

MUSKEGET GRAY SEALS  
WINTER AND SPRING, 1993

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October, 1993

### ABSTRACT

Surveys of gray seals (Halichoerus grypus) at Muskeget Island, Nantucket County, Mass., in winter and spring 1993 showed a marked increase in the number of pups born and the number of individuals present during molt, compared to the same period in 1992. 30-32 pups were recorded in January and February 1993, and 28 of the mothers with pups were identified with photographs. 11 of these females had pupped previously at Muskeget, and 7 had Sable Island, Nova Scotia, brands or tags. In April, 1,549 individuals were counted in a single survey. The site was relatively free from disturbance during the study period. It is likely population parameters will show further increase in 1994 or 1995.

### METHODS

Pupping was monitored by 3 aerial surveys and 6 ground surveys in January and February. Two aerial and 2 ground surveys were conducted between 1 March and 1 May, including the molting period. During the breeding season surface observations were made from the east end of Seal Island (Fig. 1), at a minimum distance from the seals of 180 feet. Thereafter observations were carried out from Muskeget itself at a distance of 300 feet or more from the seals. Flights were conducted at altitude of 700 feet or greater. For individual identification, photographs were taken of all females during ground surveys, and of males on the pupping beach during the breeding season.

### RESULTS

Muskeget underwent no major topographic change since spring of 1992, although there were minor changes in the shape of Long Pt. and Seal Is. (Fig. 1). In 1993 as in 1991 and 1992 the main pupping ground was on Muskeget's east shore. Pupping occurred on about 1,500 feet of beach, more than twice the length of beach used in 1992. Between high and low water width of this beach varied from approximately 70 to 85 feet at the east and west ends, and from 38 to 45 feet in the middle section. The number of pups and the length of beach they occupied in 1993 make diagrammatic representation of the survey observations impractical. To make sighting data more manageable, the breeding beach was arbitrarily divided into 4 sections, unequal in size, as shown below.

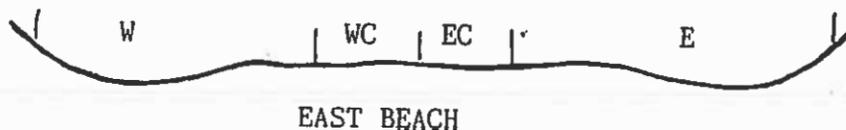
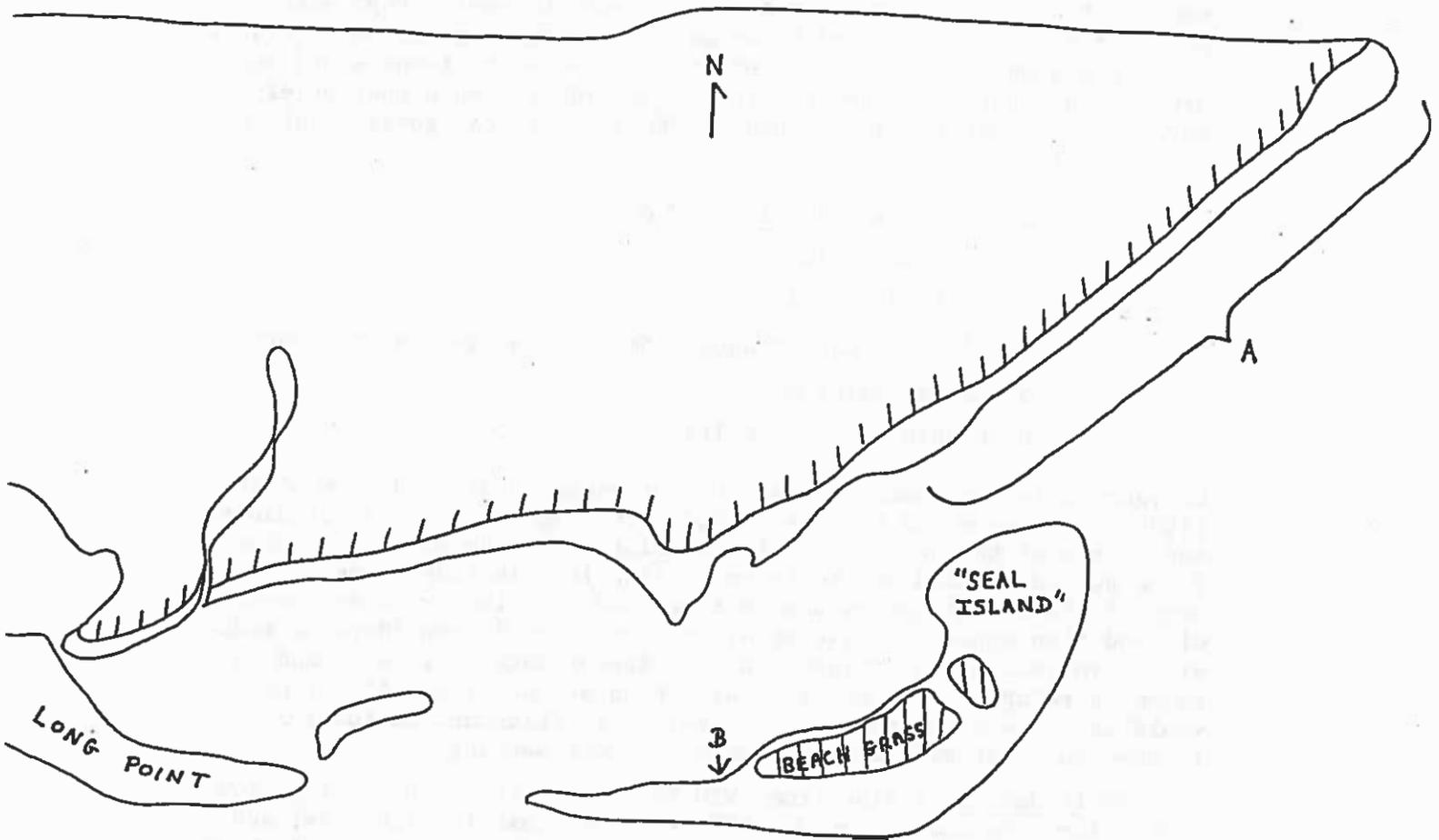
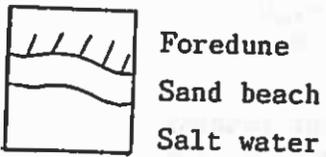


