

STATUS AND CONSERVATION OF CROCODYLUS INTERMEDIUS IN VENEZUELA

Robert E. Godshalk
P.O. Box 773846, Steamboat Springs, Colorado 80477, U.S.A.

INTRODUCTION

The distribution of Crocodylus intermedius is restricted to certain regions within the Orinoco River Basin of Colombia and Venezuela. The area, known as the Llanos, covers approximately 250,000 km² in Colombia and 265,000 km² in Venezuela. Intermittent commercial hunting, most intense from about 1925 to 1950, nearly eliminated the Orinoco crocodile before any scientific studies on the species had been undertaken. Medem (1955) first noted the declining Colombian populations and called for immediate protection. He began investigations with the species in 1956 and subsequent publications (Medem 1958a, 1958b, 1968a, 1968b) reinforced the need for better legislation and more detailed studies. C. intermedius was fully protected in Colombia by Resolution No. 411 (Min. Agric.) in 1968 and Resolution No. 573 (INDERENA) in 1969 (Medem 1971). The critical condition of crocodilians in Colombia (Medem 1970) led to funding by the World Wildlife Fund--International. Status surveys were conducted in Colombia from 1973 to 1975, and only 280 adult crocodiles were located, indicating alarming conditions there.

Information on C. intermedius in Venezuela from this century is very limited. The scant references usually report the species as rare or near extinction and give few details. Vila (1953) was perhaps first to comment on the disappearance of crocodiles in the northern part of its range but stated that they were relatively common in the south, especially in Apure State. Later reports (Mondolfi 1957, 1965; Medina 1960; Vila 1965; Sónoso Barros 1966a, 1966b; Rivero Blanco 1968, 1970; King 1973; Godshalk and Maness 1976) indicated that the Orinoco crocodile was nearly exterminated throughout its range. In 1969, Prof. Medem advised the IUCN/SSC Crocodile Specialists Group that a status survey for C. intermedius was "urgently required" (Bustard 1970). In 1972 Prof. Medem undertook a general survey of Venezuelan crocodilians sponsored by the New York Zoological Society. C. intermedius was found to be extinct in large areas and a more detailed study was strongly recommended (Medem pers. comm.). Funds for a survey were secured from the Fundación para la Defensa de la Naturaleza (FUDENA), the World Wildlife Fund Venezuelan affiliate, in 1977. The Fauna Preservation Society provided additional support through the Oryx Fund.

STATUS

Habitat

Survival of the remaining crocodiles is often due to the complexity of the Orinoco River system. The difficulties to human access in certain regions present a major defense.

Three general habitat types within the study area are described (refer to Figs. 1 and 2)

1) Rivers that flow through the (formerly) continuous deciduous forest of the western portions of Apure and Barinas states and the northern portions of Portuguesa, Cojedes, and Guarico states. Some areas are subject to flooding in the rainy season but, in general, the rivers usually remain within their banks even during high water. The rivers are small as they emerge from the Andes or Coastal Range, increasing in size as they proceed towards the Orinoco River. This habitat is utilized from 100 m to 500 m above sea level.

2) Rivers in the area of northern Apure, eastern Barinas and southern Portuguesa, Cojedes, and Guarico states. These are generally large, meandering rivers that cross vast savannas. Forested areas are reduced to isolated formations, scattered intermittently across the grasslands, and partial cover along some rivers. Immense areas are subject to flooding as the rivers overflow their banks in the rainy season. Due to poor drainage, this may reach up to 80-90% of the surface area in some places, and it greatly increases the habitat utilized by the crocodiles. Numerous interconnections between the rivers are formed, according to the time of year, and provide great mobility within certain areas. The rivers are frequently changing course, with the original bed retaining a reduced flow.

~~3) Rivers of southern Apure. These convoluted rivers are usually~~ bordered by dense gallery forest which is often several kilometers wide. They flow from Colombia along basically parallel courses across the flat, aeolian plains. General flooding during the wet season exists over much of the savanna, but usually forms only very shallow lakes, and the rivers lack intercommunicating networks. Large oxbow lakes and elbows, causing the repeatedly changing meanders, are a very common feature.

