

WEST INDIAN MANATEE  
RECOVERY PLAN

Prepared by  
Robert L. Brownell, Jr.  
In Cooperation with the  
West Indian Manatee  
Recovery Team  
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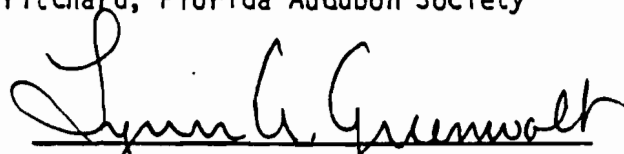
Team Members

Mr. John C. Oberheu, Leader, U.S. Fish and Wildlife Service  
Dr. Robert L. Brownell, Jr., U.S. Fish and Wildlife Service  
Dr. Daniel F. Jackson, Florida International University (1976-1979)  
Mr. A. Blair Irvine, U.S. Fish and Wildlife Service  
Mr. Patrick M. Rose, Florida Audubon Society  
Lieutenant J. Robert Lee, Florida Department of Natural Resources  
Major Lewis W. Shelfer, Jr., Florida Department of Natural Resources (1976-1979)  
Mr. Kenneth B. Stansell, U. S. Fish and Wildlife Service (1976-1978)

Consultants

Dr. Howard W. Campbell, U.S. Fish and Wildlife Service  
Mr. Harry Harper, Florida Department of Natural Resources  
Dr. Peter C. H. Pritchard, Florida Audubon Society

Approved:

  
\_\_\_\_\_  
Director, Fish and Wildlife Service  
Title

04-15-80  
\_\_\_\_\_  
Date

THIS IS THE COMPLETED WEST INDIAN MANATEE RECOVERY PLAN. IT HAS BEEN APPROVED BY THE U. S. FISH AND WILDLIFE SERVICE. IT DOES NOT NECESSARILY REPRESENT OFFICIAL POSITIONS OR APPROVALS OF COOPERATING AGENCIES AND IT DOES NOT NECESSARILY REPRESENT THE VIEWS OF ALL RECOVERY TEAM MEMBERS WHO PLAYED THE KEY ROLE IN PREPARING THIS PLAN. THIS PLAN IS SUBJECT TO MODIFICATION AS DICTATED BY NEW FINDINGS AND CHANGES IN SPECIES STATUS AND COMPLETION OF TASKS ASSIGNED IN THE PLAN.

LITERATURE CITATIONS SHOULD READ AS FOLLOWS:

WEST INDIAN MANATEE RECOVERY PLAN, DATED APRIL 15, 1980 PREPARED BY THE U. S. FISH AND WILDLIFE SERVICE IN COOPERATION WITH THE RECOVERY TEAM COMPOSED OF THE FOLLOWING INDIVIDUALS:

Mr. John C. Oberheu, Leader, U. S. Fish and Wildlife Service  
Dr. Robert L. Brownell, Jr., U. S. Fish and Wildlife Service  
Dr. Daniel F. Jackson, Florida International University  
Mr. A. Blair Irvine, U. S. Fish and Wildlife Service  
Mr. Patrick M. Rose, Florida Audubon Society  
Lieutenant J. Robert Lee, Florida Department of Natural Resources  
Major Lewis W. Shelfer, Jr., Florida Department of Natural Resources  
Mr. Kenneth B. Stansell, U. S. Fish and Wildlife Service

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## INTRODUCTION

The West Indian manatee or sea cow, Trichechus manatus, is one of only four living species belonging to the unique group of aquatic herbivores, the mammalian Order Sirenia. It is a massive, fusiform, thick-skinned, nearly hairless animal with paddle-like forelimbs, no hindlimbs, and a spatulate, horizontally flattened tail. Most adult manatees are 9 to 11½ feet (2.8 to 3.5 meters) in length. One female 11½ feet in length (350 cm) weighed over 2,200 pounds (1,000 kilograms). Manatees are usually slow moving but are able to swim swiftly for short distances.

This species historically was found in shallow coastal waters; bays, lagoons, estuaries, rivers, and inland lakes throughout much of the tropical and sub-tropical regions of the New World Atlantic, including many of the Caribbean islands. However, at the present time, manatees are now rare or extinct in most parts of their former range (Fig. 1).

Manatees have been valued by man throughout their range and have been seriously reduced by long-term over-exploitation for meat, oil and other products. Exploitation continues in many parts of the manatee's range despite regulations prohibiting it. In Florida, where in recent years human activities other than exploitation have been by far the greatest identifiable cause of manatee injury and mortality.

