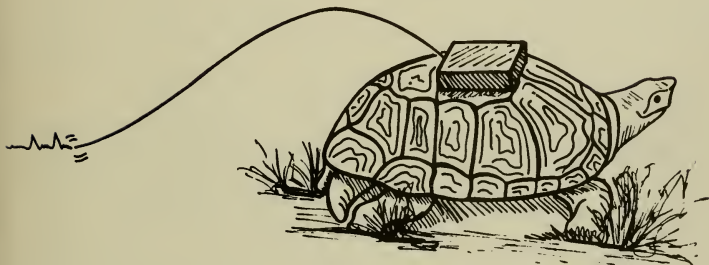


A CONTROVERSY SURROUNDING AN ENDANGERED SPECIES LISTING:
THE CASE OF THE ILLINOIS MUD TURTLE
ANOTHER PERSPECTIVE



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INTRODUCTION

Recently, two articles were published (Dodd, 1982, 1983) summarizing the natural history, conservation activities, proposed federal listing and controversy surrounding the form considered by some (e.g., Iverson, 1979) as the Illinois mud turtle, Kinosternon flavescens spooneri, and by others (e.g., Houseal et al., 1982) as an isolated population of the yellow mud turtle, Kinosternon flavescens flavescens. Unfortunately, the proposed listing of this turtle as endangered has, in fact, generated considerable controversy. This controversy has resulted in greatly polarized positions and bitter, adversarial relationships between those having the opinion that the listing is critical to the continued existence of the turtle versus those having the opinion that the turtle is presently adequately protected, or at least as well-protected, without the listing as it would be with an endangered status afforded by the federal government.

Dodd (1982, 1983) provided a wide-ranging overview and expressed a number of personal opinions concerning the events surrounding the proposed listing of the Illinois mud turtle from his perspective. Representatives of Monsanto Agricultural Products Company (Monsanto) have presented their views and opinions concerning the matter in several forums, many of which were listed by Dodd (1982). The purpose of this paper is to present our views from the perspective of the persons who performed the 1979-1980 research which was supported by Monsanto. It also represents an attempt to partition aspects of the controversy into the realms which represent differences in opinions and interpretations of the data versus the adequacy and credibility of the data which were gathered (and the analyses which were performed) as part of Monsanto's research program.

In essence, this paper is intended to supplement Dodd (1982, 1983), providing additional case history. Dodd (1982) ended with the opinion:

"In the Illinois mud turtle controversy, no one benefitted, least of all K. f. spooneri."

While we do not agree with Dodd's statement, we believe that a careful review of this case history in its entirety will greatly benefit all in the scientific community who sometimes find themselves in the public arena with regards to their position on ecological issues.

NATURAL HISTORY

Dodd (1982, 1983) provided a brief summary of the natural history and ecology of the Illinois mud turtle referencing Cooper (1975), Springer and Gallaway (1980) and Kangas et al. (1980) as containing detailed accounts. In general, the overview reasonably depicts the natural history of the turtle.

Material in Springer and Gallaway (1980) concerning the present range, distribution, abundance and natural history of the turtle is now published (Bickham et al., 1984; Christiansen and Gallaway, 1984; Christiansen et al., 1984, in press). Yet another manuscript describing the population estimation procedure developed from this project also has been prepared (Gazey and Staley, in press).

NON-FEDERAL CONSERVATION ACTIVITIES

Conservation activities directed towards preservation of the mud turtle and its habitat in Iowa, Illinois and Missouri by industry and state agencies have been extensive (Dodd, 1982). Each of the three states protects the turtle as endangered; Iowa since 1977, Illinois since 1978 and Missouri since 1979. The largest known population is located at Big Sand Mound, Iowa, where private industry has assumed responsibility for preservation of the habitat and the turtle as described below. Nevertheless, the status of the turtle is independently monitored by the Iowa Conservation Commission which has published an article including information on the mud turtle (Roosa, 1978).

Illinois, as described by Dodd (1982), has been active with regards to conservation of the turtle. Activities funded by the State have included surveys to evaluate its distribution and status (Morris, 1978) and ecological studies of the turtle at Sand Ridge State Forest for the purpose of developing a management program (Becker, 1980). The Illinois Department of Conservation published an information article about the turtle (Morris and Smith, 1981). As for Iowa, Roosa (1978) of the Iowa Conservation Commission published an information paper on the mud turtle.

