Agenda for The Workshop "Captive Rearing for Research and Conservation"

ISTS 38 Kobe, Japan February 18, 2018

Organized by Jeanette Wyneken and Dave Owens

9:00 Introduction to workshop - Jeanette Wyneken and Dave Owens

9:05 **Dave Owens** Some Insights on the Use of Captive Reared Sea Turtles for Laboratory Based Research owensd@cofc.edu

9:35 **Jeanette Wyneken** Raising Sea Turtles for Conservation Research jwyneken@gmail.com

10:05 **Kate Mansfield** Young, Captive-reared Sea Turtles Provide Valuable Insight to the Sea Turtle "lost years" kate.mansfield@ucf.edu

10:30 Break

11:00 **Isao Kawazu** Research of captive sea turtles in Okinawa Churaumi Aquarium i-kawazu@okichura.jp

11:20 Marc R. Rice and **George H. Balazs** Pelagic Phase Research of Juvenile Loggerhead Turtles Made Possible by Professional Aquaria in Japan and New Caledonia mrice@hpa.edu itsahonuworldinhawaii@hotmail.com

11:50 Zhongrong XIA Research in Captive Reproduction of Sea Turtles xzxzr@163.com

Forward:

A new Workshop on "The Captive Rearing (of sea turtles) for Research and Conservation" will be held at ISTS 38 in Kobe. It will take place first thing in the morning 09:00 to 12:30 on February 18 at the Kobe Int'l Conference Center. The organizers have two main objectives for this new Workshop.

First, to demonstrate the great value of studying captive animals for research while at the same time explaining the tremendous effort (costs, logistics, National and International permits, and organizational Animal Welfare Approvals) needed to ensure high quality data are collected.

Second, we want to strongly encourage the rethinking of the "quicky" hatchery and head-starting programs which have sprouted around the world and recommend that well-conceived programs endorse best practices in captive care and nutritionally adequate diets. The concern is that poorly planned projects are likely to do more harm than good in terms of sea turtle conservation.

Abstracts:

Some Insights on the Use of Captive Reared Sea Turtles for laboratory Based Research

Dave Owens Grice Marine Lab, College of Charleston, Charleston, South Carolina 29412

In 42 years of collaborating on sea turtle research at least 5 MS students and 9 PhD students from our lab have conducted all or part of their research on captive reared animals. In the early years of captive rearing in the US, we did not always have the best of facilities to care for our captive animals properly. In some cases turtles would not eat well, showed slow growth or alternatively were fed too much food of low quality and became obese. As an example, diseases such as steatitis were known to occur in aquaria due to over feeding of fatty fish. In the 1980s with the advancement of vastly improved veterinary care, many turtle health problems became better understood. In addition, the introduction of Permitting systems and supervisory Animal Care Committees, with legal oversight responsibilities, have fostered a large improvement in the welfare of captive animals. In our experience, for optimal sea turtle health in captivity, the key criteria which must be carefully monitored and controlled are water quality, water temperature and animal nutrition. Many other finer points of husbandry (social, behavioral, photoperiod etc.) are also now better understood and most importantly, are often unique to each of the seven sea turtle species. As an example, the Kemp's ridley has very different physiological and behavioral adaptations compared to green turtles and these need to be considered in their captive maintenance. Unfortunately, these species differences are not well documented in the literature. Finally, we have learned a lot about sea turtles from the study of captive animals including: a great deal about nutrition, sensory biology, reproductive physiology, stress, and sex differentiation. Many of these insights also contribute to our success in the conservation of these species in the wild.

Raising Sea Turtles for Conservation Research

Jeanette Wyneken Biological Sciences, Florida Atlantic University, Boca Raton, Florida 33431-0991 USA.

Raising marine turtles in captivity is restricted to conservation studies and rehabilitation in mos parts of the world. Some studies of sea turtle biology require access to relatively large numbers of turtles of similar, age, size, or condition. Such wildlife studies may necessitate raising hatchlings or juveniles under laboratory conditions. Raising sea turtles for conservation studies requires money, adequate staff, high quality environmental conditions, robust herd health protocols, and understanding of the species needs. Some species share similar needs while others can be quite unique. Keys to a healthy colony include selecting healthy turtles, without lesions or deformities, cleaning them before putting them into the facility, and establishing a strict quarantine, and training staff in aseptic techniques to prevent disease. This presentation will overview the procedures I have developed and implemented that serve as the foundations for the study of marine turtles in conservation research studies.

Young, Captive-reared Sea Turtles Provide Valuable Insight to the Sea Turtle "lost years"

Kate Mansfield: Director, Marine Turtle Research Group, Department of Biology, University of Central Florida, 4000 Central Florida Blvd. Bldg. 20, BIO301, Orlando, Florida 32816-2368

Understanding sea turtle behavior at all stages of their lives is critical for ensuring the conservation and survival of these threatened and endangered species. Yet we know little about young sea turtles from the time little hatchlings depart their nesting beaches and enter offshore, oceanic waters, until they return to coastal waters years later as larger juvenile turtles. Given their small size, oceanic juveniles are near impossible to observe via traditional methods (e.g., aerial surveys). In many ocean basins, we lack data on early oceanic stage *in situ* behavior, habitat use, and distribution. Due to these data gaps, we lack fundamental knowledge of where to survey for, capture, or sample these young animals in the wild. Until recently, we also lacked a reliable method of tracking these animals in their oceanic habitat over long periods.

Captive-reared turtles provide a way for us to test and assess the safety of new satellite telemetry methods on oceanic stage turtles, and subsequently track young turtles from captivity and the wild in order to finally answer some long-held questions about the sea turtle "lost years". Data from laboratory-reared yearling turtles have helped refine our understanding of early sea turtle life history in the North and South Atlantic Oceans, providing us with information that will allow us to better direct future in-water studies.