The manatee has been protected by Florida State Law since 1893. The statute has been revised several times to improve protection and on July 1, 1978, the State increased its protection capability significantly when its "Florida Manatee Sanctuary Act" took effect. Manatees were provided Federal protection when they were listed as endangered species under the Endangered Species Preservation Act of 1966, which was subsequently replaced by the Endangered Species Conservation Act of 1969, which in turn was replaced by the Endangered Species Act of 1973 as amended in 1978 and 1979. Additional Federal protection was provided the manatee when it was designated a marine mammal under the Marine Mammal Protection Act of 1972.

To meet the intents, provisions, and spirit of the Endangered Species Act, the Marine Mammal Protection Act, and the Florida Manatee Sanctuary Act, human-associated injuries and mortalities must be minimized, and critical habitats must be identified and protected. This plan summarizes available knowledge of the manatee and its habitat, and identifies the actions which are necessary to prevent further decline and to encourage recovery of manatee populations in U. S. waters.

Just how numerous manatees were from the time of the Spanish occupation in the 16th century until the end of the 19th century is unclear and poorly documented. However, it has been suggested that the number of manatees was gradually reduced to very low levels (Townsend 1904; Hartman, 1974; Peterson, 1974) during that period. Their number may have begun to recover slowly as a result of the 1893 Florida State Law protecting the species (Hartman, 1974), but any such population apparent increase was interrupted during the Depression and World War II when manatees were poached for meat (Moore, 1951b; Hartman, 1974).

Actual counts or estimates of manatees are rarely cited. Moore (1951a) reported two main areas of manatee abundance near the southern tip of mainland Florida, one being the bays and rivers of the west coast of the Everglades National Park and the other the northern part of Biscayne Bay, including the rivers, creeks, and canals which drain into it. As many as 100 manatees were killed around 1943 by dynamiting of rock in the Miami River to deepen the channel (Moore, 1951a). During the winter of 1954-55 Moore (1956) estimated a total of 195 manatees in the Miami River.

Recent estimates of manatee abundance are based largely on aerial censuses. A maximum count of about 800 manatees was made by Irvine and Campbell (1978) during an intensive winter aerial survey of Florida habitat in January and February 1976, but the percentage of the population observed is unknown. Rose (1978) estimated a minimum total population of 450 on the basis of his aerial surveys over six power plants during the winter of 1977-78. Powell (1978) counted a maximum of 72 manatees congregated in the Crystal River headwaters during the winter of 1977-78. Powell and Waldron (1978) reported that 21 manatees wintered in Blue Spring during the winter of 1977-78.

All existing data suggest a Florida population of at least 800 to 1,000 (Brownell, Ralls, and Reeves, 1978), which is similar to an earlier estimate of between 750 and 850 (Hartman, 1974). Available population estimates were evaluated in the light of the known level of manatee mortality in Florida by participants in the West Indian Manatee Workshop (Brownell, Ralls, and Reeves, 1978). Some participants noted that the population must be undergoing a serious decline if current estimates are correct. Other participants, however, argued that the high rate of mortality could indicate that the population is larger than has been estimated. It was agreed that until better data are available, it would be prudent to base management policies on the most conservative estimates of population size.

Except in extreme southwest Florida, most manatees were within 5 kilometers of a warm water source during a cold weather aerial survey conducted in January 1976 (Irvine and Campbell, 1978). Animals usually begin to arrive at these congregating sites in November and most remain for the winter. However, animals do move in and out so the composition of the congregations does not remain constant. During the warmer months, manatees are not commonly observed around the winter congregating sites (Hartman, 1974; Irvine and Campbell, 1978). However, they are found in nearby creeks, bayous, and canals where they are rarely observed during cold periods. "Known" manatees from the Crystal River area dispersed north along the Florida coast as far as the Suwannee River during the summer and south as far as the Chassahowitzka River (J. A. Powell, pers. comm. and Hartman, 1979).

