

OCEAN RESEARCH CONSERVATION AFRICA

# **Loggerhead Turtle Husbandry (2010)**

An ORCA Foundation Initiative

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June 2012

## **Abstract**

The *Caretta caretta* (loggerhead turtle) is one of seven turtle species, all of which are endangered. The turtles are subject to high mortalities throughout their lives and survival to adulthood is low.

The 'headstarting' program explained by Charles & Pritchard, 1980, gives opportunity for turtles to survive past infancy and minimize avian and marine predation.

The turtles are subjected to various protocols such that a standard is kept for procedures upon arrival and during the treatment phase and release of the animals. Every opportunity is given to the animals to adapt to life at sea and to learn the necessary skills for survival.

The 'headstarting' program has been successfully used by the foundation in the rearing and release of 7 loggerhead turtles.

## **Keywords**

Loggerhead, turtles, loggerhead turtles, turtle growth, turtle captivity, turtle husbandry, ORCA Foundation results, *caretta caretta*, turtle conservation

## **Table of Contents**

1. Title page	1
2. Abstract	2
3. Keywords	2
4. Table of contents	3
5. Introduction	4
6. Study area	4
7. Materials and methods	5
8. Results	7
9. Discussion	8
10. Conclusion	9
11. Acknowledgements	9
12. References	10
13. Appendix	11

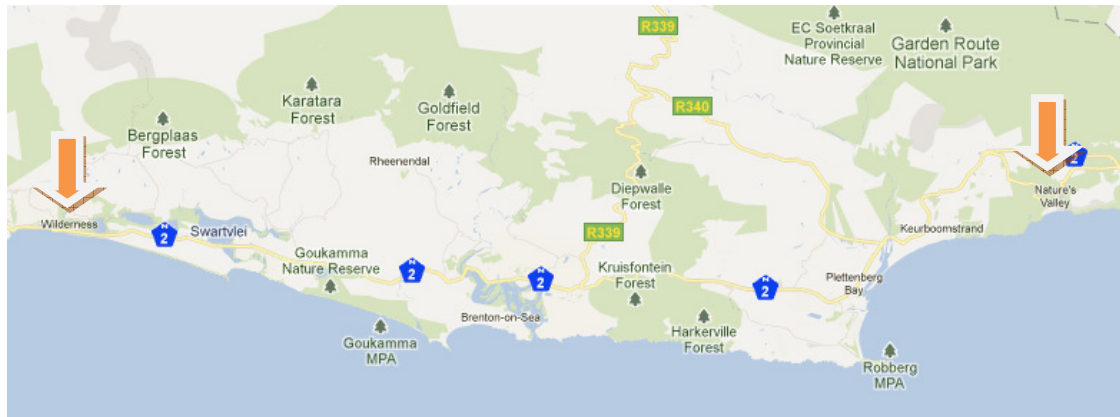
## **Introduction**

*Caretta caretta* (loggerhead turtles), like most turtles, experience a long juvenile period and high mortality rates in their first year (Heppell *et al.*, 1996). There are a variety of causes for this mortality, including habitat loss due to coastal development, accidental capture by fisherman, anthropogenic pollution, anthropogenic disturbance (such as motor operated boats), photo pollution, and human and animal predation (Euroturtle, 2006). There are only about 1,000 *Caretta caretta* nesting areas in South Africa and, although other nesting areas are still being discovered, there is clear evidence indicating that turtle populations are rapidly declining (Euroturtle, 2006; Charles & Pritchard, 1980). Over the course of the past few decades, conservationists have made attempts to circumvent the “trends towards the extinction of sea turtle populations” (Charles & Pritchard, 1980, pg. 609). “Headstarting,” one of such attempts, is a method aimed to reduce mortality by holding hatchling turtles in captivity until they are deemed to have grown enough to avoid predation from most avian and marine predators (Charles & Pritchard, 1980). The process of headstarting takes anywhere from a few months to a year, depending on the individual turtle’s growth rates and diving abilities while in captivity (Charles & Pritchard, 1980). Before the turtles can be released, they must lose their infantile buoyancy and have the ability to dive freely (Charles & Pritchard, 1980). This is to allow the turtles to “escape birds, [and] start feeding straight away” (Charles & Pritchard, 1980, pg. 616). It is hoped that, upon release, the turtles will be able to survive and grow as they normally do in the wild (Heppell *et al.*, 1996).