Distribution historically was continuous throughout these habitat types. The narrow forest streams had lower carrying capacities per kilometer than larger rivers of the plains. These plains rivers (Type 2) held extremely numerous populations of C. intermedius before commercial hunting exterminated them. Factors such as the availability of nest sites and the dry season conditions of a river greatly affected the relative densities.

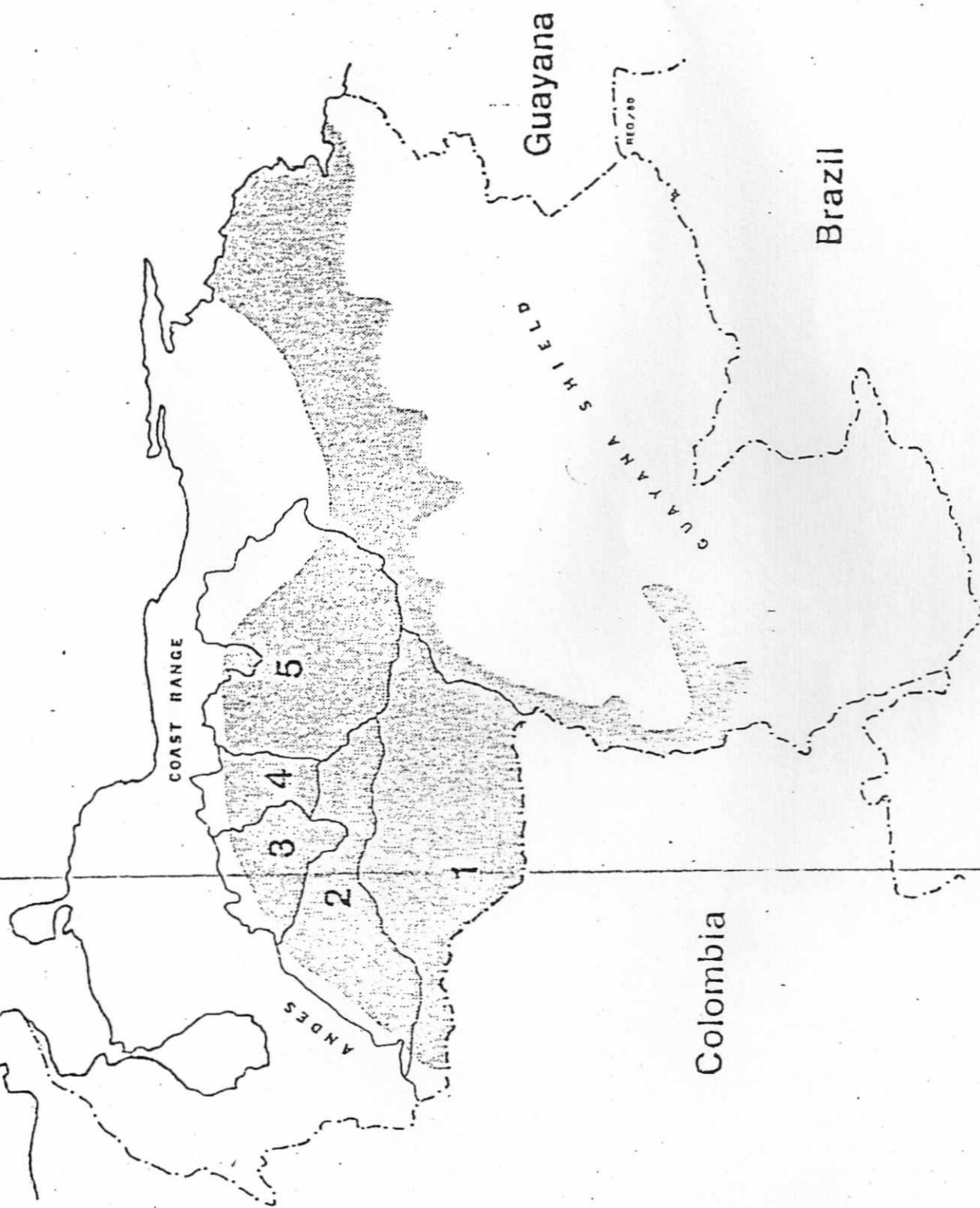


Figure 1.-- The distribution of *Crocodylus intermedius* in Venezuela. States (area) of the western Llanos region where status surveys were undertaken are as follows: 1 = Apura (76,500 km²), 2 = Barinas (35,200 km²), 3 = Portuguesa (15,200 km²), 4 = Cojedes (14,800 km²), 5 = Guarico (66,400 km²).

