United States Department of the Interior

FISH AND WILDLIFE SERVICE
South Florida Ecological Services Office
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Vero Beach, Florida 32960

June 22, 2007

Colonel Paul L. Grosskruger
District Commander
U.S. Army Corps of Engineers
701 San Marco Boulevard, Room 372
Jacksonville, Florida 32207-8175

Service Consultation Code: 4-1-07-I-0318
Corps Application Number: SAJ-2005-10488 (LP-MJW)
Consultation Initiation Date: January 8, 2007
Applicant: Sami Shiro
Project: West Bay Harbor Drive
County: Miami-Dade

Dear Colonel Grosskruger:

This document is the Fish and Wildlife Service's (Service) biological opinion for a 6-slip docking facility in Miami-Dade County, Florida. The biological opinion addresses potential effects of the project on the West Indian (= Florida) manatee (*Trichechus manatus*) (manatee), in accordance with section 7 of the Endangered Species Act of 1973, as amended (Act) (87 Stat. 884; 16 U.S.C. 1531 *et seq.*), the Marine Mammal Protection Act of 1972, as amended (MMPA) (16 U.S.C. 1361 *et seq.*), and the provisions of the Fish and Wildlife Coordination Act of 1958, as amended (48 Stat. 401; 16 U.S.C. 661 *et seq.*).

This biological opinion was prepared based on information provided by the U.S. Army Corps of Engineers (Corps), the Corps' Reach Characterization Analysis, the *Florida Manatee Recovery Plan* (Service 2001), the *South Florida Multi-Species Recovery Plan* (MSRP) (Service 1999), data supplied by the Florida Fish and Wildlife Conservation Commission (FWC), Florida Wildlife Research Institute (FWRI) and other sources of information. A complete administrative record of this consultation is on file at the Service's South Florida Ecological Services Office in Vero Beach, Florida.

Miami-Dade County Department of Environmental Resources Management (DERM) evaluated the proposed project's consistency with the county's Manatee Protection Plan (MPP) and determined, based on existing site conditions, that the facility as proposed is not consistent with the MPP. Specifically, the proposed facility does not comply with the bathymetry, benthic resource impacts, and navigability requirements of the State-approved MPP. Therefore, the Service believes the proposed facility may have an adverse effect on the manatee.

CONSULTATION HISTORY

On January 4, 2007, the Corps issued the Public Notice for permit application number SAJ-2005-10488 (LP-MJW) for construction of a dock. The Corps provided a determination of "may affect" for the endangered manatee.

By letter to the applicant dated June 9, 2005, DERM provided a biological assessment of the proposed marina. This assessment stated a Florida Department of Environmental Protection (DEP) permit would be required for the proposal and the proposed slips were shallower than the -3.5 feet MLW depth specified in the Miami-Dade County environmental regulations.

By email to the Service dated April 23, 2007, DERM stated the proposed facility does not comply with the bathymetry, benthic resource impacts, and navigability requirements of the State-approved MPP.

The Service acknowledges the Corps' determination of "may affect" for the manatee.

FISH AND WILDLIFE RESOURCES

The project is located in a man-made canal. The impacts include the shading of 0.54 acre of seagrass habitat dominated by *Halophila johnsonii*, *Halophila decipiens*, and *Halodule wrightii*. The seagrasses within the proposed project's footprint are important habitat features of manatee critical habitat in Biscayne Bay and, therefore, are important to the conservation of the species and require special management considerations or protection. The Corps' public notice did not include a compensation proposal for these anticipated impacts to seagrass.

The seagrasses within the project site provide shelter and substrate for important wildlife and fisheries species. These resources include blue crab, shrimp, snappers, red drum, bluefish, Spanish and king mackerel, Florida pompano, tarpon, and snook. These species utilize mangroves, seagrasses, hardbottoms, and adjacent estuarine waters for requisite spawning, nursery, and/or developmental uses. The seagrasses within the project site also provide shelter and substrate to subadult gag and yellowedge grouper, gray, mutton, lane, and schoolmaster snappers. The seagrasses are also an important food source for manatees.

Section 404 (b)(1) guidelines recognize mitigation as a stepwise process that incorporates both careful project planning and compensation for unavoidable losses and represents the desirable sequence of steps in the mitigation planning process. Initially, project planning should attempt to ensure adverse effects to fish and wildlife resources are avoided or minimized as much as possible. In many cases, however, the prospect of unavoidable adverse effects will remain in spite of the best planning efforts. In those instances, compensation for unavoidable adverse effects is the last step to be considered and should be used only after the other steps have been exhausted.

The Service believes the applicant has not demonstrated adherence to Section 404 (b)(1) guidelines regarding avoidance, minimization, and compensation for impacts to aquatic resources of national importance. The application for the proposed project, Corps application number SAJ-2005-10488 (LP-MJW) does not indicate the following:

1. An alternatives analysis that incorporates measures taken to avoid and minimize the proposed project's impacts to seagrasses. The Service recommends the alternatives analysis include alternative configurations that avoid and minimize the impacts to seagrasses.

2. A detailed description of proposed mitigation for unavoidable impacts to seagrasses and mangrove habitat. The mitigation proposal should include a detailed description of the proposed seagrass harvesting techniques, storage sites for harvested plugs, transplanting

methods, monitoring protocol, success criteria, and contingency plans for unsuccessful transplants. This proposal should include the location and detailed description of the proposed mitigation site that includes a bathymetric, substrate, and seagrass survey. Additionally, the mitigation proposal should provide a detailed description of how any mangrove and seagrass compensation areas will be maintained in perpetuity.

In the absence of demonstrated adherence to Section 404 (b)(1) guidelines regarding avoidance, minimization, and compensation for impacts to aquatic resources, and in view of the potential for this project to adversely affect fish and wildlife species and their habitat, the Service believes that the shading impacts to 0.54 acre of seagrasses, may result adverse environmental effects. Adverse environmental effects include potential direct and indirect impacts of the project to onsite seagrasses, offsite seagrasses, and loss of important habitat features of Biscayne Bay.

The Service believes the applicant has not demonstrated adherence to Section 404 (b)(1) guidelines and the Service's Mitigation Policy. In view of the potential for this project to adversely affect seagrasses in Biscayne Bay, we recommend the Department of the Army permit be held in abeyance until the applicant has demonstrated adherence to Section 404(b)(1) guidelines. The above findings and recommendations constitute the report of the Department of the Interior.

BIOLOGICAL OPINION

DESCRIPTION OF PROPOSED ACTION

The proposed action would authorize the construction of a 6-slip, 205-foot dock along 225 feet of shoreline of three adjacent lots. The project is located in the Biscayne Bay adjacent to 9920-9960 West bay Harbor Drive, in Section 27, Township 52 South, Range 42 East, Miami, Miami-Dade County, Florida.

To reduce direct construction-related impacts to the manatee, the Corps has agreed to include as condition of the permit, the *Standard Manatee Construction Conditions* (FWC 2005). Seagrasses, if present, are avoided through modifications in the project design during the permit review process and/or the application of *Dock Construction Guidelines for Florida* developed by the Corps and the National Marine Fisheries Service (Corps and NOAA Fisheries 2001). Indirect effects of the project to the manatee have been ameliorated by the establishment and posting of manatee speed zones in the project vicinity and the enforcement of these zones by Federal, State, and local law enforcement agencies.

