

WEST INDIAN MANATEE (*Trichechus manatus*)

FLORIDA STOCK (Florida subspecies, *Trichechus manatus latirostris*)

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STOCK DEFINITION AND GEOGRAPHIC RANGE

The West Indian manatee (*Trichechus manatus*), is found in coastal and riverine areas of North America, Central America, and South America and in islands in the Caribbean basin. Manatees found within the jurisdictional waters of the United States (US) include Florida and Antillean manatees, subspecies of the West Indian manatee (*Trichechus manatus latirostris* and *Trichechus manatus manatus*, respectively). Within these waters, Florida manatees are found throughout the southeastern US and Antillean manatees are found in Puerto Rico. Significant genetic differences between the manatees of Florida and Puerto Rico exist and, as a result, these populations are identified as two separate stocks (Vianna *et al.* 2006, Kellogg 2008, and Tucker *et al.* 2011). Vianna *et al.* (2006) identified a gene flow barrier between Florida and Puerto Rico using mitochondrial DNA (mtDNA) analyses.

Florida manatees are generally restricted to the inland and coastal waters of peninsular Florida during the winter, when they shelter in and/or near warm-water springs, heated industrial effluents, and other warm water sites (Hartman 1979, Lefebvre *et al.* 2001, Stith *et al.* 2006). In warmer months, manatees leave these sites and can disperse great distances (Figure 1). Individuals have been sighted as far north as Massachusetts, as far west as Texas, and in all states in between (Rathbun *et al.* 1982, Rathbun *et al.* 1990, Schwartz 1995, Fertl *et al.* 2005). On rare occasions, known Florida manatees have been sighted in Cuba and the Bahamas (Alvarez-Alemán *et al.* 2010, Melillo-Sweeting *et al.* 2011). Warm weather sightings are most common in Florida, coastal Georgia, and Alabama (Rathbun *et al.* 1982, Rathbun *et al.* 1990, Schwartz 1995, Fertl *et al.* 2005).

POPULATION SIZE

There are currently no statistically significant estimates of population size for the Florida manatee stock. However, the State of Florida, pursuant to a State legislative mandate, conducts winter counts of manatees at warm water sites throughout peninsular Florida each year. Each count includes a summation of the counts from each warm water site to produce a total count that describes the number of manatees seen at all warm water sites during the survey. Survey methods limit any quantitative interpretation of these counts. The Florida Fish and Wildlife Conservation Commission (FWC) has conducted these counts since 1991, as survey conditions permit (FWC FWRI Manatee Synoptic Surveys 2011c). Because these counts do not provide statistically significant estimates of abundance, these counts are not used to describe population trends. Instead, information from photo-identification studies is used to accurately describe population trends as they relate to growth rates, adult survival rates, and reproductive rates. Management decisions

are based on these more accurate, scientifically supportable numbers and trends.