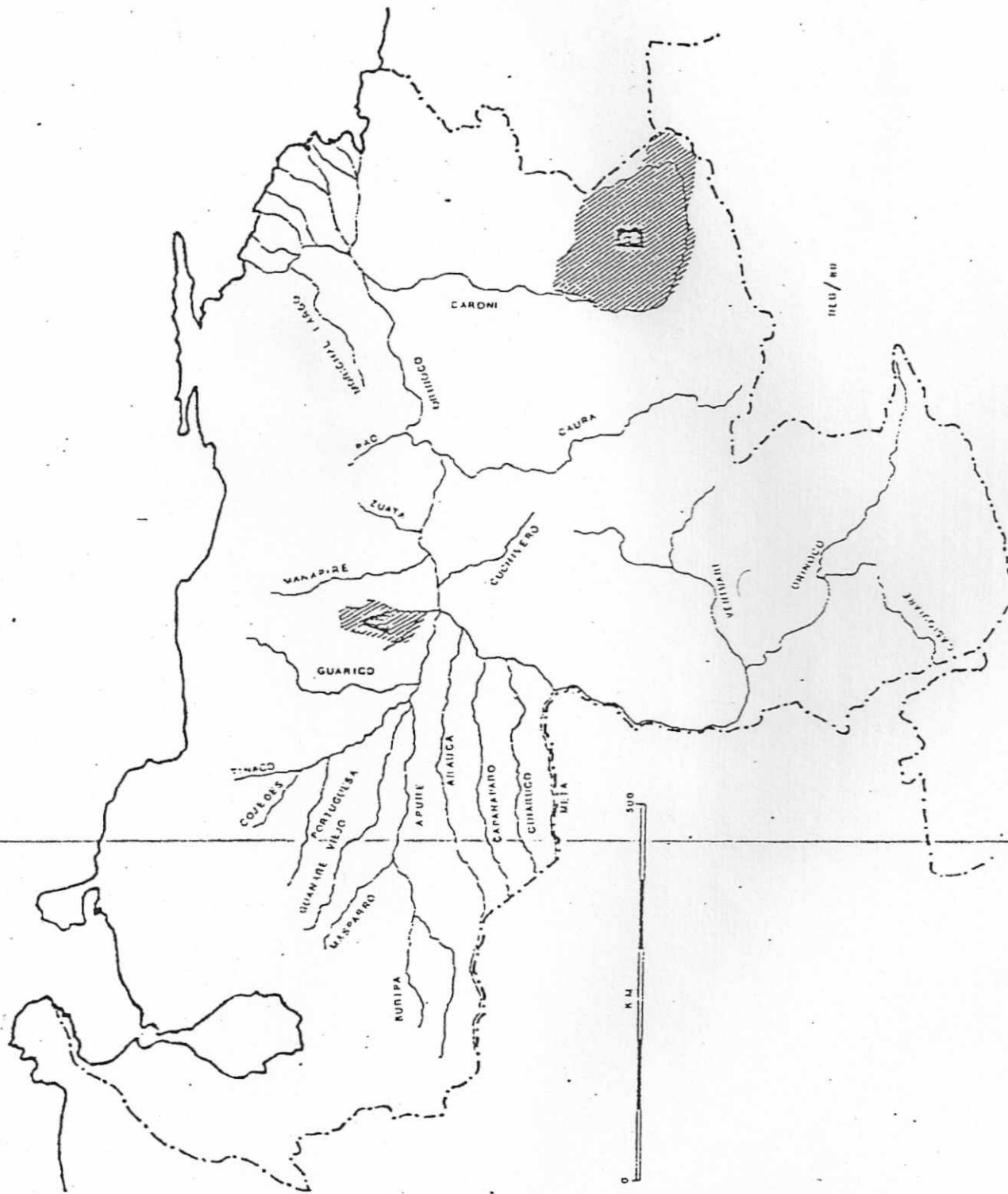


Figure 2.-- Simplified diagram of the Orinoco River system in Venezuela. Diagonally striped areas are national parks (area in hectares) as follows: A = Aguaro-Guariquito (560,000), B = Canaima (3,000,000).