STATUS OF THE SPECIES/CRITICAL HABITAT

Species/Critical Habitat Description

West Indian (= Florida) manatees are massive fusiform-shaped mammals with skin that is uniformly dark grey, wrinkled, sparsely haired, and rubber-like. Manatees possess paddle-like forelimbs, no hind limbs, and a spatulate, horizontally flattened tail. Females have two axillary mammae, one at the posterior base of each forelimb. Their bones are massive and heavy with no marrow cavities in the ribs or long bones of the forearms (Odell 1982). Adults average about 10 feet in length and 2,200 pounds in weight, but may reach lengths of up to 15 feet (Gunter 1941) and weigh as much as 3,570 pounds (Rathbun et al. 1990). Newborns average 4 to

4.5 feet in length and weigh about 66 pounds (Odell 1981). The nostrils located on the upper snout, open and close by means of muscular valves as the animals surface and dive (Husar 1977; Hartman 1979). A muscular flexible upper lip is used with the forelimbs to manipulate food into the mouth (Odell 1982). Bristles are located on the upper and lower lip pads. Molars designed to crush vegetation form continuously at the back of the jaw and move forward as older ones wear down (Domning and Hayek 1986). The eyes are very small, close with sphincter action, and are equipped with inner membranes that can be drawn across the eyeball for protection. The ears are external, minute, with no pinnae. The anatomy of the internal ear structure indicates that they can hear sounds within a relatively narrow low frequency range, that their hearing is not acute, and that they have difficulty in localizing sound (Ketten et al. 1992). However, Gerstein (1995) suggested manatees may have greater low-frequency sensitivity than other marine mammal species that have been tested.

Critical habitat for any species is described as the specific area within the geographic area occupied by the species, at the time it is listed under the provisions of section 4 of the Act, on which are found those physical or biological features (*i.e.*, constituent elements): (1) essential to the conservation of the species; and (2) which may require special management considerations or protection [Act §3 (5)(A)].

Critical habitat for this species was designated in 1976 (50 CFR 17.95). Designated critical habitat on the west coast of Florida includes Crystal River in Citrus County, portions of the Little Manatee River in Hillsborough County, the Manatee River in Manatee County, the Myakka River in Sarasota and Charlotte Counties, the Peace River in DeSoto and Charlotte Counties, and the Caloosahatchee River in Lee County. It also includes all the coastal waters in Lee, Collier, and Monroe Counties between Gordon's Pass (Collier County) and Whitewater Bay (Monroe County).

Designated manatee critical habitat on the Atlantic Coast of Florida includes those intracoastal waters connecting rivers and bays from the Florida/Georgia border south to Key Largo in Monroe County, excluding those waters in Broward County, Florida. The Atlantic Subpopulation of manatees also uses critical habitat identified between Key Largo and mainland Miami-Dade County in Florida Bay.

Constituent elements for any designated critical habitat include those physical and biological features essential to the conservation of the species. No specific primary or secondary constituent elements were included in the critical habitat designation. However, researchers agree essential habitat features for the manatee include seagrasses for foraging, shallow areas for resting and calving, channels for travel and migration, warmwater refuges during cold weather, and fresh water for drinking (Service 2001).

Life History

Manatees are herbivores that feed opportunistically on a wide variety of aquatic vegetation. Feeding rates and food preferences depend, in part, on the season and available plant species. Manatees frequently feed in water depths of 3 to 9 feet where aquatic vegetation is abundant. Seagrasses appear to be a staple of the manatee diet in coastal areas (Ledder 1986; Provancha and Hall 1991; Kadel and Patton 1992; Koelsch 1997; Lefebvre et al. 2000). Manatees can remain submerged for several minutes with the longest submergence record lasting 24 minutes

(Reynolds 1981). Breeding takes place when one or more males (ranging from 5 to 22 individuals) are attracted to an estrous female to form a temporary mating herd (Rathbun et al. 1995). Mating herds can last up to 4 weeks, with different males joining and leaving the herd daily (Hartman 1979; Bengston 1981; Rathbun et al. 1995; Rathbun 1999). Permanent bonds between males and females do not form. During peak activity, the males in mating herds compete intensely for access to the female (Hartman 1979). Successive copulations involving different males have been reported. Some observations suggest that larger, presumably older, males dominate access to females early in the formation of mating herds and are responsible for most pregnancies (Rathbun et al. 1995). Although breeding has been reported in all seasons, Hernandez et al. (1995) reported that histological studies of reproductive organs from carcasses of males found evidence of sperm production in 94 percent of adult males found between March and November. Females appear to reach sexual maturity by about age 5 but have given birth as early as 4 (Marmontel 1995; Odell et al. 1995; O'Shea and Hartley 1995; Rathbun et al. 1995), and males may reach sexual maturity at 3 to 4 years of age (Hernandez et al. 1995). Manatees may live in excess of 50 years (Marmontel 1995), and evidence for reproductive aging is unclear (Marmontel 1995; Rathbun et al. 1995). Calf dependency usually lasts 1 to 2 years after birth (Hartman 1979; O'Shea and Hartley 1995; Rathbun et al. 1995; Reid et al. 1995). Calving intervals vary greatly among females, with an average birth cycle of 2 to 2.5 years, but may be considerably longer depending on age and perhaps other factors (Marmontel 1995; Odell et al. 1995; Rathbun et al. 1995; Reid et al. 1995). Females that abort or lose a calf due to perinatal death (small manatees, less than 60 inches in length) (O'Shea and Hartley 1995), may become pregnant again within a few months (Odell et al. 1995) or even weeks (Hartman 1979).

Manatees often use secluded canals, creeks, embayments, and lagoons, particularly near the mouths of coastal rivers and sloughs, for feeding, resting, playing, mating, and calving (Marine Mammal Commission [MMC] 1986 and 1988). Manatees frequent coastal, estuarine, and riverine habitats and are capable of extensive north-south migrations. Based on telemetry, aerial surveys, photo-identification sighting records, and other studies over the past 20 years, manatee distribution in the southeastern United States is better understood (Beeler and O'Shea 1988; O'Shea 1988; MMC 1984 and 1986; Lefebvre et al. 1989). In general, the data reveal manatees exhibit opportunism, as well as predictable patterns in their distribution and movement. They are able to undertake extensive north-south migrations with seasonal distribution determined by water temperature below 68 degrees Fahrenheit (20 degrees Celsius). Manatees depend on areas with access to natural springs, man-made warmwater refugia, areas with vascular plants, and freshwater sources. Manatees normally migrate along shorelines and use deeper corridors to access shallow water feeding and resting areas. When ambient water temperatures drop below 68 degrees Fahrenheit in autumn and winter, manatees aggregate within the confines of natural or artificial warmwater refuges (Lefebvre et al. 1989) or move to the southern tip of Florida (Snow 1991). Most warmwater artificial refuges are created by outfalls from power plants or paper mills. As water temperatures rise, manatees disperse from these winter aggregation areas. While some remain near their winter refuges, others undertake extensive migrations along the coast of Florida and far up rivers and canals. Most manatees return to the same warmwater refuges each year. However, some manatees use different refuges in different years, and others use two or more refuges in the same winter (Reid and Rathbun 1984; Rathbun et al. 1990; Reid et al. 1991). There are many lesser known, minor aggregation areas used as temporary thermal

refuges. Most of these are canals or boat basins where warmwater temperatures persist as temperatures in adjacent bays and rivers decline.

