

Status and distribution of the West Indian manatee, *Trichechus manatus manatus*, in Colombia

Ruby A. Montoya-Ospina^{a,*}, Dalila Caicedo-Herrera^b, Sandra L. Millán-Sánchez^a,
Antonio A. Mignucci-Giannoni^c, Lynn W. Lefebvre^d

^aFundación Ecológica Amigos del Manatí, Cra. 3 No. 16–15, Magangué, Bolívar, Colombia

^bMinisterio del Medio Ambiente, Cra. 8a. No. 15-73 Ps. 10, Santa Fe de Bogotá, DC, Colombia

^cRed Caribeña de Varamientos, Caribbean Stranding Network and Departamento de Ciencias y Tecnología, Universidad Metropolitana, SUAGM, PO Box 38030 San Juan, PR 00937, USA

^dSirenia Project, US Geological Survey, 412 NE 16th Avenue, Room 250, Gainesville, FL 32601, USA

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Abstract

Historical and recent information on the status and distribution of West Indian manatee, *Trichechus manatus manatus*, in Colombia was reviewed. Opportunistic and systematic interviews were also conducted. Historical information suggested that the distribution of manatees had been reduced in the Caribbean basin. Manatees can be found in the Atrato, Sinú, San Jorge, Cauca, Cesar and Magdalena rivers and the Ciénaga Grande de Santa Marta marsh in the Caribbean basin, and in the Meta River in the Orinoco basin. The Magdalena riparian system provides the largest area of suitable habitat, which also has the highest frequency of captures. Most animals (81.20%) were killed for sale or to share meat in a subsistence base. Hunting is apparently increasing but capture with nets still represents the species' major direct threat. Habitat destruction occurs in all areas. International and national laws protect the species, however, funding is inadequate for effective enforcement of present laws. © 2001 Published by Elsevier Science Ltd. All rights reserved.

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1. Introduction

The West Indian manatee (*Trichechus manatus*) is considered as a vulnerable taxon by the World Conservation Union (Thornback and Jenkins, 1982), and is listed as threatened with extinction by the Convention of International Trade in Endangered Species of Wild Fauna and Flora (CITES) since 1975. The present status of this species in Colombia is unknown. Domning and Hayek (1986) described two subspecies, the Florida manatee (*T. m. latirostris*), mainly found around the Florida peninsula, and the Antillean manatee (*T. m. manatus*) which range from Mexico through the greater Caribbean area and northeastern South America. However, recent genetic research has documented the

existence of three distinctive genetic lineages corresponding to an approximate distribution of (a) Florida and the West Indies, (b) Mexico to the Caribbean rivers of South America and (c) the northeast Atlantic coast of South America (García-Rodríguez et al., 1998). Haplotypes from Colombia form part of the Florida–West Indies cluster and the Gulf of Mexico–Caribbean rivers of South America cluster (García-Rodríguez et al., 1998).

Surveys for the West Indian manatee have been sporadic and uncommon in Colombia. However, a pioneer ecological and educational project in the San Jorge River was developed by the national government agency, Instituto Nacional de los Recursos Naturales Renovables y del Medio Ambiente (INDERENA), during 1988 (Prieto, 1990). An ecological study was also developed by the Ministerio del Medio Ambiente (MMA) in Ciénaga de Parcedes, during 1994 (Montenegro 1995). The Caribbean Stranding Network (CSN), a non-profit research organization based in Puerto Rico,

* Corresponding author at present address: Department of Wildlife and Fisheries Sciences, Texas A&M University, TX 77843-2258, USA. Tel.: +1-409-845-5702.

E-mail address: mvelasco@ecua.net.ec (R.A. Montoya-Ospina).

developed cooperative rehabilitation efforts and health status assessment on captive manatees with government agencies between 1992 and 1993, and in 1995 (Montoya-Ospina, 1994; Montoya-Ospina and Caicedo-Herrera, 1995). A National Recovery Plan was prepared by the MMA between 1996 and 1998 (Millán-Sánchez, 1996; Garzón et al., 1998). This paper reviews historical information and reports recent results on the status, distribution, and capture/deaths cases of the West Indian manatee in Colombia.

2. Methods

An extensive review of the information available on the presence of manatees in Colombia was carried out. The information was analyzed to identify capture, hunting and sighting areas and type of use of the species. Opportunistic interviews were conducted during rescue and rehabilitation efforts conducted from 1989 to 1995 in all major aquatic systems (Sinú, San Jorge, Magdalena, and Meta rivers and the Ciénaga Grande de Santa Marta) except the Atrato River. Current information from the Atrato River was obtained through interviews with the regional natural resource government agencies. Opportunistic sightings by the authors were recorded in the Sinú, San Jorge and Magdalena rivers.

Historical and opportunistic data, whether published or unpublished, consisted of solicited or voluntary reports of captures or hunting cases from lay persons, fishermen, scientists or government officials were also documented. In other instances, data were collected during rescue and rehabilitation efforts. In 1996, data were collected in a cooperative effort with the MMA in a systematic survey throughout all major river systems. Also, museum osteological collections at the Museo Venado de Oro and the Museo del Mar in Santa Fe de Bogotá and osteological remains in private farms were surveyed. Necropsies were conducted when possible following protocols in Bonde et al. (1983).

3. Results and discussion

3.1. Classification of recorded cases

Museum collections, published and unpublished information, and interviews revealed a total of 153 cases (Table 1) but more cases probably were unnoticed due to difficult access and communication with isolated communities. The data presented here may be biased mainly by effort of the researchers. Therefore, conclusions based on the analysis which follows must be treated with caution. Still, this information provided a general overview of the patterns of human interaction with the species in Colombia. A total of six necropsies were conducted.

Manatee records fell into three categories: captures, hunting and undetermined. Because, it was difficult to discern if fishermen were hiding the truth when describing the nature of the event, we classified under the capture category all accidental and intentional captures that used nets, and under the hunting category those cases where use of harpoon was indicated. Of the 153 cases, the highest number of cases, 131 (85.62%), were classified as captures, followed by 18 cases of hunting (11.76%) and four cases undetermined (2.61%) that correspond to osteologic remains without history.

