

THE DISTRIBUTION AND ABUNDANCE OF THE FLORIDA MANATEE IN FLORIDA BAY AND THE UPPER KEYS

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I. INTRODUCTION AND RATIONALE

Aerial surveys to document and describe the current distribution and relative abundance of the Florida manatee (*Trichechus manatus latirostris*), a Federally-listed endangered species, in Everglades National Park were conducted from March 1990 through February 1993 (Snow 1991, 1992, 1993). Previous aerial surveys were conducted in December 1979 through September 1981 (O. Bass unpublished data), between July and December 1979 (Irvine 1980) and (Irvine et al. 1981, 1982), in March 1977 (Powell USFWS unpublished data in Beeler and O'Shea 1988), in January 1977 (Ross USFWS unpublished data in Beeler and O'Shea 1988), from January through February and August of 1976 (Irvine and Campbell 1978), and from September 1973 to June 1976 (Odell 1979). Moore (1951a,b) gave early accounts on the distribution of manatees within the park, based on boat or shore sightings, and Hartman (1974) updated and expanded these accounts. Hartman concluded that the distribution had not changed over the intervening years. Past surveys for the area through 1987 are summarized in Beeler and O'Shea (1988).

Although more manatees were sighted during the recent aerial surveys (1990 - 769; 1991 - 1451; 1992 - 1581) than any previous surveys, the comparison of aerial survey results between investigators must consider differences in survey methodology. These historical data and methodologies are currently being reviewed with the intent of further analysis and comparison of historical distribution and abundance. However, major patterns revealed by Odell (1979) appear consistent with those of subsequent investigators, with the exception of some interesting departures noted during the recent surveys of 1990, 1991 and 1992, (Snow) and discussed below.

In general the relative abundance in the park appears somewhat bimodal with peaks in the summer and winter, but the significance of these data must partially await information on diurnal and seasonal movements. Although manatees can be observed in all survey zones during all seasons, manatee sightings are most common in the southerly zones of the park during the winter. During the summer there appears to be a northerly shift in distribution. There also appears to be a shift in distribution from open water (including offshore shoals and river mouths) in the summer to more protected waters (inland rivers, creeks, and bays) in the winter.

These recent aerial surveys have demonstrated that Everglades National Park provides year-round habitat for the Florida manatee. During these surveys, park waters accounted for up to 20% of the west coast population and 9% of the state-wide population (Snow, 1991).

The Florida manatee is a fully aquatic mammal, a distinction shared only with other Sirenians and the Cetacea. The manatee occupies a prominent position in the park's marine and estuarine systems as a prodigious grazer of submerged aquatic vegetation, spending about five hours a day feeding and in that time consuming about 4 to 9% of its body weight (20-45 kg/day) (Bengtson, 1983). Submergent aquatic vegetation, such as seagrasses, is a major component of the diet of manatees, and although manatees appear to tolerate marine and hypersaline conditions, they are most frequently found in fresh or brackish waters.

Therefore, the effect of changes in freshwater flow on salinity patterns, submerged vegetation and the overall quality of the foraging habitat in Florida Bay, and elsewhere in the park are, along with

water temperature, important influences on the distribution and abundance of manatees in the area. Movements and aggregations of manatees can be correlated to some degree with the distribution of seagrasses and vascular freshwater aquatic vegetation (Hartman 1974). Manatees may or may not need freshwater to survive, but they frequently are reported drinking freshwater from hoses, sewage outfalls and culverts in marine and estuarine areas.

Preliminary data show interannual variability in distribution of manatees within northeastern Florida Bay which may be related, in part, to freshwater flow and resultant distribution of food resources. The relative abundance of manatees in the northeast Bay was higher in 1992 compared to the surveys conducted in 1990 following several years of drought. By year the total number of manatees observed in the N. Florida Bay survey zone were as follows: 1990 - 24; 1991 - 77; 1992 - 101 (Snow 1991, 1992, 1993).

Changes in the distribution of manatees in Florida Bay from historic times are, in part, based on anecdotal accounts, but suggest a decline in use of northern Florida Bay. Accounts of manatee distribution and abundance from the 1930s suggest that northeastern Florida Bay, "including the streams and estuaries bordering it", was the most important area for manatees in southwest Florida (Beard 1938). In subsequent years the low number of manatee sightings from Florida Bay in general has been attributed to both the scarcity of fresh water as well as generally shallow conditions (Moore 1951b, Hartman 1974, Odell 1979). Irvine and Campbell (1978) made no sightings of manatees in Florida Bay during their 1976 surveys, and neither did Bass in 1979-81. Observations of manatees in upper Florida Bay are still uncommon but may be on the increase as indicated above (Snow 1991, 1992, 1993). This increase may be related in part to the increased availability of fresh water from man-made sources associated with development in the Upper Florida Keys.