In attempt to reduce infantile mortality for loggerhead sea turtles and to rehabilitate stranded individuals, ORCA Foundation created its own headstarting program at Ocean Blue Adventures in Plettenberg Bay, South Africa. Because beach strandings have become increasingly common for loggerhead turtles due to pollution and anthropogenic disturbance, ORCA Foundation has chosen to collect stranded individuals to take part in its headstarting project (Epperly *et al.*, 1996; Tracy Meintjes, personal communication).

## **Study area**

The turtles received by ORCA Foundation were found stranded on the stretch of beach between the town of Wilderness (33° 59' 47.46S, 22° 33' 47.00E) and Nature’s Valley (33° 58' 36.64S, 23° 34' 32.49E), a distance of approximately 80km (Tracy Meintjes, personal communication). The majority of the turtles were found stranded on the coastline in the Eden National Park area.



**Figure 1: The Garden Route coastline from Wilderness to Nature's Valley (Google Maps, 2010).**

Once collected from their stranding area, the turtles were brought to a large aquarium located in Ocean Blue Adventures in the town of Plettenberg Bay. The aquarium was approximately 2300mm by 2000mm (triangular), and was 800mm deep. The tank's size and depth allowed the turtles to swim and dive freely. The water contained in the aquarium was salty, collected from the Indian ocean near Central Beach of Plettenberg Bay, and was kept at an ambient temperature to mimic the natural temperature fluctuations that occur at sea.

## **Materials and methods**

### **Food:**

*Caretta caretta*, though mainly carnivorous, show little preference in terms of food (EuroTurtle, 2006). Their diets range geographically, and their strong jaws allow them to eat many varieties of food (Burke *et al.*, 1993; EuroTurtle, 2006). The turtles in this study were fed a diet consisting of *Callinassa kraussi* (the common sand prawn), *Mytilus galloprovincialis* (the Mediterranean mussel), and fresh fish off-cuts, provided to us by a local fish shop. *Callinassa kraussi*, though not a typical food source, were collected from the Piesang River estuary and put into the tank while still alive. The addition of live prawns allowed the turtles to simulate their natural feeding behaviours by diving and catching their food. *Mytilus galloprovincialis*, an invasive mussel species, were collected from rock pools near the Beacon Island Hotel in Plettenberg Bay. The mussels were frozen to open the shells, and were later thawed to allow the removal of the meat from the shell. The fish off-cuts were collected weekly from Robberg Seafoods, located in the industrial area of Plettenberg Bay, and were deboned (to prevent choking and digestion problems) and frozen with the meat removed from the mussels in premeasured amounts. The frozen food was removed from the containers, lightly thawed, broken up by hand, and was then dropped into the tank for the turtles to eat. As the turtles grew and

their ability to dive increased, hermit crabs were placed in the aquarium as a source of food. This was to aid them in learning the skills of diving and breath hold, as well as the challenge of retrieving a crab that had retreated into its shell.

Twelve percent of each turtle's body weight was fed to the turtles each feeding session. The turtles were caught and placed into an isolated enclosure during feeding to allow easy monitoring of how much food was eaten and to prevent other animals in the tank from gaining access to the turtle food. The enclosure used was 50cm by 100cm by 50cm, and was made with a PVC pipe frame attached to shade net. The depth of the enclosure not only allowed the turtles to dive for their food, but also allowed turtles unable to dive deeply (weighing less than 50 grams) to feed (Davenport & Clough, 1986) in the shallow areas of the enclosure. The turtles were fed five to six times a week, with added starve days to mimic natural conditions experienced by turtles in the wild.