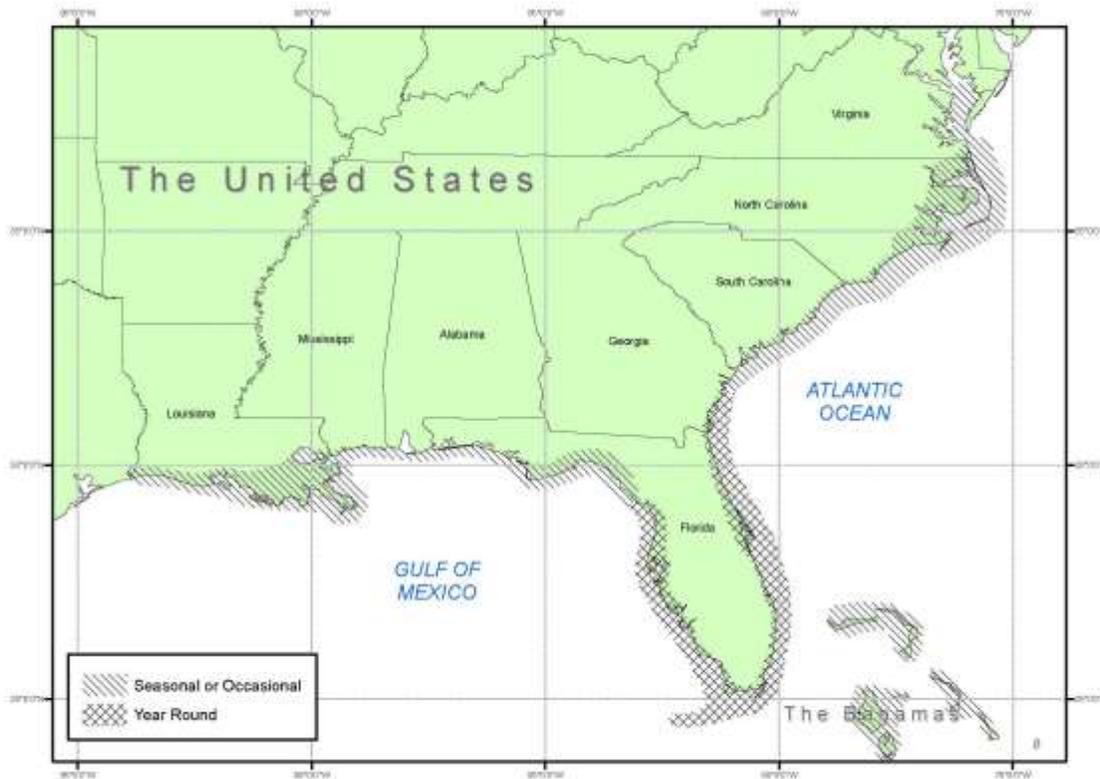


Figure 1. Range of the Florida manatee

Minimum Population Estimate

Absent a minimum population estimate of the number of manatees in this stock that incorporates precision and variability, the current, best available information suggesting a minimum population size includes FWC’s January 2011 count of 4,834 Florida manatees (FWC FWRI Manatee Synoptic Surveys 2011c). The single highest count to date was 5,076 animals, based on a single synoptic survey of warm-water refuges in January 2010 (FWC FWRI Manatee Synoptic Surveys 2011c).

Current Population Trends

Recent demographic analyses indicate that the Florida stock of manatees is increasing or stable throughout much of Florida (Runge *et al.* 2004, 2007a). The analyses rely on photo-ID based mark-recapture analyses using a manatee-specific core biological model. A recent adult survival rate analysis for the Florida manatee, through the winter of 2005 – 2006, identifies a range-wide survival rate of 96% (C.A. Langtimm, USGS, pers. comm.). The fastest growing segment of this stock is found in the St. Johns River, with a growth rate of 6.2% (95% CI 3.7 to 8.1%) (Runge *et al.* 2004).

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

Current and maximum net productivity rates have not been determined for the Florida manatee. In the absence of maximum net productivity rates for this stock, the aforementioned maximum growth rate for the St Johns River segment of this stock (6.2% with a 95% CI of 3.7 to 8.1%), which incorporates both reproductive and adult survival rates, is identified as R_{\max} . This rate describes a maximum rate of increase and reflects both additions and losses to this population, including losses due to both natural and human-causes.

POTENTIAL BIOLOGICAL REMOVAL (PBR)

PBR is the product of three elements: the minimum population estimate (N_{\min}), half of the maximum net productivity rate ($0.5 R_{\max}$), and a recovery factor (F_r). Recovery factor values range between 0.1 and 1.0 and population simulation studies demonstrate that a default value of 0.1 should be used for endangered (depleted) stocks and a default value of 0.5 should be used for threatened stocks or stocks of unknown status (NMFS 2005). Absent a true estimate of population size and a maximum net productivity rate, we are using FWC's January 2011 count of 4,834 Florida manatees and the highest calculated growth rate to calculate PBR.

$$\begin{aligned}N_{\min} &= 4,834 \\R_{\max} &= 6.2\% \\F_r &= 0.1\end{aligned}$$

$$\text{PBR} = (4,834) (0.031) (0.1) = 14.98 \text{ (or 14)}$$

HUMAN CAUSED MORTALITY AND SERIOUS INJURY

Sources of human caused manatee mortality and injury (whether serious or non-serious) include watercraft, water control structures, recreational and commercial fishing gear, and others. These sources were identified and are documented through manatee carcass salvage and rescue programs (Bonde *et al.* 1983, O'Shea *et al.* 1985, Ackerman *et al.* 1995, Wright *et al.* 1995, Pitchford *et al.* 2005, Lightsey *et al.* 2006, Rommel *et al.* 2007, FWC FWRI Manatee Mortality Statistics 2011b, USFWS Manatee Rescue, Rehabilitation, and Release Program Reports 2011).