Survey

Field surveys were carried out from January to July 1978. Dr. Evelio Sosa A., DVM, assisted throughout the project and provided valuable knowledge from experience with the species. Surveys were conducted first in the north, moving progressively southward, in order to take advantage of the dry season drainage pattern (Godshalk 1978). This allowed us to travel on waterways where the adjacent flooded areas were reduced or nonexistent. We expected greater success with more limited available habitat. Recent crocodile sightings were incorporated in planning the itinerary. Rivers were also selected to represent various habitats and river sizes (see Fig. 2). Many less important tributaries were also included in the study. The usual strategy involved traveling upriver by day, looking for evidence on the mud banks and sandy beaches. Numerous interviews were also made with the local inhabitants (Llaneros) closely associated with the rivers. Various Amerindian groups were also visited in the south Apure region. Spotlighting at night was done during the downriver travel. The outboard engine noise was thus reduced to increase the possibility of encounters with crocodiles. Paddles were sometimes used downriver to eliminate noise completely. By this method most areas were covered twice, once by day and returning later at night. Competent local guides were always used and they contributed greatly to the project. Transportation in the Llanos has traditionally been by water, and men were found with excellent knowledge both the rivers and the crocodiles. Three observers were always present and in some cases as many as six.

More than 3500 km were traveled on water during the survey. A total of 273 adult crocodiles were located in the study area and were generally scattered over large expanses. Reproduction was found in several locations but immature crocodiles (less than 2 m) were rarely encountered or reported by the Llaneros. It was not uncommon to find large areas totally devoid of C. intermedius. Where they are found, the low numbers of individuals and lack of reproductive success often cause the species to be functionally extinct.

On the basis of our results, the situation must be considered extremely serious. Rivers were usually selected for study according to the possibility of crocodiles being present. The number of animals recorded cannot be regarded as an absolute, as there always remains a certain number uncounted. They do give an indication of the relative abundance, however. In the case of the Cinaruco River, many earlier reports suggested good possibilities for positive results. The habitat appears virtually identical to the nearby Capanaparo River, where a reproductive population exists. The area is remote and few Llaneros or Indians live there, so a main source of disturbance was absent. Yet, with little or no hunting pressure along the river, evidence of crocodiles on the numerous sand beaches was surprisingly rare. Some young animals (1 m) were reported but recuperation has been very slow.

TABLE 1.

Major Rivers Traveled:	Km	Crocodiles Seen	Crocs/10 km	Hab. type
Tinaco	55	7	1.30	1
Cojedes	130	76	5.90	1
Portuguesa	170	1	.06	2
Orinoco	120	5	.40	2
Capanaparo	370	78	2.00	3
Cinaruco	485	19	.40	3
Meta	230	67	2.90	3

Recent reports of C. intermedius exist for other rivers which, due to time constraints, were not included in the study project. Observations suggest that similar conditions exist in these areas and the species is very rare throughout its entire distribution.

CONSERVATION

The following are major factors affecting present and future populations of Crocodylus intermedius in Venezuela.

Legal Status

Regulations on hunting crocodylians were first legislated in 1944 (Ley de Pesca) under the jurisdiction of the Departamento de Fisheries, Ministerio de Agricultura y Cria (MAC). Permits were required but generally were issued automatically. Provisions existed for restrictions on the taking of certain species as well as "for their conservation and protection." No biological value was perceived for the crocodiles, which were considered as vermin, and hide hunting was permitted without control until the populations were reduced to extreme levels. Commercialization had brought C. intermedius to the brink of extinction before the existing legal machinery effected any sort of protection. In 1970 the Fauna Law was enacted which placed responsibility for the crocodylians under the Office of Fauna, MAC, and is presently in effect. The clear and comprehensive text presents the groundwork for excellent protection. Some of the relevant provisions are as follows:

Ley de Fauna -

Provisions governing the conservation and management of fauna

Art. 11 - MAC given legislative power:

- c) - for establishment of Refuges and Sanctuaries.
- d) - for prohibition of hunting of species or collection of eggs to avoid extinction.
- f) - for taking the necessary measures for species "conservation, protection, production, and rational utilization."

Art. 18 - for taking measures to preserve, modify or restore habitat.

