

WEST INDIAN MANATEE (*Trichechus manatus latirostris*) FLORIDA STOCK

U.S. Fish and Wildlife Service, Jacksonville, Florida

STOCK DEFINITION AND GEOGRAPHIC RANGE

Manatees are typically found in the temperate and equatorial waters of the southeastern U.S., the Caribbean basin, northern and northeastern South America, and equatorial West Africa. Their near relative, the dugong (*Dugong dugon*), is found in the Indo-Pacific region. At present, manatees of the genus *Trichechus* are represented by three allopatric species: *T. senegalensis*, the West African manatee, *T. inunguis*, the Amazonian manatee, and *T. manatus*, the West Indian manatee. The West Indian species is subdivided into two subspecies, the Antillean manatee (*Trichechus manatus manatus*) and the Florida manatee (*Trichechus manatus latirostris*) (U.S. Fish and Wildlife Service, 1989). Such subspeciation may reflect reproductive isolation brought on by the temperate northern coast of the Gulf of Mexico and characteristically strong currents found in the Straits of Florida (Domning and Hayek, 1986).

Historically, the winter range of the Florida manatee (*Trichechus manatus latirostris*) was thought to focus on south Florida, with some animals ranging north of Charlotte Harbor on Florida's west coast and north of Sebastian on Florida's east coast. Extralimital movements occurred and were typically seasonal, with animals travelling north during warmer periods and travelling south as temperatures declined. While most manatees wintered in south Florida, some were known to winter in natural spring areas to the north (Hartman, 1974). With the advent of artificial warm water refugia, the spread of exotic submerged aquatic vegetation, and increased protective measures, the manatee's winter range has expanded significantly (Beeler and O'Shea, 1988). On the east coast, manatees are now known to winter as far north as southeastern Georgia and, on the west coast, as far north as Crystal River, Florida. Documentation of manatee movements between Gulf and Atlantic coast populations in far south Florida is lacking, presumably because lack of suitable habitat in Florida Bay is not conducive to such movements, but significant genetic variation between coastal populations has not been demonstrated (McClenaghan and O'Shea 1988). Range extremes extend north to Virginia on the Atlantic coast and west to Louisiana on the Gulf coast. The number of sighting reports outside of Florida has increased in recent years.

POPULATION SIZE

Minimum Population Estimate

The exact population size for Florida manatees is unknown but the minimum population is estimated at 1,822 animals, based on intensive statewide winter aerial surveys at warm-water refuges coordinated by the Florida Department of Environmental Protection in early February of 1995 (FDEP 1995). A previous high count of 1856 manatees was obtained in a survey conducted in 1992 (Ackerman, 1992). While not a statistical estimate, this count provides the best available data on the minimum size of the population.

Population Trends

Manatee population trends are poorly known but, based on the results of a carcass recovery program, deaths have increased by an average of 5.9 percent per year in Florida from 1976 through 1992 (Ackerman et al. In press). Garrott et al.'s (1994) analysis of trends at winter aggregation sites suggest a mean annual increase of 7-12 percent in adjusted counts at sites on the east coast from 1978-1992, noting that this figure exceeds Packard's conservative estimate of maximum potential rate of increase for manatees of 2-7 percent annually (Packard 1985). Reynolds and Wilcox (1994) reported a decline in the percentage and number of calves seen at power plant aggregation sites during recent winter aerial surveys. It is not clear at this time whether this is related to increases in perinatal mortality or to some other factor.

Marmontel (1994) conducted a population viability analysis through computer simulations using 16 years of data and material collected by the carcass recovery program. This study yielded information on age-related aspects of mortality and reproduction for the Florida manatee population. A scenario, calculated from the data, having an initial population size of 2,000 individuals resulted in a gradually declining population ($r = -0.003$), a probability of persistence of 44 percent in 1,000 years, and a mean final population size of less than 10 percent of the original

value. When adult mortality was reduced by 10 percent in the model, population growth improved considerably, but when adult mortality was increased by 10 percent the population quickly dwindled. These results clearly indicate that the Florida manatee population is still at high risk of extinction in the long term. Any negative change in the population parameters, caused by environmental changes or a catastrophe, might tip the balance towards greater risk of extinction.