Figure 1.  
EAST PART OF MUSKEGET ISLAND, JANUARY-FEBRUARY 1993.  
(Sketch map, not to scale)



KEY

- A. Main pupping beach.
- B. Site of Brun and pup, 15 and 18 February.



For each observation period female-pup pairs are listed within each section as they were situated from west to east. Pups with no mother present are labelled by number according to position in a west to east sequence on date of observation. Below the females and pups are listed other seals present in the section for more than brief duration, in west to east sequence. Each pup is categorized into one of 6 age classes:

1. 0-5 days old. 1 = 0-2 days old.
2. 6-10 days old.
3. 11-16 days old.
4. 16+ days old, weaned. Molt of lanugo has not begun.
5. Lanugo being molted.
6. Lanugo entirely molted.

Categories 1-3 are based in part on pup stages described by Mansfield (1988) and Kovacs and Lavigne (1986). In stage 1 the head, shoulders and pelvis of the pup are prominent relative to the girth. In stage 2 the pup has filled out to become cylindrical in body shape. In stage 3 the pup is barrel-shaped to rotund. In theory these indices of condition denote certain ages; in fact there is considerable individual variation, so designations are approximate. Stages 4 and 5, based on pelage state, are variable in duration. Typically stage 4 would last 2-4 days, and stage 5, 7-10 days (Ling and Button 1975). In some pups lanugo molt may commence before weaning.

On 16 January I flew from 0910 to 1015, 1 to 2 hours before low tide. Air temperature was 31-35°F, wind was calm to light NNW, and the sky mostly overcast. None of the Eel Pt., Nantucket, shoals were exposed, however many harbor seals (Phoca vitulina) were visible in the water just to the west of that area. None of the Wasque shoals, southeast of Martha's Vineyard, were exposed. At Muskeget 167 gray seals were on the west end of Seal Is. On the east shore of Muskeget were 15 gray seal pups, 10 adult females, and 1 adult male, or bull. The animals were scattered, but 3 loose groups were evident, corresponding to W, combined WC & EC, and E sections. The distribution was the same as seen in the ground survey of that day (see below). The flight also surveyed Monomoy, at 0945. No gray seals were sighted there, however 1,738± harbor seals hauled out partway down the east shore of the south island were noted.

Enroute to Muskeget early that afternoon I passed a boat returning from there. The operator later told me he had gone there to view the seals. I landed at the island at 1320 and stayed until 1500.

Air temperature was 37-35°F, the wind N at 5 knots, and the sky mostly cloudy. A group of gray seals was still on the west end of Seal Is. On the east beach of Muskeget were 15 pups and 11 females, as listed below. (Note: E385 is a female). Pup stages are in parentheses.

| W          | WC        | EC         | E         |
|------------|-----------|------------|-----------|
| Gis (2-3)  | Meeb (-2) | Cub (1)    | Wyst (1-) |
| 2. (1)     | Able (1-) | Seflor (1) | Zee (1)   |
| E385 (2-3) | Bake (1-) | 11. (1-2)  | 14. (1)   |
| Bird (1-2) | 8. (1)    |            | Bell (1)  |
| Bull       |           |            | Bull      |

Possible or probable mothers of unattended pups: 2 = Checker;  
8 = Line; 11 = Fox; 14 = Pet.

Four of the youngest pups were alone at the water's edge; females were seen in the water near them. Female Bell went in and out of the water. The 2 bulls on the beach were placid. A third bull came out briefly at the east end, following a young female, and causing a fracas with females Wyst and Zee. At 1430 a small plane swooped low overhead.

On 21 January I was at Muskeget 1100-1500. Tide was ebbing, air temperature was 38-39°F, wind was light SE, and the sky mostly cloudy. On the west end of Seal Is. were about 52 Hg, including 2 young females. On the east beach were 21 pups and 19 females, as listed.

| W                        | WC         | EC         | E          |
|--------------------------|------------|------------|------------|
| Gis (3)                  | E385 (3)   | 12. (1-2)  | Zee (1-2)  |
| Checker (2)              | Able (1-2) | Wej (1-)   | Pet (-2)   |
| Bird (2)                 | Meeb (2-3) | Seflor (2) | Wyst (-2)  |
| Monce (1)                | Line (1-2) | Tyk (1)    | Bell (1-2) |
| Bull with<br>bloody neck | 9. (1-2)   | Suim (1-2) |            |
|                          | 10. (1)    | Fox (2-)   |            |
|                          |            | Bull       |            |
|                          |            | Bull       |            |

Possible or probable mothers of unattended pups: 9 = Bake; 10 = Moby, Shot or Skace; 12 = Smoke.

