Assessing Health, Status, and Trends in Northeastern Sea Turtle Populations

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Introduction

Along the continental shelf of the eastern U.S. four sea turtle species, the loggerhead turtle *(Caretta caretta)*, the Kemp's ridley turtle *(Lepidochelys kempii)*, the green turtle *(Chelonia mydas)*, and the leatherback turtle *(Dermochelys coriacea)*, migrate seasonally from offshore and warmer southern waters, far into northern latitudes each summer. Contrary to earlier beliefs that the Northeast is a harsh environment for otherwise southern turtles, the highly productive coastal northern waters provide a rich and diverse assemblage of benthic biota. This richness attracts and supports large contingents of juvenile sea turtles each year during the summer and fall.

As a result of an extensive mark-recapture project we conducted more than a decade ago, we determined that the vast majority of the annual migrants into coastal New York waters are young loggerhead and Kemp's ridley turtles that come mainly to feed within the shelter of the varied embayments of the Peconic Bay and Long Island Sound Estuaries. Throughout the foraging season, these loggerhead and Kemp's ridley turtles feed heavily, predominantly on crabs and mollusks, while the less numerous green turtles feed mainly on algae. Furthermore, we measured high growth rates in these developing turtles, and individuals encountered were apparently in excellent health during the foraging season. The picture that emerged from these and related studies was that, both historically and currently, northeastern coastal waters play a crucial role in the early developmental life stages of many sea turtles of at least two species: the loggerhead turtle and the Kemp's ridley turtle.

In the face of the ongoing environmental changes to the region over the subsequent decade, it became important to re-examine the northeastern coastal developmental habitats upon which juvenile sea turtles are highly dependent. In this context, it was deemed essential to closely monitor and assess the current health status of the sea turtle populations that use these specialized habitats, and to gauge recent and current human impacts on the northeastern populations. Thus, a new study was initiated beginning in September 2002, re-establishing coastal New York waters as an index site for juvenile turtles.

From the outset, the results of a new investigation will provide comparative data to determine whether health, relative abundance, and seasonal distribution of juvenile sea turtles has changed in association with human activity and environmental changes. Moreover, the many-year span between studies at this site provides an opportunity to gain a synoptic view of longer term population trends. For example, comparisons across years might make it possible to directly

measure the regional or global population impacts of recent increases in nest production recorded for Kemp's ridleys in Mexico and green turtles in Florida. Similarly, from this study, we may be able to directly assess the effectiveness of management and conservation policies of the past 10 to 20 years, such as trawling restrictions, gill net regulations, and TED enforcement.

Beginning in September 2002, we re-instituted an intensive capture-recapture and health assessment investigation of the sea turtle populations that use the waters of Long Island Sound and the Peconic Bay Estuary (Fig. 1). With this new research, we hope to be in a unique position to evaluate the current health, distribution, and abundance of juvenile sea turtles in the Peconic system relative to baseline data that we collected more than 10 years ago, from the same study area, and using the same capture and monitoring processes. Indeed, results of the first year's research, summarized in the following report, lead us to believe that sea turtles of the region may be undergoing a shift in relative abundances from a decade ago.

Project Objectives

Short-term: To institute a long-term mark-recapture study intended to monitor and compare contemporary population levels and health status of sea turtles inhabiting the Long Island Sound and Peconic Bay Estuaries. In the early stages of the study a major emphasis was placed on setting up a study design, and putting in place a collection and monitoring scheme. Essential to these efforts was the re-establishment of a cooperative network of participants and partners in retrieving, reporting, and responding to live-captured turtles. Essential collaborators include local fishing community, Federal and State agencies, and a select group of professionals from the realms of Extension, Education, Conservation, and Academia.

Mid-range: To continue and expand data collection on turtles and their essential habitats in coastal New York waters, and to begin assessing the impacts of human activities and recent management endeavors. Increases in data collection already have stimulated preliminary analyses of patterns and trends of species composition, populations, demographic structure, and distribution. Accumulated data are beginning to provide the basis for comparisons of these measured current parameters to those of the previous assessments of more than a decade ago. In addition to turtle population measurements, increased efforts were begun to be expended toward collecting samples and analyzing environmental data relevant to ecosystem health and health status of sea turtles inhabiting New York's nearshore waters. The expanded focus during the mid-term will be on collecting data directly comparable to those of our past studies, compiling and analyzing complementary data on population structure and ecosystem health, and identifying new influences and recent effects of human activities, both detrimental and beneficial to sea turtles.