Natural mortality - There are many reports, dating back to 1886, of manatees dying during or shortly after periods of extremely cold weather in Florida (Bangs, 1895; Moore, 1951b; Layne, 1965; Campbell and Irvine, 1978). These reports are based on the discovery of one or more dead animals after these cold periods. Although the specific cause of death has rarely been determined because of decomposition, one manatee recovered during January 1977 had acute bronchopneumonia (Campbell and Irvine, 1978). Layne (1965) reported an unusual case of seven dead manatees found in the vicinity of Fort Myers, Lee County, between March 26 and April 9, 1963. These deaths coincided with newspaper reports of many dead cormorants, gulls, and raccoons and the occurrence of a red tide outbreak to the north in the Englewood area, Sarasota County.

Population structure - Hartman (1979) classified manatees into the following age groups: calves, small animals associating with a cow; juveniles, any independent small animals not yet sexually mature; and adults, animals taking part in reproduction. In the winter of 1968-69, Hartman's Crystal River population consisted of 11 calves, 11 juveniles, and 26 adults, with a sex-ratio of 23 males to 25 females. During the winter of 1978-79, the Blue Spring population consisted of 2 calves, 5 juveniles, and 16 adults, with a sex ratio of 17 males to 6 females (K. Brugger, pers. comm.). Sexual maturity may not be attained until 7 or 8 years of age for females and 9 to 10 years for males (Odell, 1978). The longevity of manatees in the wild is unknown, but a captive has been successfully maintained in Florida for over 30 years (as of mid 1979).

#### Habitat Preference and Use Patterns

Turbidity seems to have no observed effect on manatees as they are found in very clear to extremely muddy waters. In Florida, severe storms do not cause manatees to seek shelter on the leeward sides of land masses (Hartman, 1979). However, hurricanes or other severe storms could affect manatee populations and their food resources. In general, very little is currently known about habitat requirements or areas of special biological significance, other than warm water refugia.

Flood control structures - Odell and Reynolds (1978) presented data on manatee mortality from entrapment in automatic flood control structures. All such deaths that are documented have occurred in Dade County, and five different dams have been implicated. Of the 23 deaths reported in Dade County for which the cause could be determined, 14 were due to dams, 7 due to boats, and 2 due to other human factors. These data suggest that entrapment in automatic flood control structures may be a more serious threat than boats to manatees in Dade County.

No one has ever watched a manatee become trapped, but Odell and Reynolds (1978) set forth two hypotheses for how entrapment may occur. One is that a manatee near the upstream side of a floodgate is drawn down and pinned against the gate as it opens and the water begins to rush through. If the animal is too large to pass through, it may be held submerged by the suction long enough to drown. The other possibility is that a mother becomes trapped or lodged when she tries to follow a calf that has been swept through the gate. She may then be crushed as the gate closes or drowned if it remains open for an extended period.

During 1978, one death was caused by a canal lock gate in Okeechobee County (Beck, Bonde, and Odell, Ms.).

Fishing gear - Irvine, Odell, and Campbell (1978) reported two cases of manatees being accidentally taken and drowned in fishing gear during the period between 1974 and 1977. One was recovered from a shrimp net in South Carolina and another from a fish net in Florida. Beusse (1978) stated that manatees occasionally get crab-trap lines wrapped around their flippers and knotted so tightly that septicemia results. The following cases were reported at a West Indian Manatee Workshop (Brownell, Ralls, and Reeves, 1978): (1) Powell knew of two animals at Blue Spring with troutlines wrapped around their flippers and another in Crystal River missing a flipper, (2) Odell knew of two animals in south Florida with monofilament wrapped around their flippers, and (3) Reynolds said that animals at Blue Lagoon sometimes had hooks or lures embedded in their lips. During 1979, two manatees became entangled and died in hoop nets (G. B. Rathbun, pers. comm.) used for catfish.

Manatees are attracted to certain types of fishing gear, anchor lines and buoy lines. If they become entangled in such gear, they can be injured or drown.

Poaching and vandalism - Hartman (1971) regarded vandalism as second only to boat collisions as a cause of manatee mortality and believed it was increasing during the 1970's. He mentioned a surfacing manatee that was shot in the head and another that was seen swimming with the head of a garden rake embedded in its back. However, other data were not provided to support this claim. Between 1974 and 1979, there are only six records of mortality apparently caused by a vandal or poachers; four of which were butchered (G. B. Rathbun, pers. comm.).

### Legislation and Protection

The manatee has been protected by Florida State Law (Ch. 4208. 94) since 1893. That Law was amended in May 1907 (Ch. 370.12) when the State imposed a fine of up to \$500 and/or six months imprisonment for killing or molesting a manatee. The 1907 statute was further amended in 1953 to allow capture of manatees for scientific or educational purposes.