Art. 26 - for relocation of fauna one place to another for its conservation.

Art. 73 - prohibits hunting on protected areas: National Parks, etc.

Art. 77 - prohibits the killing "in any form, time or place":

- 4) - rare species.

Provisions governing hunting and commerce of fauna

Art. - 81 - Prohibition of hunting:

- 3) - "with motorized vehicles whether aerial, terrestrial or aquatic."
- 6) - animals "on their nests, burrows, or together with their young."

Art. 82 - prohibits hunting at night or with artificial light.

Art. 83 - prohibits "collection or destruction of eggs, alteration or damage of nests, burrows or dens, and of hunting the young."

Art. 84 - prohibits commerce of protected fauna and its products.

Art. 109 - establishes fines for commercial hunting, trade, industry or transport of protected fauna or products from 1000 Bolivares (US\$ 230) to 50,000 Bs. (US\$11,625) plus confiscation of animals, products and equipment.

In 1974, a four-year nationwide moratorium on all hunting was enacted in order to investigate the faunal resources. The Minister of Environment and Renewable Natural Resources (Ministeria del Ambiente y Recursos Naturales Renovables [MARNR]) was created in 1977 and assumed responsibility for the Department of Fauna. In 1978, the hunting ban was

extended for an indefinite period with very limited exceptions. The prohibition has definitely reduced general hunting impact on the wildlife but illegal hunting is a continuing problem in some areas. Although the government will not issue permits required for legal hunting of C. intermedius, more specific and permanent action is required. During a trip I made to Venezuela in November 1979, personnel from the Department of Fauna discussed the formation of a comprehensive National Endangered Species list. I do not know if this has been realized yet.

National Parks

Only one National Park, Aguaro-Guaritico, is found within the distribution of C. intermedius (see Fig. 2). This large Park encompasses 569,000 hectares of the Central Llanos of Guarico State and includes an extensive luvial network of prime habitat. The crocodile appears to have been eliminated due to extensive and long-term use of the area for hunting and fishing. This occurred before the establishment of the Park in 1974. A few individuals may exist in the southern part but apparently are absent in most areas. The Park presents a logical site for a controlled crocodile release program.

C. intermedius is included in the faunal list for Canaima National Park prepared by the Division of National Parks, although no reliable reports or specimens exist. The great distance from the nearest confirmed locality, plus the altitude and habitat types, make this area very unsuitable.

Captive Programs

Semi-captive breeding began in 1960 at Cachamay Park near Ciudad Bolivar, Bolivar State. Two adult pairs were acquired and successful reproduction followed. Various problems led to the escape or death of most of the subsequent young. ~~A biologist with the Department of Wildlife last reported 32 three-year olds and 3 adults (Dr. S. Gorzula pers. comm.).~~ Information on the current state was not available, but the Park is trying to maintain production with the ultimate goal of restocking areas which have not been designated yet.

T. Blohm has a reproductive pair in semi-captive conditions on his ranch in Aragua State. The first successful hatching took place in May 1980 and produced 14 young (Blohm this volume).

Five crocodiles were born in July 1980 at the Crandon Park Zoo in Miami, Florida, USA. The eggs, which were laid in captivity, were artificially incubated and represent the first zoo births for C. intermedius.

A clutch was collected during our surveys in Cojedes State in 1978. The resulting hatchlings marked the first successful artificial incubation for the species. The 21 surviving young are currently being raised by Dr. Sosa on his ranch in the Llanos of Cojedes.

FUDENA Project No. 28 was designed to gather eggs in certain areas following our results and recommendations. Unfortunately, the investigators arrived at the locations and were not able to find any nests. No following effort was made after hatching nor during the ensuing 1980 season.

At least 20 additional specimens (mostly unsexed) are located privately or in zoos in Venezuela. These are usually not paired, and no other reproductive success has been recorded. The present state of captive production clearly does not provide an adequate base for the species' recuperation.

Hunting

The crocodilian hide industry has been effectively dismantled in Venezuela, and no products of national origin may be manufactured or sold. Near the Colombian border some hunting still exists on a small scale, mainly for Caiman crocodilus. These hides are smuggled to the legal Colombian tanneries, and the products often return to Venezuela as "Colombian."