Long-term: To continue to monitor the population levels and health status of sea turtles within the same nearshore waters using the same techniques. In effect, renewed scrutiny and scientific study in the region will extend the value of the study area as a practical index site from which to gauge population trends of juvenile Western North Atlantic sea turtles. One of the ultimate objectives will be to establish, through continued presence in the coastal waters of the New York,

a long-term ecological research and monitoring site with particular importance to sea turtles. The potential for long-term monitoring, coupled with longer term comparisons has attracted the attention of conservation organizations, such as Wildlife Trust and The Nature Conservancy, in addition to local, State, and Federal agencies. The long-term goals also will include the development of sound integrated management plans for sea turtles within coastal U.S. waters, and the improvement of practical schemes toward the enrichment of local and regional marine habitats.

First Year Activities and Accomplishments

As a necessary first step, we successfully obtained a Permit for Scientific Purposes under the Endangered Species Act of 1973 (Permit No. 1389) that authorizes us to coordinate the capture, measurement and biological sampling of juvenile sea turtles retrieved from commercial fishers who operate pound nets in New York waters. The acquisition of this permit represented a significant accomplishment because it was the first permit of its kind for New York sea turtle research. Additionally, it enabled us to establish a network of cooperating fisherman and scientific agents to monitor endangered sea turtles, and to collect data for years to come. The legal authorization was a result of many months of document modifications, discussion, and development of new legal processes. The length of the deliberation over the permit process with NMFS Permits, Conservation and Education Division was only matched by the importance of the completed permit to successful long-term research and conservation efforts.

Research efforts started with the official authorization of the Federal Permit on 19 September 2002. Much preparation had already been done by then, and many elements of the study were in place. This enabled us to begin, even before the end of the year's turtle activity season, with hopes of gathering data on some end-of-the-year captured turtles. Early November marked the end of the field season, and field activities were resumed again in summer 2003.

In overview, during our first year, we instituted effective and efficient retrieval, handling, marking, and scientific collection procedures following the protocols designed in our Permit No. 1389. In order to develop the necessary collaboration between commercial fisherman and project staff we developed a communication network to facilitate the retrieval of sea turtles from fishermen. By establishing a hotline response number, dedicating a vehicle equipped with a transportation tank to the project, and outfitting our research team with cell phones to respond immediately to calls from the fisherman, the response and research program went according to plan. Therefore, no methodological modifications were required during the 2003 field season. Rather, as a complement to the mark-recapture and comparative aspects of our originally planned research, we were able to develop methods for additional sea turtle health and environmental assessment to integrate into our long-term research plans. In addition, because of the accelerated start, the first turtles were being retrieved within the first week; captures of live turtles have continued through October 2003.

Establishment of Partnerships, Collaborators, and Cooperative Network Participants

Once empowered with the authority granted by our permit, we began including and training a key group of commercial fishers and local conservation and education professionals to provide proper instruction of sea turtle handling guidelines and sampling protocols. The original

team consisted of a small and important group of commercial fishermen who operate pound nets in some of the most turtle-productive areas within the Peconic Bay Estuary. The working nets of this group (see Appendix) were in the same vicinity, and in some cases, the same exact locations as those in our previous studies. This is not peculiar because pound nets apparently have been in many of these places for centuries.

Through subsequent interviews and discussions, the original group of five fishermen has been expanded to include several other interested participants. These and some other key individuals are being added to the growing network of cooperators to providing data and possibly turtles in future seasons. In the second year of the project, the list of cooperators is planned to double, and probably triple, in numbers.

Crucial among the group of collaborators is the Cornell Cooperative Extension (CCE) Marine Program of Suffolk County, which has contributed greatly, especially in terms of resources and professional scientific and educational staff participation. Moreover, the CCE Marine Program, headed by Christopher Smith, has agreed to partner with this research project for the long term, providing a 24 hr reporting hotline, a rapid-response team, on-site lab and office facilities, and logistical support (see Appendix).

A second partner, critical to the long-term success of the research project is the Riverhead Foundation for Marine Research and Preservation, located at the geographic center of the project in Riverhead, NY. The Riverhead Foundation scientific staff, directed by Robert DiGiovanni and Kimberly Durham, also has committed to long-term involvement in the project. During the first year this conservation and research organization generously provided expertise and training, additional support to the rapid-response team, office space for data processing and storage, and a full-functioning laboratory (see Appendix). The laboratory has become the principal site in which blood, tissue, and genetic samples are initially processed and stored. In conjunction with the Riverhead Foundation scientists, during the first year we have stocked this lab with supplies and equipment, including blood centrifuge and staining equipment, along with an ultra-cold freezer for long-term storage for genetics and toxicology samples. Additional plans for the second year include further expanding the capacity of the lab, and including the addition of a photomicroscope for blood analysis.