The Florida Manatee Sanctuary Act of 1978 established the entire state of Florida a "refuge and sanctuary for the manatees." The Act has been in effect since July 1, 1978, and provides for regulating boat speeds in 13 manatee aggregation areas (Fig. 5) between November 15 and March 31. Between 650 and 850 manatees are found around those 13 areas during the winter months.

State responsibilities for manatee protection are vested with the Department of Natural Resources (DNR) and the Florida Game and Fresh Water Fish Commission. Blue Spring State Park was designated a manatee sanctuary by the DNR in 1973, and was the first locality in Florida where boats were prohibited and swimming was restricted specifically for manatee protection. As many as 23 manatees took refuge in the spring during the winter of 1978-79. The St. Johns River, from 0.8 km south to 0.6 km north of the entrance to the run, has also been posted by the State as a manatee refuge area with only idle boat speeds (no wake) allowed.

Federal efforts toward manatee protection began on March 11, 1967, when the manatee was listed as an endangered species under the Endangered Species Preservation Act of 1966 (P. L. 89-669; 80 Stat. 926). This Act covered species in the United States and authorized acquisition of habitat, but left protection to the states. The Endangered Species Conservation Act of 1969 (P. L. 91-135; 83 Stat. 275) superceded the 1966 Act and the manatee was listed again on December 2, 1970. The 1969 Act regulated importation of listed species and extended its scope to cover species world-wide.

The Marine Mammal Protection Act (MMPA) of 1972 (P. L. 92-522; 80 Stat. 1027) established a national policy designed to protect marine mammals to obtain and maintain optimum sustainable population levels consistent with the maintenance of the health and stability of the ecosystem. The manatee was designated as a marine mammal under the Act. State jurisdiction for marine mammals was preempted by the MMPA and jurisdiction over manatees was vested in the Department of the Interior, pending return of management to states when their laws and regulations are found to be consistent with the Act. The Act prohibits the "take" of any marine mammal. Violators of the Act may be fined up to \$20,000 and/or up to one year in prison.



## WEST INDIAN MANATEE RECOVERY PLAN

## Primary Objective and Rationale:

To re-establish and maintain optimum sustainable populations of West Indian Manatees in natural habitats throughout their historical range in the United States. \*

The historical range of the West Indian manatee includes the coastal range areas and associated rivers of the southeastern United States, Mexico, Central America, northern South America, and many of the Caribbean islands, but they are now rare or extinct throughout most of this area. Most countries within the species' range are presently faced with severe social, economical and political problems. These conditions pose serious problems which make it difficult for these countries to take actions to save manatees. Exploitation continues in many parts of the manatee's range despite regulations prohibiting it. Therefore, every effort must be made within the United States to prevent its extinction. This can be done most effectively by the combination of: (1) minimizing human-associated injury and mortality and (2) protecting natural habitat within all significant portions of historical range. This presumably will allow the species to re-establish itself and to achieve and maintain optimum sustainable populations. This goal of establishing optimum sustainable populations and the recovery of each population to that level may be above and beyond what is necessary to delist the species. However, the goal of optimum sustainable populations is required by the Marine Mammal Protection Act of 1972.

- \* The Fish and Wildlife Service, for the purpose of the Marine Mammal Protection Act of 1972, has interpreted the Act's definition of optimum sustainable populations to mean:

"a population size which falls within a range from the population level of a given species or stock which is the largest supportable within the ecosystem to the population level that results in maximum net productivity. Maximum net productivity is the greatest net annual increment in population numbers of biomass resulting from additions to the population due to reproduction and/or growth less losses due to natural mortality."  
44 F. R. 2541 (Jan. 11, 1979).

- 1.2 Minimize boat/barge collisions with manatees
  - 1.21 Continue to investigate and evaluate possible methods.
    - 1.211 Determine types of boats causing major damage.
    - 1.212 Evaluate feasibility of propeller guards.
  - 1.22 Inform and educate public.
  - 1.23 Establish State/Federal Regulations for winter and summer areas used by manatees and needs are identified.
  - 1.24 Enforce regulations.
  - 1.25 Evaluate the effectiveness of education programs, regulations, and enforcement.
- 1.3 Minimize manatee mortality caused by flood control structures, including locks.
  - 1.31 Continue to investigate and evaluate possible methods.
  - 1.32 Conduct pilot study to test and evaluate alternative operational techniques or barriers.
  - 1.33 Implement alternative operational techniques or modify water control structures as appropriate and possible.
- 1.4 Minimize incidental injuries and mortalities of manatees due to fishing gear.
  - 1.41 Evaluate extent and type of problems.
  - 1.42 Inform and educate public.
  - 1.43 Establish State/Federal regulations as needs are identified.
  - 1.44 Enforce regulations.
  - 1.45 Evaluate the effectiveness of education programs, regulations, and enforcement.