Population Dynamics

The total population size of manatees in Florida is unknown. Annual synoptic surveys suggest a minimum population of 3,000 animals statewide. Adult manatee survival rates are considered to be the most important indicator of maintaining a stable and secure manatee population. Given the low reproductive rate, manatee populations would be slow to recover from extensive depletions of their numbers.

Status and Distribution

Based on telemetry studies, aerial surveys, photo identification studies, and other research over the past 30 years, manatee distribution in the southeastern United States is now well known (Beeler and O'Shea 1988, Fertl *et al.* 2005, Lefebvre *et al.* 1995, Rathbun *et al.* 1982, Schwartz 1995). Florida manatees can be found in Florida waters throughout the year, and nearly all manatees use the waters of peninsular Florida during the winter months. In winter months, most manatees rely on warm water from industrial discharges and natural springs for warmth.

There are four regional management units of manatees in Florida: (a) the Northwest Region, along the Gulf of Mexico from Escambia County east and south to Hernando County; (b) the Upper St. Johns River Region, consisting of Putnam County from Palatka south to Lake and Seminole counties; (c) the Atlantic Coastal Region, consisting of counties along the Atlantic coast from Nassau County south to Miami-Dade County and that portion of Monroe County adjacent to the Florida Bay and the Florida Keys; and counties along the lower portion of the St. Johns River north of Palatka, including Putnam, St. Johns, Clay and Duval counties; and (d) the Southwest Region, consisting of counties along the Gulf of Mexico from Pasco County south to Whitewater Bay in Monroe County. The largest numbers of manatees, comprising perhaps 80 percent of the manatee population in Florida, are found in the Atlantic Coast and Southwest regions. The Northwest and Upper St. Johns River units comprise about 20 percent of the population. Manatees in the NW, Upper St. Johns River and Atlantic Coastal regions are exhibiting positive growth, however those in the SW region appear to be in decline, probably due to the combined effects of watercraft mortality and episodic red-tide events (Craig and Reynolds 2004; Runge *et al.* 2004; Langtimm *et al.* 2004; K. Langtimm pers. comm. 2006).

Reasons for Legal Protection

In 1967, both the Florida and Antillean subspecies of manatees (*T. manatus latirostris* and *T. manatus manatus*) were listed as endangered (32 FR 4061) and received Federal protection with the passage of the Act in 1973. However, since the manatee was designated as an endangered species prior to enactment of the Act, there was no formal listing package identifying threats to the species, as required by section 4(a)(1) of the Act. However, since that time, threats to the manatee (discussed below) have been identified.

Manatees are also protected under the MMPA. The MMPA establishes, as national policy, maintenance of the health and stability of marine ecosystems and, whenever consistent with this primary objective, obtains and maintains optimum sustainable populations of marine mammals.

It also establishes a moratorium on the taking of marine mammals, which includes harassing, hunting, capturing, killing, or attempting to harass, hunt, capture, or kill any marine mammal.

Section 101(a)(5)(A) of the MMPA allows the Service, upon request, to authorize by specific regulation the incidental, unintentional take of marine mammals by persons engaged in identified activities within specific geographic areas, if the Service determines such taking would have a negligible impact on the species or subpopulation. Since the manatee, which is comprised of the Florida and Antillean manatee subpopulations, is currently listed as "endangered" under the Act, they are considered "depleted" under the MMPA. Section 115(b) of the MMPA requires conservation plans be developed for marine mammals considered "depleted." In the case of the Florida manatee, the Service developed the initial recovery plan for the manatee in 1980. This initial plan focused primarily on manatees in Florida, but included Antillean manatees in the Commonwealth of Puerto Rico and the United States Virgin Islands. In 1986, the Service adopted a separate recovery plan for manatees in Puerto Rico. To reflect new information and planning needs for manatees in Florida, the Service revised the original plan in 1989 and focused exclusively on the Florida manatee. This first revision covered a 5-year planning period ending in 1994. The Service revised and updated the plan again in 1996, which again covered a 5-year planning period ending in 2000. In 1999, the Service initiated the process to revise the plan for a third time. An 18-member recovery team, consisting of representatives of the public, agencies, and groups that have an interest in manatee recovery and/or could be affected by proposed recovery actions, was established to draft the third revision. The latest manatee recovery plan, which also covers a 5-year planning period, was finalized in October 2001.

Threats

The two most significant threats to the Florida manatee population statewide are collisions with watercraft and the loss of warm water habitat. All other threats are relatively minor in comparison. Mortality from watercraft collisions accounts for 25-33 percent of all manatee mortalities statewide (FWC-FWRI 2006). Warm water habitat is essential for manatee survival during cold weather. Prolonged exposure to cold water temperatures can result in debilitation and/or death due to "cold stress syndrome" (Bossart *et al.* 2004, Rommel *et al.* 2001). However, when compared to all other threats, including the loss of warm water habitat, watercraft-related mortality poses the most serious long-term risk to the growth and resilience of the manatee population.

Other threats to manatees include crushing or entrapment in gates and locks, entanglement in ropes, lines, and nets, ingestion of fishing gear or debris, vandalism, poaching, and exposure to red tide brevetoxin (Bossart *et al.* 1998).

Manatee Protection Plans

Concerned with an increased number of manatee mortalities and boating accidents, the Governor and Cabinet directed the Florida Department of Natural Resources (DNR) in June 1989 to make recommendations for specific actions to protect the manatee and its habitat and to make the State's waterways safer for the boating public. DNR's final report, *Recommendations to Improve Boating Safety and Manatee Protection on Florida Waterways*, found over 80 percent of all watercraft-related manatee mortality occurred in 10 counties: Brevard, Broward, Citrus,

Collier, Miami-Dade, Duval, Lee, Martin, Palm Beach, and Volusia. Though watercraft-related mortality was not high for St. Lucie and Indian River Counties, these counties were considered important as travel corridors as well as foraging and resting areas for manatees. Sarasota County volunteered to be the 13th county and was included because it too provided on the west coast the same important use areas that St. Lucie and Indian River counties did on the east coast.

Subsequent to this report, the Governor and Cabinet directed each of these 13 coastal (= key) counties to develop an MPP. The purpose of an MPP is to present a summary of existing information about manatee use and watercraft use within the county and to develop strategies to balance manatee protection, resource protection, waterway uses, boating facility siting, speed zones and signage, boating safety, and to educate the boating public. The final report recommended new or expanded boating facilities in these key counties should be limited to one powerboat slip per 100 linear feet of shoreline (the 1:100 ratio) until the county implements its State-approved MPP, including a boating facility siting component. Watercraft access projects consistent with a county's MPP provides levels of boater access and activities within the capacity of the manatee protection measures established. Projects not consistent with a MPP may exceed the capacity of these protective measures and, therefore, may result in incidental take of manatees. Countywide MPPs are identified in the *Florida Manatee Recovery Plan* (Service 2001) as a method for protecting manatees and manatee habitat.