All of the sea turtle health assessment portions of the project, including blood and tissue sampling and processing protocols, have been conducted in close collaboration with Wildlife Trust's Conservation Medicine Program, headed by research veterinarian Dr. Alonso Aguirre. Through this collaboration, we have instituted a new Veterinary Intern Program, which is now incorporated into our long-term research design. In the first year of the project, our veterinary intern collaborators were Dr. Katie McGonigle (2002) and Dr. Michele Sims (2003), both graduates of Tufts University School of Veterinary Medicine. After initial intensive training in established sea turtle handling protocols, the field veterinarians are charged with medical oversight, sample processing and analysis, and exploring new avenues of health-related research in the context of sea turtle conservation.

Field Results

After obtaining authorization on 19 September 2002, we retrieved, measured, individually tagged, and biologically sampled 29 individual sea turtles, 2 of which were recaptured within the

same vicinity at a later date (Tables 1-2). All 31 of the captures were in pound nets. In all, there were 16 green turtles, 11 Kemp's ridley turtles, and 2 loggerhead turtles. Both recaptures occurred in 2003. An individual green turtle was recaptured after an interval of 13 days, and another individual green turtle after 31 days. Both were recaptured within 15 km of their original captures sites. All turtles were apparently healthy upon retrieval and subsequent release. In addition, the two recaptured turtles exhibited measurable growth between captures.

Capture locations during both years were distributed throughout the eastern Peconic Bay Estuary system, at a site in eastern Long Island Sound, and in Shinnecock Bay on Long Island's southern shore (Fig. 2). Within the Peconic Bay system, there was a relatively even distribution of captures in all areas where there were pound nets. There was no evident clustering in any particular area, nor were there any other apparent trends in the spatial distribution of the turtles. In 2003, with the increased sample size, a potential temporal pattern emerged in which turtles in the easternmost nets were captured later in the season. The three turtles captured farthest east all were encountered in October. In previous years, such a temporal pattern was interpreted as an indicator the timing of emigration from the bays.

Upon retrieval, all turtles were weighed, measured, and inspected for external signs of health, damage, scars, or previous tags (see Appendix). Before release, all turtles were tagged with individually coded tags of two types (Tables 3-4). An internal PIT tag was inserted beneath the skin of the right front flipper, and an external inconel tag was attached to the trailing edge of the left front flipper. None of the turtles in 2002 or 2003 had been previously tagged from other studies. In addition, small biopsy samples were taken from distal regions of left and right hind flippers, and blood samples were taken from each animal, in accordance with guidelines and instructions of the Federal Permit. Tissue samples were banked in an ultra-cold freezer for future genetic, virological, histopathological, and toxicological analysis. Blood morphology also was analyzed and catalogued for comparison to future and past samples (see Appendix).

2002

During the 2002 field season, turtle captures occurred from 25 September through 3 November, yielding nearly an even distribution of five Kemp's ridley turtles and four green turtles (Table 5). All individuals were juveniles, with mean standard carapace lengths of 29.1 cm for the green turtles and 29.9 cm for the Kemp's ridley turtles, and mean weights of 3.26 and 4.27 kg respectively. These sizes are consistent with benthic immature life stage, and ages of approximately 2 to 3 years-old for these species. Contrary to expectations, no loggerhead turtles were captured in 2002.

During the 2002 field season, the first eight sea turtles observed were healthy and active upon retrieval. Immediately after field measurements and processing, all of these turtles were transported back to the point of capture and released nearby. The last turtle, which was encountered on 3 November 2002 was a Kemp's ridley retrieved by a fisherman after being observed floating lethargically in a pound net. Our field crew, along with personnel from the stranding network of the RFMRP, retrieved the turtle from the fisherman and immediately suspected that the turtle may have stayed in northern waters too long, lingering into the cold season.

The turtle's general condition was different than the captures from earlier weeks. Externally, the turtle appeared thin and possibly dehydrated, and hosted a growth of algae on its

head and carapace. In addition, the water temperatures at the time were low in response to an extended cold snap, which occurred more than a week after the last capture of the main activity season. Furthermore, this turtle was encountered within a few days of the first reported cold-stunned turtle in Massachusetts waters. Based on previous experience, the time of year, and a tendency toward caution, this turtle was classified as a cold-stunned turtle, and treated accordingly. The animal was transported to the RFMRP for rehabilitation and examination by Dr. Rob Pisciotta, DVM. After a short and successful rehabilitation, it was deemed healthy and ready for release during the following spring as is the normal procedure for cold-stunned turtles.

