TURTLES AND TOURISTS IN A GLOBAL ECONOMY: THE FUTURE OF ECOTOURISM AS A CONSERVATION TOOL

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Ecotourism is a popularly promoted means of reconciling conservation and development objectives, and can accommodate two conservation catch-phrases: sustainable use and community-based conservation. Ten years have passed since ecotourism gained wide-spread recognition with the publication of Elizabeth Boo's (1990) Ecotourism: potentials and pitfalls, and it is timely to look at the strengths and weaknesses of the ecotourism approach based on experiences to date. This paper combines research on wildlife based ecotourism in general and around marine turtles specifically with data and examples from Costa Rica, to illustrate the successes and failures of the ecotourism approach. The meaning of ecotourism in general, its links to the global capitalist system, and its potential to both conserve and destroy what it purports to value are discussed. While the paper does not presume to offer solutions, it does attempt to raise some important questions and to broaden the discussion of ecotourism beyond its immediate application to marine turtle conservation.

SCIENCE, CONSERVATION, AND SEA TURTLES: WHAT'S THE CONNECTION?

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SCIENTIFIC PRODUCTION

Scientific activities are appraised in terms of the growth in human resources and production of information: i.e., the training of students, especially graduate students, and publication of articles. A simple way to gauge scientific production is with the Annual Symposium on Sea Turtle Biology and Conservation, where there has been steady growth in both human resources and presentations (Table 1). Academic journals also show an increase in the number and proportion of publications that deal with sea turtles. Moreover, during the past decade various courses have been developed specifically for teaching sea turtle biology and conservation. Research groups specializing on sea turtles have been established in scores of countries on all continents, and graduate students working on sea turtles have been trained at laboratories in dozens universities. Improved technologies, such as genetic sequencing, GIS, and satellite tracking, have made possible research in areas that is rapidly producing enormous amounts of new information. Clearly, the growth in human resources and production of scientific information on sea turtles has been staggering.

THE STATUS OF SEA TURTLES

This remarkable scientific production begs the question: what are the consequences of growth in human resources and information, particularly in relation to the status of sea turtles? The most endangered of all, *Lepidochelys kempii*, is at long last – after millions of dollars and decades of dedicated work by a bi-national program – in the early stages of recovery (TEWG, 1998); but it is nowhere near as abundant as it was 50 years ago. Recent reviews for 3 other species, *Caretta caretta*, *Dermochelys coriacea*, and *Eretmochelys imbricata*, show that far more than two-thirds of the respective nesting populations fall into 2 categories: depleted or declining, and too poorly known to be able to estimate trends (Fig. 1). The concepts of "population" and categories of status can, and will, be debated. Yet, does increased scientific production mean better knowledge and conservation of turtles? The overall picture bodes poorly. Rather than increased scientific production resulting in enhanced status of sea turtle populations, it seems as if we are learning more and more about what is becoming less and less!

THE CASE OF POLICY DECISIONS, WITH SPECIAL REFERENCE TO THE CARIBBEAN

The status of sea turtles is influenced by policy decisions. There are 47 geo-political units (G-PUs) in the western hemisphere, including sovereign states and dependent territories. Sea turtles, their eggs, and derivative products are totally protected in most of these countries, but there is legal exploitation of turtles in 12: Antigua and Barbuda (A & B), Bahamas, Belize, British Virgin Islands (BVI), Cayman Islands, Cuba, Grenada, Haiti, Nicaragua, St. Kitts & Nevis (St K & N), Trinidad and Tobago (T & T), and Turks and Caicos (T & C) (remarkably, 75% are, or were, part of the UK). Details vary between these territories, but eggs are protected in 11, and nesting females, in 8 (Table 2). Open seasons for turtling vary from 4 to 12 months; timing varies between territories and is often planned to avoid hunting during the nesting season.

Eretmochelys is totally protected in 3 G-PUs, and *Dermochelys*, in 4. In 75% of these territories there are legal size limits, and with the exception of Belize, it is a **minimum** size that is legal – the smaller turtles are protected and human exploitation is focused on the larger animals.

Which phase of the life cycle is most critical to a sea turtle population, and most in need of protection? For decades demographers have argued that the larger turtles are most valuable to a population. Crouse et al. (1987) explained the reproductive value of different life phases; these ranged from 1 for egg and hatchling to over 500 for reproductive animals. This is not to say that eggs are worthless, but rather that one breeding animal is 500 times more valuable than one egg.

Setting aside debates about exploitation of sea turtles, the laws that allow for legal exploitation need to be considered in the light of scientific studies. The "science" shows that larger turtles are most important for maintaining a population, yet the laws focus exploitation on just these life phases. These laws do not reflect the

"best scientific information." In this respect it is important to appreciate that the Caribbean is not only a well-circumscribed area, but it has enjoyed decades of intensive research, environmental education, training programs, regional meetings and other conservation activities focused on sea turtles. Furthermore, there have been diverse activities of commerce and investments focused on sea turtles for decades, if not centuries, involving numerous sectors of local societies. Why are the laws so discordant with the science?

