

house effect) on reptilian sex ratios (Janzen, 1994; Mrosovsky et al., 1984a), debate on management strategies is needed even more. If Vogt's article stimulates such debate, it will have done a valuable service.

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Workshop on the Ecology, Status, and Management of the Diamondback Terrapin (*Malaclemys terrapin*), Savannah River Ecology Laboratory, 2 August 1994: Final Results and Recommendations

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On 2 August 1994, 33 invitees from 13 states gathered at the Savannah River Ecology Laboratory in South Carolina to discuss the ecology, status, and conservation of the diamondback terrapin (*Malaclemys terrapin*). The Workshop was prompted by reports of potential declines of terrapin populations in several locations in its range. In addition to sharing data on terrapin biology and status, the Workshop was designed to produce specific recommenda-

tions for action by local, state, and federal management agencies. Below, we have summarized some of the major findings and recommendations of the Workshop. Our goal is to disseminate this information as widely as possible to those who have responsibility for managing this unique resource. Additional questions concerning the Workshop may be addressed to either Richard A. Seigel or J. Whitfield Gibbons. A list of all participants and contributors is also attached.

Recommendations

Research. — Although some aspects of terrapin biology are well-known in at least some parts of the range, many areas remain poorly studied. What follows is an unranked list of some areas the Workshop participants considered critical at this time. These areas warrant special consideration for funding by federal and state agencies, private

conservation groups, and commercial entities having an interest in conservation or legal issues dealing with the diamondback terrapin or salt marsh ecosystems:

- Demography
- Genetic studies (e.g., DNA fingerprinting)
- Habitat use
- Movement patterns and home range size
- Ecology of juveniles
- Long-term life history studies
- Taxonomic studies on subspecies
- Behavioral ecology

Status. — 1) Based on information developed at the Workshop, it was obvious that comprehensive data on population status are lacking for most states within the range of the species. In addition, opinions sometimes differed among participants from the same state concerning population status. These opinions are summarized in Table 1. In

Table 1. Summary of results of questionnaire on the status and research needs for diamondback terrapins (*Malaclemys terrapin* spp.). Not all those who responded to this questionnaire attended the meeting. Note that for some states, more than one status is listed. This is the result of either differing opinions among respondents, or differences in status among localities in the same state. As noted in the text, quantified data on the status of terrapins are lacking from most states.

State	Subspecies	Source	Status	Recent Survey?	Threats (in rank order)	Steps Needed	Current Research?
MA	<i>terrapin</i>	Auger	Stable or Increasing	Ongoing	Motor boat impacts; nesting habitat alteration	Retain "Species of Special Concern" status	Yes
RI	<i>terrapin</i>	Goodwin	Unknown/Stable	Yes-1993	Predation, habitat loss, pollution, harvesting, motor boats	State Protected Status; regulations on motor boats	Yes
CT	<i>terrapin</i>	Garber	Declining	Yes-current	Crab traps, habitat loss, road kills	Crab trap regulations	Yes
NY	<i>terrapin</i>	Morreale	Stable	1991	Shoreline development; channelization of marshes; pollution	Habitat protection	No
NJ	<i>terrapin</i>	Wood	Declining	No	Crab traps, habitat loss, road kills	Crab trap regulations	Yes
DE	<i>terrapin</i>	Gelvin-Innvaer	Unknown	No	Crab traps, loss of nesting beaches	Insufficient data; currently game status	No
MD	<i>terrapin</i>	Roosenburg	Declining/Stable	No	Crab traps, habitat loss, motor boats, harvesting	State Protected status; crab trap regulations	Yes
VA	<i>terrapin</i>	Mitchell	Unknown	No	Crab trapping, harvesting, habitat loss, predation, pollution, pet trade	State Protected status; crab trap regulations	No; not planned
NC	<i>terrapin, centrata</i>	Braswell, Conant	Declining or Unknown	Yes	Crab traps, predation, habitat loss, road kills, pollution, predation	State Protected status; crab trap regulations	Yes
SC	<i>centrata</i>	Lovich, Zimmerman, Alfieri	Unknown or Declining	No (local only)	Crab traps, habitat loss, road kills, harvesting	State Protected status; crab trap regulations	Yes
GA	<i>centrata</i>	Harris	Unknown	No	Crab traps, road kills	Insufficient data	No
FL (Atlantic)	<i>centrata, tequesta</i>	Seigel	Declining	Yes (local)	Predation, habitat loss, crab traps, harvesting	State Protected species	Yes
FL (Keys)	<i>rhizophorarum</i>	Wood	Stable	No	None	None	No
FL (Gulf)	<i>macrospilota, pileata</i>	Cook, LaClaire	Unknown	No	Unknown	Insufficient data	No
AL	<i>pileata</i>	Clay	Unknown	No (planned in 1994-95)	Crab traps?, habitat loss, pet trade, harvesting	Crab trap regulations; education of enforcement officers	Yes
MS	<i>pileata</i>	Mann	Declining	Yes-1994	Crab traps; commercial harvesting; predation; habitat loss	Crab trap regulations; state protected status	No
LA	<i>pileata, littoralis</i>	Seigel	Unknown or Declining	No (none planned)	Crab traps?	Unknown	No; not planned
TX	<i>littoralis</i>	Price	Unknown	No (1984)	Habitat loss, crab traps, harvesting, pollution	State Protected status or game status; crab trap regulations	No; not planned