The immediate success with this turtle underscores the benefits of institutional partnerships that have been formed for this project. We have developed a good working relationship with the personnel from the RFMRP, and have included them in subsequent and future study plans in order to respond effectively and immediately to these rare events where turtles may need special care.

This type of cold-stunning event was not without precedent. In our study spanning the previous decades, another cold-stunned turtle similarly wandered into a pound net. On 19 November 1989, a loggerhead turtle was encountered in a pound net, also floating lethargically in the cold water. Upon retrieval, the cold-stunned turtle was successfully rehabilitated, and subsequently released on 29 June 1990.

Despite the modest sample size from the abbreviated 2002 season, there was a notable feature: namely, no loggerhead turtles were encountered. This was contrary to all expectations going into the first season of the new study. In the prior study that spanned the previous decades, loggerhead turtles comprised the majority (59%) of all turtles captured, and it was rare to capture a consecutive series of turtles that did not include a loggerhead turtle. In fact, the calculated probability for capturing two consecutive turtles that were not loggerhead turtles was only 10%; for three in a row, the chance was reduced to 6%; and for the maximum ever recorded of six in a row, the probability plummeted to 0.5%. In this context, the 2002 total of nine consecutive turtles in a row without a single loggerhead was remarkable. The cautious interpretation at the end of the first season was that the sample size needed to be increased before overly scrutinizing this pattern.

2003

During the 2003 field season, turtle captures occurred from 1 August through 22 October 2003, yielding 6 Kemp's ridley sea turtles, 12 green turtles (with two additional recaptures), and 2 loggerhead turtles (Table 6). Based on the sizes, all individuals were juveniles, with mean standard carapace lengths of 29.3 cm for Kemp's ridley turtles, 32.1 cm for green turtles, and 59.0 cm for the two loggerhead turtles. Similar to the 2002 field season, the sizes encountered in 2003 were comparable to benthic immature individuals of the first two species, probably around 2 or 3 years old. Throughout the season, the sea turtles observed were healthy and active upon retrieval. All were transported back to the point of capture and released nearby. Although loggerhead turtles were not entirely absent in the 2003 season, the two individuals were not encountered until October.

The recapture records provided us with a first glimpse of growth rates of these juveniles under present-day conditions. Both recaptured green turtles during the 2003 field season showed positive gains in weight and length. Upon original capture on 3 September, turtle 030903-CM-

005 measured 28.8 cm standard carapace length, and weighed 3460 g. At first recapture on 16 September, its length was recorded at 29.1 cm, and its weight at 3640 g. Over the 13 days between captures this individual increased its body weight by 180 g, or 5.2%, and increased its carapace length by 0.25 cm, or 0.87 % (see Appendix). Similarly, turtle 030908-CM-008 was originally captured on 8 September with a standard carapace length of 28.3 cm, and weighing 3140 g. Upon recapture on 9 October, its length had increased to 28.5 cm, and its weight to 3340 g. After 31 days at-large this young green turtle increased its body weight by 200 grams, or 6.4%, and its carapace length by 0.2 cm, or 0.7 %. The observed positive growth in these two turtles, supported our assumptions of general good health in the turtles, and provided an indication of general foraging conditions.

Despite, the capture of two loggerhead turtles, the lack of individuals of this species in two consecutive seasons was remarkable. The 10% contribution of loggerheads to the overall species assemblage in 2003 was only mildly more than the total absence in the previous year. This too fell far below the expected value of 59%, the relative rate of encounter of loggerhead turtles in previous decades. Moreover, the string of consecutive captures without a single loggerhead at the beginning of the 2003 season was 12. In addition, after the capture of a single loggerhead turtle, this was followed by another series of seven. Based on calculations of capture records from previous decades, such capture trends would have been highly improbable. The capture of 12 consecutive green turtles and Kemp's ridley turtles was more than twice the previous maximum of six consecutive captures of other species. But, when combined with the string of captures from the end of the 2002 season, the combined number 21 consecutive captures without a single loggerhead turtle was striking. After two consecutive seasons of such unlikely capture patterns in both sequences and species ratios among pound-net captured turtles, it is possible that we are in the process of observing a species composition shift in northeastern coastal waters.

Comparisons and Trends Among Decades

The spatial distribution of turtles captured in pound nets in 2002-2003, fell squarely within the boundaries of the distribution of turtles that were captured in pound nets during the previous study from 1987-1992 (Fig.3). Although there is an inherent constraint on the locations of captures, which ultimately are dictated by the locations of pound nets, it was possible to compare trends among the decades. In both studies, turtles were captured in locations distributed throughout the eastern Peconic Bay Estuary system, at a site in eastern Long Island Sound, and in Shinnecock Bay on Long Island's southern shore. In the early study, captures extended farther eastward along Long Island's southern fork, but this likely was the result of greater numbers of pound nets participating at the time. Where the two studies overlap, there was a relatively even distribution of captures in all areas where there were pound nets. In addition, more than one half of all of the captures in the eastern-most pound nets occurred after late September in both studies.