Various large, adult C. intermedius, wary survivors of previous hunting pressure, continue to reproduce in the Colombian border area. The resulting inexperienced offspring are occasionally taken by the caiman hunters, principally along the Meta River, and it appears that little or no recruitment into the adult population exists there. These hides, along with those of Caiman, are shipped to the tanning facilities in Colombia. No C. intermedius hides have arrived at European tanneries in the last few years (Hr. K. Fuchs pers. comm.). The low population levels make ~~widespread-commercial-hunting-impossible.~~ Tighter security at the National Guard checkpoints and more rigid enforcement of the laws have helped to eliminate hunting of the crocodile as a lucrative endeavor.

A passive hunting pressure now proves to be a more important factor. This is the elimination of crocodiles that enter areas adjacent to ranches or towns during seasonal movements. Their presence is not tolerated when people feel themselves or their livestock "threatened." This accounts for a slow but continued removal of adult animals throughout most of the distribution. The single hide value, usually under US\$ 50, is not so great for the Llanero and is usually a side benefit, not the main incentive. Sometimes the skin is not taken through fear of legal problems and the difficulties in selling the raw hide.

Crocodile eggs are highly prized by most Llaneros and many Indian groups and are often encountered while they search for Podocnemis nests. They report a decreased tendency for nest guarding, due to human disturbance, which leaves the clutch open to common nest predators such as Procyon and Tupinambis.

Fishing

Commercial fishing is a problem with C. intermedius, as it is with many of the world's riverine crocodilians. Huge gill nets are used and crocodiles are occasionally drowned. The nets are often stretched entirely across a stream and the fauna beaten toward the trap before closing the circle. Large wooden barriers (called tapas), 5 m to 10 m high, are sometimes erected to span small streams. The fish move downstream with the receding waters of the dry season and are swept against the barrier. Llaneros are suspended on platforms at water level and use long gaffs to remove all fish and turtles. Small crocodiles are also taken when encountered. Long fish lines (called espinel), with up to 150 baited hooks, and the use of dynamite account for occasional deaths, as do various other damaging fishing techniques.

Habitat Destruction

-Continued deforestation of the headwaters in the north and west accelerate runoff, and some rivers have decreased flow in the late dry season as compared to former years. This also includes certain legally protected units, such as the Ticoporro Forest Reserve, which lost 79,500 hectares (34%) between 1950 and 1975 due to illegal hardwood exploitation (Hamilton et al. 1976). However, most loss is due to slash-and-burn agriculture, the worldwide disintegration of tropical forests.

In large portions of Apure State, the sand beaches are being intensely utilized for cotton production. This seriously reduces the sites suitable for nesting in many areas. Heavy silting from erosion and water control projects is covering beaches at other locations. How great the effects are on reproduction is not known.

Water Management

Dam construction and water diversion cause very adverse effects for fauna in some rivers. The lakes produced by the dams usually present suitable crocodile habitat but close proximity to human populations and increased use for recreation (fishing, boating, etc.) negate this factor. Human consumption and evaporation by the intensified use of irrigation remove great quantities of water from certain systems. The severely reduced flow downstream of the dams has rendered certain stretches of rivers devoid of crocodiles.

Rural Development

Amplification and modernization of the road systems in the Llanos increase the human/crocodile conflicts. The expanded use of land for ranches, farms, and communities, with the increased ease of access, has the same effect. This trend is irreversible.

Public Education

The Venezuelan government has made a major effort to increase public environmental awareness and is among Third World leaders in this respect. Major effectiveness is at the primary school level, and thus a large segment of the population remains resistant or excluded from any reorientation. The traditional characterization of the crocodile as a dangerous predator of livestock and man, with no intrinsic value, is hard to modify. Many of the crocodiles taken recently are hunted as a result of this fear. Extensive coverage of our project by the national news media emphasized the need for public cooperation for the protection of the species. The Orinoco crocodile must be valued as a significant element of Venezuelan heritage and folklore, and, if allowed to recuperate, an important renewable resource and essential component of the Llanos ecosystem. Public education is the most important factor in eliminating the slow attrition of remaining crocodiles.

