarily remained with the first whales that were found, staying with them as long as they could be studied.

Our searches for right whales were irregular, but were made in all months of the year as weather and other work permitted, mostly under conditions of light wind and good visibility. Fewer trips were made in winter because of poor weather and few sightings, increasing to one to five trips a week in spring with improved weather and greater abundance of whales, and then decreasing during summer and autumn as fewer whales were found. Usually, we made only one trip a day, by aircraft or boat. Sighting efficiency during searches was variable due to changes in weather and whale behavior. From the air, right whales feeding below surface often were located by the light reflected from their baleen. (Though dark above water, baleen appears pale when seen through the sea surface.) Individual whales sometimes were recognizable by natural skin marks and by the pattern of cephalic excrescences (often called callosities) variably covered by light-colored Cyamidae (Leung 1967), a method used for identifying Pacific right whales by Klumov (1962) and

southern right whales, *Eubalaena australis*, by Payne (1974, 1976).

## RESULTS

In 1955 we identified two right whales from an aerial photograph taken by Bruce M. Clark on 24 January in Cape Cod Bay off Barnstable, Mass. Then in 1956, six whales were found off Martha's Vineyard Island, south of Cape Cod. In 1958 we again found right whales in that area, and in Cape Cod Bay. Active searches began in 1959, and right whale sightings during 21 yr between 1955 and 1980 are summarized in Table 1 and listed in the article by Schevill et al. (1981). No searches were made in 1957 and in 1967-71, although a research cruise through the area in 1970 located a large group of right whales.

The same individual whales were ordinarily sighted for only a few days at a time. Although groups of whales often appeared and then disappeared together, the usual sequence was a procession of right whales through the area. Successive sightings several days apart and within the same area were often of different whales. Right whales were observed alone or in small

groups of two to six adults (49% of the sightings), as cow-calf pairs, occasionally in larger aggregations, and in groups including adults and older calves. A wide variety of sizes was seen, from 5 m calves to adults of from 12 m to about 16 m. Calves were apparently born in these waters, since adults observed without calves sometimes were seen a short time later accompanied by small calves. We found no seasonality or geographic factor that could be related to group size. Sometimes new whales replaced individuals in groups seen on previous days.

During winter and early spring, right whales were difficult to observe because they were at the surface for relatively short periods and were easily disturbed. These whales sometimes blew underwater so that no surface blow (spout) was visible, and they did not always raise their flukes above water as they began a dive. In late spring, the whales were found feeding frequently at or near the surface (Watkins and Schevill 1976), and apparently were less disturbed by our presence. Thus, before the middle of April, sightings were usually short encounters, often sufficient only for identification. Later sightings generally were of more leisurely surfacings, allowing longer periods of observation.

Over the 21 yr there were 641 sightings of individual right whales, with 117 seen on more than 1 d during a year (758 total sightings including repeaters). Some whales were positively recognized as repeaters and others were suspected repeaters because of location, sizes, and markings. During the years 1959-66 and 1972-79, approximately equal time was spent on searches during corresponding seasons in likely sighting areas, although the number of whales and the months and number of days of whale sightings varied markedly (Table 1). The large number seen in 1970 was comprised of at least 30 whales close to our ship (for several hours) and two other large groups of at least 20 each a short distance away, totaling between 70 and 100 right whales. Most of our sightings have been in April (57%) and fewer in May (27%), although we usually have searched more than three times as much in May than in April because of improved weather.

In our usual search, the boat or aircraft first crossed Cape Cod Bay (1-5 times) before rounding Race Point and searching east and north of Cape Cod, and less often south of Martha's Vineyard and Nantucket Islands. Right whales were seen most often near the northern tip of Cape Cod

(Race Point) where movement of water masses collects plankton in nearsurface concentrations (Watkins and Schevill 1976). Otherwise, the whales consistently did not seem to prefer locations within the search area. Right whales were sometimes seen a few hundred meters off the beach, but generally they were several kilometers from shore; thus their occurrence cannot be related to bottom topography. No habitual direction of movement was observed.