ANNUAL HUMAN-CAUSED MORTALITY

Manatee deaths resulting from human activities are well documented through a carcass recovery program, initiated in 1974. Causes of death include collisions with large and small boats, crushing by barges and man made water control structures (flood gates/canal locks), entanglement in nets and lines, entrapment in culverts, poaching, entanglement in, and ingestion of marine debris (e.g., monofilament), and others (Ackerman et al., In press).

From 1974 through 1994, 2,456 manatee carcasses were recovered in the southeastern U.S. Eight hundred and two (33 percent) were attributed to human-related causes. Of these, 613 were caused by collisions with watercraft, 111 were flood gate/canal lock-related, and another 78 were categorized as other human-related.

In Florida, human-related mortality accounted for the greatest proportion of deaths with identifiable causes (45 percent, with another 24 percent of deaths resulting from undetermined causes) from 1986-1992. Collisions with watercraft accounted for 83 percent of human-related causes of death during this period (Ackerman et al. 1994, Wright et al. 1994). Watercraft-related deaths increased by an average of 9.3 percent per year from 1974 to 1992, increasing as a percentage of total deaths from 21 percent in 1976-1980 to 28 percent from 1986-1992 (Ackerman et al., In press). Overall, watercraft collisions account for approximately 25% of all manatee deaths.

The highest known annual mortality for the Florida manatee in any given year occurred in 1990 when 214 deaths (206 of which occurred in Florida) were recorded (Ackerman et al. 1994). In 1994, the second highest annual level of mortality on record occurred, when 193 carcasses were recovered (FDEP 1995).

FISHERIES INFORMATION

Manatee deaths have been attributed to inshore and nearshore commercial fishing activity. Fisheries gear involved in these incidents include shrimp nets, crab trap lines, hoop nets, and a trotline (National Marine Fisheries Service, 1992; Beck, C.A. and N.B. Barros, 1991). Recreational fishing activities have also been implicated in manatee deaths; manatees have died as a result of ingesting monofilament line and fishing tackle and from entanglement in monofilament line, crab trap lines, and cast nets. Non-lethal entanglement associated with these gear types, sometimes resulting in the loss of a flipper due to constriction, is also known to occur. Collisions with fishing boats probably occur; however, it is not possible to determine the extent to which this occurs.

While fisheries have been implicated in the deaths of manatees, the number of such incidents is low. The manatee carcass recovery program has identified 17 manatee deaths which are directly attributable to commercial fisheries gear (FDEP Manatee Mortality Database, 1994). Fishing gear is suspected in three additional deaths. "Because total annual manatee mortality is increasing, the population is small, and reproduction is low, incidental mortality from commercial fisheries, when added to other human-related mortality, could be significant if not critical to the manatee population" (Young et al., 1993).

The majority of the manatee deaths attributed to commercial fisheries involve the shrimping industry. Mortalities have occurred in northeast Florida (Duval County), east central Florida (Volusia County), and the Florida Panhandle area (Franklin County), as well as in coastal waters of Georgia and South Carolina where shrimping is permitted. Other fishery interactions have occurred throughout the manatee's range in Florida. No distinct seasonality has been associated with these events (FDEP Manatee Mortality Database, 1994).

STATUS OF STOCK

The Florida manatee is listed as "endangered" under provisions of the Endangered Species Act of 1973 (16 U.S.C. 1531 et seq.), as amended. The manatee is considered a "strategic stock" as defined in Section 12 of the Marine Mammal Protection Act of 1972, as amended. The basis for this designation is the high level of documented mortality (natural and human-related) relative to the estimated population level and continuing, severe threats to critical manatee habitats in the southeastern U.S.