Other Diverse Problems

- Widespread and indiscriminant use of pesticides and herbicides (including DDT and Dieldrin) is found. Uncontrolled applications have led to resistance in some pests and hence to increased concentrations of the highly poisonous chemicals. This vicious cycle was experienced in the U.S. and Mexico two decades ago. Local inhabitants report huge fish kills when the first rains wash out chemicals that have concentrated in the fields during dry season sprayings. The toxic effects have even led to suspected human death in eastern Colombia (Medem pers. comm.). Though no studies have been undertaken to monitor the problem, there is undoubtedly some biochemical effect on the piscivorous predator at the top of the complex Llanos foodweb. Concentration of the toxins surely occurs at this trophic level.

- The modern outboard engine provides lightweight, rapid, and economical transportation over vast areas where travel is restricted to water. It also represents the Llanos' most destructive technological advancement in terms of its impact on the fauna. Increased range of travel and access to formerly remote areas are the most detrimental aspects.

- Future plans to develop the Orinoco Tar Belt for oil production will undoubtedly cause tremendous effects on the ecology of the central Orinoco region. Impact studies are currently being planned, but the very nature of the exploitation of the petroleum-rich sands will severely degrade the environment, no matter how strict the resulting controls may be.

DISCUSSION

The distribution of Crocodylus intermedius covers an enormous and ecologically complex area. Original populations were very abundant until efficient, concentrated commercial hunting exterminated or severely reduced the crocodiles throughout their entire range. The time limitations of our project necessitated selective surveys in order to gain a general idea of the species' present condition. Reliable reports concerning areas not surveyed reinforced our discouraging findings. Field observations also indicated many important factors that presently affect the Orinoco crocodile.

Our results support the IUCN Red Data Book statement that C. intermedius is "virtually extinct in Colombia and rare in Venezuela" (Honegger 1975). Populations are very low and assistance is needed to insure the species' survival. It is interesting to note that we found no area where the crocodile has recuperated in spite of the hide industry collapse 20 to 30 years ago. At best, only minor recruitment into the population is occurring. Sporadic hunting and factors mentioned above mentioned above maintain a constant pressure and the result is evident. Although C. intermedius remains one of the world's most endangered crocodylians, it is not too late to save the species. A comprehensive program that protects the remaining wild stock combined with well planned captive projects would provide safeguards for the future and is urgently advised.

RECOMMENDATIONS

- 1) Urgent, specific legislation in Venezuela to protect C. intermedius as an endangered species. Under this status the existing law is sufficient.
- 2) Increase enforcement of existing laws, not only those directly concerning the hunting and products of C. intermedius, but also those governing habitat disturbance and destruction.
- 3) Establish a National Park in western Apure State to include sections of the Capanaparo and Cinaruco rivers. This habitat type is not represented within any existing Park, and survey results show a relatively abundant, reproductive crocodile population there. The Llanos fauna appears intact and protection would also be afforded to the primitive Amerindians of the region.

- 4) Establish a Fauna Refuge on the upper portion of the Cojedes River in the State of Cojedes. In approximately 100 km, 89 large crocodiles were found. This was the highest concentration of crocodiles/km encountered and active reproduction was also found.
- 5) Undertake further surveys, especially in western Apure and Barinas where reports indicate isolated populations. Nothing is known about the delta region (approx. 30,000 km²) where possible interaction with *C. acutus* may exist. Results would then be utilized in formation of future sanctuaries, refuges, and/or national parks.
- 6) Initiate studies into the general ecology and breeding biology of the species. Further knowledge is required for proper conservation and management.
- 7) Research possibilities for expanded captive breeding and rearing. Existing captives should be sexed, paired, and placed in proper facilities for reproduction. Some areas of prime habitat which are devoid of crocodiles exist in regions of sparse human settlement and may be very suitable for restocking. Aguaro-Guaritico National Park is suggested for the first efforts, provided that adequate and sustained protection is provided to insure success.
- 8) General public education, utilizing various media, is necessary to explain the situation and to stress the need for national cooperation. A certain level of public awareness will have to be maintained throughout the species' recovery.