Most of the females present lay on the beach, though Fox was mostly in the water. Pet spent some time in the shallows, with her pup paddling nearby. Two bulls were present, one resting in the beachgrass, the other, which resembled Male C of 1992, was more active, moving in and out of the water. A bull with a bloody neck which came out in the W section late in the period may have been the latter, or a third bull.

On the outside of Seal Is. a dead pup was found. It was a male, 35" standard length, 21" girth, thin, weighing 25-30 lbs. It had apparently washed ashore, and may have been stillborn or may have died shortly after birth judging from its emaciated condition.

On 26 January I was at Muskeget 1100-1500. High tide was at 1325. Air temperature was 31-33°F, wind light N becoming NE, and sky partly cloudy. On the east beach were 21 females and up to 26 pups: 25 were seen for most of the period, however 26 were counted at one point by 2 observers. The "extra" pup was in the EC section.

| W                   | WC        | EC                     | E         |
|---------------------|-----------|------------------------|-----------|
| 1. (4)              | Able (-3) | Skace (1-)             | Wyst (2-) |
| Checker (-3)        | Bake (-3) | Smoke (2)              | Zee (2)   |
| 3. (5)              | Line (2-) | Tyk (1-2)              | Pet (3)   |
| Monce (1-2)         | Jug (1)   | 17. (2-3)              | Bell (2)  |
| Bird (2-3)          | Meeb (-3) | 18. (2-3)              |           |
| Moby (1-)           | Shot (1-) | Wej (1-2)              |           |
| Small year-<br>ling | Cub (2-3) | Suim (2-)              |           |
|                     | Bull      | Seflor (2)             |           |
|                     | Bull      | 26. "Extra"<br>pup (?) |           |
|                     |           | Bull                   |           |
|                     |           | Bull                   |           |
|                     |           | Bull                   |           |

Possible or probable mothers of unattended pups: 17 = Fox; 26 = possibly but not probably Wix.

Female Skace appeared very briefly, and was captured in a distant photograph of her left side. A very fat, evidently full-term pregnant female, Perl, dashed from mid beach to the east end, then into the water and out again, accompanied by a bull, near Bell, who

pulsed her. No obvious newborn pups were seen. Up to 7 bulls were noted. One, very large, dubbed Mr. S, frequently rolled in the sand, covering himself with it from head to tail. He accosted Bake, but was rejected. Later he came out near Bird. Another bull, in the EC section, lurked in the beachgrass at the top of the beach, then made a foray to challenge Mr. S among a group of females, who drove both bulls away. As observed on previous surveys, although females consorted at times with bulls in the water, none did so on the beach. There, females rebuffed all close approaches by bulls, at this stage of the breeding season.

There were about 50 gray seals on the west end of Seal Is.

About 1445 a small plane flew low over Muskeget.

Over the next two weeks, boat travel to Muskeget was hindered by either high winds, or fast ice at Nantucket's west end. On 3 February at 1130, from the hill at Eel Pt., Nantucket, I could see 5 adult gray seals on the east beach at Muskeget.

On 5 February I flew over Muskeget, 1130-1212 total flight time. Tide was at half-ebb. Air temperature was 42°F, wind SW at 20 knots, the sky clear, and the air hazy. No shoals were showing at Eel Pt., Wasque, or northeast of Muskeget. On the east tip of Long Pt., Muskeget, were 5 young gray seals, and 294 gray seals were on the west tip of Seal Is. In the middle of Seal Island's west end were patches of blood. On the east beach there were 21 pups; 8 were with mothers, 5 were apparent weaned whitecoats, and the rest were molting. Females could not be identified individually; female-pup pairs and lone pups are numbered from west to east. F = female.

| W           | WC               | EC               | E                |
|-------------|------------------|------------------|------------------|
| 1. (5)      | 8. (5)           | 13. (5)          | 15. (5)          |
| 2. (5)      | 9. (5)           | 14. F & (2)      | 16. F & (3)      |
| 3. F & (-3) | 10. (5)          | Bull             | 17. (4-)         |
| 4. F & (-3) | 11. F & (2)      | Young adult male | 18. (4)          |
| 5. F & (-3) | 12. (4)          |                  | 19. F & (2)      |
| 6. F & (-3) | Bull             |                  | 20. (4)          |
| 7. (5)      | Young adult male |                  | Bull             |
| 2 bulls     |                  |                  | Young adult male |

Probable identities of females: 11 = Wix; 14 = Perl; 19 = Lyte. The other 5 pups with mothers likely were some of the 7 category (1) and (1-2) pups of 26 January. Others of the 26 January category (1-2)

pups, and some of the 7 category (2) pups, probably account for the 5 stage (4) pups observed on 5 February. 8 pups apparently in stage (5) on 5 February could have been the remaining 8 in categories (2) and (2-3) of 26 January. The 2 pups that were stage (4) and (5) on 26 January likely would have left the island by 5 February. The 5 category (3) pups seen on 26 January may either have left the island, or may have been well back in the dunes and not spotted in the 5 February survey.

Wix's pup most likely was born after the 26 January survey, but the possibility it was present on 26 January cannot be ruled out. The "extra" pup, No. 26, of 26 January, whose age stage was not specifically noted, possibly could have been that of Wix.