#### Measuring equipment:

Volunteer research assistants measured the turtles twice weekly at Ocean Blue Adventures, where the aquarium was located. The turtles were caught with nets and placed into a large, rectangular container. Each turtle was removed from the container individually to be weighed and measured. Shell measurements were taken with both calipers and cloth tape measurers. The calipers, which were calibrated to one millimeter, were used to measure the length, width, and depth of the shell. The length was measured along the middle of the shell from just behind the neck to the end of the tail, the width was measured across the widest point of the carapace, and the depth was measured from the highest point on top the carapace to underneath. Each of these measurements was promptly recorded onto a data sheet. The curved shell length was measured by a cloth tape measure (also calibrated to one millimeter) to provide a precise measurement involving the curvature of the shell. Small kitchen scales measured the turtles' weight in five-gram intervals prior to feeding sessions, which eliminated food consumption as a factor in weight. After being measured and weighed, each turtle was returned to the aquarium.

#### Time schedule:

The majority of the turtles were held in the Ocean Blue aquarium from their time of collection (between January 2010 and August 2010) until November 20, 2010. Two turtles, however, were not large enough to be released on this date. One of these turtles died; the other was released in January 2011.

Protocol for Turtles on arrival at the Aquarium:

When the turtles arrive at the aquarium, they are immediately given a dose of Darrows at a 10:1 dilution and 1ml per 100g of turtle weight. They are then allowed to rest in the aquarium until the following day when they are weighed and measured. They were then added to general population and offered food.

Protocol for ill Turtles:

If, during the turtles stay at the aquarium, the turtles showed a drop in weight over two weigh-ins, they were immediately put onto a daily course of antibiotics for 5-7 days. Doxysyrup was used at 0.1ml per 100g of weight. This was provided by a local vet.

Tabulation of data:

The results of these measurements were recorded into a Microsoft Access database and from their entered into graphs, which were divided into categories: those that survived and were eventually released (category 1), and those that died while in captivity (category 2).

The release:

The turtles were washed up on the shores of the Garden Route which is not their normal breeding grounds. To prevent the turtles from scent marking on the beach where they would be released, the foundation took the turtles by boat, several kilometers off the point of Robberg, such that it would be easier for the turtles to reach the oceanic currents and for them to continue their journey.

## **Results**

Firstly, it must be mentioned that there were irregularities in the turtle results gathered. These discrepancies may be attributed to mistaken identity of the turtles, misreading of measurements or errors in entering the relevant information onto the database.

It should also be noted that curvature length and width were only reported from June 21, 2010 onward.

The turtles have been sorted into categories: those that were successfully released (category 1) and those that died in captivity (category 2). Graphs for the turtles in each category can be found in the appendix.

The turtles in category 1 exhibited similar and consistent rates of growth. Shell weight, length, width, depth, curvature length, and curvature width. All grew steadily during the time that these turtles spent in the aquarium. In all of these turtles, the change in weight was the most drastic.

The turtles in category 2, Barnie and Goodman, both grew ill and died before they could be released. Goodman's graph (figure 8) exhibits fluctuations in growth during his time in the aquarium, and on several occasions displayed a drop off in growth with the most significant around the time of his death. Goodman's treatment also included several courses of antibiotics that showed his marginal improvements during his captivity with the final decrease and death thereafter. Barnie's graph (figure 7) shows a slight decrease in growth during his short time in the aquarium. Barnie's weight decreased the most rapidly. At the time of our treatment of Barnie, the foundation unfortunately did not have access to antibiotics. This may have given him the opportunity for survival or alternatively may have delayed the inevitable.

## **Discussion**

Because the turtles' movement was restricted in the tank, their growth was "more directly influenced by [the] quality and quantity of food provided and the water temperature conditions" (Njoman & Uchida, 1982, pg. 159). The most consistent figures from the results were that the turtles, on average increased in weight by 40g each month for the first three months. During the fourth month, this average weight gain increased to 78g for those turtles weighing less than 250g. This indicates that once a turtle reaches approximately 300g, its weight gain is even more pronounced. Diving improved as the turtles developed, and when a weight of 300 – 400g was reached, the animals could dive to a depth (0.8 meters) of the aquarium. Overall, the turtles' weight increased between 97% and 283% of their original weight over a 4-month period. The average increase was 190%, which is similar to findings from previous studies (Njoman & Uchida, 1982). Their size, as measured by curvature width and length, increased between 29% and 56% over the same period. On average, the turtles grew in size by 5.5 mm for each 10 g increase in weight. It was noted that when weight in grams exceeded length in millimeters, the turtle's were often able to dive. This tended to occur around the 50g/50mm mark. This, however, is only speculation and requires further research.