LITERATURE CITED

- Blohm, T. This volume. Husbandry of the Orinoco crocodile (*Crocodylus intermedius*).
- Bustard, R. 1970. Crocodylians of the World - Summary of the present position. World Wildl. Fund Yrbk. 1969-1970: 313-320. Morges.
- Donoso Barros, R. 1966a. Contribución al conocimiento de los cocodrilos de Venezuela. Continuación. Physis 26(71): 15-32.
- _____. 1966b. Contribución al conocimiento de los cocodrilos de Venezuela. Conclusión. Physis 26(72): 263-274.
- Godshalk, R.E. 1978. El caiman del Orinoco, *Crocodylus intermedius*, en los Llanos Occidentales Venezolanos con observaciones sobre su distribución en Venezuela y recomendaciones para su conservación. Final Report to FUDENA (WWF/Ven.). Unpublished MS. 58 + xxvi p., 37 figs., 3 tables, 18 maps. Caracas.

- Godshalk, R.E., and S.J. Maness. 1976. El genero Crocodylus en Venezuela. Presented at the Second Symposium on Capybara (Hydrochoerus hidrochaeris) and Spectacled Caiman (Caiman crocodilus). Unpublished MS. Maracay, Venezuela.
- Hamilton, L.S., J.A. Steyermark, J.P. Veillon, and E. Mondolfi. 1976. Conservacion de los bosques humedos de Venezuela. Sierra Club/Bienestar Rural. Caracas. 181 p.
- Honegger, R. 1975. Red Data Book, Vol. 3 - Amphibia and Reptilia. IUCN/SSC, Morges.
- King, F.W. 1973. Summary of the surveys of the status of crocodilian species in South America undertaken by Professor F. Medem. In Crocodiles. IUCN Publ. (N.S.) Suppl. Paper 41: 33-36.
- Medem, F. 1955. Los caimanes, un recurso en peligro. Economia Colombiana (Rev. Contral. Gen. Republ.) 4(10): 91-95.
- _____. 1958a. Informe sobre reptiles Colombianos. III - Investigaciones sobre la anatomia craneal, distribucion geografica, y ecologia de Crocodylus intermedius Graves en Colombia. Caldasia 8(37): 175-215.
- _____. 1958b. El conocimiento actual sobre la distribucion geografica y ecologia de los Crocodylia en Colombia. Rev. Univ. Nac. 23: 37-57.
- _____. 1968a. El desarrollo de la herpetologia en Colombia. Re. Acad. Colombiana Cienc. Exactas, Fis., Nat. 13(50): 149-199.
- _____. 1968b. Exterminacion de la fauna en los Lanos Orientales de Colombia. Univ. Nac., Gac. Cienc., Publ. Especial 1; 1-13. Bogota.
- _____. 1970. El estado actual respecto a la terminacion de los crocodilideos en la hoya del Orinoco Colombiano. Natura 42/43: 9-12.
- _____. 1971. Situation report on crocodilians from three South American countries. In Crocodiles. IUCN Publ. (N.S.) Suppl. Paper 32: 54-71.
- _____. 1974. WWF Project 748. Orinoco crocodile - status survey. First interim report. World Wildl. Fund Yrbk. 1973-1974: 254-256, pl. 32. Morges.

- _____. 1976. WWF Project 748. Orinoco crocodile - status survey. Second interim report. World Wildl. Fund Yrbk. 1975-1976: 191-192, pl. 9. Morges.
- Medina P.G. 1960. Caza y conservacion de la fauna en Venezuela. El Agricultor Venezolano 22(216): 22-28.
- Mondolfi, E. 1957. La conservacion de nuestra fauna autoctona. Conservacion 3: 3-18.
- _____. 1965. Nuestra fauna. El Farol 27(214): 12 p.
- Rivero Blanco, C. 1968. El caiman y su valiosa piel. Lineas 136: 11-13.
- _____. 1970. Situacion de la baba y los caimanes, efectos de la explotacion comercial. Recomendaciones en el manejo de las especies. Presented at the Conference on Protection and Development of Wild Fauna. Unpublished MS. 12 p. Caracas.
- Venezuela. 1944. Ley de Pesca. Gaceta Oficial Ven. 21.529. 4 p. Caracas.
- _____. 1970. Ley de Proteccion a la Fauna Silvestre. Min. Agric. y Cria. 51 p. Caracas.
- Vila, M.A. 1953. Geografia de Venezuela. Fundacion E. Mendoza. 389 p. Caracas.
- _____. 1965. Geografia de Venezuela. Vol. 2 - El paisaje natural y el paisaje humanizado. Min. Educacion. 558 p. Caracas.
-