Apparently, most animals were incidentally captured during normal fishing activities with a weighted bottom-line net of small size mesh, called "chinchorro" placed across where a river enters a lagoon. This practice is illegal in some areas. Once captured, a common practice was to tie the animals by the tail to any well-anchored object on land for days, even months, before they were sold in local markets or eaten. Indications of commercial scale operations as reported in Brazil (Domning, 1982) were not found. Hunting is conducted mainly by local fishermen (92%), but also outsiders (5%) and farmers (3%) (Millán-Sánchez, 1996). Hunting only occur in specific regions and seasons. Hunting is frequent during the dry season in Magdalena, Sinú, and San Jorge rivers. In the Atrato and Meta rivers, hunting occurred in both seasons (Millán-Sánchez, 1996). Local people indicated that to hunt a manatee is a tedious task due to the current scarcity of the species and its shy behavior. To hunt, fishermen first located feeding areas ("comederos") looking for bite marks on plants and where a "sweet smell similar to watermelon" was detected. This characteristic sweet smell is how locals described the smell of the manatee breath. During examination of eight captive animals in 1992, two of the authors (RAMO, AAMG) noticed this particular "sweet breath". Hunters use a metal harpoon attached to a rope with a piece of wood or a float at the end of the rope to follow the animal. When the animal is tired, hunters pull it to land and then kill it with any knife-like instrument or by suffocation by blocking the animal's nostrils.

3.1.1. Spatial distribution

One hundred and thirty-six of the cases occurred in the Caribbean basin, while 17 were recorded in the Meta River. The riparian system with the highest number of cases was the Magdalena River with 63 (41.2%) followed by the San Jorge River (28.8%), Meta River (11.1%), Sinú River (9.1%), Cesar River (3.9%), Ciénaga Grande de Santa Marta (3.3%), Atrato River (2.0%), and Cauca River (0.6%). However, this spatial distribution may relate more to observer efforts, with specific localities having a higher probability than others to have a carcass reported. Thirty-one (56.4%) of the animals captured in the Magdalena River were sold as

Table 1

Classification of 153 records of West Indian manatee, *Trichechus manatus manatus*, in each major estuarine and riparian systems in Colombia between 1950 and 1998^a

Date	Total no. animals	Specific locality	Category	Captive/cause of death	Association with other manatees	Age	Gender
1950s	1	Magdalena River	Capture	Killed	Alone	U	U
1960s	1	Magdalena River	Hunted	Killed	Alone	U	U
1960s	1	Meta River	Hunted	Killed	Alone	U	U
1968	1	Meta River	Capture ^d	U death	Alone	I	U
1970s	1	San Jorge River	Capture	U death	Alone	U	U
1977	1	Sinú River	Capture ^c	U death	Alone	U	U
1980s	1	Meta River	Capture	U death	Alone	I	U
1980s	1	San Jorge River	U	U death	Alone	U	U
1982	1	Magdalena River	Capture	Captive	Alone	U	U
1984	2	San Jorge River	Capture	Killed	Alone	U	U
1985	1	Ciénaga Grande de Santa Marta	Hunted	Killed	Alone	U	U
1986	2	Meta River	Capture	Killed (1) U death (1)	Alone	U	U
1987	17	San Jorge River	Capture ^b	Killed	Unknown	U	U
1987	1	Magdalena River	Capture	Captive	Alone	U	F
1988	15	San Jorge River	Capture ^b	Killed (14) U death (1)	Unknown (14) Alone (1)	U (14), D (1)	U U (1)
1988	9	Magdalena River	Capture	Killed (1) Captive (3) Release (4) U death (1)	Group of five Alone (4)	U (6), I (3)	U (6), F (3)
1989	1	Sinu River mouth-coast	Capture	U death	Alone	U	U
1989	1	San Jorge River	Capture	Killed	Alone	U	U
1989	3	Magdalena River	Capture	Killed (1) Captive (2)	Alone	U (1), I (2)	U (1), M (1), F (1)
1990	3	Sinú River	Capture	Killed (2) Post-capture illness (1)	Mother calf Alone (1)	I (1), D (2)	U (1), M (1), F (1)
1990	1	Cauca River	Capture	Captive	Alone	U	U
1990	7	Magdalena River and Canal del Dique	Capture	Killed (3) Captive (3) Release (1)	Mother calf One pair Alone (3)	U (3), I (3), D (1)	U (5), M (1), F (1)
1990	1	Meta River	Capture	Killed	Alone	U	U
1991	2	Sinú River mouth-coast	Capture	Captive (1) Post-capture illness (1)	One pair	I	M (1), F (1)
1991	10	Magdalena River and Canal del Dique	Capture	Killed (4) Captive (5) U death (1)	Alone	U (5), I (5)	U (5), M (3), F (2)
1992	2	Sinú River	Capture	Captive	One pair	I	M (1), F (1)
1992	1	San Jorge River	Capture	Captive	Alone	I	F
1992	5	Cesar River	Capture	Killed (3) Escape (2)	Group of five	U (4), D (1)	U
1992	5	Magdalena River	Capture (4) U (1)	Killed (1) Captive (3) U death (1)	Alone	I (4), U (1)	U (2), M (2), F (1)
1992	1	Ciénaga Grande de Santa Marta	Capture	Post-capture illness	Alone	D	F
1993	3	Magdalena River	Capture	Killed	Group of three	U	U
1994	1	San Jorge River	Capture	Killed	Alone	D	U
1994	1	Cesar River	U	U death	Alone	U	U
1994	1	Magdalena River	Capture	Captive	Alone	D	M
1995	2	Brazo León, Atrato River	Hunted	Killed	Alone	U	U
1995	4	Sinú River mouth coast	Capture	Killed	Group of three Alone (1)	U	U
1995	1	San Jorge River	Capture	Killed	Alone	D	U
1995	10	Magdalena River	Hunted (5) Capture (5)	Killed (6) Captive (3) U death (1)	Group of four One pair Alone (4)	U (4), I (4), D (2)	U (7), M (1), F (2)

(continued on next page)

Table 1 (continued)

Date	Total no. animals	Specific locality	Category	Captive/cause of death	Association with other manatees	Age	Gender
1995	2	Ciénaga Grande de Santa Marta	Capture	Killed (1) Post-capture illness (1)	Alone	I (1), D (1)	U (1), M (1)
1995	7	Meta River	Capture (6) Hunted (1)	Killed (6) Captive (1)	Mother-calf Alone (5)	U (4), I (1), D (2)	U (6), F (1)
1996	1	Golfo de Urabá, Atrato River	Capture	Killed	Alone	U	U
1996	3	San Jorge River	Capture (2) U (1)	Killed (1) Escape (1) U death (1)	Alone	U (2), I (1)	U
1996	6	Magdalena River	Capture	Killed (4) U death (1) Post-capture illness (1)	Group of three Alone (3)	U (3), I (2), D (1)	U (4), F (2)
1996	2	Meta River	Capture	Killed	Alone	U	U
1997	5	Magdalena River	Hunted (4) Capture (1)	Killed (4) Post-capture illness (1)	Group of four Alone (1)	U (4), D (1)	U (4), F (1)
1997	1	Ciénaga Grande de Santa Marta	Hunted	Killed	Alone	I	U
1998	1	Sinú River	Capture	Killed	Alone	U	U
1998	1	San Jorge River	Capture	U death	Alone	I	M
1998	2	Meta River	Hunted	Killed	Alone	U	U

^a Capture, using nets, accidental and intentional; Hunted, using harpoon; U, undetermined; I, independent (≤ 200 cm); D, dependent (> 200 cm); F, female; M, male. Numbers within parentheses indicate number of animals.