2.3 Identify and evaluate potential hazards to manatee habitats.

2.31 Coastal zone development.

2.32 Outer continental shelf oil and gas development.

2.33 Other (toxicants, dredging, siltation, etc.).

2.34 Power plant failures.

2.4 Identify and protect essential habitats. This protection may take the form of easements, management agreements, acquisition, etc.

2.5 Monitor status of essential habitats.

2.51 Develop standard survey methodology.

2.52 Conduct habitat surveys at regular intervals.

2.6 Inform and educate public.

2.7 Establish additional State/Federal regulations as needs are identified.

2.8 Enforce regulations.

2.9 Evaluate effectiveness of education programs, regulations, and enforcement.

3. Objective: Minimize harassment of manatees. Disturbances to manatees may upset natural activity and patterns, cause movements to less favorable habitat, or lead to sickness or death.

3.1 Minimize manatee harassment by boat and barge traffic.

3.11 Identify specific harassmant problems caused by boat and barge traffic.

3.12 Inform and educate public.

3.13 Establish State/Federal regulations.

3.14 Enforce regulations.

## General Recommendations

As a result of the meetings of the West Indian Manatee Recovery Team and the preparation of this Recovery Plan, certain specific needs or recommendations became clear. These are discussed below under the headings of Research, Management, and Regulations.

Research - Background papers should be prepared on the following subjects in an effort to clarify the confusion in the literature:

- (1) The historical range of the manatee in the southeastern United States. This report should include discussions on: (a) extralimital records, (b) cold related deaths, (c) possible changes in distribution due to power and industrial plants, and (d) changes due to loss of habitat.
- (2) The past and current exploitation of manatees in the southeastern United States, Puerto Rico and the U. S. Virgin Islands.
- (3) The historical and current abundance and trends of manatee populations in the southeastern United States, Puerto Rico, and the U. S. Virgin Islands.

Management - Background papers should be prepared in an effort to clarify problems relating to the following subjects:

- (1) The types and toxicity of aquatic herbicides used most extensively in areas where manatees occur in Florida, including seasonal application.
- (2) Specific contaminants that might affect manatee digestion and the quantity and quality of aquatic vegetation on which manatees feed.

national law and related regulations, proposals for new laws or amendments, (3) habitat, (4) administration and enforcement of laws and regulations, (5) plans for public education, (6) identification and recommendations of conservation roles to be played by all interested parties and (7) funding.

Regulations - Swimmer regulations are needed for Crystal River before the 1979-80 winter, with designated areas for snorkeling and SCUBA diving. An analysis of all existing laws covering manatees should be undertaken.