Human-caused Mortality

Data on manatee mortality in the southeastern United States have been collected since 1974 by the Manatee Carcass Salvage Program (O'Shea *et al.* 1985, Ackerman *et al.* 1995, Lightsey *et al.* 2006, FWC FWRI Manatee Mortality Statistics 2011b). Based on these data, primary human-related threats include watercraft-related strikes (direct impact and/or propeller), which cause injury and death (Rommel *et al.* 2007, Lightsey *et al.* 2006), entrapment and/or crushing in water control structures (gates, locks, *etc.*),

entanglement in fishing gear, and ingestion of marine debris. Natural threats include exposure to cold and red tide. Mortality associated with these natural threats includes cold stress syndrome and brevetoxicosis, respectively.

Causes of death for many salvaged carcasses cannot be determined. These “undetermined” causes can be the result of a carcass that is too decomposed to diagnose, a carcass that was reported but never retrieved, or when no specific factor or set of factors can be identified as a cause of death. In addition, small manatees (less than or equal to 150 cm in length) that die at or near the time of birth and whose deaths cannot be attributed to one of the known human-related causes are described as “perinatal” deaths, an undetermined cause.

From 1978 through 2011, 8,359 manatee carcasses were salvaged in the southeastern United States. Of these carcasses, 2,266 were animals that died from human causes. Eighty-four percent of manatees (1,896) that died from human causes were killed by watercraft. Water control structures (including flood gates and navigation locks) killed 193 manatees and the deaths of the remaining 177 manatees were attributed to other human causes (including entanglement in and ingestion of marine debris [including fishing gear], etc.) (FWC FWRI Manatee Mortality Statistics 2011b, USFWS Manatee Rescue, Rehabilitation, and Release Program Reports 2011).

During the most recent five-year period (2007 to 2011), 2,302 manatee carcasses were salvaged in the southeastern United States (Table 1). Of these carcasses, 470 were of animals that died from human causes. Based on this, the annual estimated average human-caused mortality is 94 manatees per year. Ninety-two percent of manatees (431) that died from human causes were killed by watercraft. Water control structures (including flood gates and navigation locks) killed 13 manatees and the deaths of the remaining 26 manatees were attributed to other human causes (including entanglement in and ingestion of marine debris [including fishing gear], entrapment in pipes and culverts, etc.) (FWC FWRI Manatee Mortality Statistics 2011b).

A recent threats assessment (Runge *et al* 2007b) states that “watercraft-related mortality is having the greatest impact on manatee population growth and resilience” and “elimination of this threat alone would greatly reduce the probability of quasi-extinction. Anticipated losses of winter warm-water habitat could also be a significant, long-term threat.”

Table 1. All manatee deaths (number of deaths, percent of annual total), 2007 through 2011. (Source: FWC FWRI Manatee Mortality Statistics 2011b). Numbers include reported, dead manatees that were salvaged and confirmed/verified carcasses that were not salvaged (included in “Other”).

Year	Human-caused Mortality	Perinatal	Cold Stress	Other	Total
2007	80 (25%)	59 (19%)	18 (6%)	160 (50%)	317
2008	99 (29%)	101 (30%)	27 (8%)	110 (33%)	337

2009	109 (25%)	114 (27%)	56 (13%)	150 (35%)	429
2010	89 (12%)	97 (13%)	282 (37%)	298 (39%)	766
2011	93 (20%)	77 (17%)	112 (25%)	171 (38%)	453
TOTAL	470 (20%)	448 (19%)	495 (22%)	889 (39%)	2,302
5-Year Avg.	94.0	89.6	99.0	117.8	460.4

Human-caused Serious Injury

The Service and its manatee recovery partners maintain a manatee rescue and rehabilitation network to treat distressed manatees (including seriously injured manatees) and return them to the wild. This program, in existence since at least the 1950s, responds to public reports of distressed manatees (Zeiller 1992). These reports are verified and, if warranted, are addressed through the manatee rescue and rehabilitation network.

Rescued manatees are distressed due to both human-related and natural causes. Sources of distress include watercraft, marine debris, entrapment in water control structures and tide pools, exposure to brevetoxin and cold, disease, calf abandonment, and others. Not all distressed animals are injured, that is, are damaged, harmed, or experience loss(es) due to trauma (“injury” 2012).

Examples of distressed animals without injuries include orphaned calves, animals exposed to cold and red tides, diseased animals, entrapped animals (stranded due to high tides, caught behind water control structures, etc.) and others. Some examples of distressed animals with injuries include animals cut by watercraft propellers, animals with broken bones due to watercraft collisions, animals with cuts from embedded marine debris, etc. Some injuries, but not all, are superficial and non-life threatening. For example, some marine debris entangled animals are minimally tangled with minor entanglement-related scrapes.