^b Prieto 1990.

^c Bössenecker, 1978.

^d Vidal, 1990.

meat in the town of Magangué. Magangué's location may be very significant. It is located north of the mouths of the Cauca and San Jorge rivers, both with manatees, along the Brazo Loba of the Magdalena River. Also, Magangué is a very important commercial port, and captured animals (alive and death) in El Retiro, Las Brisas, Tacalao, Talaiga Nuevo, Tacamocho and Piñalito villages were frequently offered in the Magangué's public market. This situation could artificially increase the percentage of manatees reported for this area rather than represent an actual higher frequency of captures compared to other areas.

3.1.2. Temporal distribution

Encounter cases were documented from 1950 to 1998, a span of 38 years. Changes in the annual number of reported cases may be due to changes in the interest and dedication of the public and government agencies in reporting and recording these events. Since 1988 the average number was 12.20 cases per year. Number of hunted animals has been increasing during the last four years while captures have been relatively constant until 1997. In 1997, hunting was higher than captures and in 1998 both categories were equal. This change during the last 2 years could be reflecting a better effort in documenting cases than a real increase in hunting. This stresses the necessity to conduct an effective assessment.

Apparently season affects captures and hunting activities due to movement of animals in their habitat which are discussed in detail later in this paper. Most animals were captured at the beginning of the rainy (May) and

dry seasons (January) (Fig. 1) when animals move between the main river and their lagoons increasing the chance to encounter a gill net. Usually gill nets are placed by fishermen in the communication channels between river and lagoons. Fishermen in the San Jorge River indicated that during March, it was common to find broken nets probably damaged by manatees (Prieto, 1990). Hunting occurs mainly during the dry season (January to April) (Fig. 1) when low water level facilitates the location of the animals. However, hunting

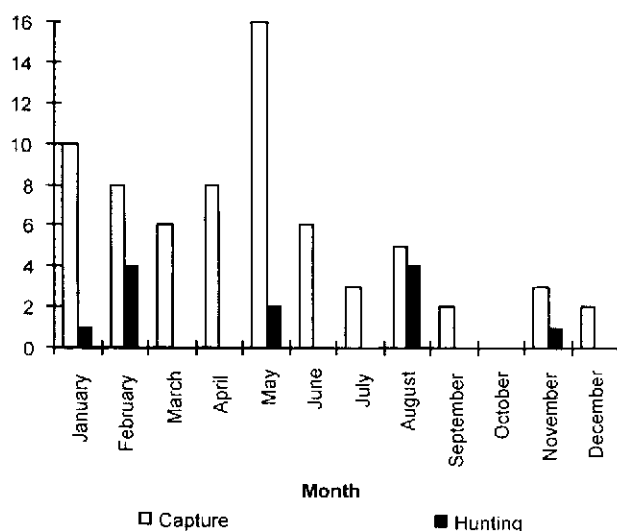


Fig. 1. Seasonal distribution of capture and hunting manatee cases between 1988 and 1998, Colombia.

was also recorded at the end of the rainy season (August) when water level is high.

3.1.3. Cause of death

Of the 153 recorded cases, 117 corresponded to death records, the other 36 include 28 captive manatees that were rescued when they were for sale on markets for human consumption and the remaining eight animals escaped or were released to the habitat. Cause of death fell into three main categories: killed, post-capture illness and undetermined. No natural causes were detected. Of the 117 deaths cases, 95 (81.20%) animals were killed to sale or share the meat, 16 (13.67%) captive or rescued animals died due to undetermined causes because there was not trained personal to conduct a necropsy, and six (5.13%) were rescued manatees that died due to post-capture illness. Six necropsies were conducted on these rescued animals which died during the rehabilitation process. Five of these animals were neonates, two of which died soon after rescued due to chronic starvation, and the other three died during rehabilitation due to bacterial infection. *Flavobacterium meningosepticum* and *Xanthomonas maltophilia* were identified as the infectious agents (Millán-Sánchez, 1999). These opportunistic bacteria may enter through the umbilicus of the newborn. One case was an adult with a harpoon wound on the dorsal area, knife-like scars on the flippers and malnutrition when rescued. During rehabilitation it showed purulent necrotic areas over the body and after 35 days under medical treatment it died. Internal examination revealed a round 5-cm perforation on the caudal portion of the right pleural cavity, 20% of right lung tissue was necrotic and the 12th and the 13th vertebrates were necrotic. Post-mortem hemoculture indicated *Klebsiella* sp. as a possible agent of the septicemic process.

3.1.4. Age and gender classification

Age classification was established using independent (≥ 200 cm), and apparently dependent (< 200 cm) categories, only when photos or osteological remains were available. However, this is an arbitrary criteria because no information about size/age relationship is available for the Colombian manatees. One hundred and one (66.01%) animals were undetermined because nobody provided reliable information, 36 (23.53%) were independent, and 16 (10.46%) were dependent animals. Fishermen indicated that calves and juveniles are more easily captured, whereas large animals may break the net. When mother–calf pairs were captured, the adults were usually killed and the calves were kept without proper care as pets or raised by the fishermen for future use.

Gender was recorded only when ventral photos were available or direct examination by one of the authors was conducted. The gender of 119 cases was undetermined (77.78%) because nobody confirm the sex, 20 were females (13.07%), and 14 were males (9.15%).

3.2. Distribution

Historical and recent distribution are described by aquatic system. Recent distribution was determined by 139 recorded cases of human interaction and nine sightings since 1987. Eight major aquatic systems were identified in the Caribbean basin, including the Atrato, Sinú, San Jorge, Cauca, Cesar and Magdalena rivers, National Park Isla de Salamanca and the Ciénaga Grande de Santa Marta marsh systems (Fig. 1). The Orinoco basin included only the Meta River as the major aquatic system (Fig. 1).

3.2.1. Atrato River and Golfo de Urabá

Goldman (1920) and Allen (1942) reported the presence of manatees in the Atrato River where Mosquito Indians frequently caught them using harpoons. Based on preliminary interviews, Powell and Gicca (1975, US Fish and Wildlife Service, Gainesville, FL, unpubl. trip report) stated that the Atrato River system appeared to have one of the largest remaining groups of manatees in Colombia and that this region had the highest hunting pressure. Later, Husar (1977) confirmed the presence of manatees in this river. Recent interviews suggest that manatees range from the Truandó River, a tributary of the Atrato River, to its mouth at Bahía Candelaria, covering approximately 90 km (Fig. 2). Within this range manatees have been reported at Ciénaga (riparian lagoon) de Unguía and Ciénaga Marriaga (Fig. 2). At the Golfo de Urabá, manatees have been sighted as far north as Necoclí town (Millán-Sánchez, 1996) (Fig. 2). Captures have been recorded in a river branch called Brazo León, and at the Golfo de Urabá (Table 1). Few human settlements in this area may explain the low number of reports.

