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Source: *Herpetologica*, Vol. 41, No. 1 (Mar., 1985), pp. 103-111

Published by: [Herpetologists' League](#)

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- imens in U.S. National Museum. U.S. Natl. Mus. Bull. 24:1-249.
- YARROW, H. C., AND H. W. HENSHAW. 1878. Report upon the reptiles and batrachians collected during the years 1875, 1876, and 1877, in California, Arizona, and Nevada, by Dr. H. C. Yarrow, Acting Assistant Surgeon, U.S.A., and H. W. Henshaw. Pp. 1628-1648. In Appendix L, of Appendix NN, In Report of the Chief of Engineers, In Annual Report of the Secretary of War for the Year 1878, Volume II, Part III. U.S. Government Printing Office, Washington, D.C.
- ZWEIFEL, R. G. 1955. Ecology, distribution, and systematics of frogs of the *Rana boylei* group. Univ. California Publ. Zool. 54:207-292.
- Accepted: 22 August 1984
Associate Editor: Kentwood Wells

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APPENDIX I

This date was quoted as "1879" by Jordan and Evermann (1905), and Oliver and Shaw (1953), while Cobb (1902) stated that it is "1899." The actual date is probably October 1897, when a shipment of black bass (*Micropterus* sp.) and several other organisms were received at Hilo, Hawaii, from San Francisco, California (Cobb, 1902).

Herpetologica, 41(1), 1985, 103-111
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EDITOR'S NOTE: This is the third in a series of "State-of-the-Art Book Reviews."

CONSERVING SEA TURTLES: CONSTRUCTIVE CRITICISM IS STILL NEEDED

C. KENNETH DODD, JR.

ABSTRACT: The recent publication of the book *Conserving Sea Turtles* presents a sharp criticism of programs and techniques developed for the management of these biologically and socio-economically valuable species. While many of the criticisms are valid, they are couched in terms that are unnecessarily acrimonious, and thus are likely to prolong heated debate rather than assist the understanding of the bases of particular techniques. This review analyzes the content of this book in light of both the accuracy and tone to determine if the criticism might result in more constructive programs, and concludes that it falls far short of its objectives. Constructive criticism of conservation programs is necessary to ensure a sound biological basis and ultimate success of such programs; emotional and inaccurate criticism may be more detrimental than beneficial.

THE biological characteristics of sea turtles (long life span, large number of eggs produced by a female during her reproductive life, migratory nature, temperature dependent sex determination, long amount of time until sexual maturity is reached, large aggregations of nesting females), the many unknowns concerning the biology of these species (such as survivorship rates, sex ratios, population estimates, movement patterns), coupled with a large number of threats, a complex sociocultural position in the lives of many

coastal peoples, and a great potential economic value, have combined to create some of the most difficult problems imaginable in terms of scientific study, conservation and management. As a result, many views and opinions have been expressed in many forums as to the "best" way to conserve as well as to allow controlled use of these species. Papers by Pritchard (1979, 1980), Ehrenfeld (1982) and many other papers in Bjørndal (1982), and the recent publication of a research and conservation techniques manual (Pritchard et al., 1983)

offer insights into the direction and development of contemporary thought on the management of sea turtle populations. To this list comes a small book likely to fuel the debate on many controversial subjects.

Conserving Sea Turtles. By Nicholas Mrosovsky. The British Herpetological Society, London, 1983, 176 pp. \$10.00.

Conserving Sea Turtles is a soft cover book divided into 14 chapters, ranging in length from two (Turtles Are Big, chapter 1) to 26 pages (An Egg-Laying Machine, chapter 14). In these chapters, Mrosovsky provides a brief overview of the biology of the seven or eight species, depending on which authority is followed, and critically examines a wide range of research and conservation techniques currently being practiced or advocated, including head-starting, the use of styrofoam boxes as incubation chambers, and tagging methods and rationale. In places, Mrosovsky advocates particular practices such as farming or ranching of sea turtles, as well as starting a captive herd of Kemp's ridleys as an insurance against the alarming decline of this species. Such topics are quite controversial in the rather close knit fraternity of sea turtle biologists. The titles of some of the chapters also display something of the views of the author: for instance, "The Anathema of Farming" (chapter 8), "Dangerous Categories" (chapter 10), and "The Alarmist Strategy" (chapter 11); in some cases they are overly cute, such as "Head-Starting: The Heart Has Its Reasons" (chapter 4). Indeed, the problem of cuteness and overt sarcasm is a main detracting point from a book which has imbedded in it many important points.