The Missouri Department of Conservation has also expressed tangible evidence of their desire to protect mud turtle populations. The State has encouraged and supported ecological studies, provided technical assistance to individual land owners and is pursuing the opportunity to purchase privately-owned lands containing the second largest known population of the turtle (Dodd, 1982).

The Big Sand Mound site in Iowa is ringed by industry, namely Iowa-Illinois Gas and Electric Company (IIGE) and Monsanto. Both industries have contributed in a major way towards the conservation of the habitat and its residents, including the mud turtle. First, IIGE in the mid-1970's established the Big Sand Mound Nature Reserve on 420 acres of their property which was supplemented by 115 acres of Monsanto's property in 1981. As an advisory group for the management of the Big Sand Mound ecosystem, the Louisa Ecological Advisory Committee was established in 1977 by IIGE. This advisory group, consisting of representatives from private sector, state and federal government, is in part charged with the development of a master plan for management and protection of the Big Sand Mound Nature Reserve over the long-term (50 years). Monsanto is also providing assistance in the development of this plan.

The development of the master plan will be based largely upon a five-year study (1978-1982) conducted by Drake University with funding from IIGE and the 1979 study conducted by LGL Ecological Research Associates, Inc. with funding from Monsanto. Preliminary management procedures and experiments have already been implemented and include fencing of the site and controlling access, diking and filling drainage areas to control runoff of waters that might be of adverse quality, predator removal experiments, eradication of exotic plant species and, in 1979, pumping 80 million gallons of water into Spring Lake to raise the water level. Of these, all but the latter activity appeared to have greatly benefitted the

turtle and the system. Whereas, Dodd (1982) noted that filling of Spring Lake occurred only once, he failed to point out that this activity was discontinued because it was believed by the investigators (not Monsanto) to be ineffective as an enhancement tool. The turtles are adapted to use the ephemeral waters of spring and early summer, and are burrowed during the other times of the year. The successional pattern of aquatic macrophytes in shallow, permanent waters may not enhance the habitat for mud turtles (see Springer and Gallaway, 1980), and we recommended to Monsanto that pumping and filling be discontinued.

From the above, it is clear that the value of the disjunct populations of mud turtles is appreciated within the region in which they occur, and steps have been taken to insure their survival. Each state recognizes the populations to be endangered and, as such, the turtles are beneficiary of protective measures. Further, each state is actively pursuing research and enlightened management and protection measures for the turtle and its habitat. The site of the largest known population is now a nature reserve, and industry has provided large amounts of funding for study of the turtle.

PROPOSED FEDERAL ENDANGERED STATUS

Dodd (1982) described The Endangered Species Act and various amendments and executive orders as they relate to the proposed listing of the mud turtle as endangered. An endangered species is one in danger of extinction throughout all or a significant part of its range. The basis for considering the mud turtle in danger of extinction centered around Brown and Moll's (1979) contention that, in 1977, the total population of this turtle had declined, since about the late 1960's, to not more than 650 individuals living at only one or two localities in Illinois, and one in Iowa. Historically, the turtle had been known from some 13 localities across the three-state area including Missouri where, by 1977, it had presumably been extirpated. The populations at the Illinois sites were considered to be on the verge of extinction because of the small number of individuals remaining there and detrimental land-use practices. The situation for the population at the Iowa site, Big Sand Mound, was described in the Status Report (Brown and Moll, 1979) as a "classic horror story of economic growth versus a nearly extinct organism."

In early 1977, Dodd was preparing lists of amphibians and reptiles which might be candidates for federal protection but for which little supporting data were on file. According to information in letters on file in the Office of Endangered Species (OES) of the United States Fish and Wildlife Service (USFWS), Dodd contacted Dr. Lauren E. Brown and requested him to prepare an application to the OES proposing that the Illinois mud turtle be declared endangered. Given this application, Dodd placed the Illinois mud turtle on a Notice of Review and Dr. Brown was requested to prepare a status report which strongly urged federal protection.