3.2.2. Sinú riparian system

Husar (1977) reported that manatees were at one time found as far upstream as Tierralta, but now there were rare or extirpated. Recent information confirms their presence from Ciénaga Grande de Loricá to its mouth Boca de Tinajones, covering a total of 45.5 km (Fig. 2). Animals have been observed by one of the authors (DCH) at the Ciénaga Grande de Loricá complex, which included the Momil and Cascarrón lagoons and at the Bugre and Aguas Prietas channels. Captures have been registered along the coast from Playa del Viento to San Antero close to the river mouth (Fig. 2, Table 1).

3.2.3. San Jorge riparian system

Husar (1977) reported manatees in this tributary of the Magdalena River. Local people reported sighting large groups of manatees during the 1950s in the upper part of the river (Prieto, 1990). During the last 10 years, manatees have been captured and sighted at the middle and lower part of San Jorge River, from the Ciénaga de

Ayapel to its junction with the Magdalena River branch, Brazo de Loba, covering approximately 120 km (Fig. 3). Within this range, captures were recorded at the lagoons close to San Marcos, San Benito de Abad and Piñalitos (Table 1). The Ciénaga de Ayapel complex includes several smaller lagoons (Escobilla, Escobillita, Mantequera, San Francisco, Las Palmas, Playa Blanca, La Almojabana, and La Loma) most of them interconnected through channels (Caño Barro, Caño Muñoz, Caño Cuatro Bocas and Caño Gusanera) where the presence of manatees has been reported (Prieto 1990).

3.2.4. Cauca riparian system

Husar (1977) reported animals in this tributary of the Magdalena as far as Caucasia (Fig. 3). However, recent

sightings and captures restrict the range from Achí to Pinillos, the juncture between the Cauca and the Brazo de Loba, Magdalena River, covering 45 km.

3.2.5. Cesar riparian system

Manatees were reported in this tributary of the Magdalena by Husar (1977). Recent captures (Table 1) confirmed the presence of animals in Ayorro el Delirio, an small tributary, and at the lagoon system called Ciénaga de Zapatosa (Fig. 3).

3.2.6. Rio Grande de la Magdalena system

Holton (1857) reported manatee stories told by people about a “viviparous fish with women’s breast” that may be found in the Laguna de Tesca, close to Cartagena

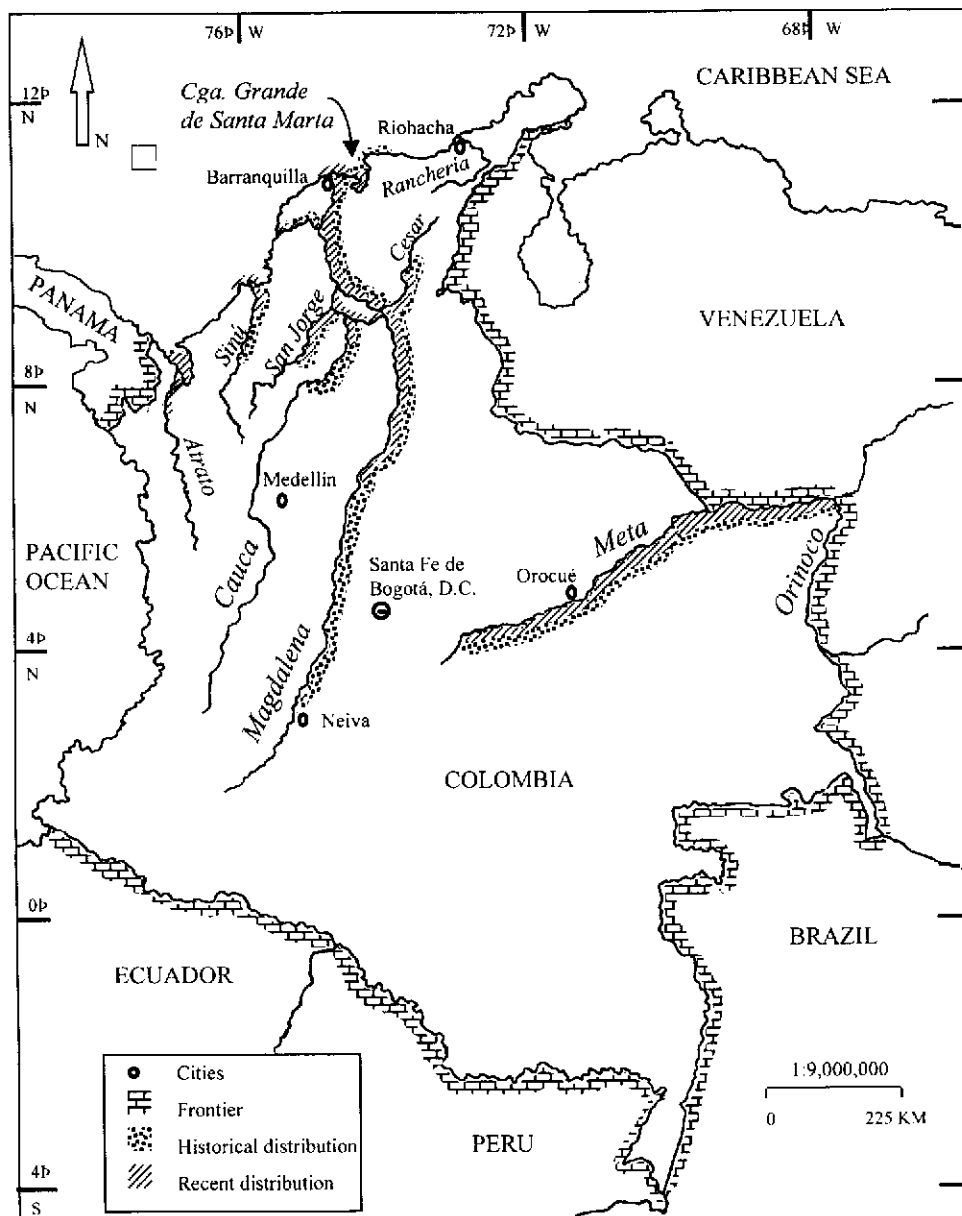


Fig. 2. Historical and recent distribution of the West Indian manatee, *Trichechus manatus manatus*, in Colombia.

