

# Head-starting and Translocation of Juvenile Crocodylus acutus in Lago Enriquillo, Dominican Republic

by

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## ABSTRACT

Since 1992 the Dominican Republic is carrying out a conservation project in Lago Enriquillo, a hypersaline inland lake, where the country's only Crocodylus acutus population is surviving. The population had declined from 300-600 adults in the early 1980s to some 200 in 1992, mainly due to illegal killings. The Dominican Wildlife Department (DVS), in charge of animal and plant conservation, developed an action plan to secure the crocodiles' survival and well-being. An inter-institutional executive council was formed to plan and supervise the plan's activities.

Because of the delicate state of the Crocodylus acutus population the council decided in 1993 to take eggs to the Santo Domingo Zoo for a headstart program. In April and May 178 eggs and 53 hatchlings were taken to the zoo. A total of about 130 neonates were in the zoo by the end of 1993. Most of them died in 1995 due to severe internal problems in the zoo.

In 1994 it was decided to translocate the hatchlings from the nesting beaches on the islands to freshwater habitat along mainland shores, in order to improve survival rates. 255 hatchlings were translocated, after being marked. In Los Borbollones area some 20 % were recaptured. Since post-hatching care is an important phenomenon in Lago Enriquillo crocodiles, we are not sure if mortality was reduced significantly by our translocation activities.

Growth rates in the juveniles were 30 to 35 mm per month. Mean weight gain in the first year was 63 g / month, in the second year about 200 g / month.

## RESUMEN

Desde el 1992 la República Dominicana está llevando a cabo un proyecto de conservación en el Lago Enriquillo, un lago hipersalino en el interior, donde la única población del cocodrilo americano (Crocodylus acutus) del país sobrevive. Esta población ha declinado de 300 - 600 adultos en los años 80 a unos 200 en el 1992, sobre todo por matanzas ilegales. El Departamento de Vida Silvestre, responsable para la conservación de animales y plantas, desarrolló un plan de acción para asegurar la sobrevivencia y el bienestar de los cocodrilos. Un consejo ejecutivo, de forma inter-institucional, fue formado para planificar y supervisar las actividades del plan de acción.

Por el estado delicado de la población de Crocodylus acutus en el lago, el concejo decidió en 1993 de llevar huevos al Jardín Zoológico de Santo Domingo para iniciar un programa de crianza en cautiverio. En abril y mayo 178 huevos y 53 neonatos fueron llevados al zoológico. Un total de unos 130 neonatos estaban en el zoológico a finales de 1993. La mayoría de ellos murió en el 1995, por fuertes problemas internos de la institución.

En 1994 fue decidido trasladar los neonatos desde sus playas de anidamiento en las islas hacia los sitios de agua dulce en las orillas del lago, con fines de aumentar la tasa de sobrevivencia. Unos 255 neonatos fueron trasladados, después de haber sido marcados. En el área de Los Borbollones un 20 % de ellos fueron recapturados. El cuidado que las cocodrilas les dan a sus crías parece ser un fenómeno muy importante en el Lago Enriquillo. Así no estamos seguros, si la mortalidad ha sido reducida significativamente por las actividades de traslado.

Las tasas de crecimiento de los juveniles eran 30 - 35 mm por mes. El promedio del aumento de peso era 63 g por mes en el primer y 200 g por mes en el segundo año.

## INTRODUCTION

The American crocodile (*Crocodylus acutus*) was once abundant along much of the Hispaniolan coastline (Descourtiz 1809, Moreau de St. Mery 1797). Today, in Haiti there are only small populations along the coast and in Etang (Lake) Saumatre (Thorbjarnarson 1988); and in the Dominican Republic *C. acutus* has only persisted in Lago Enriquillo (SEA/DVS 1993).

Lago Enriquillo is situated in the Neiba valley in the southwestern part of the Dominican Republic, bordered by two 2000 m mountain ranges. It has a water surface of about 200 km<sup>2</sup>, a length of 35 km, a width of 11 km and a maximum depth of 22 m (Araguás et.al, 1993). There is one big island, Isla Cabritos and two small islands, La Islita and La Barbarita. At the moment Lago Enriquillo has a salinity of 80 ppt (1996) and lies 40 m below sea level. The lake is a remnant of a marine channel that once divided Hispaniola into two paleo-islands (Mann et.al 1984, Inchaustegui et.al 1978). The climate is semi-arid: annual precipitation ranges between 470 and 780 mm and evaporation is estimated to exceed 2000 mm. Mean air and lake water temperatures are approximately 30° C. Water level, lake surface, and salinity vary significantly from year to year.