two states (Massachusetts and New York), populations are thought to be either stable or increasing, whereas in three other states (Connecticut, New Jersey, and Mississippi), terrapin populations appear to be declining. No status data were available from five states (Delaware, Virginia, Georgia, Alabama, and Texas). In the remaining six states (Rhode Island, Maryland, North Carolina, South Carolina, Florida, and Louisiana), population status varied either among localities or among participants. For example, K. Alfieri felt that terrapins in South Carolina were declining, whereas J. Lovich felt that insufficient data were available for a determination. In Florida, populations in the Keys are thought to be stable, whereas populations on the east coast are thought to be declining (Table 1).

2) Because of the lack of data from many areas, the Workshop participants felt that there is insufficient evidence at this time to warrant listing the species under the Endangered Species Act. However, there is sufficient evidence to consider placing all the separate subspecies as Category 2 candidates for listing (two subspecies are already listed as Category 2 candidates). In other words, there is reason to believe that terrapins are declining, but insufficient data to make a definitive determination at this time.

3) Based on results of a questionnaire distributed at the Workshop, most participants felt that terrapins merited Protected Status in states where such protection was not already provided. The results of the questionnaire are attached (Table 1). These results include information provided after the conclusion of the Workshop.

4) There is an urgent need for better survey data throughout the range. Surveys should use multiple methods to insure reasonable sampling representation of both sexes and all size/age classes. The exact methods used will vary from region to region. Surveys should be repeated at appropriate intervals (i.e., a single year is not considered sufficient).

Threats. — 1) One of the major threats to populations of terrapins appears to be incidental drowning in crab traps. Incidental drownings have been documented in Connecticut, New Jersey, Maryland, and Mississippi, but may occur in many other states as well (see Table 1; also Bishop, 1983; Burger, 1989; Garber, 1989; Roosenburg, 1992). Although much of the data on drownings in crab traps are unpublished, available data suggest that mortality rates may be quite high. For example, Roosenburg (1992) found that a single crab trap killed 49 terrapins, an estimated 1.6–2.8% of a local population in a single event. Immediate efforts should be made to reduce incidental killing in crab traps by the use of excluder devices developed by Roger C. Wood (Stockton State College, Pomona, NJ 08240). In addition, efforts should be made to determine the extent of mortality in crab traps by determining the number of operational traps in optimal habitats of terrapins, and extrapolating from known mortality rates in well-studied areas. Better data are also needed on natural mortality rates from other portions of the range.