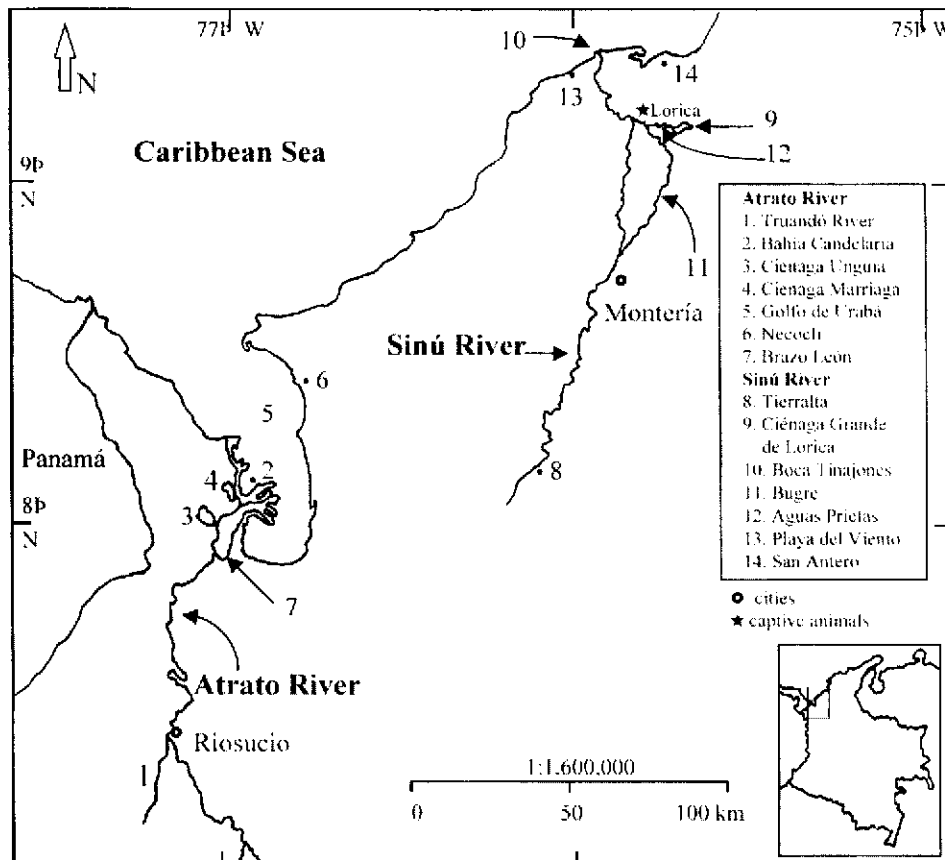


Fig. 3. Recent distribution of the West Indian manatee, *Trichechus manatus manatus*, in the Atrato and Sinú rivers in the Caribbean basin, Colombia.

city. Husar (1977) indicated that manatees could be found as far upstream as Saldaña and even to Neiva, while Lefebvre et al. (1989) suggested Santa Fe de Bogotá as the upstream limit (Fig. 1). Recent information on captures and sightings restrict the range from Puerto Berrio to its mouth at Bocas de Ceniza, covering approximately 630 km (Fig. 3). Within this range, manatees have been observed at the riparian lagoon of Ciénaga de Paredes and Ciénaga de Colorado (Montenegro, 1995), near the towns of El Dique, La Gloria, Tamalamcque, and El Banco where the river subdivides in two branches surrounding a depression known as Isla de Mompós. Along the river branch called Brazo de Loba, localities where manatees have been captured and sighted include Pinillos, San Sebastian, El Retiro (close to where the San Jorge River joint), Magangué, Taca-loa, and Las Brisas. Along the other river branch, Brazo Mompós, localities include Talaigua Nuevo, Talaigua Viejo, Santa Ana, and Pinto. Continuing north, after the two branches join again, manatees have been reported at Tacamocho town. Accidental captures have taken place at Bocas de Ceniza and sighted by one of the authors (SMS) at Barranquilla's port.

Powell and Gicca (1975, unpubl. trip report) mentioned that historical evidence exists of the presence of

manatees in the Canal del Dique, a navigation channel constructed by the Spaniards in the 1500s connecting the coast with the Magdalena River. Husar (1977) indicated that manatees no longer occur in this channel. However, captures recorded since 1990 (Table 1) confirmed the presence of manatees in this channel which runs from the town of Calamar west into the Barbacoas Bay, covering 91 km (Fig. 3).

3.2.7. Natural Park Isla de Salamanca

Powell and Gicca (1975, unpubl. trip report) reported that a captive animal was maintained in a pond during the 1970s. Later, Husar (1977) stated that a small number of manatees occurred at this marsh system (Fig. 3). Recent information on captures or sightings was not found. A pair of captive manatees from the Magdalena River were transported to a pond in this park in March 1997 as part of a government education program.

3.2.8. Ciénaga Grande de Santa Marta

This marsh system of 400 km² lies just west of the Magdalena River mouth and is fed by rivers from a snow-capped mountain system called Sierra Nevada de Santa Marta (Fig. 1). Manatees were reported by Carriker (1922) who stated that manatees were seen at the

mouth of the Aracataca tributary River. Powell and Gicca (1975, unpubl. trip report) also reported that the Frio River, which also feeds this marsh system, was identified as an area where animals come to feed and could be easily hunted. Recent captures confirmed the presence of manatees at the Frio, Fundación and Sevilla tributary rivers (Table 1).

3.2.9. East Coast from Santa Marta to border with Venezuela

Allen (1904) reported manatees along the Santa Marta coast, especially at the mouths of the Buritaca and Don Diego rivers (Fig. 3). During high water, manatees entered these rivers to feed (Allen, 1904). He also indicated that during August and September parties of fishermen from Santa Marta and Taganga Bay went to these rivers to hunt manatees using harpoons. Husar (1977) indicated that manatees no longer occurred in Taganga Bay and there were few manatees reported east of Santa Marta. Husar (1977) also mentioned that manatees did not inhabit Ranchería River. No recent sightings or capture information east of Santa Marta were found, probably due to limited freshwater sources. From Santa Marta to Riohacha, rivers are short, although permanent, except the Ranchería River. East of the Ranchería River there are no permanent streams, only natural rain drainage channels.

3.2.10. Meta riparian system

Medem (1968) stated that manatees were very scarce in the upper Meta River and its tributaries due to over-hunting, as well as in the area of Puerto Carreño, where the Meta River joins the Orinoco River. Husar (1977) stated that some animals were captured at the upper Meta in Puerto López. Recent reports were found from Puerto López to Puerto Carreño covering 660 km (Fig. 4). Specific localities where animals have been captured within this range included water bodies near the town of Orocué, Guachiría River tributary, Caño de La Hermosa, Puerto López, La Poyata, Santa Rosalía, El Bordereño, La Culebra villages and Isla El Pañuelo (Fig. 4, Table 1).