Citrus County was the first county to have a State-approved MPP in 1991. The county's MPP identified actions that address manatee mortality and included a boating facility siting plan. The MPP also discussed conservation measures to protect manatee habitat. Subsequent to its approval, the State established regulatory speed zones for watercraft. The State of Florida subsequently approved MPPs for Collier County in May 1995 followed by Miami-Dade County in December 1995; Duval County in June 1999; Indian River County in August 2000 which was amended in February 2002 and in August 2004; St. Lucie County in March 2002; Martin County in June 2002; Brevard County in February 2003; Sarasota County in February 2004; Lee County in August 2004; and Volusia County in October 2005.

The Service believes county MPPs are one of the best vehicles to address such issues as boating facilities (marinas, docks, boat ramps, and dry storage areas); boating activity patterns; manatee information; a boat facility siting plan; manatee protection measures; and an education and awareness program for the boating public. They are valuable planning tools and provide an excellent venue for local manatee protection efforts. In addition, it is our view an effective MPP must contain components that address manatee protection areas (*e.g.*, manatee refuges), speed zone enforcement, funding for manatee protection efforts, and a reporting/monitoring element. Implementation of a State-approved MPP will have met State standards and addressed our concerns in maximizing benefits to the manatee while providing regulatory certainty to the public.

Analysis of the Species/Critical Habitat Likely to be Affected

Due to the increase in the number of watercraft resulting from the proposed action the Corps has determined that the proposed project "may affect" the manatee. We acknowledged the Corps' determination, and as directed by our January 14, 2003, memorandum have engaged in formal consultation in an effort to provide a more complete analysis of the effects of the proposed action

in order to determine whether or not the proposed activity is likely to jeopardize the continued existence of the manatee.

The construction of this multi-slip dock will likely affect the manatee and its critical habitat by increasing watercraft in the action area, and increasing the potential to adversely affect submerged aquatic resources (*i.e.*, seagrasses). An analysis of increased watercraft access and impacts to seagrasses will be considered further in the remaining sections of this document.

ENVIRONMENTAL BASELINE

Consultation was initiated on this project, and the Service evaluated the specific conditions of the areas expected to be affected by the project to determine whether the project is likely to result in incidental take of manatees. If this analysis determines that incidental take is likely, the Service would normally issue a biological opinion with an incidental take statement. However, the Service cannot provide an incidental take statement for a facility under Act until and unless incidental take is authorized under MMPA. If a special regulation is promulgated that authorizes incidental take under the MMPA, then we would consider this information in our determination as to whether incidental take could be authorized under the Act. However, it is ultimately the Corps' responsibility to decide whether or not to issue a permit.

The project analyzed in this document is located in Miami-Dade County, Florida. After reviewing the Corps' Reach Characterization Analysis, we have determined that the northern portion of Reach 1, all of Reach 2, the southern portion of Reach 3, and the northern portion of Reach 25 occur within Miami-Dade County. This biological opinion will address all relevant biological and physical factors that may affect the manatee, resulting from the construction of this multi-slip dock.

Enforcement of posted speed zones in Miami-Dade County is conducted by the FWC, Miami-Dade County Marine Patrol, Coral Gables Marine Patrol, Indian Creek Village Marine Patrol, Miami-Dade Marine Patrol, Miami Beach Marine Patrol, North Miami Marine Patrol, and North Miami Beach Marine Patrol. Designated manatee speed zones are enforced by members of all duly authorized law enforcement agencies within the county. The U.S. Coast Guard and the Service also provide speed zone enforcement through special task force events.

The Service also considered impacts from alteration of manatee habitat through dredge and fill activities associated with construction of new watercraft access projects and potential direct harm or harassment of manatees during construction activities. These types of anticipated direct impacts to habitat are addressed through facilities siting and through modifications in the project design during the permit review process. Direct impacts to manatees during construction are dealt with through application of the *Standard Manatee Construction Conditions* (FWC 2005), which are routinely included as conditions of Department of the Army permits issued for construction projects in manatee habitat.

ACTION AREA

The Corps has received an application for the construction of 44 additional slips within Reach 2. The Service believes the action area for this biological opinion is the most-probable travel route

of watercraft using the proposed multi-slip docking facility. It is anticipated these watercraft will be used primarily for day trips, mostly on weekends and holidays, and during daylight hours, traveling throughout Reach 2, which includes the Atlantic Intracoastal Waterway (AIW), and Biscayne Bay, in Miami-Dade County, and out into the Atlantic Ocean for fishing and pleasure purposes. Therefore, the action area for this biological opinion has been identified as the coastal waters of Miami-Dade County, within Reach 2, as defined in the Corps' Reach Characterization for Florida Waters (Corps 2001).

Status of the Species within the Action Area

Manatees migrate through Miami-Dade County. Manatee distribution and dispersal patterns, and numbers of individuals within an area, can vary considerably from year-to-year and season-to-season. This variability in dispersal patterns is dependent on a variety of biotic and abiotic factors, such as warmwater discharges, freshwater supplies, high quality feeding areas, and mating season.

During January 2003, there were three synoptic aerial surveys covering Florida. A total of 1,695; 1,814; and 1,705 manatees were observed along the east coast of Florida. These surveys did not delineate how many manatees were observed within Miami-Dade County.

Designated manatee critical habitat is found within the action area. No specific primary or secondary constituent elements were defined in the critical habitat designation. However, an important component of manatee critical habitat within Miami-Dade County includes seagrasses used for foraging. Miami-Dade County has approximately 145,650 acres of seagrasses, including approximately 11,220 acres that are lightly, moderately, or severely scarred from boat propellers (unpublished sources). Other important components of manatee critical habitat include shallow areas for resting and calving, channels for travel and migration, fresh water for drinking, and warmwater refugia. In the action area, manatees congregate at Florida Power and Light's Cutler Power Plant and Turkey Point Power Plant during winter cold spells. These plants discharge warmwater resulting from the generation of electricity.

Factors Affecting the Species' Environment Within the Action Area

We know that sublethal forms of take (such as injury and harassment) occur, but some of these forms are immeasurable. Sublethal injury to manatees due to boat interactions is a significant factor. On a continued basis, this type of injury could have an impact on maintaining a healthy and viable population. In that regard, most manatee carcasses examined bear scars from previous strikes with watercraft (Wright et al. 1995), and a significant number of living, but scarred, manatees exist. A photo-identification system and database of scarred manatees currently maintained by the Sirenia Project (Beck and Reid 1995) contain only individuals with distinct scars, the vast majority of which appear to have been inflicted by propeller blades or keels. This database now documents 1,184 living individuals scarred from collisions with boats. Most of these manatees (1,153, or 97 percent) have more than one scar pattern, indicating multiple strikes with boats. Carcasses examined at necropsy also bear healed scars of multiple past strikes by boats; one extreme case, recently noted by the FMRI, had evidence of more than 50 past boat collisions (O'Shea et al. 2001). The severity of these boat strikes, including completely severed tails, major tail mutilations, and multiple disfiguring dorsal lacerations, is thought by some manatee researchers to impact population processes by reducing calf production

(and survival) in wounded females, although there are no reliable data to establish this cause and effect relationship. Overall, the full effects of harm to manatee population dynamics resulting from boat strikes remain largely unknown.