The graphs in category 1 illustrate the turtles with similar and consistent growth patterns. Each of these turtles, with the exception of Tabby, was deemed healthy and released on November 20, 2010. Tabby was released in January 2011, when her weight was thought to be sufficient to ensure survival in the wild. Tabby was the



last turtle to be added to the collection in August of 2010 and did not have the same feeding opportunities as the other turtles. This is why her growth was delayed as was her release.

Category 2 displays the turtles that died during the project. Barnie (as seen in Figure 7) was kept for a duration of approximately two and a half months. The graph clearly exhibits his deteriorating condition.

Goodman's graph (figure 8) displays greater fluctuation in health during his time in captivity. This turtle was also given courses of antibiotics when it was noticed that his weight and general health were declining. After temporary improvement of condition and weight gain, Goodman would fall ill again. This animal died in early January from what was assumed to be a lung infection. No autopsy was conducted.

## **Conclusion**

The turtles showed great gain in weight and size on the 'headstarting' program with the successful release of 7 of the 9 (78%) turtles that were brought to the foundation. The turtles also learned vital skills such as to capture live food and to dive to the depth of the aquarium. The researchers were satisfied with the size, strength and skill of the turtles and deemed them ready for release after 6-8 months of rearing. The program gave the turtles every opportunity to reach adulthood. The foundation intends to continue with their 'headstarting' program if the need again arises. Unfortunately, due to expense, there were no tracking units put on the animals to monitor their movements.

## **Acknowledgements**

This study was made possible by Ocean Blue Adventures, who donated their facilities and the aquarium; Tracy Meintjes, ORCA Foundation's volunteer coordinator and manager; Luigi Lottino, ORCA Foundation's house manager and assistant volunteer coordinator; countless ORCA Foundation volunteers who were caregivers; and the residents of Plettenberg Bay and surrounding area, who helped to locate stranded turtles and supported ORCA Foundation both financially and with turtle food throughout the project.

## References

- Burke, V.J., Standora, E.A., & Morreale, S.J. (1993). Diet of juvenile kemp's ridley and loggerhead sea turtles from Long Island, New York. *Copeia*, Vol. 1993, No. 4, pp. 1176-1180.
- Charles, P., Pritchard, H. (1980). The conservation of sea turtles: practices and problems. *American Zoologist*, Vol. 20, No. 3, pp. 609-617
- Davenport, J., Clough, W. (1986) Swimming and diving in young loggerhead sea turtles (*Caretta caretta*). *American Society of Ichthyologists and Herpetologists*. Vol. 1. pp 53-57.
- Epperly, S.P., Braun, J., Chester, A.J., Cross, F.A., Merriner, J.V., Tester, P.A., & Churchill, J.H. (1996) Beach strandings as an indicator of at-sea mortality of sea turtles. *Bulletin of Marine Science*, Vol. 59, pp 289-297
- EuroTurtle. (2006). *Loggerhead sea turtle*. Retrieved July 19, 2011 from [www.euroturtle.org](http://www.euroturtle.org)
- Google Maps. (2011). Retrieved July 19, 2011 from <http://maps.google.com/?ll=-33.813384,23.124847&spn=0.762188,1.190643&z=10>
- Heppell, S.S., Crowder, L.B., & Crouse, D.T. (1996). Models to evaluate headstarting as a management tool for long-lived turtles. *Ecological Applications*, Vol. 6, No. 2, pp. 556-565
- Njoman, S.N., Uchida I. (1982). Preliminary studies on the growth and food consumption of the juvenile loggerhead turtle (*Caretta caretta* L.) in captivity. *Aquaculture*, 27, pp. 157-160

## Appendix

Category 1 - Displaying turtles that were successfully released:

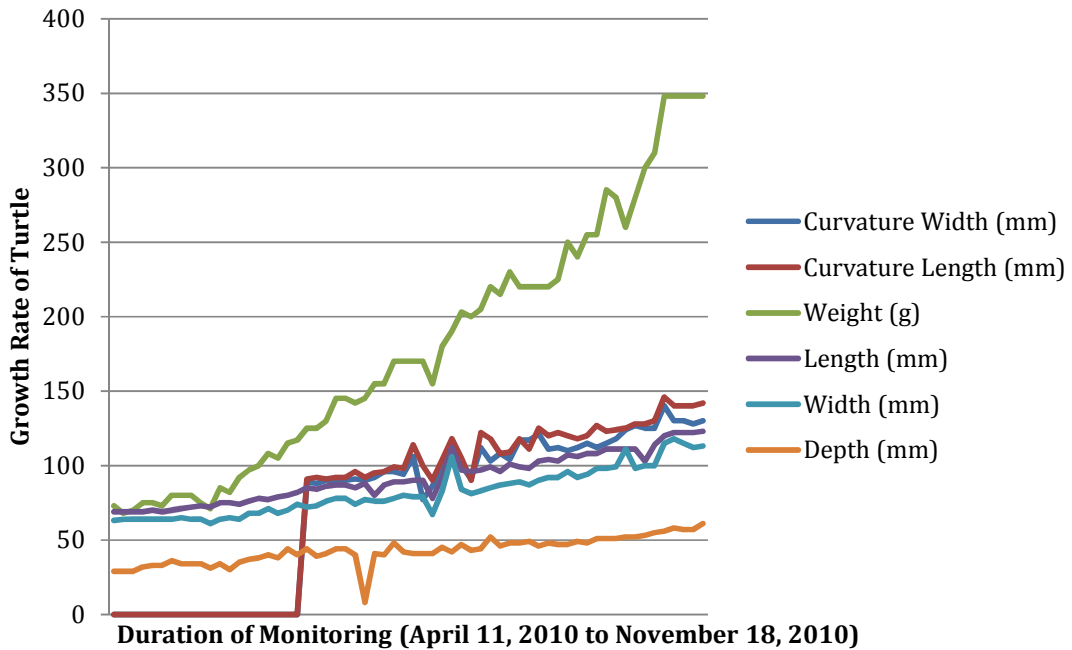


Figure 2: Loggerhead Turtle Growth Chart (Terri)

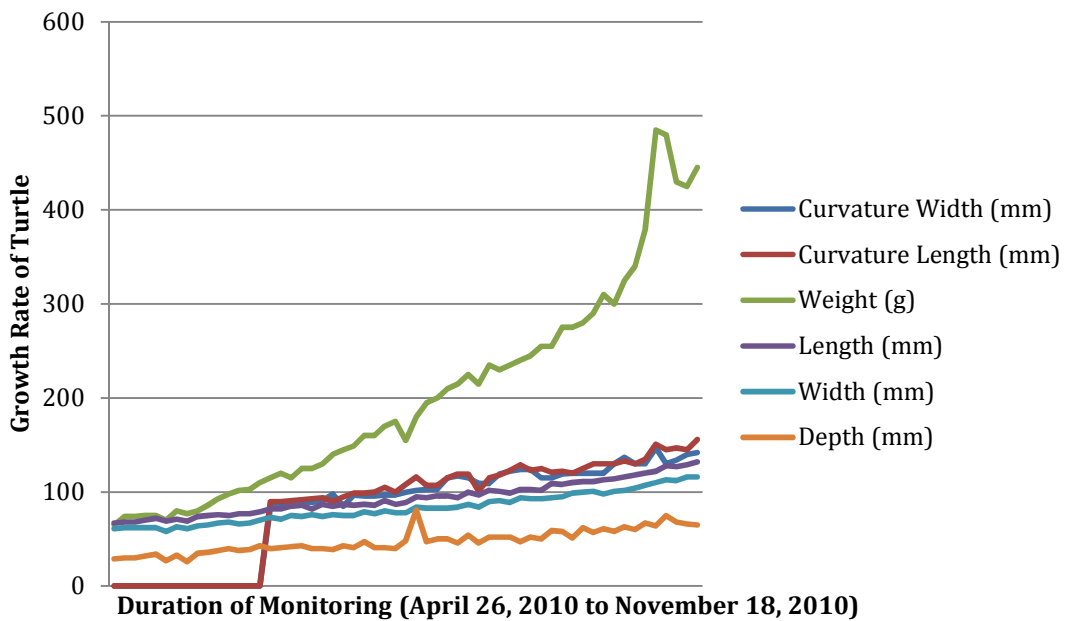


Figure 3: Loggerhead Turtle Growth Chart (Nic)