3.3. Habitat and manatee associations

Although manatees apparently spend most of the time in riparian systems, captures close to the Sinú and Magdalena river mouths suggest that trips to the coast are made. Interviews suggested that some manatees travel from riparian lagoons to the main river and perhaps to the sea when water level is low during the dry season (December to April), while other animals stay or move to deep permanent riparian lagoons called locally "madre-viejas". When the rainy season begins (May–August), manatees travel upstream to lagoons apparently searching for food. Prieto (1990) stated that at the

start of the rainy season manatees have been observed in the Magangué port traveling upstream to the San Jorge and Cauca rivers. Similar patterns of seasonal movements were reported by Prieto (1990) within the San Jorge River system. However, specific research on manatee movements has not been conducted. Fishermen also indicated that riparian lagoons where floating macrophytes form large carpets, called locally "tapón", were frequently used by manatees. Capture/hunting records (Table 1) suggested that manatees were more frequently encountered alone with 84 (%) cases, followed by six cases of groups formed by three to five animals, four cases of adult pair, three (%) cases involving mother-calf pairs and 32 cases without clear information. Millán-Sánchez (1996) found similar results through interviews reporting 35% for alone animals. Apparently, three of the six cases of groups were formed by mother-calf pairs and other manatees, but no clear information was available to confirm it. Mother-calf pairs, pair of adults or group of animals were reported at the Magdalena/Canal del Dique, Cesar, Sinú, and Meta rivers.

3.4. Status of captive manatee

A total of 32 manatees are at present kept captive in Colombia, 28 from the wild and four born in captivity. Only one of the animals is kept in a pool under controlled conditions, while the rest are maintained in artificial lakes with natural food and limited human contact. All animals, except one, were located at the Caribbean basin. The history of these animals is described below by location.

3.4.1. Barranquilla

A female captured by fishermen was rescued and donated to the public zoo at the city of Barranquilla in 1989 (Fig. 3), with periodic examination have been conducted by the CSN and the Barranquilla Zoo personnel since 1990 poor husbandry conditions were improved. Fundación Zoológico de Barranquilla (FZB) was established to run the zoo, in 1993. Currently the animal is maintained in a circular pool (2 m depth, 6 m diameter) with controlled water quality and fed a balanced diet. No plans exist to release the animal. The FZB is interested in developing a reproduction program.

3.4.2. Cesar

An animal bought approximately in 1982 by a Mr. Ubaldo Mesas and placed in a private lake in La Gloria. This animal has been not examined yet.

3.4.3. Lorica

Four manatees captured by local fishermen from the Sinú and San Jorge rivers were rescued by the Cor-

poración Autónoma Regional de los Valles del Sinú y del San Jorge (CVS) and placed in an artificial lake close to Lorica town (Fig. 2). Periodic examinations have been conducted since 1992 by the CSN and CVS. In 1992, a female that was pregnant when rescued, gave birth to a male calf a few months later. Future plans for these animals are unknown.

3.4.4. Magangué

In 1987, the Botero-Maya family began rescuing live-captured manatees that were for sale for human consumption in the Magangué's market, and transported them to man-made lakes to control aquatic vegetation. A total of 19 animals are formally under the care of the non-profit organization Fundación Ecológica Amigos

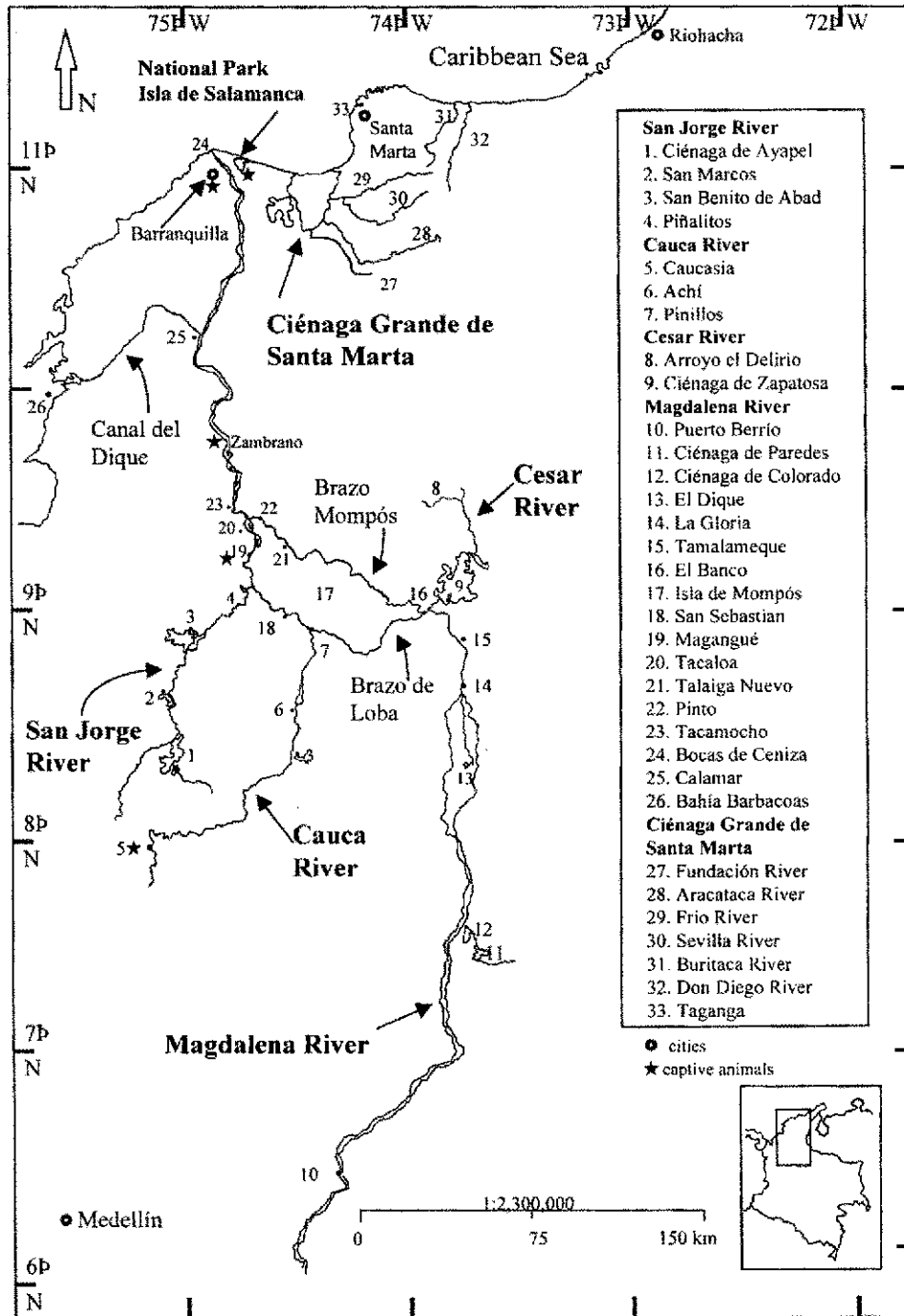


Fig. 4. Recent distribution of the West Indian manatee, *Trichechus manatus manatus*, in the San Jorge, Cauca, Cesar and Magdalena rivers, the National Park Isla de Salamanca, and Ciénaga Grande de Santa Marta in the Caribbean basin, Colombia.