In addition to direct injury due to boat strikes, harassment by boats and swimmers may drive animals away from preferred sites thus altering manatee behavior and movement patterns. Significant and/or long-term harassment may require manatees to travel greater distances to feed or to reach warmwater refugia. Furthermore, some researchers are concerned that manatee calves can be separated from their mothers and some individuals may be driven from preferred warmwater refuges due to harassment.

Watercraft-related death and serious injury is the most important human-related factor affecting the manatees within the action area. Between 1974 and 2005, 236 manatee deaths were recorded within Miami-Dade County. The cause of death categories includes watercraft, flood gate/canal lock, other human causes, perinatal, cold stress, natural, and undetermined. Death category quantities are as follows: watercraft, 49; flood gate/canal lock, 72; other human causes, 31; perinatal, 17; cold stress, 2; natural, 12; and undetermined, 53.

Many boat owners in Miami-Dade County utilize public boat ramps to access Biscayne Bay, the AIW, and the Atlantic Ocean. There are seven public boat ramps within Miami-Dade County. Boat launch facilities occur at the following locations: (1) Barry Kutun Boat Ramp; (2) Black Point Park; (3) Crandon Park; (4) Haulover Park; (5) Homestead Bayfront Park; (6) Matheson Hammock Park; and (7) Pelican Harbor. The Corps does not regulate watercraft operations from either private docks or public boat ramps. However, other programs that do regulate watercraft operation from these facilities, such as the agencies that establish and enforce speed zones, have the greatest potential to contribute to take of manatees and the greatest potential to control such take.

The potential long-term effect of continued growth in Miami-Dade County's human population on the quality of coastal ecosystems is another factor affecting the manatee. As Miami-Dade County's human population increases, particularly in the coastal areas, threats to submerged aquatic vegetation communities will increase. These submerged aquatic vegetation communities are an important component in the survival and recovery of the manatee. The combined effects of propeller scarring of seagrasses, water pollution from stormwater discharges, new docks, dredging, and filling will further degrade seagrasses. These activities will continue to degrade habitat that provides foraging opportunities for manatees.

Miami-Dade County developed a MPP to include boating speed regulations and facility siting criteria. This plan was approved by the State of Florida in 1995. Miami-Dade County adopted manatee speed zones in June 1991. Florida Administrative Code 68C-22.025 establishes manatee speed zones on Miami-Dade County waterways. The zones were established for the purpose of regulating the speed and operation of motorboats within Miami-Dade County, including all associated and navigable tributaries, lakes, creeks, coves, bends, backwaters, canals, channels and boat basins, unless otherwise designated or excluded. Waters of Miami-Dade County have been designated as "Slow Speed," Slow Speed, November 15 through April 30," "30 mph," and "35 mph."

All Miami-Dade County posted manatee speed zone signs are in compliance with both the State-approved design parameters and Chapter 68D-23 "Uniform Waterway Markers in Florida Waters." The intent of Chapter 68D-23 is to provide for uniformity in design, construction and coloring of markers so that all vessel operators may readily recognize, identify and distinguish between authorized markers and unlawfully placed markers, and to provide a means by which the FWC law enforcement officers and all other law enforcement officers charged with the enforcement of this chapter may determine with reasonable certainty which boating areas are lawfully established and marked.

Regarding Corps application number SAJ-2005-10488 (LP-MJW) the AIW adjacent to the project site is designated as "Slow Speed" all year. The open water zone in the vicinity of the project encompasses an area that the manatee would reasonably be expected to utilize.

EFFECTS OF THE ACTION

This section includes an analysis of the direct and indirect effects of the proposed action on the manatee and its interrelated and interdependent activities.

Factors to be Considered

New watercraft access projects may have a number of direct and indirect effects on manatees and manatee habitat. Direct impacts include alteration of manatee habitat through dredge and fill activities associated with construction of the development and potential direct harm or harassment of manatees during construction activities. Anticipated direct impacts to habitat are addressed through modifications in the project design during the permit review process. Direct impacts to manatees during construction are dealt with through application of the *Standard Manatee Construction Conditions* (FWC 2005), which are routinely included as conditions of Department of the Army permits issued for construction projects in manatee habitat. Indirect effects include effects to manatees and manatee habitat caused by operation of the facility. Construction of new watercraft access projects may provide increased access by watercraft to areas frequented by manatees or may alter watercraft traffic patterns in such a way as to increase watercraft-manatee interactions. This may lead to increased harassment of manatees or increased watercraft collisions with manatees. Depending on the location of the project, construction of watercraft access projects may encourage boats to travel through important manatee habitat features such as submerged aquatic vegetation and warmwater refugia; thereby potentially altering manatee habitat and manatee habitat use patterns.

This project is in proximity to areas: (1) occupied by the manatee and (2) within designated critical habitat. This project is located in Biscayne Bay and the AIW in Miami-Dade County, and occurs within the southern portion of the geographic range of the Atlantic Subpopulation of the manatee. The timing of construction for this project (when it will be constructed) as it relates to sensitive periods of the manatee's life cycle is unknown. Manatees may be found adjacent to the proposed construction footprint during the spring, summer, and fall. Due to cooler water temperatures generally present during mid-winter, there is a significantly lower likelihood manatees will be adjacent to the construction footprint during this time. There is a high probability during the cooler months manatees will be present at Florida Power and Light's Cutler and Turkey Point Power Plants. This project will be constructed in a single, disruptive

event, followed by perpetual activities, such as maintenance of the dock structures and watercraft entering and leaving the docks. The entire construction sequence is expected to be completed in less than 3 months. Although users of watercraft associated with this project must operate at posted speeds within the action area and must be cautioned about the possible presence of manatees, physical contact, or harassment is still possible.

Analyses for Effects of the Action

The Corps has determined the project addressed in the biological opinion is within Reach 2, as defined by the Corps' Reach Characterization Analysis. Furthermore, the Corps has determined all projects within Reach 2 cause an increased risk to the manatee due to several reach characteristics including: (1) the high dock and boating density; (2) the reach is very close to a manatee aggregation area; and (3) the high potential for watercraft traffic to cross manatee aggregation areas.

Beneficial Effects - There are no known beneficial effects to manatees from the proposed activity.