TABLE 2. IMPLEMENTATION SCHEDULE, RESPONSIBILITIES AND COSTS FOR THREE YEAR PERIOD FY 80 - FY 82

No.	Task	Agency/Organization	Responsible Agency/Organization	Source of Funding	Target Dates		Priority	Estimated Cost (X\$1,000)		
					Start	Finish		FY 80	FY 81	FY 82
1.11	Conduct salvage and necropsy	FMS,UM	FMS	FMS	underway	continuing	1	65	70	75
1.12	Rescue and rehabilitate animals	SM,WMS,MF	SM,WMS,MF	SM,WMS,MF	underway	continuing	1			*
1.13	Behavioral observations re human-caused injuries	FMS	FMS	FMS	underway	FY-81	2	(4.12)	(4.12)	(4.12)
1.21	Evaluate boat/barge collisions	FMS	FMS	FMS	underway	FY-81	1	{(1.11)}	{(1.11)}	{(1.11)}
1.211	Determine types boats causing major damage	FMS	FMS	FMS	underway	FY-80	1	{(1.11)}	{(1.11)}	{(1.11)}
1.212	Evaluate feasibility of propeller guards	FMS,UC	FMS	FMS	underway	FY-80	1	6	--	--
1.22	Inform and educate public	DNR,FMS,FA,FG	DNR,FMS,FPL	DNR,FMS,FPL	underway	continuing	1	41, 25	41, 25	41, 25
1.23	Establish State/Federal Regulations	DNR,FMS,FG	DNR,FMS,FG	DNR,FMS,FG	underway	continuing	1			
1.24	Enforce regulations	DNR,FMS,FG	DNR,FMS,FG	DNR,FMS,FG	underway	continuing	1	170, 177, 85	174, 127, 90	178, 127, 90
1.25	Evaluate effectiveness of education, regulations and enforcement	DNR,FMS,FA	DNR,FMS	DNR,FMS	?	?	2	*	*	*
1.31	Evaluate deaths from flood control structures	FMS,UM	FMS	FMS	underway	FY-80	1	(1.11)	(1.11)	(1.11)
1.32	Implement alternative operational techniques or modify water control structures	FMS,ACE	FMS,ACE	FMS,ACE	underway	FY-80	1	--	--	--
1.33	Pilot study on barriers or alternative operational techniques	FMS,ACE	FMS,ACE	FMS,ACE	underway	FY-80	1	28	*	*
1.41	Evaluate death from fishing gear	FMS	DNR,FMS,FA,FG	DNR,FMS,FPL	underway	FY-80	1	{(1.11)}	{(1.11)}	{(1.11)}
1.42	Inform and educate public	DNR,FMS,FA,FG	DNR,FMS,FG	DNR,FMS,FG	underway	continuing	3	{(1.22)}	{(1.22)}	{(1.22)}
1.43	Establish State/Federal regulations	DNR,FMS,FG	DNR,FMS,FG	DNR,FMS,FG	underway	continuing	3	{(1.23)}	{(1.23)}	{(1.23)}
1.44	Enforce regulations	DNR,FMS,FG	DNR,FMS,FG	DNR,FMS,FG	underway	continuing	3	{(1.24)}	{(1.24)}	{(1.24)}
1.45	Evaluate effectiveness of education, regulations, and enforcement	DNR,FMS,FA	DNR,FMS	DNR,FMS	?	?	3	*	*	*
1.51	Evaluate extent of poaching and vandalism	FMS,FG,ORN	FMS,FG,DNR	FMS,FG,DNR	underway	continuing	2	{(1.11)}	{(1.11)}	{(1.11)}
1.52	Inform and educate public	FMS,DNR,FA,FG	FMS,DNR,FPL	FMS,DNR,FPL	underway	continuing	2	{(1.22)}	{(1.22)}	{(1.22)}
1.53	Enforce regulations	FMS,DNR,FG	FMS,DNR,FG	FMS,DNR,FG	underway	continuing	2	{(1.24)}	{(1.24)}	{(1.24)}
1.54	Evaluate effectiveness of education, regulations, and enforcement	FMS,DNR,FA	DNR,FMS	DNR,FMS	?	?	3	*	*	*
2.11	Determine daily moments and activity patterns	FMS	FMS	FMS	underway	FY-81	1	(4.12)	(4.12)	(4.12)
2.12	Determine seasonal movement patterns	FMS	FMS	FMS	underway	FY-81	1	(4.12)	(4.12)	(4.12)
2.21	Develop standard survey methodology for habitat	FMS	FMS	FMS	?	?	2	*	*	*
2.22	Determine essential elements of natural and artificial warm water refugia	FMS	FMS	FMS	underway	FY-81	1	(4.12)	(4.12)	(4.12)

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Figure 1. Present distribution of the West Indian Manatee. Historical records are marked with arrows and areas of questionable former distribution as "?". Mean annual isotherm of 24°C is also shown. Map is modified from Whitehead (1977).