del Manatí (FEAM) established by the same family in 1993. These animals are distributed in five artificial lakes in different localities (Fig. 4). Three animals have been conceived and born in the largest colony (nine animals) kept in a 20-ha lake. Periodic examinations have been conducted since 1992 by the CSN and FEAM and supported by the Save The Manatee Club in the USA (Maitland, FL) (Montoya-Ospina and Mignucci-Giannoni, 1993; Montoya-Ospina, 1994; Jimenez-Marrero et al., 1998). Three of these animals were relocated to an artificial lake in Caucasia, Cauca River, and a pair was moved to a pond in the National Park Isla de Salamanca. Both relocation were conducted as part of education programs developed by regional government agencies. There are plans to release all animals back to the wild in protected areas.

A pair of animals was bought in 1991 by the Calderon brothers and placed in a private lake (1 ha) in Magangué. These animals were examined only in 1992 because assessment was not permitted by the owners in subsequent years.

3.4.5. Puerto Gaitán

One calf was captured in the Meta River in 1995. It was bought by the Yamato Foundation and transported to one of their facilities close to the town of Puerto Gaitán (Fig. 4). This orphan was successfully rehabilitated in a cooperative effort of MMA, CSN and the Yamato Foundation. The animal is currently maintained in an artificial lake and future plans are unclear.

3.5. Legal status

In 1981 (Law 17) and in 1994 (Law 165), Colombia adopted the Convention on International Trade in Endangered Species of Wild Fauna and Flora of 1973 (CITES) and the Biologic Diversity Treaty of 1992, respectively. Manatees are also protected by national laws such as Resolution 574 of 1969 which prohibits hunting activities. In 1974, the National Regulation Code for Natural Resources was established by Decree 2811 and later reformed by Decree 622 of March 1977, which is the first national regulation on natural resource management and conservation. In addition, the Regulatory Decree 1608 of 1978 regulating aquatic wildlife use and research, and Law 84 of 1989 concerning animal rights, extend protection to manatees. Decree 100 of 1980 established penalties for infractions of endangered species regulations. Fishery activities are regulated by Decree 2356 of 1991 which indirectly affects manatee conservation. A regional regulation, Decree 256 of 1995 was adopted by Magangué City Hall in 1994 to protect the species. Habitat is protected by Decree 1681 of 1978 and Law 13 of 1990. However, funding is inadequate for effective enforcement of any of the laws or regulations. In most of the regions enforcement activities are not

conducted. Under Law 99 of 1993, any military or police corps can enforce wildlife regulations, partially solving the limitation on natural resource guards and funds. Since 1991, CVS has been developing programs in conjunction with police to control hunting, capture and marketing of manatees. As a result of these coordinated efforts, criminal charges were presented against fishermen that captured and killed four animals in 1995. Also, participation of police and military corps to confiscate and transport captured animals in Magangué has helped to enforce the law.

The national natural resources government agency, INDERENA, was restructured by Law 99 in December of 1993 establishing a central office, the MMA to determine general policy and regional agencies with partial autonomy to conduct wildlife management. A national agreement on the priorities for the conservation of the manatee has not been established. Specific legislation to regulate and control minimum requirements and husbandry protocols for captive manatees under rehabilitation or on exhibition does not exist.

Isolated cases occur where local communities enforce protection, for example in Ciénaga de Paredes (B. Ortiz, INDERENA, pers. comm.) or where guerrilla activities prohibit and/or control hunting and fishing activities, for example at the Middle Magdalena River (R. Vidal, FEAM, pers. comm.).

3.6. Socio-economic importance and myths

Most of the people in communities located along rivers and other bodies of water live under conditions of poverty and heavily depend on fishing (National Resources Conservation Authority and United Nations Environmental Program Regional, 1994). During unsuccessful fishing activities, a manatee represents a source of income or food for these families. Manatee hunting and capture is opportunistic and for subsistence; many times meat is shared among fishing families or local communities, or sold locally. The meat is the main item used from the carcass. Millán-Sánchez (1996) indicated that 34% of the time manatees were hunted to consume their meat while only 8% were captured to be sold. Captured manatees are butchered at the captured site or are sold alive in local markets for meat at about half the cost of beef (Montoya-Ospina and Caicedo-Herrera, 1995). We did not find any indication of a high price in the black market as stated by Lefebvre et al. (1989). The average price is about US\$3.80/kg, varying among regions from the most expensive at the Antioquia and Chocó states (US\$5.00/kg) to the cheapest at the Orinoco basin (US\$1.60/kg) (Millán-Sánchez, 1996). This low price could suggest that manatee is not an important part of the economy and represents an occasional income. In many Colombian communities it is common for fishermen to lease

their fishing gear equipment. Thus, a captured manatee represents a way to pay for its rent and/or repair. Sometimes tourists buy meat attracted by the three to seven different meat flavors manatees are supposed to have, a myth common throughout the Caribbean (Mignucci-Giannoni et al. 1991). Sometimes farmers buy live manatees to control aquatic vegetation on their farm lakes.

Manatee skin was used to make whips, reins, and boot soles by British conquerors (McKillop, 1985) and for machine belts during the 1900s in Europe and America (Durand, 1983). Currently, skin is still used to make reins, oars, muzzle (Prieto, 1990) and hammocks. Fat is used to make candles (Prieto, 1990), and to cook in the Magdalena and Meta rivers.

Manatee bones were used to cure asthma in the San Jorge River (Prieto, 1990) and as an antidote for snake bites in the Sinu and San Jorge rivers. In the Atrato River, manatee bones were worn as amulets to attract rain and fish (Husar, 1977) and their earbones to have sharp hearing. Most of the folklore stories in the Caribbean region refer to the similar appearance of teats between female manatees and women. Also, there is the belief that where manatees exist, the lagoons never dry. In the Orinoco basin, folklore medicine uses manatee fat and bones to cure respiratory, muscle, and rheumatic problems. Rituals with bones were used to supposedly change river courses or to have plentiful water, and male reproductive organs were used as aphrodisiacs.