At Muskeget on 9 February, 1130-1500. Tide was high, falling to half-ebb. Air temperature was 28-29°F, wind NE at 10 knots, and the sky mostly clear. 200 gray seals occupied the west end of Seal Is. A possible whitecoat pup was glimpsed there but was not confirmed as it was obscured by other seals. An apparent copulation was in progress off the east beach at 1130. 12 pups were on the east beach: 2 molting (stage 5), and 10 in whitecoat, 6 of which were stage (4), weaned and alone; the other 4 were with mothers.

| W      | WC                | EC        | E                |
|--------|-------------------|-----------|------------------|
| 1. (5) | 6. (4)            | 9. (4)    | 11. (5-6) female |
| 2. (4) | Wix (-3)          | Perl (-3) | Lyte (-3)        |
| 3. (4) | Late ( <u>1</u> ) |           |                  |
| 4. (4) | Bull              |           |                  |
| 5. (4) |                   |           |                  |

There were probably other molting pups back of the dunes, out of view. One pup on the east beach, Late's, was newborn. A nearby lone whitecoat approached Late, and she drove it off. Wix's male pup was aggressive in its nursing behavior; in one observation it suckled for 18 minutes in 2 sequential episodes. In the second, as the cow prepared to roll over she reached out to flipper the milk-drooling pup, who responded by biting her flipper and snapping at her face. She took this calmly, rolled over, and the pup resumed nursing. Afterwards the pup twitched spasmodically before falling asleep. Wix drove off a sand-covered bull, apparently Mr. S., who retreated down the beach.

The third female with pup was Perl, who was observed racing along the beach on 26 January, behavior suggesting impending birth was a new

and unfamiliar experience. She stayed with her pup throughout the period. During the afternoon a bull came out to sleep very close to her. The fourth female, Lyte, and her pup were partly obscured in a depression; only her right side was visible. It is possible, though not probable, she is the same individual as Skace, seen only on the left side, 26 January.

For the next week wind and ice prevented boat travel. On 12 February, from Eel Pt. hill, at 0900, I could see 2 females or a female and a pup on the east beach, Muskeget; also a bull which came out briefly. There were many seals on the west end of Seal Is.

On 15 February, with ice still impeding boating, I flew over Muskeget, 1100-1145 total flight time. Tide was almost low. Air temperature was 32°F, wind NW at 10 knots, and the sky clear. There were 267 gray seals on the west end of Seal Is. On the inside of the west end, east of the main group, was a female with a stage (2) pup, and a bull. On the east beach, W/WC border, was a female, probably Late, with stage (2) pup, and nearby a stage (4) whitecoat. At the east end of the beach were 3 stage (5) pups and 1 stage (4) pup. One of these was on top of a grass covered dune, and the others were in blowouts back of the beach.

A shoal ("Bean Shoal") was exposed west of Muskeget. 191 harbor seals were on a small shoal north of Tuckernuck, and there were 180± on the Nantucket Harbor Jetties, the majority on the east Jetty.

At Muskeget on 18 February, 1100-1500. Tide was low at the end of the period. Air temperature was 28-30°F, the wind light NE, and the sky was overcast, with occasional flurries in the afternoon. There were 160+ gray seals on the west end of Seal Is. On the inside of the west end, near the beachgrass, was a nondescript brown female, Brun, and stage (2-3) pup. A bull was with them at first. A molted pup was in the middle of the Seal Is. beachgrass.

Among those on the west tip of Seal Is. were a molted female pup of the year, 5 female yearlings, and 3-4 mature females, including Yo, a Sable Island-branded female which has been sighted at Muskeget in many years since 1977. She was very thin.

On the east beach, WC section, were Late and pup (stage 2-3), and a bull. After nursing the pup ventured into the shallows, then rejoined the mother. They engaged in amicable flipping of each other. Then the pup nursed again. To their east, partway up the dune, was a molting male pup, possibly that of Wix.

I landed on the main island, west of the east beach, and walked back of the dunes to the east end, discovering 3 pups not previously seen that day: a weaned female whitecoat, not very fat, in a washout between dunes; a fat, nearly molted female on the rear of the main

dune backing the east beach, and a fat molting male on top of another dune. There were numerous seal tracks behind the main dune in the central beach area.

11 harbor seals were on rocks at the North Head, Tuckernuck, on the return trip.

At Muskeget 2 March, 1030-1430. Tide was low to half-flood. Air temperature was 37-38°F, wind SW at 8-10 knots, and the sky clear. 200+ gray seals were on the outside of the west end of Seal Is., not well seen from Muskeget itself. Two molted pups of the year were at the rear of the group, on top of the rise. Several adult females were seen briefly. On the east beach, center, was a molting male pup, probably Late's. A female molted pup came out on the beach at the east end. 60 black ducks were counted in the salt pond of Muskeget.

I was away from Nantucket for the next few weeks, returning on 13 April. During that period occurred the "Storm of the Century", on 13 March, and a strong ocean storm on 10-11 April. One of these, probably the latter, affected Muskeget.

On 14 April I visited Muskeget 1000-1700. Tide was low at 1226, air temperature was 46-49°F, winds were light and variable, and the sky was partly cloudy. Seals covered the outside of Long Pt. and Seal Is. Photos taken from the boat were used for an estimated count of seals visible: Hg = gray seals, Pv = harbor seals: Long Pt., west group, 89 Hg; east group 263 Hg, 1 Pv. On Seal Is., 4 groups, west to east: group 1, 218 Hg; group 2, 410 Hg; group 3, 139 Hg, 4 Pv; group 4, 50 Hg, 5 Pv. After landing on Muskeget I counted 57 Hg on the inside of the west tip of Seal Is. Total estimated gray seals was 1,226, and of harbor seals, 10. More seals hauled out til the group inside the west end of Seal Is. grew to 121 Hg visible. The seals on the tip were actively eroding the edges of the bank as they entered and exited the water.