In the early 1980s the crocodile population of Lago Enriquillo was considered to be the biggest and densest for the entire species, estimating an adult population between 300 and 600 individuals (Inchaustegui and Bautista pers. comm.). Between 70 and 112 nests were found in the years 1977 through 1984 (Inchaustegui in SEA/DVS 1993).

Surveys carried out in 1990/91 by the Departamento de Vida Silvestre (Dept. of Wildlife) revealed alarmingly low numbers of nests and of crocodiles seen. In 1992 Vida Silvestre started the project "Study and Protection of the American crocodile". Surveys during the first months showed that the situation of the crocodiles was even worse than expected. Few adults were seen along the coast. Despite intense searching only four nests were located. Thereafter evidence of crocodile killings; bones, including smashed skulls, human tracks, wooden poles and crocodile traps were found in many places (SEA/ DVS 1993, Schubert and Santana 1996).

A "Surveillance Plan" was established and implemented for the whole lake. An "Action Plan for the Conservation of the American Crocodile" was worked out. It includes five programs: 1. Surveillance, 2. Investigation, 3. Reproduction, 4. Public Relations and 5. Resource Management. An interinstitutional "Executive Council" was created to plan and supervise the activities. Members of this council are representatives of the National Park Directorate (DNP), the Wildlife Department (DVS) and the Santo Domingo Zoo (ZOODOM). Grupo Jaragua (a national NGO) and the German Service for Development (DED) are included as consultants. The action plan is in its fourth year of implementation. Human impacts on the crocodiles have been reduced and public awareness improved significantly; the crocodile population is increasing slowly. More than 200 adults are now estimated for the lake area.