POTENTIAL BIOLOGICAL REMOVAL

Because of its endangered status, the recovery factor for the Florida manatee should be 0.1, the lowest allowable figure. Given a minimum population estimate of 1,822 and an R_{\max} (maximum net productivity rate) of 0.04, the Potential Biological Removal (PBR) rate for manatees is as follows:

$$\text{PBR} = (1822)(.02, \text{ or } 1/2 R_{\max})(.1) = 3$$

The calculated PBR level is greatly exceeded by known human-related manatee mortality (primarily watercraft collisions and water control structure deaths) every year in Florida. For this reason, and because current efforts of the Florida Manatee Recovery Team focus intensively on the reduction of these major types of mortality, the determination of the PBR level for manatees is of limited value. The excessive level of documented manatee mortality and the resulting unlikelihood of attaining Optimum Sustainable Population (OSP) make the calculation of meaningful PBR for manatees a difficult exercise. Marmontel's (1994) estimate of net productivity is essentially zero (-0.003). Substituting this value for the default value for maximum net productivity rate (0.04) in the above equation results in a PBR level of 0.

The U.S. Fish and Wildlife Service has consistently concluded in Section 7 Biological Opinions, pursuant to the Endangered Species Act, that the take of a single manatee would "jeopardize the continued existence" of the species. We therefore believe that designating any level of take for manatees would be inappropriate and inconsistent with the revised Florida Manatee Recovery Plan.

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WEST INDIAN MANATEE (*Trichechus manatus manatus*) ANTILLEAN STOCK

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STOCK DEFINITION AND GEOGRAPHIC RANGE

Manatees are typically found in the temperate and equatorial waters of the southeastern U.S., the Caribbean basin, northern and northeastern South America, and equatorial West Africa. Their nearest relative, the dugong (*Dugong dugon*), is found in the Indo-Pacific region. At present, manatees of the genus *Trichechus* are represented by three allopatric species: *T. senegalensis*, the West African manatee, *T. inunguis*, the Amazonian manatee, and *T. manatus*, the West Indian manatee (U.S. Fish and Wildlife Service, 1986). The West Indian species is subdivided into two subspecies, the Antillean manatee (*Trichechus manatus manatus*) and the Florida manatee (*Trichechus manatus latirostris*). Such subspeciation may reflect reproductive isolation brought on by the temperate northern coast of the Gulf of Mexico and characteristically strong currents found in the Straits of Florida (Domning and Hayek, 1986).

The Antillean manatee is found in eastern Mexico, Central America, northern and eastern South America, and in the Greater Antilles (Lefebvre et al., 1989). In Puerto Rico, the manatee is most abundant along the south and east coasts, particularly in the area of Fajardo and Ceiba (Roosevelt Roads Naval Station) and in the Jobos Bay area between Guayama and Salinas. In general, manatees are not abundant on the north coast although they are infrequently seen in areas immediately to the west of San Juan (Mignucci Giannoni, 1989, Caribbean Stranding Network, unpubl. data). Manatees are rarely seen near Culebra Island and are generally absent from Mona Island and the Virgin Islands (Caribbean Stranding Network, unpubl. data). The U.S. has jurisdictional responsibilities for the Antillean subspecies only in Puerto Rico and the U.S. Virgin Islands.

POPULATION SIZE

The exact number of Antillean manatees known to occur in Puerto Rico is unknown but, based on aerial surveys conducted on July 16 and 17, 1994, this population includes at least 86 individuals (Oland, pers. comm.). Manatees are virtually unknown from the U.S. Virgin Islands (Lefebvre et al., 1989). A rare sighting and stranding was reported here in 1988 (Caribbean Stranding Network, unpubl. data).

Population Trends

Quantitative information is limited regarding trends in the abundance of the Antillean manatee, although "[h]istorical accounts indicate that manatees were once more common and that hunting has been responsible for declining numbers throughout much of their range" (Lefebvre et al., 1989).