Among the 121 visible were a branded female, K368, a branded male, M686, and another female with a distorted brand. Most of the seals were male, however 22 mature and 5 immature females were photographed. One mature female, Vane, was seen in the same location on 16 April 1992. 9 fully molted individuals were noted, of which 8 were female. On the inside of the east end of Seal Is. a harbor seal and a gray seal pup in whitecoat, with the head molted into black, had hauled out. This pup was probably not born recently (see Discussion).

At 1105 a small plane flew over the seals below 100 feet, but did not appear to disturb them. At 1230 22 harbor seals were on a shoal northeast of Muskeget.

Nearly all the beachgrass in the center of Seal Is. had disappeared under a layer of sand due to a major overwash event in a recent storm. The Snow-Little camp was damaged. Part of the deck had been torn away, and the interior of the house had been flooded.

On 15 April I flew 0940-1020, about  $2\frac{1}{2}$  hours after high tide. Air temperature was 44°F, wind S at 5 knots, and the sky mostly cloudy. Gray seals were in 3 groups on the outside of Long Pt., numbering 97, 178 and 85. There were 10 groups on the outside of Seal Is., west to east: 689 and 2 Pv; 35; 82; 27; 39 (including the whitecoat with black head); 72 and 3 Pv; 47; 169 and 6 Pv; 9 and 1 Pv; 20 and 1 Pv. Total: 1,549 gray seals and 13 harbor seals. 43 Pv were on Muskeget's northeast shoals, and 206 Pv were on a shoal NNE of Tuckernuck. Total harbor seals in the survey, 262; this count did not include the Jetties.

On 21 April, at 1645, from the "Cliff", I counted seals on the Jetties; there were 45 Pv on the West Jetty, and 78 on the East Jetty. From Eel Pt. harbor seals were seen on a shoal off Tuckernuck well north of that occupied on 15 April.

On 30 April a brief trip was made to Muskeget to retrieve gear. The seals were distributed very much as on 14 and 15 April.

On 1 May I flew 1245-1355, at low tide. Air temperature was 54°F, wind N at 12 knots, and the sky clear. No seals were on the Jetties. 235 harbor seals were in 3 groups (68, 12 and 155) on a shoal NE of Tuckernuck. In the 2 smaller groups were 7 very fat individuals lying on their sides, apparently near term pregnant females.

Muskeget had seals, mostly grays, in many locations as many shoals were exposed. There were 5 Hg on the Bean Shoal west of the island, including a female branded S. 3 shoals north of Muskeget had, from west to east, 11 immature Hg and 53 Pv; 14 Pv; 7 Pv and 2 possible young Hg; 8 in the water, of which 4 were Hg. On Long Pt. were 477 Hg and 1 Pv. On the outside of Seal Is. were 6 groups, west to east: 370 Hg; 77 Hg; 106, including 23 in water, Hg, and 4 Pv; 8 plus 3 in water Hg and 13 Pv; 129 Hg; 65 plus 18 in water Hg. There were 13 Hg on the east beach of Muskeget. Total Muskeget gray seals, 1,286 and 2 possible others; total Muskeget harbor seals, 92 and 4-6 possible others. Total harbor seals in the survey, 327.

A section of trawl net, apparently a cod end about 30 feet long, was underwater about 300 feet south of the cut between Long Pt. and Seal Is. Perhaps this was a twisted mesh cod end (these were banned on 23 April) that had been jettisoned.

Table 1.

Gray seal females with pups at Muskeget, 1993.

Females marked\* pupped here previously.

| Female   | Pup sex | Approx. birth date of pup | Comments   |
|----------|---------|---------------------------|--|
| Gis      |         | 8 Jan                     |  |
| E385     |         | 8 Jan                     | Branded E385. Born Sable Is. 1987.   |
| Meeb*    |         | 10 Jan                    | At Muskeget spring 1988 & 1989. Puppied here in 1992. Born 1985 or 1986.                         |
| Fox      |         | 10-11 Jan                 |  |
| Bird     |         | 10-11 Jan                 | White tag, Sable Is.   |
| Able     |         | 11-12 Jan                 |  |
| Bake     |         | 11-12 Jan                 |  |
| Wyst     |         | 11-12 Jan                 |  |
| Checker* |         | 12-13 Jan                 | Puppied here in 1991 and 1992.   |
| Zee      | M       | 12-13 Jan                 |  |
| Pet*     |         | 12-13 Jan                 | Puppied here in 1991. Sable Is. tag.   |
| Bell*    |         | 12-13 Jan                 | Sighted here annually since 1980. Puppied here in 1991. At least 18 y.o. in 1993.                |
| Line     | M       | 15 Jan                    |  |
| Cub      |         | 15 Jan                    |  |
| Seflor*  | M       | 15 Jan                    | Puppied here in 1992.  |
| Smoke*   |         | 16-17 Jan                 | Puppied here in 1992.  |
| Suim*    |         | 16-17 Jan                 | Puppied here in 1991 and 1992. Sable Is. tags. Probably born 1985.                               |
| Wej      |         | 17 Jan                    |  |
| Monce*   |         | 18 Jan                    | Puppied here in 1992, at Monomoy in 1991.  |
| Tyk      | M       | 20 Jan                    |  |
| Moby*    |         | 21-22 Jan                 | Puppied here in 1992, at Monomoy in 1991. Sable Is. tag. Probably born 1985.                     |
| Shot*    |         | 21-22 Jan                 | Puppied here in 1988.  |
| Skace    |         | 22 Jan                    | (possibly but not probably Lyte)   |
| Jug      |         | 22-23 Jan                 |  |
| Perl     | M       | 28-29 Jan                 | Sable Is. tag. Born 1988 or 1989.  |
| Wix*     | M       | 29-30 Jan                 | In the area spring 1983 and 1986. Puppied here in 1991 and 1992. Branded S, born Sable Is. 1978. |
| Lyte     |         | 29-30 Jan                 |  |
| Brun     | F       | 6-7 Feb                   |  |
| Late     | M       | 8 Feb                     |  |