The degree to which this book has stirred the sea turtle world is perhaps reflected in the number of reviews it has received (at least nine so far). Mrosovsky certainly recognized the contentious nature of the book, for he took care to state in the preface that while he expected debate, he acknowledged that "I am also convinced that the intentions of those ac-

tive in sea turtle conservation are irreproachable." While reading the book, however, I had at times great difficulty reconciling the tone of the criticism with this caveat. Mrosovsky stated that his purpose was not to question whether sea turtles are worth preserving, but to debate the methods in the hope that his criticisms will result in stronger and more scientifically sound measures on their behalf. Unfortunately, it is more likely that the tone he chose to use will further polarize the sea turtle research and conservation community rather than lend constructive criticism to current practices.

Mrosovsky makes a number of good points throughout the book with which I, and I believe nearly all sea turtle biologists, would agree: the need for a complete rationale and well thought out plan prior to undertaking a particular research program or using a particular technique, especially with regard to tagging projects; the need for procedures to evaluate the tag loss problem and the degree to which it affects views of sea turtle population biology; the need to recognize the limitations of head-starting as an as yet unproven technique; the need for a strong scientific foundation for conservation programs. Mrosovsky makes a case for each convincingly, but unfortunately his arguments are often given in the context of jibes at particular projects while neglecting others closer to his own interests, are sometimes clouded by fuzzy or naive rationale, or are beset by incorrect data, such as statistics on the Japanese hawksbill trade. Indeed, critiquing this book can quickly become an exercise in pointing out errors of omission or commission.

Chapter 2 ("A Brief Life History") provides an illustration of some of the annoying errors found in the book. When discussing life history similarities of species (p. 6), Mrosovsky notes that Kemp's ridleys and some hawksbills nest by day, but fails to note that olive ridleys also regularly nest by day during arribadas. When mentioning the migrations of leatherbacks (p. 7), he fails to include southern lati-

tudes, such as New Zealand and the coasts of South America. He implies (p. 10) that all newly hatched sea turtles are counter-shaded, whereas only *Chelonia* sp. are so colored. In a later chapter, he states (p. 51) that 40,000 Kemp's ridleys nested per year in 1947; the number 40,000 was actually based on a film made of a single arribada. Hence, the number of nesting female *Lepidochelys kempii* in the late 1940's will never be known.

Mrosovsky may argue, however, that it is ideas that he is putting forth for debate, not isolated facts. This is true. But ideas should always be underlain by carefully thought out lines of reasoning based on a critical assessment of published as well as unpublished information. Examples of the lack of such critical assessment could be seen as undermining the basic tenets of his ideas, and such examples are found all too often.

The process of tagging sea turtles is tackled in chapter 3. By putting a metal tag on a flipper, then recording where the turtle returns to nest, or if it is caught later while feeding or along migratory routes, researchers have been able to record much basic data concerning migratory patterns, feeding areas, and reproductive parameters in the female. As Mrosovsky laments, there has been an unfortunate tendency among some individuals and agencies to equate tagging with conservation per se, without an adequate rationale for what purpose the tagging is being done, how long the project should proceed, and what is to be done with the data. Mrosovsky does provide information about why turtles should be tagged, and gives an adequate summary of the tag loss problem to those who may not be familiar with it. But why the shots at the Tortuguero project, a project begun when virtually nothing was known about the tag loss problem? If a discussion (and criticism) of tagging and the need for multiple tagging is desirable, then it would have been valuable to provide a complete review of the history of the development of the flipper tag, as well as a critique of tagging applications and

indications as to where tagging studies are particularly needed today. Why did Mrosovsky begin the chapter with the cute little story about the overworked tagger setting new personal records? Why state "Doubtless tagging at Tortuguero did uncover many valuable facts . . ." Doubtless? These asides are found throughout nearly all chapters and detract considerably from the content of the text.