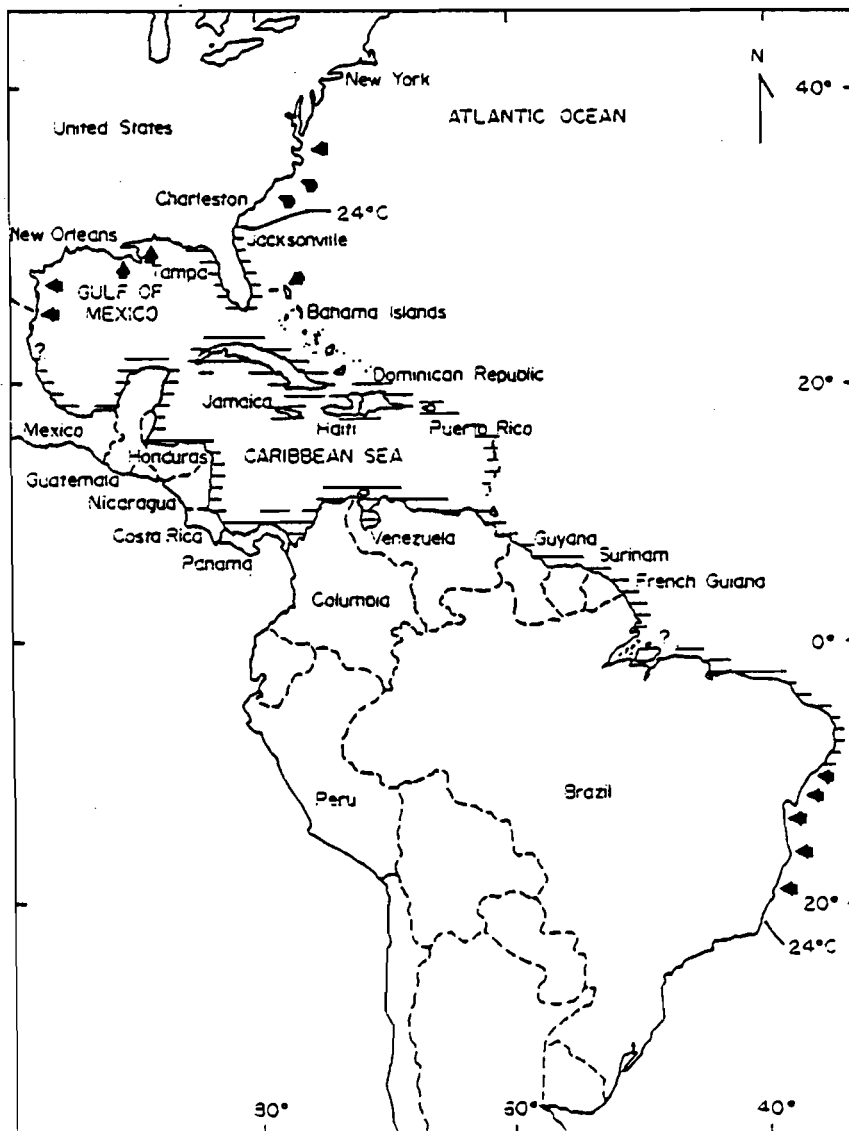


Figure 3. Natural and artificial warm water refuges used by West Indian Manatees (Hartman,1974). Natural warm water areas are: (A) Welaka Spring, (B) Silver Glen Spring Run, (C) Blue Spring Run, (D) Headwaters of Homosassa River, (E) Headwaters of Crystal River, and (F) Manatee Springs. Artificial warm water areas are: (1) Alton Box Factory, Jacksonville; (2) John D. Kennedy Generating Station, Jacksonville; (3) Southside Generating Plant, Jacksonville; (4) \*East Palatka Plant, East Palatka; (5) Turner Generating Plant, Enterprise; (6) Sanford Plant, DeBary; (7) Indian River Plant, Delespine; (8) Cape Canaveral Plant, Frontenac; (9) Vero Beach Municipal Power Plant, Vero Beach; (10) Henry D. King Municipal Electric Station, Fort Pierce; (11) Riviera Plant, Riviera Beach; (12) Port Everglades Plant, Fort Lauderdale; (13) Lauderdale Plant, Dania; (14) \*Miami River Plant, Miami; (15) \*Turkey Point Generating Plant; (16) Fort Myers Plant, Tice; (17) Big Bend Generating Plant, Apollo Beach; (18) Phosphate Plant, Gibsonton; and (19) Crystal River Plant, Crystal River. (\*The East Palatka Plant (#4) has been moth-balled since approximately 1975 and no longer constitutes a warm water refuge for manatees. The Turner Generating Plant (#5) and the Sanford Plant (#6) are used little or only sporadically by manatees. However, they remain potential sites. The Miami River Plant (#14) has been closed for several years and the Turkey Point Generating Plant (#15) has a closed cooling system with no possibility of any warm-water discharge.)

Figure 4. West Indian Manatee killed by a motorboat. (Photograph courtesy of Wometco Miami Seaquarium).