Few whales were recognized from one year to the next. Callosity patterns provided good separation of individuals within a small group of whales seen in one year, but often have not been distinctive enough for positive identification of animals from the larger population seen over several years. Many of the callosity patterns were similar, and because of the variability in light coloration (apparently caused mostly by movement of the cyamids), fine distinctions in the patterns have been difficult to separate. The callosity pattern on calves appeared to become more visibly distinct with age, perhaps as more cyamids occupied the growths. Comparison of aerial and boat views of the same callosity shapes shows that the nearly vertical aerial view (Fig. 1) loses small details because of distance, distortion through water, and relative density of cyamids, but it provides a good perspective of the pattern; whereas, the nearly horizontal view of the same whales from a boat (Fig. 2) provides good detail, but generally misses the overall shape.

The longest sequence of recognition of an individual right whale was that of a cow seen in 4 consecutive years, 1973-76. During the first and fourth years, this whale was accompanied by a very small calf. In 1974, the yearling calf still accompanied the cow, and in 1975 the cow was in a group that may have included this calf. In 1976, the cow with a new calf was seen repeatedly throughout 7 wk of observation. The pattern of callosities on this cow was very distinctive, but since 1976 a similar pattern has not been recognized.

Groups of right whales generally were involved in social as well as feeding activity. They sometimes broke off from feeding together to chase, splash, and roll against each other, often with three or more whales participating in sexual routines (penises sometimes visible).

The relative ease of sighting right whales depended on their activity at the surface. The respiration period was variable, often averaging 1 blow/min of dive cycle. Dive durations also



FIGURE 1.—Aerial view of two right whales feeding in a slick of collected plankton in Cape Cod Bay, Mass., 1 May 1979 (same individuals shown in Fig. 2). Note the pattern of head callosities and the pale appearance of the baleen underwater. Photo by K. E. Moore.



FIGURE 2.—View of two right whales seen from a boat in Cape Cod Bay, Mass., 2 May 1979 (same individuals as in Fig. 1). Note the limitation in visibility through the water surface, yet more visibility in details of head callosity patterns. These whales were observed for nearly 5 h as they fed nearby at the surface, but we found it difficult to record the complete callosity shape from these surface views. Photo by K. E. Moore.

varied from 1 to 7 min during feeding (Watkins and Schevill 1976), with occasional dives of 20 min or longer. Sometimes whales that had been conspicuous in their nearsurface activity suddenly changed their behavior to that of long dives and very little surface exposure.

During two observations of these whales in offshore waters, submergences of 20-22 min with nearsurface times of 10-12 min were recorded, demonstrating less surface activity than in the nearshore sightings. A group of 12 whales was observed at lat. 42°50'N, long. 65°00'W on 9 August 1974 and another group of 7 whales at lat. 42°51'N, long. 65°30'W on 2 August 1976 (not listed in Schevill et al. 1981). Both offshore groups were observed for more than 3 h, but very little surface activity was seen.

## DISCUSSION

Our sightings do not provide a basis for a right whale census. Observations were sporadic and directed toward behavioral study, so that we usually remained with the first whales that were found. Although our efforts generally were confined to inshore waters, we note similar patterns reported in offshore surveys (Winn et al.<sup>3</sup>).

Variations in right whale surface behavior probably contribute to variability in sightings. In addition, the elusive behavior often noted in late winter and early spring, coupled with poor weather, may have been responsible for so few sightings during fall and early winter. The peak occurrence (April) of nearshore whales matches Allen's (1916) interpretation of the shore whaling data. He indicated that right whales were most abundant in the nearshore area during April and May, absent in July and August, and apparently abundant from November through March (the period of greatest catch).

The variability in the numbers of right whales sighted in 21 yr, the individual whales' apparent short stay in the area, the changing group compositions, and the few whales recognized from previous years all appear to indicate that we are seeing only a portion of a larger population of right whales. In other places and other seasons,

they may not be as visible as they are during their stay in Cape Cod waters.

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