Table 2.

## Sable Island branded gray seals at Muskeget, 1993.

| Brand  | Sex | Year of birth & marking | Sighting dates | Comments  |
|--------|-----|-------------------------|----------------|---|
| E 385° | F   | 1987                    | 16 & 21 Jan    | Seen with pup.  |
| S      | F   | 1978                    | 9 Feb          | Seen with pup. Pupped here in 1991 & 1992. Previously seen here March 1983 & at Wasque Shoal May 1986.*   |
| S2     | F   | 1972                    | 18 Feb         | Seen here or Wasque Shoal March 1977, Dec. 1981, March 1982, March & April 1983, March 1984, 1985 & 1988, Feb. 1992. Seen at 2 sites in Maine various years 1981-1989.* |
| K 368° | F   | 1989                    | 14 Apr         | Pupped at Sable Is. Jan. 1993.  |
| M 686° | M   | 1986                    | 14 Apr         |   |
| 4 S ?  | F   |                         | 14 Apr         | Brand distorted, not readable.  |

° Individual brand.

\* Identified by natural markings.

Table 3.

## Tagged gray seal females with pups at Muskeget, 1993.

| Female | Probable Sable Is. cohort                   | Comments  |
|--------|---|---|
| Bird   | One of 1978, 1985, 1986, 1987, 1988 or 1989 | Sighted 16, 21 and 26 Jan. 1993.*                           |
| Pet    | One of 1978, 1985, 1986, 1987 or 1988       | Sighted 21 and 26 Jan. 1993. Pupped here in 1991.*          |
| Suim   | 1985  | Sighted 21 and 26 Jan. 1993. Pupped here in 1991 and 1992.* |
| Moby   | 1985  | Sighted 26 Jan. 1993. Pupped here 1992, at Monomoy 1991.*   |
| Perl   | 1988 or 1989                                | Sighted here 26 Jan. and 9 Feb. 1993.*                      |

\* Identified by natural markings.

## DISCUSSION

Pup count. Table 1 lists 29 females, with pups, that were identified with photographs in 1993. To the 29 pups may be added the dead pup found 21 January, and 2 pups on 26 January with no mothers present, for a total of 32 pups born here in 1993. Of the 2 whose mothers were not identified or inferred on 26 January, one would have been weaned by 9 February; the other was seen only briefly and its age category is unknown. Possibly it was stage (1), and its mother was one of those seen on 9 February, either Wix or Lyte. The suggested pup birth dates in Table 1 for those females is later than 26 January. However the birth dates in Table 1 are estimates based on assigned pup stages, which are approximations. A 16 day nursing period is assumed, however it could be as short as 13 days for a primiparous female (Bowen and Stobo 1991), or as long as 20 days (B. Beck, pers. comm.) especially in a more mature female.

Although it is more likely, based on observed pup stages, that Wix and Lyte's pups were born after 26 January, the possibility they were born prior to that date should be considered. As noted earlier, Lyte, seen only on the right side on 9 February, possibly could be the same individual as Skace, seen only on the left side on 26 January. In this more cautious view we record only 30 pups born, with 28 mothers identified. Accepting the more probable scenario, 32 pups were born, with 29 mothers identified.