Head-starting is the raising of sea turtles past the hatchling stage to a size that, when released, should grant them a greater ability to survive predation than they would had they entered the water immediately after hatching. As all sea turtle biologists recognize, it is an experimental technique that has yet to be proven. In chapter 4, Mrosovsky examines the underlying assumptions of the technique and again provides a number of thoughts concerning these assumptions and the probability that they may or may not be correct. He begins by equating the name "headstarting" with North American social programs designed to give the disadvantaged a head-start in catching up with those more affluent, and concluding that head-starting may have many factors working against it, he suggests using simpler processes, such as reburying eggs to reduce the risk of predation.

However well taken many of these points are, they are lost when we discover later on the same page that Mrosovsky believes the real notion behind head-starting is not biological, but emotional. I fear he may be right in several cases, but I also believe that the emotion is not necessarily harmful as long as sound biology is not compromised; the adrenal atrophy shown by many biologists when viewing conservation is not particularly helpful either. Head-starting does need a thoughtful evaluation, and at least in the case of the Kemp's ridley project undertaken jointly between U.S. and Mexican authorities, the project has received extremely careful scrutiny and a great deal of soul searching. Head-starting is an experimental technique that should only be undertaken

using a minimal number of hatchlings under carefully controlled and supervised conditions. As such, it might indeed not succeed, but contrary to Mrosovsky's assertions, the problems of evaluation are not insurmountable and the technique is not the sole province of publicity seekers. One wonders also why Mrosovsky is so critical of the Florida experiment, one of the longest head-starting programs and one which may be beginning to show a degree of success (Dodd, 1982a), while at the same time not directing the same criticism at release programs in Surinam and the Cayman Islands. His criticism is so one-sided that he mistakenly equates the Florida Department of Natural Resources footnote of non-endorsement of the monel tag (a common occurrence when trade names are used in papers written by government personnel) with an assumed admittance of the total unreliability of this tagging procedure.

Chapter 5 is a brief review of Operation Green Turtle, begun in the 1950's as an experiment to seed green turtles throughout the Caribbean in an attempt to establish new colonies or supplement declining ones. His criticism of the lack of specific details concerning the methods used, and the locations and numbers of release, is well taken. Even today, it would be helpful if these were provided. But alas, sarcasm again creeps into what should have been a straight-forward analysis of a program, to where he talks about how cameras were allegedly more in evidence than notebooks during releases, implying unjustifiably that those involved were more interested in publicity than conservation. Knowing these scientists, this was certainly not the case. It is so very easy to criticize what was done 30 yr ago when we know so much more today.

Styrofoam boxes used as incubation chambers have been, and continue to be, widely used in various parts of the world to protect eggs in hatcheries from predators. These are relatively cheap and easy to use, and as Mrosovsky notes, hatch rates have been near or above those of natural

nests. Unfortunately, seemingly simple procedures sometimes have unforeseen adverse qualities, and such can be the case with styrofoam boxes; that is, the temperatures inside these boxes may be lower than natural nests, thus potentially producing a preponderance of males among the hatchlings.

Mrosovsky gives a good review of the potential problem and even gives a nice account of temperature dependent sex determination in turtles, although for some reason he does not mention the papers of J. J. Bull and R. C. Vogt. While noting the problems, however, he rarely seems to offer solutions or to acknowledge that at times the use of artificial incubation chambers may out-weigh the alternatives of letting eggs remain on the beach to face poachers, predators or natural habitat disturbances. Once a problem is identified, the best approach is to correct it and make the system work, not necessarily scrap it altogether. Chapter 6 is also marred by a long winded harangue against government agencies, specifically Florida, concerning permit problems. This may strike a positive chord in many scientists these days, but it has little relevance to a chapter devoted to critically reviewing the use of styrofoam boxes as incubation chambers.

Kemp's ridley is critically endangered today, with an estimate of fewer than 1000 sexually reproductive females. Chapter 7 purports to explore the status of this species, and even offers an alternative to the U.S.-Mexico cooperative program. However, the author's biases are immediately apparent. He begins: "Combine the unknown with the unproven and you have an appealing plan for action." It is difficult for this reviewer to fathom the logic behind this opening statement, but of course it reflects in a moment the sarcastic approach rather than critical scientific analysis evident in the review of the Kemp's program. It is also difficult to understand how Mrosovsky attained such careful insights into the analysis that went into designing the Kemp's ridley pro-

gram, since he was not one of the numerous scientists involved in its development.