In Puerto Rico, efforts have been made to assess the status of the Antillean manatee by conducting aerial surveys and by means of a carcass salvage program. Aerial surveys were initiated in 1978 and have continued sporadically to the present. Carcass salvage efforts were initiated in April 1974, by the U.S. Fish and Wildlife Service (Rathbun et al., 1986). In 1989, the Caribbean Stranding Network initiated a dedicated salvage, rescue, and rehabilitation program and has assumed responsibility for all carcass recovery efforts in Puerto Rico. Despite these assessments, limited information exists by which to determine trends in this population of manatees.

Based largely on historical accounts and increasing human pressures, the Antillean manatee as a subspecies appears to be in decline. However, efforts to quantify population levels and trends are preliminary and there are no conclusive indications as to whether or not the population of Antillean manatees is stable, increasing, or decreasing either in Puerto Rico or throughout its range.

ANNUAL HUMAN-CAUSED MORTALITY

Since the inception of Puerto Rico's manatee carcass salvage program, 70 manatee deaths have been recorded from that area (Caribbean Stranding Network, unpubl. data). Many of the deaths have been attributed to human-related causes. Carcass collection efforts have documented mortalities associated with nets and watercraft (N=37). Many net-related mortalities involve poaching and are not substantiated by the presence of a carcass (Rathbun et al., 1985). From 1974 until 1988, 41.5 percent of the documented mortality was attributed to poaching. Watercraft-related mortalities are increasing. During the period 1988 to 1991, watercraft-related mortalities accounted for 43 percent of the known mortalities (U.S. Fish and Wildlife Service, 1992).

FISHERIES INFORMATION

In Puerto Rico, fisheries interactions have been documented through the carcass recovery program and in numerous anecdotal reports. Manatees are captured primarily in gill and/or turtle nets either intentionally or inadvertently during fishing activities. Reports indicate that manatee meat is sold to ready buyers, although the extent to which this occurs is unknown (Mignucci et al., 1993). Given the scarcity of detailed information, little is known about capture sites, seasonality of occurrence, etc. (Rathbun et al., 1985). Because these deaths account for a substantial proportion of known human-related mortalities (and because of the prevalence of fishery reports), it is apparent that fisheries interactions significantly affect the status of the manatee in Puerto Rico.

STATUS OF STOCK

The manatee is listed as "endangered" under provisions of the Endangered Species Act of 1973 (16 U.S.C. 1531 et seq.), as amended. The manatee is considered a "strategic stock" as defined in Section 12 of the Marine Mammal Protection Act of 1972, as amended. The basis for this designation is the high level of documented mortality relative to the estimated population level and continuing, severe threats to critical manatee habitats throughout its range.

POTENTIAL BIOLOGICAL REMOVAL

Because of its endangered status, the recovery factor for the Antillean manatee in Puerto Rico should be 0.1, the lowest allowable figure. Given a minimum population estimate of 86 and an R_{\max} (maximum net productivity rate) of 0.04, the Potential Biological Removal (PBR) rate for Antillean manatees in Puerto Rico and the U.S. Virgin Islands is as follows:

$$PBR = (86)(.02, \text{ or } 1/2 R_{\max})(.1) = 0$$

We currently have insufficient knowledge of the Puerto Rican manatee population to determine the Optimum Sustainable Population. Inadequate information on population size and net productivity rate for manatees in Puerto Rico render the calculation of a PBR level for this population an exercise of limited value. Marmontel (1994) estimated net productivity for the Florida manatee population. This estimate, based largely on a long term sex and age dataset for that population, suggested that the net productivity was essentially zero (-0.003). When the default value above (0.2) is replaced with this empirical value, the equation results in a PBR level of zero.

The U.S. Fish and Wildlife Service has consistently concluded in Section 7 Biological Opinions, pursuant to the Endangered Species Act, that the take of a single manatee would "jeopardize the continued existence" of the species. We therefore believe that designating any level of take for Antillean manatees would be inappropriate and inconsistent with manatee recovery plans.

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