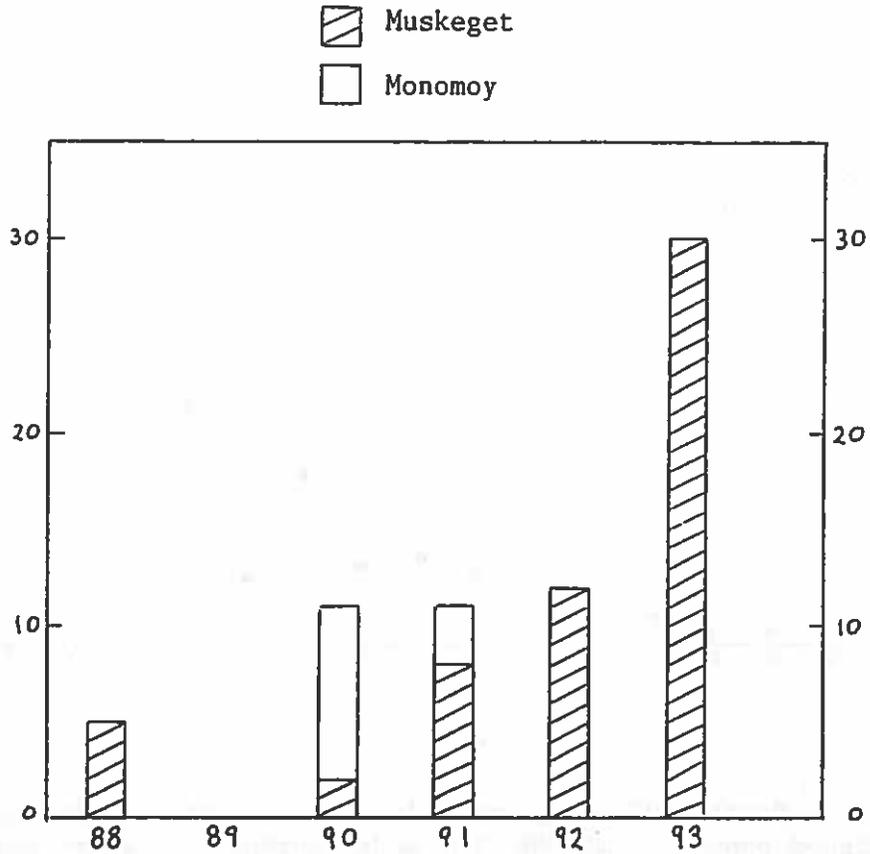
Pup survival. Survey observations indicate that the live pups seen progressed to weaning. In 1993 only one pup was found dead. If this was the only one to die before weaning, then 1993 pre-weaning mortality was about 3%, comparable to the low end of the range of pre-weaning mortality observed in Canadian gray seal colonies (Stobo and Zwanenburg 1990, Zwanenburg and Bowen 1990). Weaning weight is a factor in post-weaning survival; pups of primiparous females are likely to weigh less at weaning, and have lower survival rates, than those of multiparous females (Bowen and Stobo 1991).

14 stage (4) and (5) pups were seen in ground surveys between 26 January and 18 February, and of these only one, a stage (4) female on 18 February, was notably thin compared to the others. Survival prospects attributable to maternal investment may be good for many, though not all, of the 1993 pups.

A pup partially in whitecoat on 14 April may be one that entered the water before molting was completed. B. Beck (pers. comm.) observed about 30 whitecoat pups without mothers at Sable Island in the spring of 1993. He believes these had gone to sea before shedding the whitecoat, and suggests that cold water temperature may inhibit

Figure 2

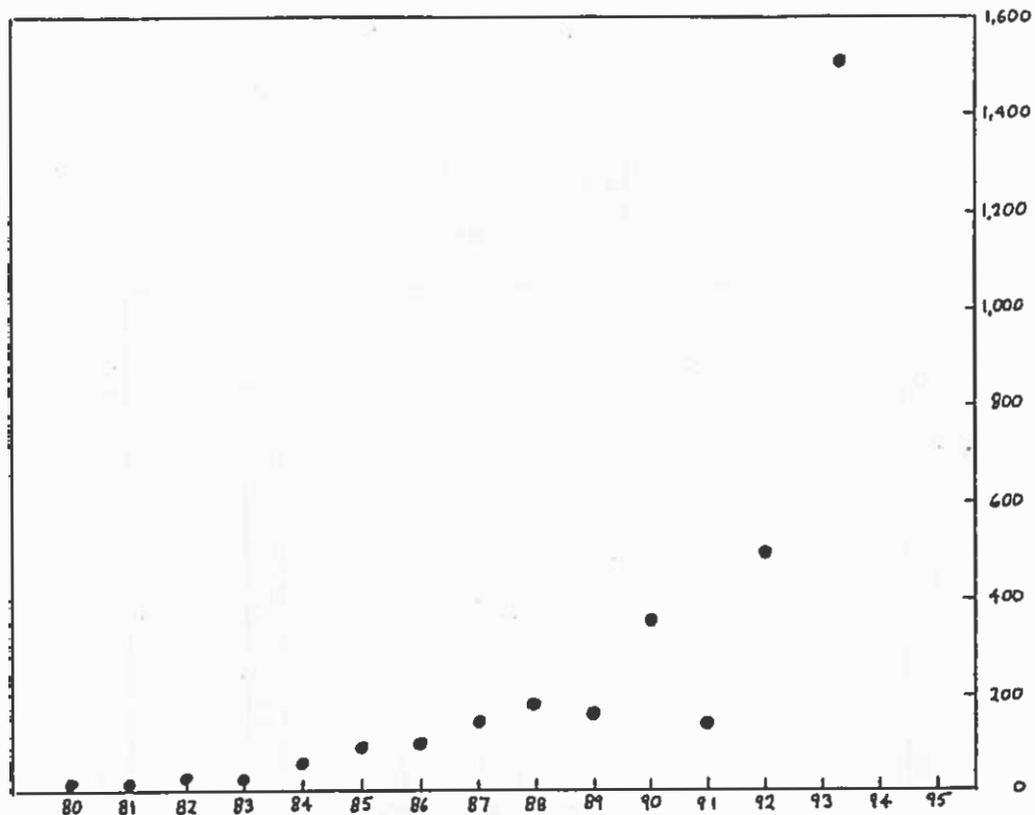
Gray seal pup counts at Muskeget and Monomoy, 1988-1993.



Monomoy was not surveyed in 1988 or 1989. There were no pups at Muskeget in 1989, and no pups at Monomoy in 1992 and 1993.

Figure 3.

Maximum annual counts of gray seals in the Muskeget area, including Wasque Shoals, 1980-1993.



lanugo molt. Hewer (1974) suggested lanugo molt may be delayed in undernourished pups. It may be that undernourished pups are more likely to enter the water before the lanugo has been shed.