Direct Effects - Direct effects are those effects caused by implementation of the proposed action at the time of construction. The direct effects of watercraft access facilities on manatees and essential features of manatee habitat (such as seagrasses), include those arising from the location, design, and construction of watercraft access facilities, and associated dredging and filling for the construction of those facilities. In examining such effects, including those on seagrasses and other important features of manatee habitat, the Service analyzes the extent to which such effects are addressed by local MPP, State review, and other protective conservation measures, such as standard precautions to protect manatees during construction. The *Standard Manatee Construction Conditions* (FWC 2005) have been used throughout the range of the manatee for more than a decade and have proven to reduce the direct effects to manatees and their habitat within the facility footprint. The direct effects this will have on the manatee within the action area include noise from barge operation and construction equipment; in-water movement of construction equipment and work watercraft; placing and securing dock support structures and mooring piles; and barge ingress and egress to the construction site.

The permittee shall comply with the following conditions intended to protect manatees from direct project effects:

a. All personnel associated with the project shall be instructed about the presence of manatees and manatee speed zones, and the need to avoid collisions with and injury to manatees. The permittee shall advise all construction personnel that there are civil and criminal penalties for harming, harassing, or killing manatees which are protected under the MMPA, the Act, and the Florida Manatee Sanctuary Act.

b. All vessels associated with the construction project shall operate at "Idle Speed/No Wake" at all times while in the immediate area and while in water where the draft of the vessel provides less than a 4-foot clearance from the bottom. All vessels will follow routes of deep water whenever possible.

c. Siltation or turbidity barriers shall be made of material in which manatees cannot become entangled, shall be properly secured, and shall be regularly monitored to avoid manatee entanglement or entrapment. Barriers must not impede manatee movement.

d. All on-site project personnel are responsible for observing water-related activities for the presence of manatee(s). All in-water operations, including vessels, must be shutdown if a manatee(s) comes within 50 feet of the operation. Activities will not resume until the manatee(s) has moved beyond the 50-foot radius of the project operation, or until 30 minutes elapses if the manatee(s) has not reappeared within 50 feet of the operation. Animals must not be herded away or harassed into leaving.

e. Any collision with or injury to a manatee shall be reported immediately to the FWC Hotline at 888-404-FWCC. Collision and/or injury should also be reported to the Fish and Wildlife Service in Jacksonville (904-232-2580) for north Florida or Vero Beach (772-562-3909) for south Florida.

f. Temporary signs concerning manatees shall be posted prior to and during all in-water project activities. All signs are to be removed by the permittee upon completion of the project. Awareness signs that have already been approved for this use by FWC must be used. One sign measuring at least 3 feet by 4 feet which reads *Caution: Manatee Area* must be posted. A second sign measuring at least 81/2" by 11" explaining the requirements for "Idle Speed/No Wake" and the shut down of in-water operations must be posted in a location prominently visible to all personnel engaged in water-related activities.

Interrelated and Interdependent Actions - There are no interdependent or interrelated actions associated with the proposed activity that is expected to impact manatees.

Indirect Effects - Watercraft-related manatee mortality was assessed for the action area of Biscayne Bay, and the AIW in Miami-Dade County reasonably anticipated having increased watercraft traffic as a result of this project. Speed zones were designated in Miami-Dade County in 1991. For the period from January 1, 1995, through December 31, 2005, a total of 23 manatee deaths due to watercraft collisions were recorded. Over the past 5 years, documented watercraft-related manatee deaths within the action area include: 5 in 2001, 1 in 2002, 2 in 2003, 2 in 2004, and 1 in 2005.

A subset of the action area was delineated to assess the effects of the project on watercraft-related manatee deaths. The area considered was Reach 2 in Miami-Dade County. This area encompasses the project discussed in this biological opinion. Within this subset of the action area, recently documented watercraft-related manatee deaths are as follows: 0 in 2001; 2 in 2001; 0 in 2003, 0 in 2004, and 0 in 2005.

Watercraft in the action area are typically used for fishing, sight-seeing, and waterskiing by local and seasonal residents. Because of their shallow draft, most powerboats can operate in areas of shallow water including seagrasses, mangrove shorelines, and waters adjacent to spoil islands and bridges. Sailboats require deeper water to operate because of their deeper drafts. Consequently, sailboats in the area tend to travel within navigation channels ranging from 10 to 12 feet in depth. Data provided by the Florida Department of Highway Safety and Motor Vehicles, Bureau of Vessel Registrations indicate that boaters in Miami-Dade County registered 57,673 vessels in 2001; 57,776 in 2002; 57,718 in 2003; 57,004 in 2004 and 58,624 in 2005.

By letter to the applicant dated June 9, 2005, DERM provided a biological assessment of the proposed marina. This assessment stated that a Florida Department of Environmental Protection (DEP) permit would be required for the proposal and that the proposed slips were shallower than the -3.5 feet MLW depth specified in the Miami-Dade County environmental regulations.

By email to the Service dated June 30, 2006, DERM stated that according to the county's MPP, consistency with the MPP is dependant upon bathymetry, benthic resource impacts, and navigability requirements defined in the Miami-Dade environmental regulations.

Species Response to the Proposed Action

The number of manatees that may occur in the vicinity of the proposed project is unknown. Manatees are sensitive to, less resilient of, and less likely to recover from significant disturbances to themselves and/or their habitat.

Although critical habitat is present in the action area, the Service believes that the addition of a 6-slip docking facility will not result in adverse modification of critical habitat because of the absence of and/or the minimization of risk to important components of manatee critical habitat, which are present in the action area. Risk to important components of manatee critical habitat were minimized through placement of slow-speed signs in winter warmwater refugia, and calving and freshwater areas. The Corps has agreed to include as a condition of the permit, and the applicants have agreed to implement as part of their construction, the *Standard Manatee Construction Conditions* (FWC 2005).

CUMULATIVE EFFECTS

Cumulative effects include the effects of future State, Tribal, local, or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions are not considered in this section because they require separate consultation under section 7 of the Act. The Service has considered cumulative effects within the action area, and based on the above discussion, has not identified any additional cumulative effects beyond those already discussed in the Environmental Baseline. However, based on the absence of the necessary measures to protect manatees (*i.e.*, consistency with Miami Dade County's MPP) the Service believes that the proposed action is reasonably certain to result in the take of manatees in the form of additional deaths and injuries.

CONCLUSION

After reviewing the current status of the manatee, the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects, it is the Service's opinion that the action, as proposed, is not likely to jeopardize the continued existence of the manatee and are not likely to adversely modify critical habitat. However, because the proposed multi-slip dock is inconsistent with Miami-Dade County's MPP, the Service believes the proposed action is reasonably certain to result in the incidental take of manatees in the form of additional deaths and/or injuries.

The Service believes implementation of a State-approved MPP is the appropriate mechanism to address boating facilities, boat facility siting, boating activity patterns, manatee information, manatee protection measures, and an education program for the boating public at the local level. Watercraft access projects that are consistent with a county's MPP provides a level of boater access and activity that is within the capacity of the manatee protection measures established. Projects that are not consistent with an MPP may exceed the capacity of the protective measures and, therefore, may result in incidental take of manatees.

Miami-Dade County has an MPP that includes a boating facility siting component and has been approved by the State. According to the county's MPP, consistency with the MPP is dependant upon bathymetry, benthic resource impacts, and navigability requirements defined in the Miami-Dade environmental regulations. Based on DERM's review of Corps application number SAJ-2005-10488 (LP-MJW), the project is inconsistent with the county's MPP because the proposed facility does not comply with the bathymetry, navigability, and benthic resource impacts of shoreline to slips requirements defined in the Miami-Dade environmental regulations. Since the proposed multi-slip dock does not meet these requirements specified in the MPP, the Service believes the project may have an adverse effect on the manatee.