3.7. Present threats

Captures with nets, incidental or not, are still the major threat to manatees. Habitat destruction and reduction may represent a more complex threat. Manatee habitat has been reduced by filling riparian lakes to increase land for farming or ranching. The apparent reduction of commercial fish populations increases the risk for manatee exploitation by fishing communities. Construction of channels, roads, and dikes alter manatee habitat, for example, the construction of a highway (Troncal del Norte) during the 1970s blocked the water flow between the Ciénaga Grande de Santa Marta and the sea, destroying extensive mangroves areas, increasing sedimentation (Angulo, 1990) and probably affecting manatee movements between fresh and saltwater. Other factors such as contamination by mines, oil exploitation, industrial waste from large cities, and pesticides occur without accurate assessment. Deforestation is present in most of the areas, increasing runoff and sedimentation rates. A National Resources Conservation Authority (NRCA) and United Nations Environmental Program (UNEP) report (1994) noted that the construction of dams, such as Urra II in the Sinú River, may have a considerable negative effect on natural habitats and movement of manatees. Unfortunately specific assessment for the species has not been established as part of the environmental impact project.

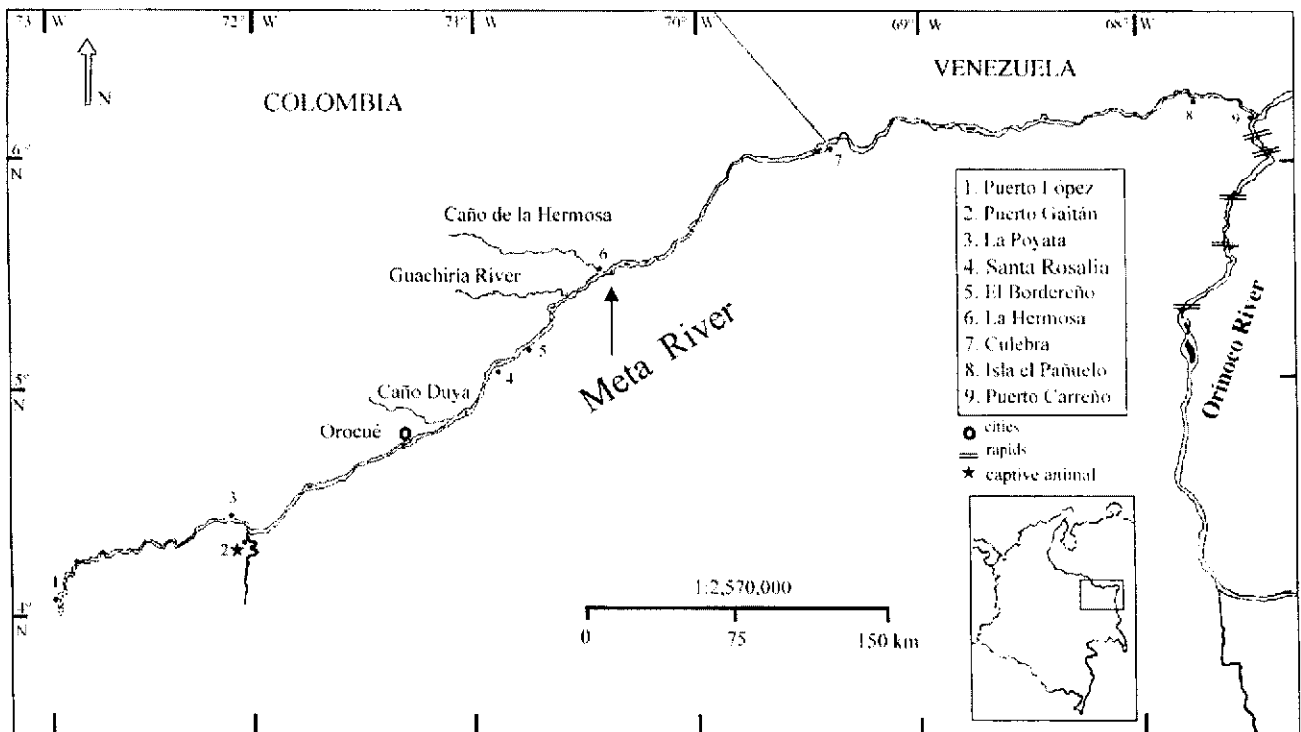


Fig. 5. Recent distribution of the West Indian manatee, *Trichechus manatus manatus*, in the Meta River in the Orinoco basin, Colombia.

3.8. Research and education efforts

Since 1992, several studies have been conducted with captive animals by government agencies, and national and international private institutions and universities. Serum glucose, lipids, total protein, electrolytes, and enzyme reference ranges were analyzed to support rehabilitation efforts (Montoya-Ospina, 1994). Immunoglobulin reference levels were also analyzed to help veterinarians diagnose and rehabilitate manatees (Jiménez-Marrero et al., 1998).

Regional government agencies that have been developing education activities include the CVS, which regulates the Sinú and San Jorge rivers, Corporación Autónoma Regional del Magdalena, which regulates the Ciénaga Grande de Santa Marta, the Corporación Regional del Atlántico which regulates the lower Magdalena River. Unfortunately, these campaigns have not been continuous due to limited funding. The FEAM has developed education talks for schools and local fishing communities concomitant with rescue and rehabilitation activities in the Magangué area.

4. Conclusions and recommendations

Manatees are still present in all major riparian systems in the Caribbean and Orinoco basins of Colombia (Fig. 5). Apparently, their distribution has been reduced in the Sinú, San Jorge and Magdalena rivers, probably due to human exploitation and/or destruction of habitat. The Magdalena riparian system, including its tributaries the San Jorge, Cauca and Cesar rivers, represents the largest manatee habitat available. However, it also had the highest frequency of captures. In this system, Magangué is a critical area for commercialization of captured animals due to its geographic location and commercial importance. Magangué may be a very important target point to develop research and educational projects regarding the manatee.

Manatee captures and hunting were mainly conducted by local fishermen for human consumption on a subsistence basis. Captures with nets represent an increasing threat as the human population and its demands on natural resources increases. Animals appear to be especially vulnerable to being captured during seasonal movements, when nets are put across water ways between lagoons and main rivers. Conflicts such as manatees illegally maintained on private farms are caused by lack of effective enforcement of the current laws. Also, national legislation needs to be developed on minimum requirements to keep aquatic mammals for exhibition and rehabilitation.

The development of education, economic and social projects should be a high priority to reduce pressure on the manatee population and habitat. Lack of trained

personnel, equipment, and effective communication systems limits access to live and dead animals, compromises collection of samples, and diminishes rehabilitation success. Finally, the scarce biological information available makes it difficult to establish management plans. Training of regional government agency personnel on education, mortality assessment, rescue, and rehabilitation procedures is highly recommended to develop an effective mortality assessment program. Also, research on population dynamics and habitat use is urgently needed. It is important to determine genetic differentiation among and within each aquatic systems to prioritize conservation efforts. Only through a combination of these methods will the manatee in Colombia have an opportunity to survive.

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