In the 2002-2003 seasons, the size distribution of the turtles captured in pound nets also is a subset of the range of sizes of turtles from the 1987-1992 study (Fig.4). This was true for all three species. Moreover, the relationships between species was very similar among the years. In both studies, the smallest individuals were Kemp's ridley turtles, the mean size was the greatest for loggerhead turtles, and there was an extremely high degree of overlap in size distribution of

Kemp's ridley turtles and green turtles. Within species the mean sizes also were highly similar among studies. Not surprisingly, the results of an ANOVA performed to detect inter-decade differences showed no significant difference among the mean standard carapace lengths of green turtles ($p=0.54$), nor of Kemp's ridley turtles ($p=0.30$). The small sample size of contemporary loggerhead turtles precluded a meaningful statistical analysis, but the sizes of the two individuals were well within 2 SD of the earlier mean.

Qualitatively, there appeared little difference in the external appearance or apparent health of turtles among studies. Turtles without obvious injury during all activity seasons appeared healthy, active and alert. Moreover, there were no external signs of papillomas, disease, or abnormal growths on any of the turtles. A small percentage of turtles from pound nets in both studies exhibited minor scars and small missing fragments of both front and rear flippers. A green turtle captured in September and again in October of 2003 had what appeared to be an old fracture of the radius and ulna which had healed, and apparently did not hinder movement. As in the past, there also was direct evidence of recent boat collisions in a small percentage of the live turtles. A Kemp's ridley encountered in late October 2003 was in apparent distress due to a recent boat impact. The propellor had excised chunks from both carapace and a rear flipper, and in another spot, cut through the carapace and plastron, along with the underlying skin and muscle. All told, however, there was not an obvious change in the rate of damaged turtles among the studies. Most turtles in retrieved in pound nets continue to be healthy and active. Further comparisons will be forthcoming with future blood and tissue analysis.

The most obvious and remarkable change observed between the 1987-1992 study, and the 2002-2003 study was the dramatic shift in species composition (Fig. 5). This shift expressed itself in two ways: in percentages of species relative to each other, and in absolute numbers. In the study spanning the previous decades, loggerhead turtles comprised the majority of all captures in pound nets, followed by Kemp's ridley turtles, and then green turtles. In the current study, after a span of more than 10 years, the percentage of captures that were loggerhead turtles declined sharply to make up less than 6% of the total. In their place, green turtle captures increased to 58%, and surpassed the numbers of Kemp's ridleys. Thus, in effect, the observed relative species composition in the current study was inverted.

A major shift in relative composition by itself is difficult to interpret. There are at least two potential explanations for the observed differences among decades. The first is that, such a species shift could be caused simply by an increase in juvenile Kemp's ridley and green turtles in the Western North Atlantic. This conclusion is not without basis. During the intervening decade, there have been major changes in management for both of these species, which undoubtedly have contributed to population increases. The most obvious change which likely has been influential in increased numbers turtles in this region has been the implementation of Turtle Excluder Devices on shrimp trawls since 1990. In conjunction with other efforts at bycatch reduction during the past decade, such as improvements to summer flounder trawl fishery regulations, it is possible that we are measuring the positive effects of improved management strategies for sea turtles in coastal waters.

Because the turtles in northeastern coastal waters mainly are young juveniles, any observed increases in numbers would be directly traceable to the nesting beaches in the preceding few years. Indeed, for the Kemp's ridley turtle, there has been a steady increase of hatchlings produced in the primary beaches in Tamaulipas, Mexico, from 45,000 in 1987, to 476,000 in

2003. Similarly, there have been recorded increases in green turtle nests at index beaches in Florida, from 1,700 in 1989, to 7,000 in 2002. During the same time loggerhead nesting in the along Western North Atlantic beaches has reached a plateau, and may be declining slightly. Thus, the regional increases in production off the nesting beaches could be directly contributing to increases of Kemp's ridley and green turtles in New York's coastal waters, without simultaneous increases in loggerhead turtles.