There are of course many unknowns in determining an effective conservation program for a species so reduced in numbers and about which so little is known. Contrary to the implications of the author, none of the scientists involved has to my knowledge any illusions about the potential for success. Equating the "apparent" lack of success of Operation Green Turtle in Bermuda with the potential for establishing a colony of Kemp's ridley in Texas is also not valid since the programs are carried out entirely differently. All involved agree that beach protection is the best method for ensuring the survival of the Rancho Nuevo colony, but the realities of economic and political life in Mexico complicate the matter to the point where "obvious" solutions are in reality no solutions at all.

Mrosovsky's suggestion to the problem of conserving Kemp's ridley, in addition to beach protection, is to put individuals into captivity to establish a captive breeding herd in case the natural population becomes extinct. The mammoth potential problems of rearing enough individuals to restock a species into the oceans, perhaps generations after the original parental generation had become extinct, seems to be rather inadequately treated in light of the author's criticism of present far simpler and better founded approaches. The author also appears not to adequately understand the concepts of Franklin (1980) concerning minimum population sizes; there is a difference between survival of a group of animals, and the maintenance of short term heterozygosity and long term evolutionary potential.

Chapter 8 delves into one of the most controversial areas of sea turtle conservation, that of farming and ranching, and here Mrosovsky firmly allies himself with the so-called "commodity conservationists." These subjects have been treated in a number of papers, and perhaps the author's own biases are reflected by not referencing two of the three major papers

that argue against these practices (Dodd, 1982*b*; Ehrenfeld, 1980). The chapter begins with two quotations from Archie Carr written 12 yr apart in which apparently divergent views are expressed concerning the practice of farming. It is well known that Carr views a cottage industry benefiting local peoples dependent on sea turtles as a perhaps acceptable practice, but has argued vigorously against international trade for the luxury markets of more affluent countries. Indeed, in 1976, Mrosovsky also argued against a mariculture exemption under U.S. law during the listing of the green turtle. The juxtaposition of these quotes at the beginning of this chapter is puzzling to me; what are they supposed to demonstrate or imply?

I agree with Mrosovsky concerning the issue of farming as to the often emotional and sometimes vehement nature of the argument; individuals on both sides have made statements concerning the motivations and/or ancestral history of their opponents that have clouded the issue. A great deal is at stake, however, and it is the realm of discussions of such issues where the greatest care is necessary to rationally argue one way or another. Since I have stated my position elsewhere (Dodd, 1982*b*), it is unnecessary to debate or restate my sharp differences with Mrosovsky and those who see farming as at worst innocuous or at best as benefiting the species. Mrosovsky's discussion does contain errors that could have been corrected, and reflects thorough misunderstanding of the economic concepts of allegedly "supplying the market demand."

Specific points in chapter 8 are certainly debatable. For instance, there is some disagreement as to whether the emphasis in trade from the Cayman Islands has shifted from meat to shell; if true, it could represent a temporary response to the lack of immediately available markets, especially in the U.S., rather than a long term marketing trend. Mrosovsky is also incorrect in speculation that green turtle shell from farmed products would displace hawksbill in the Japanese trade to any sig-

nificant extent. Japanese craftsmen work using traditional methods with techniques that are not applicable to green shell. Present import figures also confirm that green turtle shell is not replacing or even slowing down tortoiseshell imports.

Mrosovsky states that pro-farmers have shown that fertility rates are increasing, but this is not reflected in the data I have seen. Neither is he correct in discussing the conspiracy theory concerning the 1979 meeting of the International Union for the Conservation of Nature and Natural Resources in Costa Rica with regard to the criteria for "bred in captivity"; the rules were not altered but were clarified without removing the original intent. In all, I found little of the necessary comprehensive discussion which could have been a valuable exercise in the farming debate. The chapter concentrates far too much on one operation in the Caribbean without analysis of the issue as it is likely to develop in tropical areas around the world.