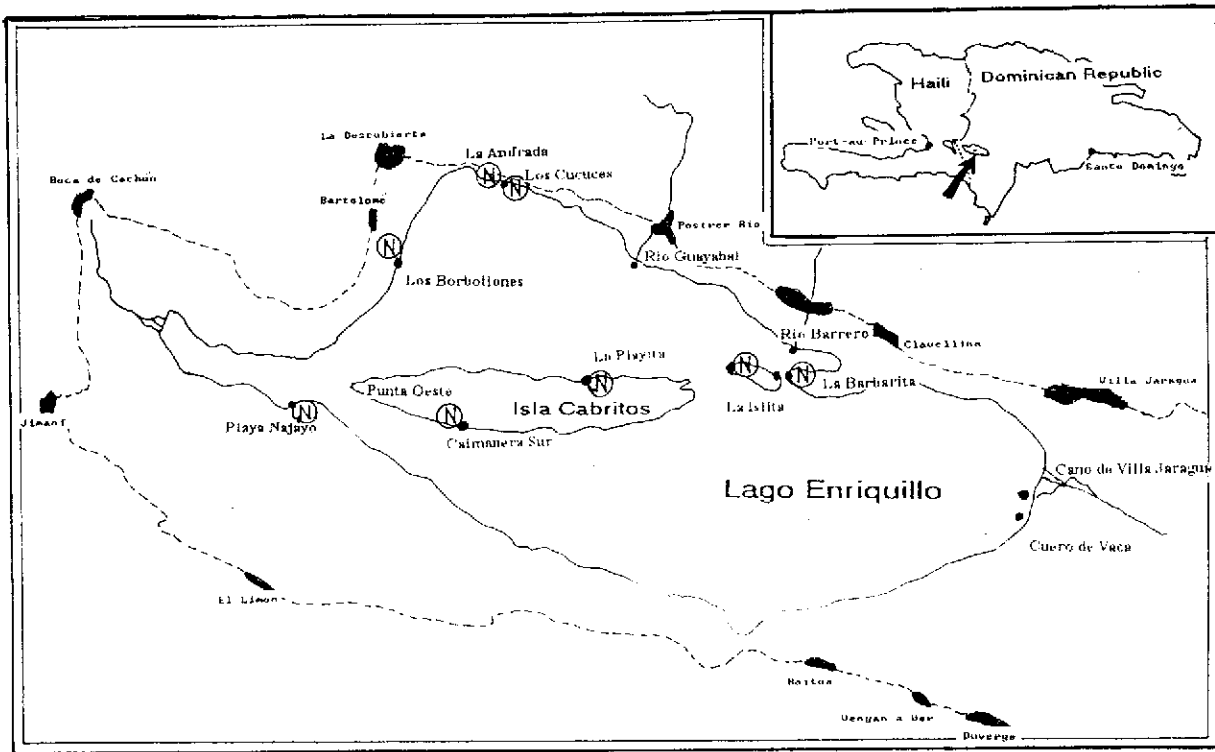


Fig. 1: Map of Lago Enriquillo. N: major nesting sites

## METHODS

Since 1993 all major nesting beaches have been patrolled every two to three days during the egg-laying period (January through March). Nests were opened, and the eggs were counted, measured and weighed, then put back in exactly the same position from where they were removed. In 1993, eight nests were reopened and the eggs were collected and taken to the Santo Domingo Zoo, after having incubated two thirds of their required time (a mean of 60 days). Once they arrived at the zoo, they were measured and weighed and checked for overall shell appearance. Then they were handed over to the zoo personnel. They were kept in an incubation room until they hatched.

Since 1993 was a good year for the crocodiles, in terms of reproduction and stabilization of the population, the "Executive Council" decided for 1994, not to take eggs or neonates to the zoo, but to evacuate them from nesting beaches, especially on the islands, to freshwater habitat on the mainland. In April and May 1994 255 neonates found on their nesting beaches were captured and taken to the mainland, where they were measured, weighed and individually marked by cutting the tail scutes according to a prearranged code. They were released in freshwater habitats along the northern and northwestern shore on the same day or a day later in four different localities.

At the same time we started a capture - recapture program with neonates and juveniles. In May and June 1994 this program focused on the neonates that hatched in the Azufrada area. They were either caught the day after hatching or some days later. After a break of three months, the capture - recapture program continued in September. Juveniles from 1993 and 1994 were caught, measured, weighed, sexed, marked and released immediately. Their position was mapped on small-scale maps (scale 1:20,000 m and 1:10,000 m).

## RESULTS AND DISCUSSION

**Nesting.** In Lago Enriqueillo nesting activities generally begin in January or February. Most females frequently visit the beaches to select their future nesting site. All nests are hole nests, excavated in the sand. Mean number of eggs is 22 per nest. The smallest nest recorded had nine eggs, the biggest 36. Clutch size does not vary significantly between years or between nesting beaches.

According to Fig. 2, the number of nests varied greatly between 1990 and 1996. Due to severe human impacts only four nests were found in 1992. In 1993 and 94 the number of nests went up to 36 and 48 respectively, then dropped again in 1995 to only 14 nests (SEA/DVS 1994b and 1995b). This year we have located 30 nests so far, and we estimate a total of at least 40 nests for 1996.

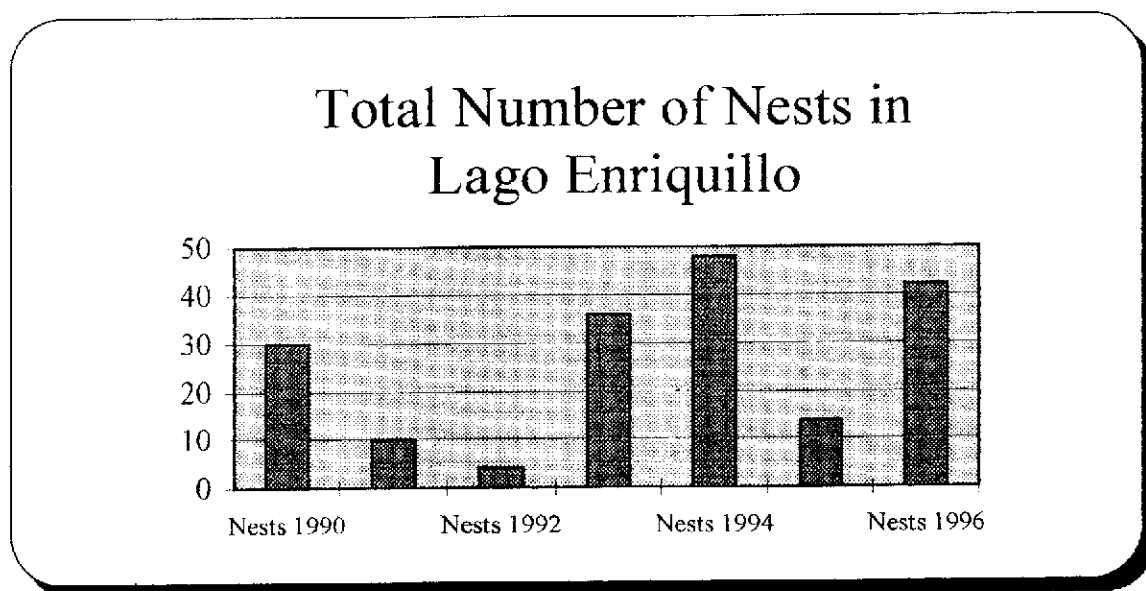


Fig. 2: Number of nest in the years 1990 through 1996. The 1996 number is estimated, based on 30 nest found after laying.