Another important measure of shifts in species composition is the absolute numbers of captures. In 2003, the first complete season from which to make comparisons among decades, there were six Kemp's ridleys, a value on the low side of the range of 4-14 observed in previous years. This does not add much in the way of supporting a postulate of greater numbers of juvenile Kemp's ridley turtles in the region. However, there indeed were more green turtles captured than in any previous year. In the previous study years, green turtle captures in pound nets ranged from as low as zero in 1988, to as high as nine in two of the seasons. In 2003, even with presumably a reduced fishing effort, there were 12 individual green turtles captured in pound nets.

One of the factors contributing to difficulty of interpretation of the capture patterns is the potential inequity in fishing effort among years and among studies. However we believe that the 2002 and 2003 seasons almost certainly represent a subset of the fishing effort of the earlier study. This reduced effort would be expected to result in a commensurate reduction in captures of turtles. Furthermore, because of the widespread distribution of the pound nets in the current study, we would expect a relatively uniform reduction among all three turtle species. However, this was not the case with regard to numbers of green turtles and loggerhead turtles.

A second, and potentially alarming, possibility is that the low numbers of loggerhead turtles captured in pound nets during the 2002-2003 seasons in New York are indicative of a regional decline in juveniles of this species. Not only were the proportions of this species far lower than in the previous study, but the absolute number of two loggerhead turtles in the 2003 season was the lowest recorded for any of the complete years of study. This was in stark contrast to the previous decade in which total numbers of individual loggerheads ranged from 11 to 28 per year. Although a potential reduction in fishing effort could account for the lack of loggerhead turtles, it remains possible that the complete absence of turtles from the size classes between 30 and 55 cm could be indicative of a more far-reaching influence.

Unlike the trends of increasing Kemp's ridley and green turtles, the observed lack of juvenile loggerhead turtles in New York waters cannot be explained by obvious recent declines of nests on U.S. beaches. That leaves open the possibility of recent increases in mortalities of early-stage juveniles, or alternatively, shifts in behavioral or movement patterns. At the least, this potential reduction in numbers of loggerhead turtles warrants immediate attention. Most certainly, this will be the focus of more scrutiny in our current and future studies, with particular emphasis on comparisons of fishing efforts, and analysis of environmental shifts and patterns of regional strandings and observations.

Ongoing Lab Studies

An important component of the study to assess and compare the overall status of sea turtles in Northeastern coastal waters lies within the realm of conservation medicine. In effect, our goal for this is to combine an understanding of the health status of the turtles, including known diseases, environmental threats, and pathogens, with our accumulating knowledge of the

detailed ecology of the juvenile turtles that occur in the region.

Early in this portion of the study, much of the emphasis has been placed on collection, preliminary processing, and proper archival of blood, tissues, and samples to build up a bank for future analysis. Also, there has been a great deal of effort in quantifying and cataloguing basic characteristics of the turtle's blood, namely the cell counts and blood morphology (see Apendix). Over the upcoming months these analyses will continue, including comparisons of blood morphology of northern and southern sub-populations of Kemp's ridley turtles, and comparisons of cell counts with similar data from 1987-1992.

Other major emphasis is being placed on the eventual evaluation of both sea turtle and environmental health through the analysis of histopathology and virology. While there have been no measurable signs of widespread disease, or chronic illness in the juvenile turtles of this study, viral infection in individuals often can be latent. It is possible too that young turtles moving into inshore waters for the first time in their lives, are just beginning to accumulate toxins or biological pathogens, and are as yet subclinical.

Currently, three separate avenues for the above studies are being pursued. All of these will first require additional funding. For the toxicology analysis, we will likely concentrate on organochlorine compounds and some select heavy metals. Along these lines, we also are working toward creating a new partnership with Grice Marine Laboratory and the National Institute of Standards and Technology to analyze blood, tissue, and scute material for toxic residue, especially methyl mercury, and perhaps MTBE, the gasoline oxygenate. For the virology analysis, we are working toward collaborating with researchers at Cornell University College of Veterinary Medicine. Essential to all of these health studies is the establishment of baseline values from which to compare samples. Ultimately, the results of the analyses of these studies will be compared to samples from our own previous study, and to those of other regions.

Summary

Sea turtle captures by fisherman during the initial two seasons of this current study appear comparable to the numbers observed during the early part of the study more than a decade ago, indicating the overall success of the initial efforts. In the first season, records of the participating fisherman indicated that they encountered 10 sea turtles prior to the start of our sampling, which combines with our captured individuals for a total of 19. This slightly exceeded the first year of the previous study (1987) in which there were 17 recorded pound net captures. Similarly, the following complete season's total of 22 captures, exceeded the 18 that were captured in pound nets in 1988.