"Four Thousand Unwanted Turtles" concerns an incident which occurred several years ago about the potential release of surplus stock of turtles from Cayman Turtle Farm in the West Indies. The Farm wanted to release these animals as a one time gesture rather than slaughter them; controversy arose concerning the fate of these turtles and the desirability of the release. As a one time release, this was a controversy that never should have happened and wasted valuable time and energy; on that much, Mrosovsky and I agree. However, I am not convinced that this particular incident deserved a chapter by itself, rather than discussing in general the desirability of the release of captive turtles. In this sense, it could have been incorporated with the discussion of release sites and monitoring of head-started turtles. Again, Mrosovsky shows a curious double standard by supporting the release in the Cayman Islands as beneficial while criticizing past releases, such as Operation Green Turtle. As to why the Cayman Islands Farm was not commended for the care it took in the release program by the

World Conference on Sea Turtle Conservation, perhaps it is because the release occurred nearly a year after the Conference.

Chapter 10 discusses another controversial topic among sea turtle workers: that is, the categories we place them in while discussing conservation programs (endangered, threatened, vulnerable, rare, etc.). Working within an organization that must deal with status, I certainly appreciate that there is a world of difference of opinion concerning such categorization, and the interpretations given by individuals. Mrosovsky argues that for the most part, status projections are inaccurate, especially within the IUCN. I may agree with that for the leatherback and even for the green and olive ridley. Due to long life spans, it is unlikely that these species will become extinct within the near future, with the notable exception of certain populations. There is also a danger, however, which it seems to me Mrosovsky does not adequately consider, in being too casual about saying that these species are not "endangered" or "threatened" (whether biologically or within a legal context, a dichotomy which Mrosovsky seems to fail to appreciate) for that means automatically to many politicians and administrators that the species are not in need of some degree of protection and management. In such a situation, it is not the labels themselves that are "dangerous," but the lack of recognition of modern biology and its complexities among administrators, politicians, and general public that is dangerous to research and conservation.

Mrosovsky certainly, in this reviewer's opinion, dismisses the problems faced by some species, particularly the hawksbill, too readily, especially with regard to the long term nature of these problems and the cultural and economic framework of the nations and peoples where many sea turtle populations are found. In addition, he gets too caught up in the numbers game, confusing what appears to be a large number of nesting individuals with the status of the population in question. Con-

servation and status do not involve numbers per se, except if these numbers dip very low, as with Kemp's ridley. The factors we see today in sea turtle populations do not just reflect today's problems, but the status of the population perhaps 30 yr ago. The problem with sea turtle conservation, one which Mrosovsky should have hammered on over and over in a book designed to discuss their conservation, is that we are often not in the position to accurately assess our programs given short term memories; that what we do today reflects the future far down the line, just as what we see on the beach may reflect conditions of many years ago. This is the great dilemma of the conservation of such long-lived, slow maturing species.

Mrosovsky's contention that there are a lot of sea turtles remaining in the world's oceans is certainly correct, but he does overlook the fact that in practice no populations, with the possible exception of those in eastern Australia, are really free from serious problems. On p. 86, he seems to refer to concerns about sea turtle status as "alarmist," certainly an inappropriate choice of words in terms of discussing status. He states that there is an upward trend in the population at Tortuguero, which seems to imply that either he did not read Bjorndal's (1980) paper carefully, or did not appreciate its implications. He relies in part on Servan's (1976) paper to imply that the green turtles on Europa have not experienced a decline, but a critical reading of this paper shows it to be so seriously flawed as to be inappropriate as a valid reference.

Mrosovsky also provides incorrect figures when dealing with the hawksbill trade in Japan. He quotes a 40,000 kg amount per year being imported between 1976-1979, and states that this is equivalent to 44,000 animals. However, import figures show that 47,000 kg were actually imported; in addition, roughly 1 kg per animal of raw tortoiseshell may be too conservative, since estimates can range from 1.5-2.5 kg per hawksbill. These figures also do not include the literally hundreds of

thousands of stuffed juvenile specimens which should certainly have been considered. Also with the hawksbill, Mrosovsky states that declines in the population on Cousin Island are not apparent, but more recent data (J. Mortimer, personal communication) indicate that this is not the case.

