Population Trends of Florida Manatees in Sarasota Counties: Analysis of Aerial Survey Data from 1987 to 2004


ABSTRACT
Aerial survey data from Sarasota County, Florida were analyzed to assess temporal and spatial trends in manatee counts between 1987 and 2004. These primary surveys were conducted consistently: Sarasota Bay Region (SBR; N=124), Lemon Bay (LB; N=153), and Myakka River (MR; N=180). Analysis of variance (ANOVA) indicated that manatee counts within the three regions varied significantly among seasons and years (p<0.0001). Counts within both SBR and LB steadily increased midway through the survey period until 2000, and subsequently declined. The mean summer/fall count for SBR in 2000 was more than double the mean count from earlier survey years 1987-1995; however, winter counts within SBR remained at or above those observed over the 18-year period. Variation in counts within LB among years was consistent for all seasons. Despite significant variation in spring and winter counts, mean yearly counts decreased steadily within MR from 1996 to 2003. Manatees within Sarasota County appear to utilize open bays primarily during the warmer months, and such usage seems influenced by resource availability. Conversely, usage of MR peaks in cold winter months when manatees seek warmer refugia.

INTRODUCTION
Florida manatees (Trichechus manatus latirostris) utilizing Sarasota County during non-winter months make up an important component of the manatee subpopulation in southwest Florida. Sarasota County contains 131 km² of water, much of it habitable by manatees. In fact, Nabor and Patton (1989) deduced from four years of aerial survey data that the rivers and inland bays of Sarasota County provide important feeding and resting areas for manatees during the summer, and serve as a travel corridor for manatees migrating to and from winter refuge sites in the fall and spring. The use of county waters by a substantial manatee population prompted the Sarasota County government to voluntarily join 12 other "key" counties with significant manatee populations in establishing boat restriction zones and developing a comprehensive Manatee Protection Plan (MPP), as directed by Florida’s Governor and Cabinet in 1989. In addition to the MPP, poor Florida legislation enacted in 1983, informally known as the Growth Management Act, mandated local governments to develop growth management plans that accounted for habitat conservation and endangered species protection. To accomplish these tasks, the Sarasota County government has supported an ongoing, long-term aerial survey study of manatees in county waters, conducted by Mote Marine Laboratory, since 1987. Temporal trends in counts of manatees in Sarasota County between 1987 and 2004 are described here.

METHODS
Survey
a) Surveyed inshore and near-shore waters of Sarasota County from 1987 to 2004
b) Flights conducted at an altitude of 200 m and a speed of 150 to 160 km/hr using single-engine, high-winged Cessna 172
c) Employed extended area survey technique (Packard 1985)

Data treatment - Statistical analysis
a) Zones grouped into three regions, from north to south: 1) Sarasota Bay Region (SBR; Zones 3 through 6); (2) Lemon Bay (LB); Zone 5; and (3) Myakka River (MR; Zone 12)
b) Total count of manatees used as an index of abundance
c) Seasons defined as: winter (December-February), spring (March-May), summer (June-August), and fall (September-November)
d) ANOVA used to examine temporal variation within SBR and MR for the years 1987-2004, and within MR for the years 1996-2004

RESULTS
Seasonal Averiance
Sarasota and Adjacent Southern Bays (SBR)
- Manatee counts varied significantly among seasons (p<0.0001; Table 1)
- No significant difference between summer and fall during (Figure 5)
- Highest counts during summer and fall, lowest during winter

Lemon Bay (LB)
- Manatee counts varied significantly among seasons (p<0.0001; Table 1)
- No significant difference between summer and fall during (Figure 5)
- Highest counts during summer, lowest counts during summer and fall

Myakka River (MR)
- Manatee counts varied significantly among seasons (p<0.0001; Table 1)
- No significant difference between summer and fall during (Figure 5)
- Highest counts during summer, lowest counts during summer and fall

DISCUSSION
Manatees use Sarasota County waters year-round, however, different regions assume differential importance seasonally. MR is most important during winter and early spring, when manatees congregate near the warm waters of Warm Mineral Springs. During late spring, summer, and fall, manatees disperse into locations such as SBR and LB, where adequate forage, freshwater to drink, and quiet locations for males and calves are available.

ANNUAL VARIATION
Sarasota and Adjacent Southern Bays (SBR)
- Manatee counts varied significantly among years (p<0.0001; Table 1)
- Mean counts increased sharply from 1996 to 1999, and subsequently declined over the next two years (Figure 3)
- No significant interaction between year and season (p=0.086)

Lemon Bay (LB)
- Manatee counts varied significantly among years (p<0.0001; Table 1)
- Mean counts increased sharply from 1996 to 1999, and subsequently declined over the next two years (Figure 3)
- No significant interaction between year and season (p=0.086)

Myakka River (MR)
- Manatee counts varied significantly among years (p<0.0001; Table 1)
- Mean counts decreased steadily from 1996 to 2003 (Figure 4)
- Significant interaction effect between season and year (p<0.0001)

REFERENCES

LOCATION
ACKNOWLEDGEMENTS
No fish, no fish; no fish, no fish.

Figure 1. Mean summer/fall counts for SBR in 1987-1995 were more than double the mean counts from earlier survey years 1987-1995; however, winter counts within SBR remained at or above those observed over the 18-year period. Variation in counts within LB among years was consistent for all seasons. Despite significant variation in spring and winter counts, mean yearly counts decreased steadily within MR from 1996 to 2003. Manatees within Sarasota County appear to utilize open bays primarily during the warmer months, and such usage seems influenced by resource availability. Conversely, usage of MR peaks in cold winter months when manatees seek warmer refugia.

Figure 2. Mean counts increased sharply from 1996 to 1999, and subsequently declined over the next two years (Figure 3).