INCIDENTAL TAKE STATEMENT

The Service anticipates the proposed action is reasonably certain to result in the take of manatees. However, the Service is not including an incidental take authorization for marine mammals at this time because the incidental take of marine mammals has not been authorized under section 101(a)(5) of the MMPA and/or its 1994 Amendments. Following issuance of such regulations or authorizations, the Service may amend this biological opinion to include an incidental take statement for marine mammals, as appropriate.

REINITIATION NOTICE

This concludes section 7 consultation on the proposed issuance of Corps permit application number SAJ-2005-2452 (IP-PLC).

As provided in 50 CFR 402.15, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained and if: (1) the amount of incidental take is exceeded, (2) new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not considered by this consultation, (3) the action is subsequently modified in a manner that causes an effect to listed species or critical habitat that was not considered by this consultation, or (4) a federally listed species or its critical habitat not addressed in this biological opinion may be affected by the action. In instances where incidental take occurs, any operations causing such take must cease pending reinitiation.

The above findings and recommendations constitute the report of the Department of the Interior. Thank you for your cooperation and effort in protecting fish and wildlife resources. If you have any questions regarding this project, please contact Winston Hobgood at 772-562-3909, extension 306.

Sincerely yours,

Paul Souza
Field Supervisor
South Florida Ecological Services Office

cc:
Regional Solicitor, DOI, Atlanta, Georgia (Delores Young)
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Service, Jacksonville, Florida (Species Lead)
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FWC, Vero Beach, Florida
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LITERATURE CITED

Beck, C.A. and J.P. Reid. 1995. An automated photo-identification catalog for studies of the life history of the Florida manatee. Pages 120-134 *in* T.J. O'Shea, B.B. Ackerman, and H.F. Percival (eds.). Population Biology of the Florida Manatee. National Biological Service, Information and Technology Report No. 1. Washington, D.C.

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. Prepared by the Fish and Wildlife Service for the U.S. Army Corps of Engineers. Document No. PB 88-207 980/AS. National Technical Information Service. Springfield, Virginia.

Bengston, J.L. 1981. Ecology of manatees (*Trichechus manatus*) in the St. Johns River, Florida. Ph.D. Thesis. University of Minnesota, Minneapolis, Minnesota.

Bossart, G.D., R.A. Meisner, S.A. Rommel, J.D. Lightsey, R.A. Varela, and R.H. Defran. 2004. Pathologic findings in Florida manatees (*Trichechus manatus latirostris).* Aquatic Mammals 30(3), 434-440.

Craig, B.A., and J.E. Reynolds III. 2004. Determination of manatee population trends along the Atlantic coast of Florida using a Bayesian approach with temperature-adjusted aerial survey data. Marine Mammal Science 20:386-400.

Domning, D.P. and L-A.C. Hayek. 1986. Interspecific and intraspecific morphological variation in manatees (Sirenia: *Trichechus*). Marine Mammal Science 2(2):87-144.

Fertl, D., A.J. Schiro, G.T. Regan, C.A. Beck, N.M. Adimey, L. Price-May, A. Amos, G.A.J. Worthy and R. Crossland. 2005. Manatee occurrence in the Northern Gulf of Mexico, west of Florida. Gulf and Caribbean Research 17:69-74.

Florida Fish and Wildlife Conservation Commission. 2005. Standard Manatee Construction Conditions. Tallahassee, Florida. <http://floridaconservation.org/manatee/ permits/ STANDARD%20MANATEE%20CONSTRUCTION%20CONDITIONS.pdf>.

FWC-FWRI Manatee Carcass Salvage Program. 2006. Unpublished data.

Gerstein, E.R. 1995. The underwater audiogram of the West Indian manatee (*Trichechus manatus latirostris*). M.S. Thesis. Florida Atlantic University.

Gunter, G. 1941. Occurrence of the manatee in the United States, with records from Texas. Journal of Mammalogy 22(1):60-64.

Hartman, D.S. 1979. Ecology and behavior of the manatee (*Trichechus manatus*) in Florida. American Society of Mammalogists Special Publication No. 5.

Hernandez, P., J.E. Reynolds, III, H. Marsh, and M. Marmontel. 1995. Age and seasonality in spermatogenesis of Florida manatees. Pages 84-97 *in* T.J. O'Shea, B.B. Ackerman, and H.F. Percival (eds.). Population Biology of the Florida Manatee. National Biological Service, Information and Technology Report No. 1. Washington, D.C.

Husar, S.L. 1977. The West Indian manatee (*Trichechus manatus*). U.S. Fish and Wildlife Service. Wildlife Resource Report No. 7:1-22.

Kadel, J.J. and G.W. Patton. 1992. Aerial studies of the West Indian manatee (*Trichechus manatus*) on the west coast of Florida from 1985-1990: A comprehensive 6-year study. Mote Marine Laboratory Technical Report No. 246.

Ketten, D.R., D.K. Odell, and D.P. Domning. 1992. Structure, function, and adaptation of the manatee ear. Pages 77-95 *in* J. Thomas, R. Kastelein, and A. Supin (eds.). Marine mammal sensory systems. Plenum Press. New York, New York.

Koelsch, J.K. 1997. The seasonal occurrence and ecology of Florida manatees (*Trichechus manatus latirostris*) in coastal waters near Sarasota, Florida. M.S. Thesis. University of South Florida.

Langtimm, C.A., C.A. Beck, H.H. Edwards, B.B. Ackerman, K.J. Fick-Child, S.L. Barton, and W.C. Hartley. 2004. Survival estimates for Florida manatees from the photo-identification of individuals. Marine Mammal Science 20:438-463.

Ledder, D.A. 1986. Food habits of the West Indian manatee (*Trichechus manatus latirostris*) in south Florida. M.S. Thesis, University of Miami, Coral Gables, Florida.

Lefebvre, L.W., J.P. Reid, W.J. Kenworthy, and J.A. Powell. 2000. Characterizing manatee habitat use and seagrass grazing in Florida and Puerto Rico: Implications for conservation and management. Pacific Conservation Biology 5(4):289-298.

Lefebvre, L.W., B.B. Ackerman, K.M. Portier, and K.H. Pollock. 1995. Aerial survey as a technique for estimating trends in manatee population size - problems and prospects. Pages 63-74 *in* T.J. O'Shea, B.B. Ackerman, and H.F. Percival (eds.). Population Biology of the Florida Manatee. National Biological Service, Information and Technology Report No. 1. Washington, D.C.

Lefebvre, L.W., T.J. O'Shea, G.B. Rathbun, and R.C. Best. 1989. Distribution, status, and biogeography of the West Indian manatee. Pages 567-609 *in* C.A. Woods (ed.). Biogeography of the West Indies: Past, Present, and Future. Sandhill Crane Press. Gainesville, Florida.