Population growth, and habitat. 1993 pup and spring molting census figures represent a quantum leap in those parameters compared to the immediately previous years. Annual pup counts for the Nantucket Sound area including Muskeget and Monomoy were level, at 11-12, in the 3 years 1990-1992, but nearly tripled in 1993 (Figure 2).

The maximum annual count of gray seals of all ages, taken in the spring during molt, showed steady though not abrupt increase from 1980 to 1992. However the 1993 count of 1,549 more than triples the 1992 count of 503 (Figure 3). The lower than expected count in 1991 was possibly due in part to human disturbance during the breeding season, and to a lack of shoal and small island haulout space. The creation of Seal Is. in late 1991 provided a spacious platform for the spring molting assembly. In future the island could support even larger groups than were present in 1993.

Space for breeding on the east beach is not likely to be limiting for at least the next two years. The 1993 records show most females with pups were clustered in the narrow central section of the beach, in the small WC and EC sections, leaving plenty of space on the rest of the beach.

Sable Is. contribution. Out of 28-29 females with pups identified in 1993, 11 had pupped here previously, and 3 were pupping for the third consecutive year (the latter figure becomes 5 if 2 which pupped at Monomoy in 1991 are included). 4 of the 11 repeaters, but only 3 of the 17 "new" females had Sable Is. brands or tags visible. This indicates that while the Sable Is. contribution is important (the 1992 Muskeget report suggested that 50-80% of the 1992 breeding females were Sable-born), other areas may be supplying recruits as well.

In the one day of ground observation in spring 1993, out of a group of 100+ animals visible long enough for inspection, 3 brands were seen (Table 2). One of those, a female, had pupped at Sable in January of this year. The other 2 individually branded seals seen here in 1993 (E 385 and M 686) have not been resighted at Sable. Most individual brands sighted in New England are resighted infrequently or never at Sable Is. It appears therefore that while some of the seals in the Muskeget spring molting assembly may come more or less directly from Sable, many may not, again suggesting other source areas.

Harbor seals. Harbor seal counts during 1993 flights were opportunistic rather than directed, limited in geographic coverage, and are of limited use as a population gauge. The Eel Pt. and Tuckernuck counts are comparable to those for 1989-1990, but lower than those for 1991 and 1992. The count of 327 on 1 May 1993 is high for this date compared to other years, and the presence on that date of apparent full term pregnant females, at the beginning of the harbor seal pupping season, is of interest, since harbor seals do not regularly pup in Massachusetts at present.

Disturbance. Human disturbance at Muskeget was at a low level in 1993. Most scallopers were in Nantucket Harbor rather than at the west end, where thick ice blocked Madaket Harbor for much of the pupping season, hindering boat travel. At least 1 fisherman visited Muskeget, as on 16 January, and may have put some females in the water, but this did not appear to be a lasting effect. However frequent visitation should be discouraged, and all visitation conducted with care.

Several parties have expressed interest in visiting the breeding site for research, filming, or commercial sealwatching. Such activity could jeopardize the ongoing monitoring of the undisturbed population. Sealwatching should be directed to another area, such as Monomoy, where pupping may recur in the future if observed present population growth is sustained.

### CONCLUSION

Muskeget will likely continue to be attractive to gray seals, and increases in the breeding population and the spring molting assembly may be expected in the next two years. The 1994 surveys are planned, and have been funded. It also seems likely that pupping will occur again at Monomoy in the next 2 or 3 years. Proposed gray seal pup viewing enterprises should be directed to Monomoy, where there is established oversight and protection, and seal watch charter operations already exist.

### ACKNOWLEDGMENTS

I am very grateful for the support of The Nature Conservancy and The Massachusetts Natural Heritage and Endangered Species Program, which made this study possible. I also wish to thank the Nantucket Marine Mammal Conservation Program of the Maria Mitchell Association for their donation of funds, and the University of Massachusetts Field Station for providing accommodations on Nantucket. The FAA Tower, Nantucket Airport, kindly provided weather data.

### REFERENCES

- Bowen, W.D., and W.T. Stobo. 1991. Reproduction in primiparous and young multiparous grey seal females: is it successful? Proceedings of the 9th Biennial Conference on the Biology of Marine Mammals, December 5-9, Chicago, Illinois. Abstract.
- Hewer, H.R. 1974. British Seals. London: Collins.
- Kovacs, K.M., and D.M. Lavigne. 1986. Growth of grey seal, Halichoerus grypus, neonates: differential maternal investment in the sexes. Can. J. Zool. 64:1937-43.
- Ling, J.K., and C.E. Button. 1975. The skin and pelage of grey seal pups, Halichoerus grypus Fabricius: with a comparative study of foetal and neonatal moulting in the Pinnipedia. Rapp. P.-v. Reun. Cons. Int. Explor. Mer 169:112-32.
- Mansfield, A.W. 1988. Grey seal pup categories. CAFSAC Working Paper.
- Stobo, W.T., and K.C.T. Zwanenburg. 1990. Grey seal (Halichoerus grypus) pup production on Sable Island and estimates of recent production in the Northwest Atlantic. Can. Bull. Fish. Aquat. Sci. 222:171-184.
- Zwanenburg, K.C.T., and W.D. Bowen. 1990. Population trends of the grey seal (Halichoerus grypus) in Eastern Canada. Can. Bull. Fish. Aquat. Sci. 222:185-197.