**Nesting beaches.** Some 32 km or 30% of Lago Enriquillo's coastline are sandy beaches. However less than 5 km are used for nesting. There are seven major nesting beaches in Lago Enriquillo, five of them of high importance with more than three nests per year and two of lesser importance. In two further beaches nesting was recorded on only one occasion. Four nesting beaches are situated on the islands. In the last five years a little more than half of the nests were found on island beaches. From these beaches the neonates have to cross up to ten km of the hypersaline lake to get to freshwater habitat on the mainland.

We assume that mainly human disturbances are the reason why Lago Enriquillo crocodiles tend to choose the islands for nesting. Killings of crocodiles and egg-robbing were common before conservation measures were taken. On the islands, especially on Isla Cabritos, human access is very limited.

Due to the very low reproduction success in 1992, the Executive Council decided to take eggs to the Santo Domingo Zoo for artificial incubation in a head-starting program. In April and May 1993 eight nests (22% of total) with 178 eggs plus 53 already hatched neonates were taken to the zoo. At the end of 1993 the zoo had some 130 juvenile *Crocodylus acutus* in captivity. The head-starting program failed completely. In 1995 a change of the zoo director led to severe internal problems, causing the death of many zoo animals (see also last CSG Newsletter). More than half of the crocodiles died and the rest are probably in a very delicate state of health.

In April and May 1994 255 neonates found on their nesting beaches were taken to the mainland, only 42 neonates were left on the beach where they had hatched. Visiting the same beach a day later we found that they had disappeared. In 1995 it was agreed not to evacuate any neonates, however, due to a misunderstanding by the park rangers 53 neonates were captured and taken to the mainland. Only 9 stayed on the nesting beaches. We estimate a total of 250 crocodiles hatched for 1995.

In May and June 1994 the capture and recapture rates showed that neonates were moving west towards an area with dense cattail stands and a high abundance of freshwater. They were using small freshwater ponds along the coast to hide during the daytime. On several occasions an adult crocodile, presumably the mother, was seen in the lake next to the little ponds. On one occasion the mother was even in the pond, hiding in the mud: one of us almost stepped on her.

Between September 1994 and March 1995 a stretch of about 4 km of coastline of major importance for the juveniles was patrolled monthly, ten juveniles or more were caught during each visit, all juveniles seen were registered and their position was mapped. The same activity was repeated between September 1995 and January 96. However, this time it was much more difficult to catch the juveniles, due to increased wariness. Only a mean of two animals per patrol was obtained.