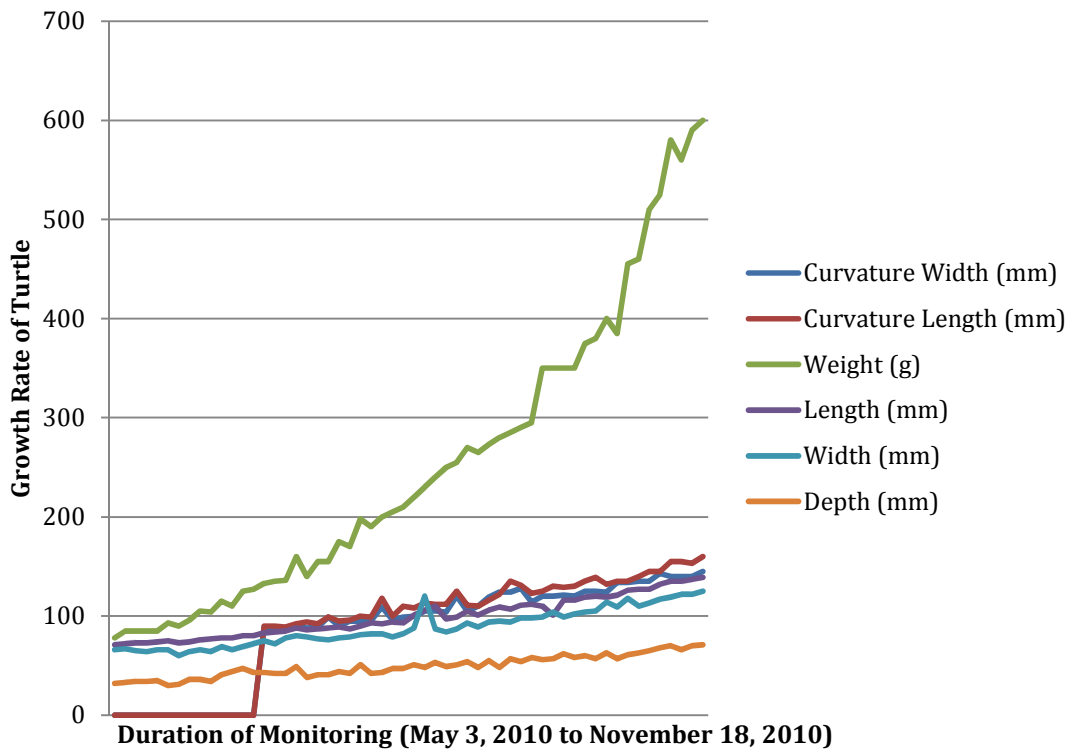


Figure 4: Loggerhead Turtle Growth Chart (Bru)