The first two seasons' observations reveal some interesting new patterns with respect to species composition. There was a conspicuous absence of loggerhead turtles observed in the initial year. Furthermore, reports from fisherman who caught turtles prior to the start of our sampling suggested that only one loggerhead turtle was encountered during the early part of the activity season. Again in the 2003, loggerhead turtles were noticeably absent until October, when only two were encountered. This absence is in stark contrast to the results of our previous study in which loggerheads were the most often encountered species, representing 59% of all turtles captured in pound nets. We do not have a definitive explanation why the numbers of loggerhead turtles in New York waters would be substantially reduced just a decade after the last study, but

our curiosity definitely is piqued, and our concern is heightened. Some possible explanations are a recent regional increase in mortality of young juvenile loggerhead turtles, or recent shifts behavioral or environmental factors. However, for obvious reasons, including the small sample size, our preliminary conclusions are speculative and should be interpreted with caution.

Simultaneous to a decline in numbers of loggerhead turtles, was a measured increase in numbers of green turtles. The total of 18 captures represents 58% of the overall total among all three species. Furthermore, the number of 12 individual green turtles captured in 2003 was the highest single season total to date recorded in New York pound nets. This may be due to a regional increase in juvenile green turtles, which may be related to recent increases in nesting on U.S. beaches. It is possible that similar increases on Kemp's ridley nesting beaches could have a similar effect, but, as yet, no such obvious trend was detected in captures of that species in New York waters.

Notwithstanding the shift in species composition, there were few quantitative or qualitative differences observed among study populations. There were no significant differences in the mean sizes of Kemp's ridley turtles or green turtles between the decades of study. In addition, the ranges of sizes of all three species captured in 2002-2003 all fell within the sizes recorded during the 1987-1992 study. Qualitatively, there were no obvious outward changes in appearance, health or overall condition of the juvenile turtles from pound nets, as was observed in the original study. More recaptures and subsequent growth measurements, along with ongoing and future blood and tissue analyses will help to quantify these factors more.

The overall successful outcome from our first two field seasons was directly attributable to the support and extraordinary collaboration of many individuals from many organizations. We were fortunate to have had Dr. Michele Sims, Dr. Katie McGonigle participate as field veterinarians for the first two seasons, as a result of our collaboration with Wildlife Trust and the establishment of a Veterinary Intern Program. In addition, the collaboration and support from the Riverhead Foundation for Marine Research and Preservation, the Marine Program of Cornell Cooperative Extension, and NMFS Protected Resources were integral to the project's early success. Perhaps the most important success during the first year was the establishment and incorporation of a team of collaborators from the commercial fishing community. This project would not have been possible without the support of the pound net fisherman who graciously joined this project and who have agreed to participate in future sea turtle conservation research. Overall, the commitment and collaborative relationship with these institutions and individuals provided an effective foundation for the successful beginning of this project, and the impetus for excellent future success.

Table 1. Summary of numbers of individuals and species of sea turtles retrieved from the Peconic Bay Estuary System and eastern Long Island waters during the 2002 field season of the research project: Assessing health, status, and trends in northeastern sea turtle populations.

Individuals #	Species	Life Stage	Sex	Origin	Take Activity Category	Location	Dates	Details
4	Sea turtle, Green *Chelonia mydas*	Juvenile live	n/a	Wild	Incidental capture, measure, Blood biopsy, tag and release	Peconic Bay Estuary, LI Sound	9/25/02 through 10/25/02	Turtles intercepted during normal activities
5	Sea turtle, Kemp's ridley *Lepidochelys kempii*	Juvenile live	n/a	Wild	Incidental capture, measure, Blood biopsy, tag and release	Peconic Bay Estuary, Shinnecock Bay	10/17/02 through 11/3/02[a]	Turtles intercepted during normal activities

[a] Upon retrieval, a turtle retrieved on 3 November 2002 was identified to be cold-stunned. New York State Stranding Coordinators from the RFMRP were on site to determine that the individual was a class 1 – 2 cold-stun. The individual was thin, dehydrated, and covered with algae; it was immediately transported to the RFMRP for rehabilitation and release in the subsequent season.

Table 2. Summary of numbers of captures and species of sea turtles retrieved from the Peconic Bay Estuary System and eastern Long Island waters during the 2003 field season of the research project (through October).