In July 1978, the turtle was proposed as an endangered species (Dodd, 1978). Two areas were proposed as critical habitat--one at Big Sand Mound

and the other at Sand Ridge State Forest. Affected and interested parties were given up to 5 October 1978 to comment on the proposal. Monsanto was clearly affected, as part of the proposed critical habitat included not only their property but also some of the actual plant facility. Further, upon review of the Brown and Moll (1979) status report, they questioned the objectivity of certain sections of the report, particularly in regard to unsupported allegations suggesting chemical contamination of Spring Lake and air pollution.

It was at this point that we (LGL) were asked by Monsanto to evaluate the proposal and supporting documentation, addressing three specific questions:

- 1) Is the systematic status of the Illinois mud turtle known with certainty?
- 2) Is the population status of the Illinois mud turtle adequately defined by available information?
- 3) Assuming an endangered state, do plant site properties and adjacent properties represent critical habitat for Illinois mud turtles?

Following review of all available published and unpublished information as well as consultation with area experts and a series of site visits, a preliminary report addressing these questions was presented in September 1978, a report which also provided pre-study recommendations (Springer et al., 1978). It was determined that the systematic status of the Illinois mud turtle was not resolved and that the current population status and distribution were even less well known. Based upon existing conditions, LGL proposed a reduction in the proposed critical habitat at Big Sand Mound. With respect to Monsanto property, it was suggested that critical habitat should include all of Spring Lake and Monsanto Bay but not a connecting channel and mud flat north of Monsanto Bay which had been included as critical habitat by OES. The mud flat area collected runoff from the plant and was adjacent to a railroad tankcar storage area, such that it could have been subject to accidental spills of chemicals. We advised that the mud flat was not suitable turtle habitat and should be diked and filled to preclude use by turtles.

Other immediate management recommendations included: (1) that Monsanto develop a means for diverting water from the Mississippi River into Spring Lake in order to maintain water levels in the pond (if desired) without detrimentally affecting the underground aquifer, (2) that the apparent areas of turtle habitat on Monsanto property be fenced and posted as a wildlife preserve and (3) that predators be removed during the winter of 1978-1979. We reviewed these recommendations with interested state and federal representatives who indicated that they thought the recommendations were appropriate. All recommendations were followed.

In order to resolve questions (1) and (2) above, research efforts were proposed in the report and later funded by Monsanto. The objectives of the research were to:

- 1) Determine the taxonomic status of the Illinois mud turtle;
- 2) Delineate areas of potential habitat within Iowa, Illinois and Missouri based upon the presence of suitable sandy soil;
- 3) Further define the current distribution of the turtle based upon systematic searches;
- 4) Determine the population levels of Illinois mud turtles at Big Sand Mound and any other localities at which the turtles appeared well represented;
- 5) Through ecological studies at Big Sand Mound, delineate key processes necessary for the continued existence and well being of the turtle; and
- 6) Based upon the above, recommend a management plan for Big Sand Mound and define additional research needs.

Objective 1) grew out of the statement in the Brown and Moll (1979) status report, that the Illinois mud turtle might represent a distinct species. When we reviewed the available taxonomic data, we did not believe that it had been clearly established that the form was sufficiently differentiated even to be called a subspecies (sample sizes were small and results of quantitative analyses were not definitive). Whereas we were knowledgeable that even a population could be designated as an endangered species, we believed that from a resource evaluation standpoint, the question of the genetic uniqueness of the resource should be addressed.

Objectives 2) and 3) were directed towards determining the accuracy of the statements in the Brown and Moll (1979) status report that the number of localities at which the turtle was extant presently numbered not more than two or three sites. Brown and Moll (1979) had noted that since its discovery the turtle had never been considered common except at a few localities. The turtle was considered in the status report to have disappeared from most sites, based mainly on subjective opinion and results of only a few superficial surveys. Whether the turtle had indeed disappeared from a significant part of its range was considered crucial to the endangered species classification process.

Objective 4) is self-explanatory, mainly addressing the question whether population levels had declined at sites where the turtle had once been considered common. The Big Sand Mound site offered the opportunity to compare abundance in 1979 to that which had been measured in 1974 (Cooper, 1975). The latter data were not mentioned in the Brown and Moll

(1979) status report. Cooper (1975) had estimated as many as 3500 turtles might have been present in 1974, Brown and Moll (1979) suggested not more than 300-600 were likely present at Big Sand Mound based on a canoe trip made in 1976.