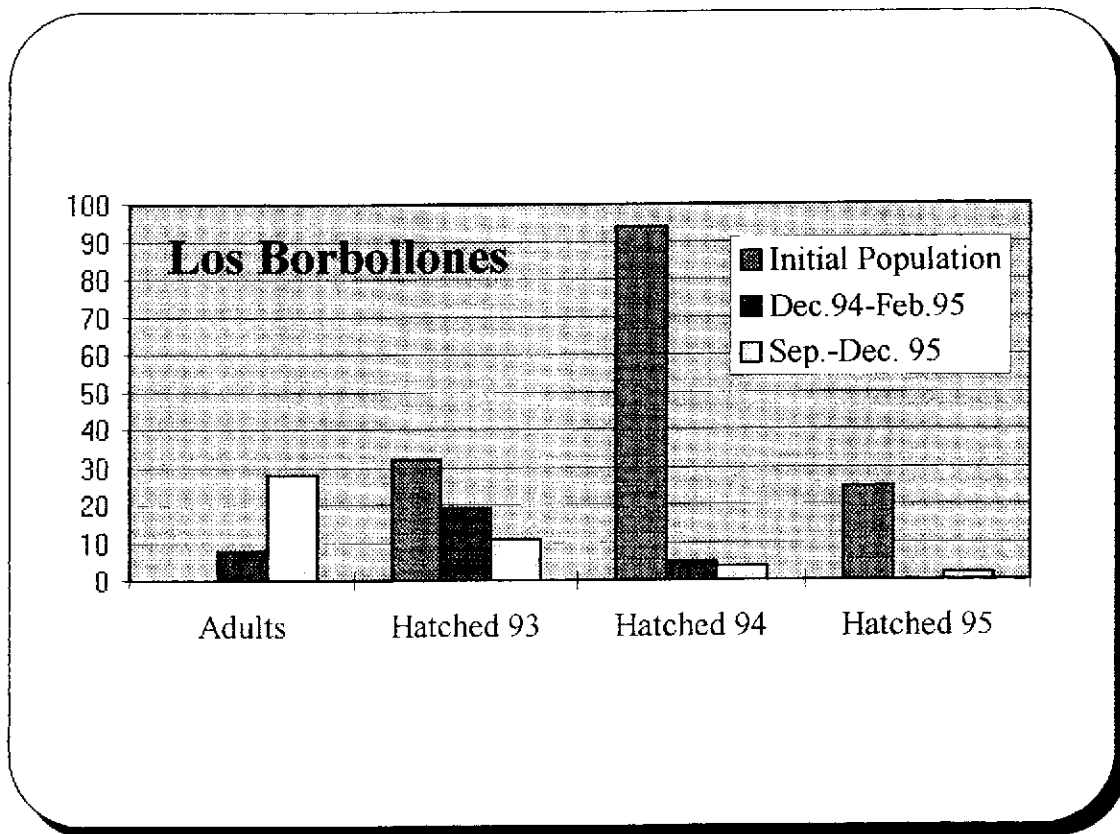


Fig. 3: Abundance of different year-classes in Los Borbollones.

Los Borbollones is one of the areas patrolled regularly. On a stretch of 1 km there are many freshwater springs that drain into the lake. Los Borbollones is an important site for adults who presumably stay here for some days to osmoregulate and, to a lesser degree, to nest (a mean of two nests per year). The streams that drain the springs and the brackish water along the shore form important habitat for neonates and juveniles. Fig. 3 shows the initial amount of neonates in Los Borbollones for each year class, as well as its abundance in Dec. '94 through Feb. '95 and for Sept. '95 through Jan. '96. While the 1993 born crocodiles diminished slowly, numbers for 1994 and 95 decreased drastically within the first months. The principal cause for this decrease is probably a very high mortality rate, rather than a high rate of migration. Even though juveniles were recorded to migrate distances of up to 3.6 km within two weeks, most of them stay in the same locality for many months. A 1993 juvenile, radio-tracked since January 1996 apparently has a rather small home range (less than 2 km of coast line).

However, it is important to point out that only a fraction of the juveniles are seen. In April and May 1994 some 82 marked neonates were released in the Borbollones area. Between September 1994 and March 1996 we captured 24 of them, corresponding to 19.5%. Another eight unmarked juveniles of the 94 age class were captured, so the relation marked : unmarked was 2 : 1. The unmarked animals came either from one of the two Borbollones nests or were brought to the area from other nesting beaches by their mother.