A potentially significant departure from the major distribution patterns revealed by Odell (1979) and again by the 1979-1981 surveys of Bass (unpublished data) suggests possible important influences on the distribution of manatees related to freshwater availability and the quantity and quality of available forage. During 1979 through 1981 (a period of locally higher rainfall compared to 1990), significant numbers of manatees were observed in the southern and southeastern Whitewater Bay area (S. Bass, unpublished data). In recent years, fewer manatees have been observed there and in some areas submerged vegetation is scarce (Snow 1991). For example, a January 1981 survey totaled 165 manatees (Bass unpublished data). Seventy-two percent of these sightings were in Whitewater Bay and vicinity, with a significant concentration in the Lane Bay and Hells Bay areas, and very few sightings in the Broad River. In contrast, recent surveys found a total of 99 manatees in January 1991, with only 21% of these sightings located in Whitewater Bay and vicinity, and a significant concentration in the upper reaches of the Broad River. Only 5 manatees were sighted in the Lane Bay and Hell's Bay areas.

Odell (1979) from 1973 to 1976 survey data reported that Whitewater Bay was used heavily, and included 46% of the total manatees sighted; 23% were seen in inland waters, 20% in the Gulf of Mexico, and only 1% were seen in Florida Bay. Bass (unpublished data) from 1979 to 1981 survey data reported 67% in Whitewater Bay, 25% in inland waters, 8% in the Gulf of Mexico, and none in Florida Bay. A preliminary look at data from 1990 and 1991 surveys (Snow 1991, 1992) indicates that 12% of the total manatees sighted were seen in Whitewater Bay, 53% in inland waters, 31% nearshore in the Gulf of Mexico, and 4% in northern and northeastern Florida Bay. These discrepancies in use may be due, in part, to changes in available forage (quantity and perhaps quality) and freshwater brought about by natural system variation compounded by effects of water management practices. This deserves a closer look.

Proposed Everglades restoration alternatives which increase freshwater flows into downstream estuaries are likely to have direct effects on the quantity and quality of benthic vegetation available to manatees. These same effects may well influence the distribution of other higher

trophic level organisms such as bottlenosed dolphin and marine turtles. What these changes will be, and their magnitude, is not well understood. And how this will affect manatee distribution and abundance is not known. Research and monitoring needs include; (1) continued long-term surveys of distribution and abundance, (2) a series of adequate benthic vegetation maps of all of Everglades National Park which demonstrate an understanding of seasonal changes, (3) document daily activity patterns and seasonal movements, especially related to the question of freshwater dependency, and (4) determine the physiological freshwater requirements of the Florida manatee. The April 1994 Science Plan for Florida Bay and the National Park Service's Florida Bay Implementation Plan (August 1994) both address the need to identify the relative abundance and distribution patterns of the manatee in Florida Bay.

II. OBJECTIVES

To document and describe the spatial, temporal, and behavioral patterns of distribution, habitat use, and relative abundance of the Florida manatee (*Trichechus manatus latirostris*) in Florida Bay and the Upper Keys, and examine any present or historical trends.

III. METHODS

Fixed-wing aerial surveys will be conducted over a 12 month period, once a month from October 1994 through September 1995, at approximately monthly intervals. The study area includes Florida Bay and the Upper Keys, in an area generally bounded by Card Sound Road, Cape Sable, and Long Key. One to three flights per month, over three consecutive days (weather permitting) may be required to cover the survey zones. The exact survey routes are being discussed with Manatee Aerial Survey Working Group members. Survey routes will follow the recommendations of the Working Group. Skip Snow, project leader for the surveys proposed herein, is a member of the aerial survey working group. The first year of surveys will be evaluated and subject to these findings and available funding, the project will continue for an additional two years.

The aircraft used will be a Cessna 172 or larger (Cessna 182) high-winged airplane. Each flight will be flown at an altitude of 213 m (700 ft) and an air speed of 148 km/hr (80 knots). When manatees are sighted, the airplane will circle the area until the observer is reasonably sure that an accurate count has been recorded. The flight path will allow comprehensive coverage of likely manatee habitat. The offshore portion of the flight path will concentrate on an area within 500 m to 1500 m of the shore or further as habitat dictates.

Flights will begin between 7:00 and 9:00 AM and last from 3 to 4.5 hours, per flight. Three flights per month are required to cover the survey area, for a total of approximately 12 hours of flight time per month. Each observation of a manatee group will be recorded on individual survey area maps using a dot. A manatee group is defined as containing one or more individuals and those less than 100m apart will be considered to be a part of the same group. Survey maps will be copies of standard 1:40,000 and 1:50,000 NOAA Nautical Charts. An arrow ("→") will be used to indicate direction of manatee travel, if any. Lines will be drawn from each observation dot towards the map margins where additional, more specific information can be entered. This information will include the number of adult manatees followed by an "A", the number of young (calves) present followed by a "Y", and a letter description of specific behavior.

Copies of the forms and survey maps will be made as soon as possible to safeguard against loss of data. Data will be entered into a computer database for inclusion in Everglades National Park's Geographic Information System. Data fields and structure will be compatible with the needs of the Florida Department of Natural Resources' ArcInfo Geographic Information System. The

surveys will explore the use of GPS and data tagging technology to provide more rapid data transfer and spatial analysis.