Objectives 5) and 6) were directed towards gathering information that could be used to protect and manage the turtle population at Big Sand Mound, regardless of its future legal status. Monsanto was advised that, regardless of the outcome of the proposed listing, the ecological resource represented at the Big Sand Mound site was of considerable value, and that they should take a major responsibility for its protection. They have done exactly that.

The aforementioned management activities designed to protect the turtles at Big Sand Mound were proposed to Dr. Dodd at a September 1978 meeting in Washington. In summary, it was suggested to Dr. Dodd that the basis for the listing appeared speculative and that Monsanto had volunteered to fund a study enabling an up-to-date evaluation of

- (1) the taxonomic status;
- (2) the present range and distribution;
- (3) present population levels; and
- (4) ecological requirements of the turtle.

This proposal of a comprehensive, structured survey, was not well received. The message was, in effect, that the data in hand (the status report and "other" data) adequately supported the listing, and there was no need to conduct additional studies until after the listing, presumably then under the auspices of OES. It was shocking to us to come away from a meeting, in which we fully expected encouragement and support, with the clear understanding that the staff herpetologist of OES had taken the position that no data generated by industry would have a bearing on the proposed listing. After all, how often does a major corporation take an interest in funding basic biological research on a cryptic endangered species? Dr. Dodd was, however, amenable to receiving progress reports on our range and distribution studies and the Big Sand Mound population and ecology study as they became available.

Representatives of state, federal, industry, and academic organizations involved in the issue were invited to attend a February 1979 Illinois mud turtle research workshop at Monsanto. At the workshop discussions were held regarding Monsanto's and IIGE's positions on mud turtle research. LGL's proposed research, taxonomy, the state's positions and recommendations, potential distribution in the three states, potential mud turtle habitat mapping, and standardization of data collection. The workshop was attended by representatives of the three state conservation agencies, Monsanto IIGE, LGL, Drake University, Eastern Illinois University, Northeast Missouri State University, and Texas A&M University.

In addition, Jim Engel of OES attended and discussed OES's position and recommendations. Dr. Dodd was invited but did not attend.

The studies commenced in winter 1978-1979 with a predator-removal experiment (Christiansen and Gallaway, 1984). The surveys and population and taxonomic field studies were conducted during the spring and summer of 1979. Analysis and reporting of data commenced in fall with some aspects being completed in November 1979, and the balance being completed in January 1980 in time for the public meetings on the proposal. OES was kept advised as to the findings of the study by progress reports submitted every two weeks throughout the field studies. Further, results of all program findings to date were presented to the Louisa Ecological Advisory Committee (including a USFWS representative) at a 7 January 1980 meeting by presentation of a draft report which included certain conclusions but not all the supporting data (qualified in this regard at the meeting).

Historically, the Illinois mud turtle had been documented to occur at 13 localities. Our surveys documented 13 localities at which mud turtles were still present (not necessarily the same sites)--three sites in Iowa, eight in Illinois and two in Missouri (Bickham et al., 1984). One of the latter sites contains the second largest population known, probably over 400 turtles based on continuing studies. The Big Sand Mound site definitely contains over 1000 mud turtles, probably twice to three times that number. None of these findings, known to OES since summer of 1978, appeared to influence the proposal in any way even though they certainly provided no evidence of a marked decline in range (Bickham et al., 1984) or in the population at Big Sand Mound, as had been claimed in the status report.

Results of our taxonomic studies indicated that the disjunct populations of mud turtles in Iowa, Illinois and Missouri had not become genetically distinct to the point of representing a subspecies (Houseal et al., 1982). This has been confirmed by Berry and Berry (1984).

Based upon all of the above findings (all well-documented by hard data) and the commitment of the respective States and private industries to protect mud turtle populations and their habitats, we proposed that there was no need for federal protection. Although the form was considered by us to be threatened, particularly in Illinois, we did not believe its status was as precarious as presented in the Brown and Moll (1979) status report and, significantly, that it was being well-tended in the region by local and state activities.