Research on captive sea turtles in Okinawa, Churaumi Aquarium

Isao Kawazu Manager, Fish Section, OCF, Japan (Okinawa Churaumi Aquarium).
424 Ishikawa, Motobu-cho, Okinawa 905-0206, Japan

Okinawa Churaumi Aquarium, located in Ocean Expo Park, Okinawa Prefecture, Japan, has had a facility for sea turtle reproduction, rescue, and rehabilitation since 1994. The facility has an outdoor holding tank (16.8 m × 10.5 m × 2 m) with an open-water system and a sandy nesting area (115 m2). The water temperature of the tank ranges between 20°C and 30°C across a 12-month period, which is similar to that of the waters near Okinawa Island. In this facility, wild loggerhead (Caretta caretta), green (Chelonia mydas), hawksbill (Eretmochelys imbricata), and black turtles (Chelonia agassizii) have already been successfully bred in captivity. This process is important for many pioneering research approaches and insights that are being developed. Captive research has advantages over field studies in performing detailed monitoring of body size and blood biochemicals in parallel with gonadal observations in the same individual. Specifically, reproductive biological information is obtained regarding sexual maturation and reproductive cycle (spermatogenesis and vitellogenesis). In addition, many captive techniques that have become valuable, such as blood sampling and ultrasonographic diagnoses, will be used for future wild sea turtle reproductive research and conservation efforts.

Pelagic Phase Research of Juvenile Loggerhead Turtles Made Possible by Professional Aquaria in Japan and New Caledonia

Marc R. Rice[1] and George H. Balazs[2]
[1]Hawaii Preparatory Academy, 65-1692 Kohala Mountain Road, Kamuela, Hawaii 96743)
[2]Golden Honu Services of Oceania, 992 Awaawaanoa Place, Honolulu, Hawaii 96825

From 1997 to 2013, 374 healthy, robust juvenile loggerhead turtles were raised by the Port of Nagoya Public Aquarium (Nagoya, Japan) and the Aquarium des Lagons (Noumea, New Caledonia). These turtles were the base of a multi-year satellite tagging project to study the pelagic migratory phase of *Caretta caretta*. In the North Pacific satellite tagged juvenile Japanese loggerhead turtles were released into The Kuroshio current at various locations and in the Sea of Japan. In the southern hemisphere one group of turtles from New Caledonia were released into the South Pacific mid-way between New Caledonia and New Zealand and a second group was release just short of 200 nm north of NC in the NC EEZ) in international waters. Data from the movements of these turtles has resulted in the publication of 17 journal articles resulting in a better understanding of the behavior of juvenile loggerhead turtles during their pelagic life phase. The use of juvenile captive-reared sea turtles is important for pelagic studies and should be encouraged when appropriate facilities and technical expertise are available.

Research in Captive Reproduction of Sea Turtles

Zhong-rong XIA (Guangdong Huidong Sea Turtle National Nature Reserve Management Bureau. China Sea Turtle Base. Sea Turtle Bay, Gangkou Town, Huidong County, Guangdong Province, 516359, China)

After years of efforts, Guangdong Huidong Sea Turtle National Nature Reserve (22°33'3"N, 114°53'40"E) finally achieved success in captive breeding of Green turtle (*Chelonia mydas*) in May 2017. There were 13 males and 19 females green turtles involved in the breeding programme. Among the 13 males, the average body weight was 91kg and there were 10 individuals over 80kg, the maximum body weight was 122.5kg, and the largest curved carapace length (CCL) was 105cm, curved carapace width (CCW) 85.8cm. As to the 19 females, the average weight was 103.9kg with 10 individuals more than 100kg, the maximum weight was 176.6kg, and the largest CCL was 135cm, CCW 90.1cm. Five pairs of adult green turtles had successfully mated, and five females produced 19 clutches, a total of 1,547 eggs. The incubation rate was about 50%. Factors influencing green turtle captive breeding mainly include nutrition in diet, water temperature, light duration, water flow, mating success, breeding stock selection, status of endocrine system and so on. It is important to study and adopt a balanced, comprehensive and reasonable nutrition in the daily diet management of the adult turtles. Water temperature is one of the important external factors in the turtle breeding: female start nesting on the beach only when the water temperature is higher than 24 ℃ ; Light period extension can promote turtle breeding activities in the spring. Covering sun-shade net above the pool will be conducive to the adult turtle's health in the summer. Cultivation mode of flowing water could be of benefit to the turtles sexual gonads maturity. Mating success rate can be greatly improved after more than a month of absence of contacts between female and male turtles by separating them using a net. Turtles reproductive cycle includes sexual gonad development and maturity, gamete formation, copulation, nesting and eggs hatching five key links, First four links are regulated directly by turtles endocrine system, but hatchability is under the influence of ambient temperature and humidity.

Key words: Guangdong Huidong; Nature Reserve; Mating success; Captive Breeding; Green Turtle

Some Questions and Concerns for Possible discussion

1. Are "Animal Care Committees" reviewing proposals and research grants too powerful to the point at which they are preventing good research?

2. Are "for profit" headstarting projects compromising the health of turtles and in some cases holding back the recovery of the target populations? Do they provide a poor educational environment for interested tourists and concerned citizens?

3. Considering the very poor organization of many small scale hatcheries around the world, are there alternative ways to protect incubating nests from predators, tidal inundation and extreme weather conditions (e.g. heat and moisture)?

4. Rehabilitation facilities have been developed around the world, often at very high cost. Are there adequate data to validate this costly strategy for conserving sea turtles. Other than anecdotal examples are there controlled studies documenting the reproductive viability of rehabilitated turtles?