CLARIFICATION OF FUNDAMENTAL CONCEPTS

What is Science? Like so many other concepts fundamental to certain disciplines (e.g. "culture," "life," "species"), "science" is difficult to define. However it may be defined, "science" is characterized by "*the art of curiosity, the gift of observational tenacity, the capacity to organize and systematize, and an omnipresent sense of skepticism.*" (Smith, 1996). "Western," or "occidental" Science is the compilation of information through empirical observation, experimentation (reductionism), formulation and testing of hypotheses, and organization of knowledge into theories. Of central relevance to this discussion are the "natural sciences:" practitioners refer to the "search for the truth" through objective, replicable, pragmatic methods. On the other hand there is conservation (or more precisely "conservation biology"). This term has been defined in many ways, but in the end it is "*The management of human activities so that populations, species, environments, landscapes, and ecological and evolutionary processes are maintained at levels acceptable to society.*"

Is "science" conservation? Or is "conservation" science? According to the definitions above, "Science" is about managing **information**; "Conservation" is about managing **people**. This dichotomy may be hard to accept for many field biologists and conservationists who consider conservation biology to be a sub-discipline of biology. Yet, the divergence between science and conservation is conceptually profound, and it is worth considering the roots of the term "science." Although the word was in use as early as the 1300s, it was not until the mid 19th century when it came to mean a special type of knowledge and method in acquiring information. Hence, "science" as it is used in modern societies today, is a relatively recent cultural phenomenon (Nader, 1996). Aristotle is recognized as a founder of western science because of the methods of inquiry and hypothesis testing that he employed and promoted. The same Aristotle called the management of people "**politics**" (in fact, he called the structure, organization, and administration of the state "politics," but these activities clearly involve **managing people**). Hence, conservation is not only outside the field of natural science, it is akin to politics.

The natural sciences are not the only bodies of knowledge relevant to conservation: disciplines related to understanding and managing people are highly germane, including: communication sciences, educational sciences, legal sciences, political sciences, and social sciences. Even the "western sciences" are not the only bodies of knowledge. So-called "indigenous knowledge" has clearly been crucial to the survival of human beings for hundreds of thousands of years, as well as to the development of complex societies and cultures over the existence of our species. Many of these knowledge systems rival western science in the ability to explain and predict our world. It is essential to appreciate that "indigenous knowledge" is not limited to romantic visions of half-naked people with feathers in their hair, dancing feverishly around glowing fires, but potentially applies to any group of people who have acquired knowledge about the world in which they live, including urbanites in First World Metropoli (Nader, 1996).

In many modern societies, science is regarded as a sacrosanct, almost divine, activity. Scientific knowledge forms the foundations to develop technologies by providing information to solve specific problems. Through technology, "Man conquers nature" - thus the veneration of science. The distinction between Scientific and Non-scientific information is regularly expressed with the following contrasts: Objective/Subjective; Unemotional/Emotional; Rational/Irrational; Unbiased/ Biased; Detached, neutral/Value-laden, politically motivated; Autonomous/Dependent on cultural and social roots; Uncensored/Censored; Reliable/Unreliable; Replicable/ Unpredictable; Undeviating/Provisional; Lasting/Ephemeral; Realistic/Unrealistic, naive. However, even the smallest familiarity with "science in real life" or the history of science reveals that the differences are not so clear: scientific activities and information often typify just what is claimed to be anathema to the profession. This leads to basic questions: How is knowledge acquired? Who builds systems of knowledge? Who controls systems of knowledge? Who owns systems of knowledge? Who evaluates knowledge? Who validates knowledge? As long as certain "sciences" claim to be in control of these processes, intellectual development will be stunted (Nader, 1996).

CONCLUSIONS AND RECOMMENDATIONS

Several points are basic to understanding the connections between science and conservation. In terms of the "Natural Sciences" it is essential to understand the **strengths** and **limitations** of the science **and** the scientists. Practitioners must seek professional help and collaboration from professions that specialize in **understanding** and **managing people**: how and why *Homo sapiens* is organized and behaves. In terms of those "Other Sciences" it is also essential that the practitioners understand the **strengths** and **limitations** of their science, and also their scientists. They must learn how to converse with natural scientists – and not hide in their ivory towers either! These are the people who need to work hardest at building teams with natural scientists – after all, "other scientists" are the specialists in human behavior and interactions! Science, conservation and sea turtles: what's the connection? It's what we make it!

Table 1. Summary of vital statistics from the Annual Symposium on Sea Turtle Biology and Conservation (* includes presentations made at the associated "mini-symposium").

Symposium	9	10	11	12	13	14	15	16	17	18	19	20
Participants	245	446	500	544	565	547	602		720	653	714	960
Countries		16	17	28	29	21	28		38	43	34	67
Presentations *	44	126	113	140	136	141	161	87	199	285	208	282

Table 2. Summary of legal exploitation of sea turtles in eleven Caribbean geo-political units.