Historical manatee sighting data for Florida Bay and the Upper Keys will be secured and entered into the GIS as appropriate. The examination of historical use patterns, evaluation of past survey data, and trend analysis is ongoing, as initiated with the surveys of 1990-93. The general methods of analysis follow those discussed in Stoms et al., (1993).

This project will also support a review of South Florida ecosystem restoration efforts and potential effects on the Florida manatee, a currently poorly understood and heretofore unaddressed concern. This review has been initiated and is a cooperative effort between Eckert College, the Marine Mammal Commission, and the South Florida Natural Resource Center.

IV. SCHEDULE AND DELIVERABLES

Aerial surveys (monthly)

Data archive (monthly)

GIS site files (quarterly/seasonal)

Analysis (annual)

Annual report

V. BUDGET

Cost sharing with the Florida Marine Research Institute and the Save the Manatee Club may be possible.

Total project cost \$15,000

	NPS	OTHER
Travel (to FMRI-DNR)	300	
Supplies (maps, film, etc)	200	
Capitalized equipment (autowind, autofocus camera w/ telephoto lens for photo ID of individual manatees)	1500	
Fixed-wing time	6000	7000 Fla. State DNR/Save the Manatee Club
Total	<u>8000</u>	<u>7000</u>

LITERATURE CITED

- Bass, O.L. (unpublished data). The status of West Indian manatee in Everglades National Park, December 1979 - September 1981. South Florida Research Center Report, 10 pp.
- Beard, D.B. 1938. Wildlife reconnaissance: Everglades National Park Project. USDI, National Park Service, 106 pp.
- Beeler, I. E. and T. J. O'Shea. 1988. Distribution and mortality of the West Indian manatee (*Trichechus manatus*) in the southeastern United States: a compilation and review of recent information. Volume one: The Atlantic Coast. U. S. Fish and Wildlife Service, National Ecology Research Center, Gainesville, Fla. Report No. 88-09. 613 pp.
- Bengtson, J.L. 1983. Estimating food consumption of free-ranging manatees in Florida. *J. Wildl. Manage.* 47(4):1186-1192.
- Hartman, D.S. 1974. Distribution, status, and conservation of the manatee in the United States. Rep. to U.S. Fish and Wildlife Service, National Fish and Wildlife Lab, NTIS PB81-140725. 247 pp.
- Irvine, A. B., and H. W. Campbell. 1978. Aerial census of the West Indian manatee, *Trichechus manatus*, in the southeastern United States. *J. Mammal.* 59(3):613-617.
- Irvine, A. B. 1980. A review of the biology of the West Indian manatee *Trichechus manatus* in the southeastern United States, and a report of the results of an aerial survey study of western Florida. U.S. Fish and Wildlife Service, National Fish and Wildlife Lab. 140 pp.
- Irvine, A. B., J.E. Caffin, and H.I. Kochman. 1981. Aerial surveys for manatees and dolphins in western peninsular Florida: with notes on sightings of sea turtles and crocodiles. U.S. Fish and Wildlife Service, Office of Biological Services, Washington, DC. FWS/OBS-80/50. 20 pp.
- Irvine, A.B., J.E. Caffin, and H.I. Kochman. 1982. Aerial surveys for manatees and dolphins in western peninsular Florida. *Fish Bull.* 80:621-630.
- Odell, D.K. 1979. Distribution and abundance of marine mammals in the waters of the Everglades National Park. *Proc. Conf. Sci. Res. in the National Parks*, New Orleans, LA, 9-12 Nov. 1976, National Park Service Series No. 5(1):673-678.
- Moore, J.C. 1951a. The range of the Florida manatee. *Quart. J. Fla. Acad. Sci.* 14(1):1-19.
- Moore, J.C. 1951b. The status of the manatee in the Everglades National Park with notes on its natural history. *J. Mammal.* 32(1):22-36.
- Snow, R.W. 1991. The Distribution and Relative Abundance of the Florida Manatee in Everglades National Park. Annual Report. South Florida Research Center, Everglades National Park. 26 pp.
- Snow, R.W. 1992. The Distribution and Relative Abundance of the Florida Manatee in Everglades National Park: An Interim Report of Aerial Survey Data from March 1991 through February 1992. South Florida Research Center, Everglades National Park, unpublished report. 32 pp.
- Snow, R.W. 1993. The Distribution and Relative Abundance of the Florida Manatee in Everglades National Park: An Interim Report of Aerial Survey Data From March 1992 through February 1993. South Florida Research Center, Everglades National Park, unpublished report. 32 pp.

Stoms, D. M., F.W. Davis, C. B. Cogon, M.O. Painho, F. W. Duncan, J. Scepan, and J. M. Scott.
1993. Geographic analysis of California Condor sighting data. *Conservation Biology* 7(1):148-159.