2) Habitat loss and alteration continue to be major concerns. Examples include drainage and impoundment of

salt marshes, human disturbance of nesting sites, and changes in the flow of fresh water into estuarine systems. Loss of habitat for both nesting and feeding areas should be estimated via traditional or GIS mapping methods.

3) Other potential threats include (but are not limited to) commercial harvesting for the meat and pet trade, incidental kills by motor boats, road mortality (especially of nesting females), and predation on adults and eggs by raccoons and other predators. These threats require additional study.

Summary

Although diamondback terrapins do not appear to be in immediate jeopardy of extinction, there is sufficient evidence that populations in some areas are declining as a result of the factors described above. Rather than call for an Endangered Species Listing at this time, the Workshop participants felt that proactive steps would help to both improve conditions for the species and avoid the restrictions imposed by such a listing. However, these proactive steps require sufficient funding by state, federal, and private agencies for detailed surveys and research, as well as cooperation from research biologists. Failure to conduct the needed studies would likely result in continued population declines and a need for federal status. Thus, action needs to be taken before the species declines to the point where only dramatic interventions will help.

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Turtle Issues at CITES 1994

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The Ninth Conference of the Parties to CITES (the Convention on International Trade in Endangered Species of Fauna and Flora) took place in Fort Lauderdale, Florida, over two weeks from 7-18 November 1994. I participated as an Observer, on behalf of the Florida Audubon Society, the Chelonia Institute, and the IUCN/SSC Tortoise and Freshwater Turtle Specialist Group.

In general, the deliberations were useful, even impressive, in that well over 100 sovereign nations were able to

debate wildlife issues, with courtesy, with exemplary background research by the Secretariat, and without the East-West rancor, or the polarization of the African nations (South Africa and its economic trading partners against the remainder of the continent) that characterized so many international conferences in recent decades. A great many decisions, some unanimous, some by majority vote, were made, and the working groups developing the position papers for complex or fractious issues went to great lengths, and very late nights, to develop positions of reasonable compromise.

Another positive aspect of the Conference was the extraordinary value – and volume – of the printed documents, position papers, and background information on agenda issues that was circulated to registered Observers as well as to National Delegations. These in many cases represent biological data unavailable in other sources, and are of permanent reference value.

There were several issues that directly or indirectly related to turtles and tortoises. Egypt proposed that the Egyptian dwarf tortoise, *Testudo kleinmanni*, be transferred from Appendix II to Appendix I, i.e., banned from international trade. This species, ironically, was being offered for sale in substantial numbers in Fort Lauderdale itself, at the very time of the Conference. Nevertheless, the tortoise is delicate in captivity, grows and breeds slowly, and has a very limited natural range in northeastern Libya and a few places in coastal Egypt and Israel. The Appendix I listing was passed unanimously.

Also passed with little debate was a proposal by the Netherlands and the United States to list the American box turtles, *Terrapene* spp. (*T. carolina*, *T. ornata*, and *T. nelsoni*), on Appendix II, while retaining *T. coahuila* on Appendix I. Although these turtles are generally thought of as common, there is substantial and growing evidence that many populations have declined markedly as a result of loss of habitat, highway mortality, and the species' intrinsically low reproductive potential and delayed maturity. Moreover, some of the taxa, especially the two described subspecies of *T. nelsoni* in northwestern Mexico, are decidedly rare. However, the progressive decline of many forms of *Terrapene* has taken a marked turn for the worse in recent years following the outlawing of the sale of Mediterranean tortoises (*Testudo* spp.) in western Europe. As a result, dealers have turned to other taxa, including various species of both *Kinixys* (hinge-back tortoises) and *Terrapene*, as substitutes. The Appendix II listing will not outlaw the international trade, but it will require that exports be subject to permit requirements, including certification by the U.S. Management Authority that the "take" of the species will not jeopardize wild populations. Box turtles will also have to be shipped under humane conditions, complying to international air transport standards, which should reduce the mortality and suffering of turtles in transit.

The assembled delegates are to be praised for their meritorious decisions on the box turtle and Egyptian tortoise issues. Nonetheless, such decisions do not happen spontane-