G-PU	Egg	Nesters	Season	C. caretta	Ch. mydas	E. imbricata	D. coriacea
A & B	No	?	Sep-Feb	>160lbs	>160lbs	>85lbs	>350lbs
Bahamas	No	No	Aug-Mar	>30	>24	None	?
Belize	No	?	Nov-Mar	<60cm	<60cm	None	?
BVI	No	?	Dec-Mar	>20lbs	>20lbs	>20lbs	?
Cayman	No	No	Nov-Apr	>80lbs	>120lb	>80lbs	None
Cuba	No	No	Aug-Apr	>65cm	>65cm	>65cm	None
Grenada	No	Yes	Sep-Apr	>25lbs	>25lbs	>25lbs	None
Haiti	No	No	Nov-Apr	all sizes	all sizes	all sizes	all sizes
Nicarag	Yes	No	Jul-Feb	None	all sizes	None	None
St K & N	No	No	Mar-Sep	>160lbs	>160lbs	>85lbs	>350lbs
T & T	No	No	Oct-Feb	?	all sizes	all sizes	all sizes
T & C	No	No	Jun-Dec	>20lbs	>20lbs	>20lbs	>20lbs

Figure 1. Summary of status of nesting populations of *Caretta caretta* ("Cc") global (Margaritoulis, pers. com.; Witherington, pers. com.); *Dermochelys coriacea* ("Dc") global (Sarti, pers. com.); and *Eretmochelys imbricata* ("Ei") Caribbean (Meylan, 1999). "I" = increasing; "S" = stable; "D" = decreasing or depleted; "?" = information not available.

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US NAVY'S SEA TURTLE CONSERVATION EFFORTS

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Navy has a good record of accomplishments in the area of sea turtle conservation. In addition to governing laws and regulations that are applicable to Federal agencies, as well as the general public, the Navy and DOD have policies for the protection of threatened and endangered species. Navy has a network of natural resource specialists encompassing many disciplines that work to ensure Navy activities comply, and where possible exceed, its legal and policy obligations. This presentation will provide some specific examples of past and present conservation efforts to illustrate the nature and extent of the Navy's commitment to protecting and conserving sea turtles. It will also provide an understanding of the cooperation and teamwork that is employed in accomplishing these tasks. Lastly, this presentation will provide information on efforts that Navy is currently undertaking with regulatory agencies in the area of spatial data analysis (Geographic Information Systems) to further our protection and conservation objectives for sensitive species, as well as to avoid impacts on military training and readiness. In achieving this objective, our hope is to solicit interest and assistance from the scientific community represented at the symposium.

MANAGEMENT RECOMMENDATIONS RESULTING FROM SATELLITE TRACKING RESIDENT, IMMATURE LOGGERHEADS (*CARETTA CARETTA*) IN AND AROUND THE FLOWER GARDEN BANKS NATIONAL MARINE SANCTUARY, NORTHWEST GULF OF MEXICO

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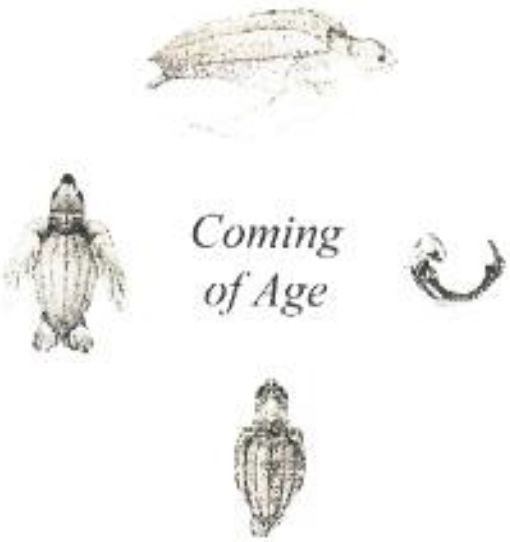
Six large immature loggerhead sea turtles (*Caretta caretta*) with carapace lengths (CCL) ranging from 70.5-101 cm were captured at depth by SCUBA divers. Five of the six were outfitted with radio and/or satellite transmitters. Five of the six animals were females. A pubescent male was recaptured three times over a period of 20 months. Over 40% of the satellite locations fell within the Sanctuary boundaries. Geographic Information System (GIS) analysis revealed an average core range of 133.6 square kilometers and an average home range of 1074 square kilometers. These ranges are not significantly different from satellite tagged *C. caretta* captured underneath oil and gas platforms in the Gulf of Mexico. The average core ranges fell within one kilometer of the sanctuary boundaries, and the home range within 30 kilometers of the sanctuary boundaries. Management recommendations are made to the National Oceanic and Atmospheric Administration's (NOAA's) Marine Sanctuary Division.

NOAA Technical Memorandum NMFS-SEFSC-528

PROCEEDINGS OF THE TWENTY-FIRST ANNUAL SYMPOSIUM ON SEA TURTLE BIOLOGY AND CONSERVATION



24 to 28 February 2001
Philadelphia, Pennsylvania, USA

Compiled by:
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April 2005