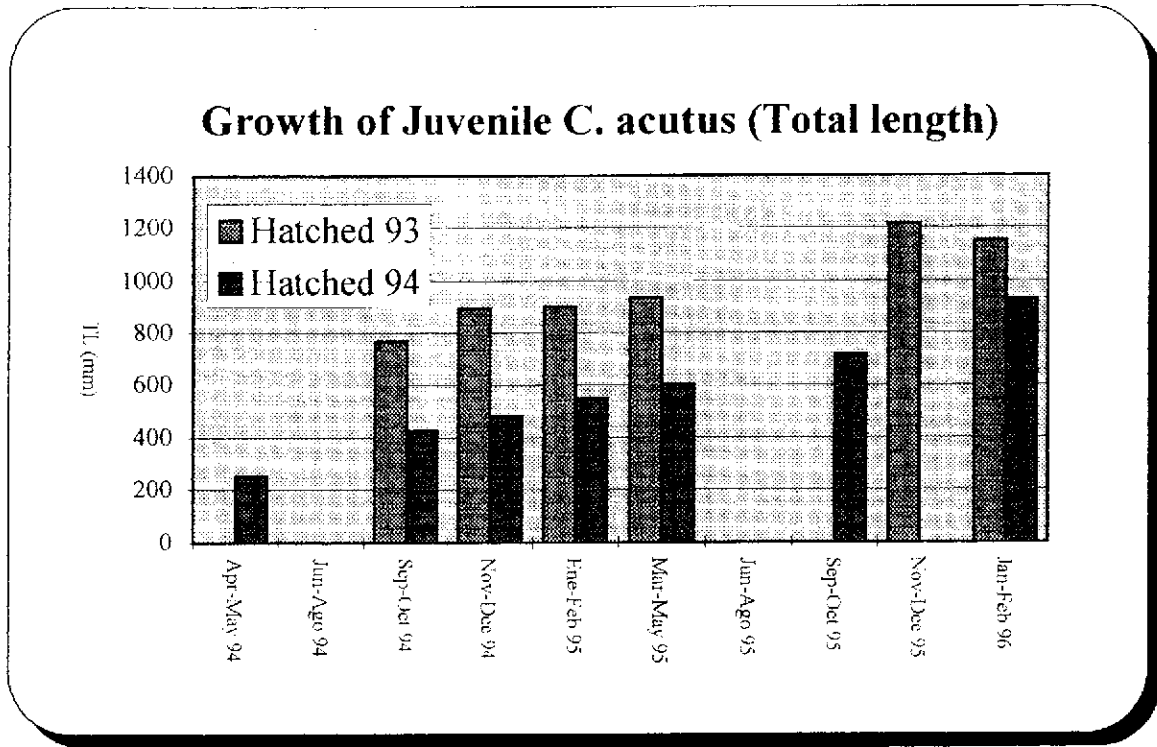


Fig. 4: Growth of *C. acutus* juveniles in mm per month (total length)

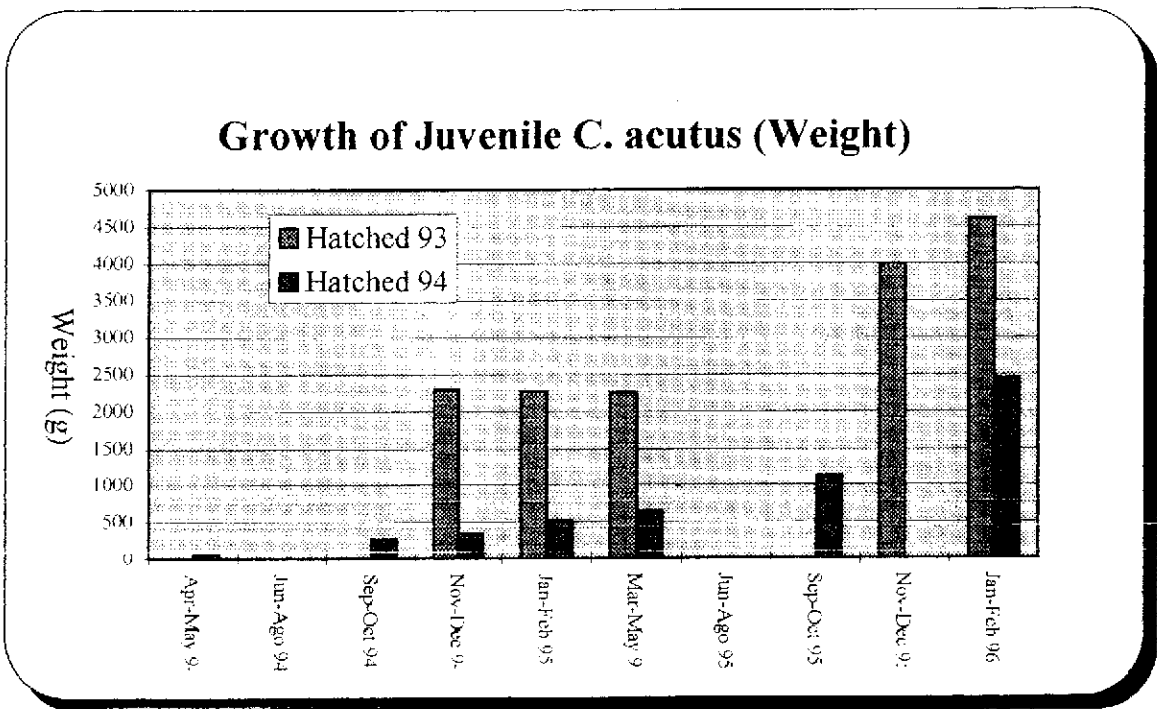


Fig. 4: Growth of *C. acutus* juveniles in grams (g) per month



## ACKNOWLEDGMENTS

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