Marine Mammal Commission. 1988. Preliminary assessment of habitat protection needs for West Indian manatees on the east coast of Florida and Georgia. Document No. PB89-162002, National Technical Information Service. Silver Spring, Maryland.

Marine Mammal Commission. 1986. Habitat protection needs for the subpopulation of West Indian manatees in the Crystal River area of northwest Florida. Document No. PB86-200250, National Technical Information Service. Silver Spring, Maryland.

Marine Mammal Commission. 1984. Marine Mammal Commission Annual Report to Congress 1983. Washington, D.C.

Marmontel, M. 1995. Age and reproduction in female Florida manatees. Pages 98-119 *in* T.J. O'Shea, B.B. Ackerman, and H.F. Percival (eds.). Population Biology of the Florida Manatee. National Biological Service, Information and Technology Report No. 1. Washington, D.C.

Odell, D.K. 1982. The West Indian manatee, *Trichechus manatus linnaeus*. Pages 828-837 *in* J.A. Chapman and G.A. Feldhammer (eds.). Wild Mammals of North America. Johns Hopkins University Press, Baltimore, Maryland.

Odell, D.K., G.D. Bossart, M.T. Lowe, and T.D. Hopkins. 1995. Reproduction of the West Indian manatee in captivity. Pages 192-193 *in* T.J. O'Shea, B.B. Ackerman, and H.F. Percival (eds.). Population Biology of the Florida Manatee. National Biological Service, Information and Technology Report No. 1. Washington, D.C.

Odell, D.K. 1981. Growth of a West Indian manatee, *Trichechus manatus*, born in captivity. pp 131-140 *in* R. L. Brownell, Jr. and K. Ralls (eds). The West Indian manatee in Florida. Proceedings of a workshop held in Orlando, Florida; March 27-29, 1978. Florida. Department of Natural Resources, Tallahassee, Florida.

O'Shea, T.J. and W.C. Hartley. 1995. Reproduction and early-age survival of manatees at Blue Spring, Upper St. Johns River, Florida. Pages 157-170 *in* T.J. O'Shea, B.B. Ackerman, and H.F. Percival (eds.). Population Biology of the Florida Manatee. National Biological Service, Information and Technology Report No. 1. Washington, D.C.

O'Shea, T.J. 1988. The past, present, and future of manatees in the southeastern United States: Realities, misunderstandings, and enigmas. Pages 184-204 *in* Odum, R.R., K.A. Riddleberger, and J.C. Ozier (eds.). Proceedings of the Third Southeastern Nongame and Endangered Wildlife Symposium. Georgia Department of Natural Resources. Social Circle, Georgia.

Provancha, J.A. and C.R. Hall. 1991. Observations of associations between seagrasses and manatees in East Central Florida. Florida Scientist 54(2):87-98.

Rathbun, G.B. R.K. Bonde, and D. Clay. 1982. The status of the West Indian manatee on the Atlantic Coast north of Florida. Pages 152-164 *in* R.R.Odum and J.W. Guthrie, editors. Proceedings: Symposium on Non-game and Endangered Wildlife. Technical Bulletin WL5. Georgia Department of Natural Resources, Game and Fish Division, Social Circle, Georgia.

Rathbun, G.B. 1999. Sirenians. Pages 390-399 *in* Chapter 8: Behavior. J.E. Reynolds, III, and S.A. Rommel (eds.). Biology of Marine Mammals. Smithsonian Institution Press. Washington, D.C.

Rathbun, G.B., J.P. Reid, R.K. Bonde, and J.A. Powell. 1995. Reproduction in free-ranging Florida manatees. Pages 135-156 *in* T.J. O'Shea, B.B. Ackerman, and H.F. Percival (eds.). Population Biology of the Florida Manatee. National Biological Service, Information and Technology Report No. 1. Washington, D.C.

Rathbun, G.B., J.P. Reid, and G. Carowan. 1990. Distribution and movement patterns of manatees (*Trichechus manatus*) in Northwestern peninsular Florida. Florida Marine Research Publication No. 48.

Reid, J.P., R.K. Bonde, and T.J. O'Shea. 1995. Reproduction and mortality of radio-tagged and recognizable manatees on the Atlantic Coast of Florida. Pages 171-191 *in* T.J. O'Shea, B.B. Ackerman, and H.F. Percival (eds.). Population Biology of the Florida Manatee. National Biological Service, Information and Technology Report No. 1. Washington, D.C.

Reid, J.P., G.B. Rathbun, and J.R. Wilcox. 1991. Distribution patterns of individually identifiable West Indian manatees (*Trichechus manatus*) in Florida. Marine Mammal Science 7(2):180-190.

Reid, J.P. and G.B. Rathbun. 1984. Manatee identification catalogue, October 1984 update. Unpublished progress report prepared by the U.S. Fish and Wildlife Service, Sirenia Project, Gainesville, Florida for the Florida Power and Light Company.

Reynolds, J.E. 1981. Behavior patterns in the West Indian manatee, with emphasis on feeding and diving. Florida Scientist 44(4):233-241.

Rommel, S.A., M. Pitchford, and T. Pitchford. 2001. Cold-related deaths of Florida manatees: final report to the USFWS. FMRI Grant No. 2280, FMRI Project Identification No. 9322-160-2280, FWC/FMRI File Code: 2280-00-F. 21 p.

Runge, M.C., C.A. Langtimm, and W.L. Kendall. 2004. A stage-based model of manatee population dynamics. Marine Mammal Science.

Schwartz, F.J. 1995. Florida manatees, *Trichechus manatus,* (Sirenia: Trichedchidae), in North Carolina 1919 – 1994. Brimleyana 22:53 – 60.

Snow, R.W. 1991. The distribution and relative abundance of the Florida manatee in Everglades National Park, an annual report, October 1, 1991. South Florida Research Center. Everglades National Park. Homestead, Florida.

U.S. Army Corps of Engineers and Florida Department of Environmental Protection. 2001. The U.S. Army Corps of Engineers, Jacksonville District, and the Florida Department of Environmental Protection effect determination key for the manatee in Florida, January 2, 2001. U.S. Army Corps of Engineers, Jacksonville, Florida.

U.S. Army Corps of Engineers and National Marine Fisheries Service. 2001. Dock Construction Guidelines in Florida for Docks and Other Minor Structures Constructed in or over Submerged Aquatic Vegetation, Marsh, or Mangrove Habitat.

U.S. Fish and Wildlife Service. 1999. *South Florida Multi-Species Recovery Plan.* Atlanta, Georgia.

U.S. Fish and Wildlife Service. 2001. Technical/Agency Draft, Florida Manatee Recovery Plan, (*Trichechus manatus latirostris)*, Third Revision. Atlanta, Georgia.

Wright, S.D., B.B. Ackerman, R.K. Bonde, C.A. Beck, and D.J. Banowetz. 1995. Analysis of watercraft-related mortality of manatees in Florida, 1979-1991. Pages 259-268 in T.J. O'Shea, B.B. Ackerman, and H.F. Percival (eds.). Population Biology of the Florida Manatee. National Biological Service, Information and Technology Report No. 1. Washington D.C.