The real problem with showing precise declines in sea turtle populations is that few populations are studied well enough to yield baseline information on population status. Yet populations have decreased in many parts of the world, such as in Mexico. Recently published work on Little Cumberland Island with loggerheads also suggests caution in interpreting even long-term data when these data are available.

Chapter 11 is short, calling attention to a few examples of the use of "alarmist" language in dealing with the potential loss of individual species. Mrosovsky is certainly justified here, because as Jack Frazier has repeatedly pointed out, crying "wolf" really does not benefit conservation in the long run. It is a problem shared by many organizations, but one not likely to disappear soon; calling attention to the facts would seem to be disturbing enough. The chapter entitled "Problem Resolving" is also very short, and really does not need much comment since it does not focus on problem resolving. Instead, it pokes fun at what on the surface may appear to be superficial international resolutions adopted by the World Conference on Sea Turtle Conservation in 1979. Not dealing with governments or international agencies, it is understandable that Mrosovsky does not appreciate the value that such resolutions may carry; I have found it most useful at times to call attention to them.

Sea turtles are poorly understood in terms of their taxonomic relationships, and there are many named subspecies based on inadequate samples of material. Mrosovsky is justified in calling attention to this problem in chapter 13, and it would be sorely hoped that biologists working on these species heed his call. There is cer-

tainly enough available material to allow for a concerted morphological analysis, and populations in many regions of the world are amenable to the biochemical and other tools available to systematic workers. His discussion of the poster developed by the Center for Environmental Education and National Marine Fisheries Service (proclaiming new (sic) species by "public poster" in the case of *Chelonia agassizii*) is certainly misplaced. The name *C. agassizii* is not new, having been used first by Bocourt (1868) and more recently by a number of other authors (including A. Carr, R. Marquez, P. Pritchard and A. Villanueva). Many workers are coming more and more to differentiate *C. mydas* from *C. agassizii*, and it would be well if someone presented the data and formally proposed the separation in a peer reviewed journal.

The last chapter in the book is devoted to the fact that sea turtles lay many eggs during their lifetime, and what this might mean for conservation and management options. Unfortunately, Mrosovsky tends to confuse the needs of coastal peoples in many parts of the world for a protein source and a method of obtaining a cash income with the question of whether eggs should be harvested even in affluent countries such as the U.S. and Australia where there is presently no rationale nor incentive to do so. In this, he exhibits a disturbing naivety with the way law enforcement and market economies operate, and the motivations of those involved in trade. He even assumes that promoting sea turtle eggs as aphrodisiacs would allow a greater market value, presumably to fund conservation programs, while admitting short term effects could be deleterious. Why long term effects of such promotion would not also be adverse is unclear, much less why human procreation should be enhanced in so many parts of the world where overpopulation is already a problem.

On pages 144–146, Mrosovsky discusses the possibility that mariculture operations would be able to satisfy the markets for

sea turtle products. Unfortunately, as economists well know, there is no such thing as being able to "satisfy a market demand." Indeed, market demand is not a single or set quantity, but refers to all the quantities demanded at all possible prices. The concept of satisfying the market demand makes no sense and would be impossible; to imply otherwise is a misconception and misuse of economic terminology.

In his discussion, Mrosovsky uses the potential of maricultured green turtle products to displace the hawksbill trade in Japan. As already pointed out, this is unlikely for both cultural and technical reasons. However, the author's attempt to illustrate how this may already have occurred is in error. For instance, Mrosovsky states that the Cayman Islands accounted for 10% of Japanese imports of raw tortoiseshell between January 1977 and October 1979, implying that all "tortoise-shell" was derived from green turtles at the Cayman Turtle Farm. This is incorrect. The figures Mrosovsky uses were actually a composite of green and hawksbill shell imports from the Cayman Islands, not all of which was derived from the Farm. Closer examination of both export and import figures reveals that the Farm actually accounted for only 1.7% of raw Japanese "tortoise-shell," shell from green turtles which is fundamentally different from that of *Eretmochelys imbricata*. In any case, the years 1978–1979 were the only years in which there was significant import of shell from the Farm, and at that only plastral shell was imported. This hardly supports the argument that a maricultured product is already providing an alternative to hawksbill shell.