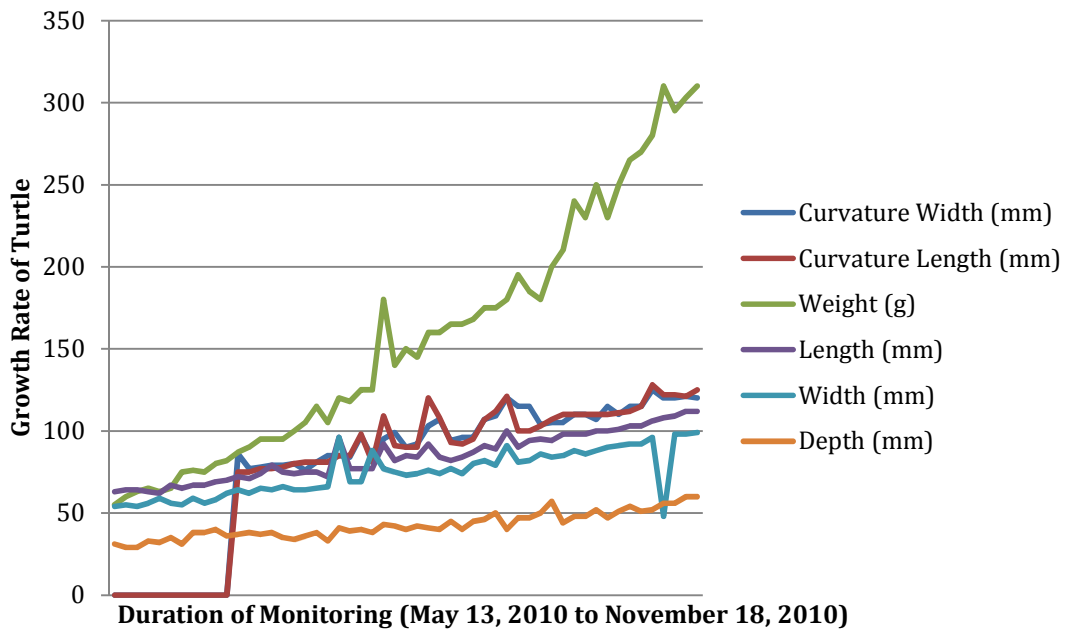


Figure 5: Loggerhead Turtle Growth Chart (Rose)

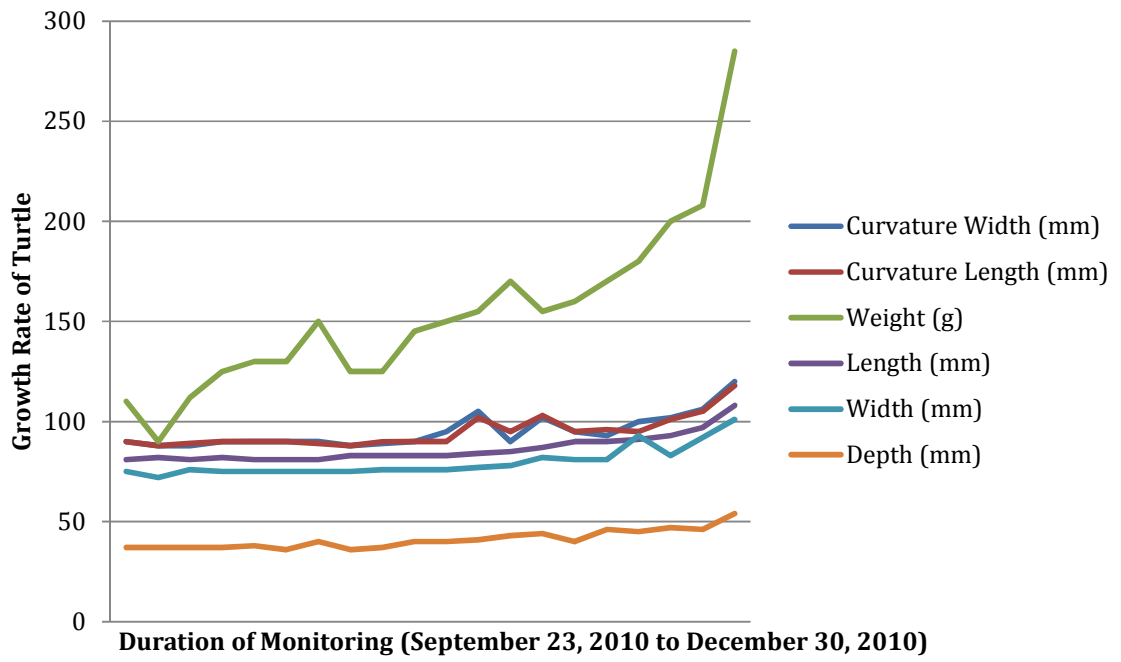


Figure 6: Loggerhead Turtle Growth Chart (Tabby)

Category 2 – Displaying turtles that died in captivity:

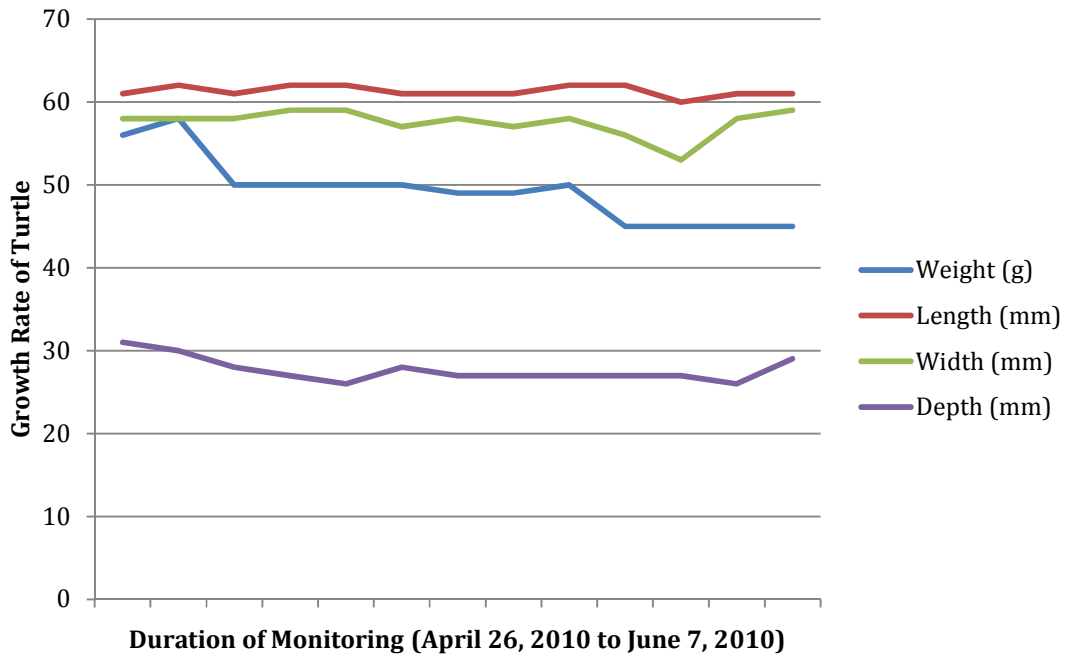


Figure 7: Loggerhead Turtle Growth Chart (Barnie)

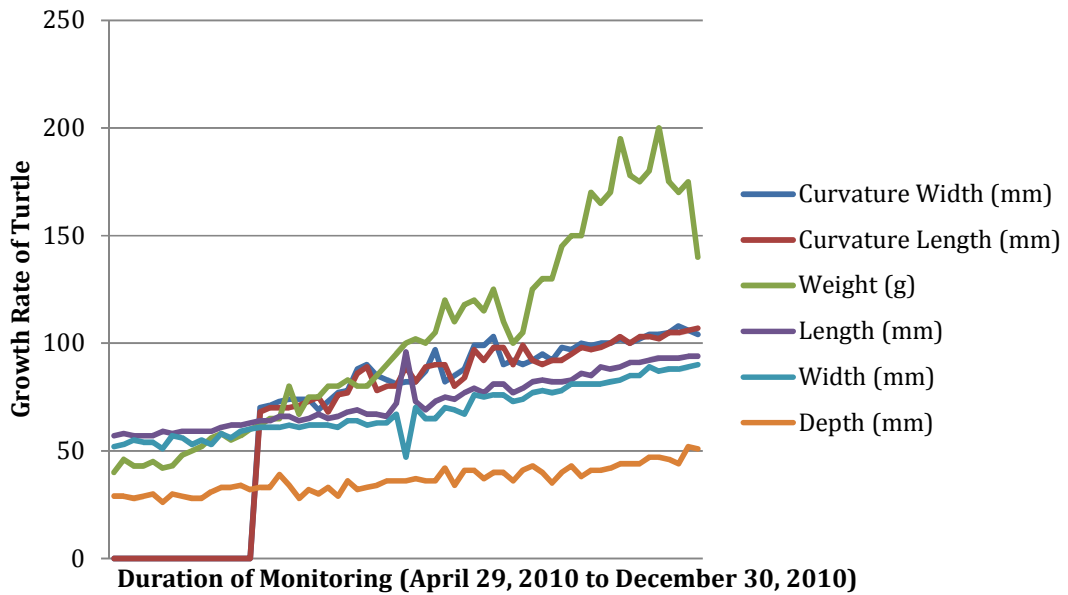


Figure 8: Loggerhead Turtle Growth Chart (Goodman)