Captures #	Species	Life Stage	Sex	Origin	Take Activity Category	Location	Dates	Details
14 (2 recap)	Sea turtle, Green *Chelonia mydas*	Juvenile live	n/a	Wild	Incidental capture, measure, Blood biopsy, tag and release	Peconic Bay Estuary, LI Sound, Shinnecock Bay	8/1/03 through 10/22/03	Turtles intercepted during normal activities
6	Sea turtle, Kemp's ridley *Lepidochelys kempii*	Juvenile live	n/a	Wild	Incidental capture, measure, Blood biopsy, tag and release	Peconic Bay Estuary, Shinnecock Bay	8/8/03 through 10/17/03	Turtles intercepted during normal activities
2	Sea turtle, Loggerhead *Caretta caretta*	Juvenile live	n/a	Wild	Incidental capture, measure, Blood biopsy, tag and release	Peconic Bay Estuary	10/3/03 and 10/19/03	Turtles intercepted during normal activities

Table 3. PIT tags and inconel tags used to mark sea turtles retrieved from the Peconic Bay Estuary System and eastern Long Island waters during the 2002 field season of the research project: Assessing health, status, and trends in northeastern sea turtle populations.

Species	ID number	PIT Tag #	Inconel Tag #
Chelonia mydas	020925-CM-001	131454185A	PPY100
	021020-CM-004	131652537A	PPY079
	021024-CM-007	131433814A	PPY082
	021025-CM-008	131127615A	PPY077
Lepidochelys kempii	021007-LK-002	131565440A	PPY099
	021008-LK-003	131635543A	PPY078
	021024-LK-005	131579481A	PPY080
	021024-LK-006	131332324A	PPY081
	021103-LK-009	RFMRP	RFMRP

Table 4. PIT tags and inconel tags used to mark sea turtles retrieved from the Peconic Bay Estuary System and eastern Long Island waters during the 2003 field season of the research project (through October).

Species	ID number	PIT Tag #	Inconel Tag #
Caretta caretta	031003-CC-012	131539537A	PPJ891
	031019-CC-019	136848354A	PPJ883
Chelonia mydas	030801-CM-001	131627090A	PPJ872
	030810-CM-003	131649185A	PPJ900
	030825-CM-004	131445737A	PPJ899
	*030903-CM-005	131648091A	PPJ898
	030906-CM-007	131568330A	PPJ895
	*030908-CM-008	047381797 B	PPJ894
	030917-CM-009	131444497A	PPJ861
	030924-CM-010	131131521A	PPJ892
	031005-CM-013	131621193A	PPJ890
	031012-CM-015	131653127A	PPJ888
	0310178-CM-017	047126586	PPJ885
	031022-CM-020	136855185A	PPJ882
Lepidochelys kempii	030808-LK-002	131451253A	PPY098
	030906-LK-006	131567212A	PPJ897
	030929-LK-011	131576527A	PPJ893
	031009-LK-014	131625574A	PPJ889
	031014-LK-016	131569314A	PPJ886
	031017-LK-018	RFMRP	RFMRP

* Recaptured once

Table 5. Summary statistics of body measurements taken for each sea turtle retrieved from the Peconic Bay System during the 2002 field season of the research project.

Species	Statistic	Standard Carapace Length (cm)	Carapace Width (cm)	Plastron Length (cm)	Carapace Notch to Notch (cm)	Weight (kg)
C. mydas (n= 4)						
	Mean	29.12	23.29	24.39	28.72	3.26
	S. E.	1.14	0.92	0.96	1.07	0.37
	Max	31.15	24.89	25.99	30.80	3.90
	Min	26.32	21.10	21.89	26.08	2.36
L. kempii (n=5)						
	Mean	29.86	27.88	23.25	29.38	4.27
	S. E.	1.98	1.88	1.32	1.94	0.82
	Max	36.22	33.70	27.4	35.55	7.14
	Min	23.89	21.93	19.59	23.48	2.30

Table 6. Summary statistics of body measurements taken for each sea turtle retrieved from the Peconic Bay System during the 2003 field season of the research project.

Species	Statistic	Standard Carapace Length (cm)	Carapace Width (cm)	Plastron Length (cm)	Standard Carapace Length Notch (cm)	Weight (kg)
C. caretta (n=2)						
	Mean	59.0	50.9	47.2	57.8	32.38
	St. Error	3.6	1.7	2.7	3.7	3.08
	Max	62.6	52.6	49.9	61.4	35.45
	Min	55.4	49.2	44.5	54.1	29.30
C.mydas (n=12)						
(orig. caps only)	Mean	32.1	27.4	27.2	31.4	4.6
	St. Error	1.08	1.0	0.9	0.9	0.6
	Max	39.6	32.7	32.7	39.2	8.90
	Min	27.9	23.2	22.8	27.4	1.50
L. kempii (n=6)						
	Mean	29.3	27.3	23.4	27.23	3.88
	St. Error	1.4	1.4	1.3	0.75	0.6
	Max	33.2	32.00	27.50	31.90	5.88
	Min	25.6	23.60	20.30	25.10	2.56