After reading this book twice, I admit that I am still not certain at what audience it was aimed. Certainly not professionals working in the field, for it does not instruct or present constructive criticisms and well thought out alternatives or suggestions. If it was, then the overly sarcastic and heavy manner with which the author treats those whom he criticizes surely

misses the mark, and is more likely to antagonize and polarize rather than cause to ponder (alas, I have already seen evidence of this). While there should be no sacred cows in science, this little book is unnecessarily acrimonious. To those not familiar with the questions in sea turtle conservation, it provides neither the background in the development of many of the techniques or programs, which would have been a valuable contribution, nor an objective analysis of them.

Dr. Mrosovsky has a long history of fine research in the biology and conservation of these large and valuable species, from his work in their orientation abilities and temperature dependent sex determination studies, to his untiring editorship for the past 8 yr of the *Marine Turtle Newsletter*. During these years, he has made many of the same points in the *Newsletter* in what appeared to me to be a much more positive yet still quite effective manner. *Conserving Sea Turtles* in both its style and content is beneath his considerable abilities and obvious concern for the welfare of these species. While this book could have been a valuable contribution to sea turtle biology, we must continue to wait for a constructive analysis of the history and methods of ways to conserve sea turtles.

LITERATURE CITED

- BJORNDAL, K. A. 1980. Demography of the breeding population of the green turtle, *Chelonia mydas*, at Tortuguero, Costa Rica. *Copeia* 1980:525-530.
- BJORNDAL, K. A. (Ed.). 1982. *Biology and Conservation of Sea Turtles*. Smithsonian Institution Press, Washington, D.C.
- BOCOURT, M. F. 1868. Description de quelques cheloniens nouveaux appartenant a la faune mexicaine. *Ann. Sci. Natur., Ser. 5, Zool.* 10:121-122.
- DODD, C. K., JR. 1982a. Nesting of the green turtle, *Chelonia mydas* (L.), in Florida: historic review and present trends. *Brimleyana* 7:39-54.
- . 1982b. Does sea turtle aquaculture benefit conservation? Pp. 473-480. In K. A. Bjorndal (Ed.), *The Biology and Conservation of Sea Turtles*. Smithsonian Institution Press, Washington, D.C.
- EHRENFELD, D. W. 1980. Commercial breeding of captive sea turtles: status and prospects. Pp. 93-96. In J. B. Murphy and J. T. Collins (Eds.), *Reproductive Biology and Diseases of Captive Reptiles*. SSAR Contributions to Herpetology No. 1.
- . 1982. Options and limitations in the conservation of sea turtles. Pp. 457-463. In K. A. Bjorndal (Ed.), *Biology and Conservation of Sea Turtles*. Smithsonian Institution Press, Washington, D.C.
- FRANKLIN, I. R. 1980. Evolutionary change in small populations. Pp. 135-149. In M. E. Soulé and B. A. Wilcox (Eds.), *Conservation Biology. An Evolutionary-Ecological Approach*. Sinauer Assoc., Sunderland, Massachusetts.
- PRITCHARD, P. C. H. 1979. 'Head-starting' and other conservation techniques for marine turtles *Cheloniidae* and *Dermochelyidae*. *Intern. Zoo Yearb.* 19:38-42.
- . 1980. The conservation of sea turtles: practices and problems. *Am. Zool.* 20:609-617.
- PRITCHARD, P. C. H., P. BACON, F. BERRY, A. CARR, J. FLETMEYER, R. GALLAGHER, S. HOPKINS, R. LANKFORD, R. MARQUEZ M., L. OGREN, W. PRINGLE, JR., H. REICHART, AND R. WITHAM. 1983. *Manual of Sea Turtle Research and Conservation Techniques*, 2nd Ed. In K. A. Bjorndal and G. H. Balazs (Eds.). Center for Environmental Education, Washington, D.C.
- SERVAN, J. 1976. *Ecologie de la tortue verte a l'ile Europa (canal de Mozambique)*. La Terre et la Vie 1976:421-464.

Accepted: 22 June 1984

Editor: Edmund Brodie, Jr.

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