Upon rescue, responders determine the condition of the rescued animal. Animals with non-life threatening injuries and distressed animals without injuries may be addressed in the field and released on-site. When responders conclude that, in the absence of medical treatment, an animal will die, the animal is taken to a critical care facility for treatment. Distressed animals with and without injuries may be treated. In the case of animals with injuries taken to a facility for treatment, we consider these animals to be seriously injured.

During the most recent five year period (2007 to 2011), the manatee rescue and rehabilitation network rescued 479 distressed manatees. Of this number, 88 distressed manatees with life-threatening injuries were taken to critical care facilities for treatment. Seventy-five of these animals were injured by boats and 13 were entangled in marine debris. See Table 2. (USFWS Manatee Rescue, Rehabilitation, and Release Program Reports 2011)

Table 2. All manatee rescue responses (total number of responses and number of

distressed manatees with injuries taken into critical care facilities for treatment, 2007-2011. (USFWS Manatee Rescue, Rehabilitation, and Release Program Reports 2011)

YEAR	No. of Rescue Responses	Manatees with Significant Injuries taken to Critical Care Facilities	Type of Significant Injury	
			Entanglements	Watercraft
2007	66	12 (18%)	2	10
2008	95	21 (22%)	3	18
2009	94	18 (19%)	4	14
2010	117	13 (11%)	1	12
2011	107	24 (22%)	3	21
TOTAL	479	88 (18%)	13	75
5-yr Avg.	95.2	17.6	2.6	15

Fisheries-related Mortality and Injury

Manatees are known to entangle in and/or ingest fishing gear used in commercial and recreational fisheries as well as in gear used in scientific research projects. As reported in mortality and rescue reports, fishing gear used by commercial fishers known to entangle or be ingested by manatees includes shrimp trawls, shrimp nets, crab traps (traps and/or associated buoys and lines), seines, shiner nets and hoop nets, trot lines, and monofilament fishing line and associated tackle. Similarly, recreational fishery gear known to either entangle or be ingested by manatees includes monofilament fishing line and/or associated tackle, cast nets, and crab traps. Fisheries, marine mammal, and sea turtle researchers have entangled manatees in shrimp trawls, seines, and hoop nets.

Manatees also become entangled in ropes and lines, possibly related to recreational and commercial fisheries (*e.g.*, float lines detached from traps, etc.) (Nill 1998, Smith 1998, FWC FWRI Manatee Mortality Statistics 2011b, USFWS Manatee Rescue, Rehabilitation, and Release Program Reports 2011). Manatees are struck and killed or injured by a variety of watercraft, including watercraft of a size and type comparable to those used by commercial and recreational fishers (Beck and Barros 1991, Pitchford *et al.* 2005, Lightsey *et al.* 2006, Rommel *et al.* 2007).

Commercial Fishing Gear-related Interactions

The National Marine Fisheries Services' (NMFS) "2012 List of Fisheries" (76 FR 73912; November 29, 2011) identifies three commercial fisheries known to take Florida manatees, *i.e.*, the Atlantic blue crab trap/pot fishery, the Gulf of Mexico blue crab trap/pot fishery, and the Southeastern U.S. Atlantic/Gulf of Mexico shrimp trawl fishery.

From 2007 to 2011, there were no gear-related interactions with the Southeastern U.S.

Atlantic/Gulf of Mexico shrimp trawl fishery. However, there were manatee-crab fishery interactions within the area of the Gulf of Mexico blue crab trap/pot fishery (29 rescues of manatees entangled in crab fishery gear, including 5 seriously injured manatees) and in the area of the Atlantic blue crab trap/pot fishery (16 rescues of manatees entangled in crab fishery gear, including 3 seriously injured manatees). All seriously injured manatees were successfully treated and returned to the wild (USFWS Manatee Rescue, Rehabilitation, and Release Program Reports 2011). Because both commercial and recreational crab pot fisheries use the same types of gear, it is difficult to attribute specific crab trap entanglement events to commercial crab fisheries.

Other interactions associated with known commercial fisheries not listed in the NMFS' "2012 List of Fisheries" include a manatee death associated with a Georgia in-shore bait shrimp fishery (George 2010).

While the threats posed by watercraft and the anticipated loss of wintering habitat on the Florida manatee are significant, the threat posed by commercial fishery activities is likely very small with a comparatively lesser impact on the persistence of the Florida manatee population. The threats assessment mentioned above describes mortality associated with fisheries interactions as "noticeable" and, when compared to other anthropogenic threats, is thought to have less of an impact on the persistence of the manatee population (Runge et al 2007b). Given the low numbers of mortalities and serious injury between 2007 and 2011 that are known to be attributed to commercial, as opposed to non-commercial or recreational, fisheries, total commercial fishery mortality and serious injury for this stock can be considered insignificant and approaching a zero mortality and serious injury rate.

Non-commercial Fishing Gear and Other Marine Debris-related Interactions

Manatees interact with fishing gear and other marine debris from non-commercial fishery sources, as well. Of the 14 deaths attributed to non-commercial fisheries-related gear, eight are attributable to fishing line and/or associated tackle of unknown origin, one to rope of unknown origin, one to a fisheries research net, and four to other sources. Of the 63 rescues attributed to non-commercial fisheries related gear, 32 are attributable to fishing line of unknown origin, 14 to rope of unknown origin, nine to nets, and eight to other sources. The nine net entangled manatees were entangled in cast nets (4), fisheries research-related nets (3), sea turtle research-related nets (1), and unidentified monofilament netting (1).

In most cases, it is difficult to attribute entangling and ingested fishing gear to specific fisheries, and it is particularly difficult to ascribe them to commercial, as opposed to recreational, fisheries. Gear and marine debris collected from carcasses and rescued manatees rarely provide information as to its source. As such, the role of recreational and commercial fishers in manatee fisheries interactions is hard to define. With this said, there were 10 deaths and 86 rescues (including 13 seriously injured manatees that were subsequently released) directly attributable to fishing gear of largely unknown origin between 2007 and 2011. Although we are unable to ascribe these mortalities and serious injuries to specific fisheries, given this small number of deaths and the fact that all

seriously injured manatees were returned to the wild, it is unlikely that these losses had a significant effect on the stock.

Efforts have been made to reduce the incidence of lethal and non-lethal entanglements in and ingestion of marine debris, including fishing gear (Spellman 1999, Spellman *et al.* 2003). Manatees entangled in or ingesting marine debris are rescued each year by the manatee rescue and rehabilitation program and manatee mortalities and serious injuries are minimized as a result of this activity (Nill 1998, Smith 1998, FWC FWRI Manatee Mortality Statistics 2011b, USFWS Manatee Rescue, Rehabilitation, and Release Program Reports 2011). The Service has funded studies to assess manatee behavior in the presence of fishing gear and to identify “manatee-safe” crab fishing gear that, if used, will minimize the number of manatee-crab trap entanglements (Bowles 2000, Bowles *et al.* 2003). Derelict crab trap removals and monofilament removal and recycling programs are helping to reduce the likelihood of manatee interactions with this gear (Koelsch *et al.* 2003). In February 2009, FWC adopted regional blue crab harvest closures across the state; derelict crab traps are removed during the closures, further reducing the likelihood of crab trap gear entanglements (FWC 2009).

Cold Weather-related Mortality Events

An unprecedented cold weather event in 2009-2010 was largely responsible for a record annual total number of manatee deaths documented by FWC for that year. In 2010, FWC reported 766 manatee deaths in Florida; this number included 282 deaths directly attributed to the cold. It is thought that a significant proportion of the 275 deaths described as “undetermined” and “unrecovered” are also attributable to the cold. Most of the cold-related manatee deaths occurred in southeast Florida and in southernmost Florida. In 2011, FWC reported the second highest number of cold-stress related mortality with 112 deaths directly attributed to the cold (FWC FWRI Manatee Mortality Statistics 2011b).

STATUS OF STOCK

The Florida manatee is protected by the State of Florida under the Florida Manatee Sanctuary Act of 1978, as amended (§ 379.2431(2), FS). Federally, Florida manatees were originally listed as an endangered species in 1967 under the Endangered Species Preservation Act of 1966. The original listing was subsequently adopted under the Endangered Species Act of 1973 (16 U.S.C. 1531 *et seq.*), as amended, and manatees continue to be identified as a federally endangered species. As an endangered species under the Endangered Species Act, manatees are considered to be a “strategic stock” and “depleted” under the Marine Mammal Protection Act of 1972, as amended (16 U.S.C. 1361 *et seq.*).

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