CONTROVERSY AND MISUNDERSTANDING

Dodd (1982) stated that few proposed listings generated such opposition as the proposal to list the Illinois mud turtle as endangered, and that the opposition stemmed from Monsanto. Monsanto challenged the listing because much of the rationale in the Brown and Moll (1979) status report appeared based upon opinion and were not supported by data. They funded studies to test the key hypotheses implied by the status report,

namely the disappearance of the turtle from most of its range, the decline in numbers and the genetic uniqueness of the form. They were prepared to accept the listing if the status of the turtle was indeed as precarious as defined and, if so, to underwrite a model program for protecting an endangered population occurring in proximity to one of their plant sites. This desire was, in fact, the basis for the extensive ecology studies at Big Sand Mound.

Dodd (1982) stated that there was no indication to the USFWS of serious problems concerning the listing until 27 July 1979 when Monsanto presented testimony at the Endangered Species Act oversight hearings for the subcommittee chaired by Congressman John Breaux. He notes the previous September 1978 meeting with Monsanto where the management and research plans were presented mentioning that two points were made clear by him at that meeting: (1) that there were more data used in the proposal than sole reliance on the Brown and Moll (1978) report and (2) that taxonomy was not an issue. At this point, Monsanto was not necessarily opposed to the listing, depending upon the outcome of the surveys and population level studies. They maintained, however, that the referenced data were not apparent and genetic uniqueness should have a bearing on the proposal since the uniqueness issue had been raised in the status report. Monsanto believed that the existing data were not adequate to make a determination of status and that additional data should be gathered before a determination was made.

At the time of the July 1979 oversight meetings, most of the survey data were in hand, and had been transmitted to OES. These data showed conclusively that the mud turtle was still represented over much of its historical range and included the discovery of a potentially large population in Missouri where it was formerly believed to be extinct. It was likewise known that the population level at Big Sand Mound was much larger than had been represented in the Status Report. OES had been supplied this information by the progress reports submitted every two weeks during the study, as the data were being compiled, yet had not in any way acknowledged their existence or modified the proposal based upon the new information. Monsanto was indeed critical, believing that OES was continuing to operate on the basis that the mud turtle was nearly extinct, when there was good evidence to the contrary.

Dodd (1982) next cited a letter of 14 November 1979 from Monsanto to the Assistant Director for Congressional Relations as evidence that Monsanto had been anticipating results of the studies prior to their completion. There was no premature anticipation. At that time, the turtle was known to be more widespread and abundant than claimed in the Status Report. Only the taxonomic data were still in doubt. The conclusions concerning distribution and total numbers in the status report had, however, been conclusively refuted. As Monsanto made more people besides OES aware of this as early in the process as possible, OES received a great deal of questioning as to why these data were not being considered. From Monsanto's viewpoint, there appeared to be either a definite reluctance to accept the results of the distributional and population findings or the results were not going to make any difference in the listing process. Acknowledgement of and response to these data as

they became available would have gone far towards reducing the misunderstandings.

As described by Dodd (1982), he was notified by a regional USFWS representative that a draft final report was available on 7 January 1980 which described the results of the surveys and some preliminary taxonomic conclusions based upon results of analyses completed to date. The regional office was told that there was no need to forward this report since a final report was scheduled for submittal on 30 January 1980. A few days later (11 January 1980) he accepted a copy of this report (which was not marked draft) from staff members of the Senate Environment and Public Works Committee as a response from them to his question of what data were being ignored. Even though he had been advised only three or four days earlier that a draft report bearing a November 1979 date was just now (January) available, and that the final report was not due until some 19 to 20 days later, he somehow perceived this report as being the final report and sent it out for review (without any notification to us) by nine turtle specialists. A simple telephone call at this point could have greatly lessened the ultimate misunderstandings.

Dodd (1982) reported that "All respondents severely criticized the many conclusions with little or no supporting data." This response could have been anticipated, given that the report was a draft. Further, most of the criticism (not all) was directed at the taxonomy sections--the data were not included in the draft. However, not all the reviewers were entirely critical. For example, with regards to the distribution studies, one of the reviewers noted that "The report performs a valuable service by demonstrating, contrary to the conclusions of the Brown and Moll report, that additional, extant populations of *K. f. spooneri* do indeed exist. I agree with the authors of the LGL report that the Illinois Mud Turtle is not on the verge of extinction." Among the most critical of these reviews (dated 20 January 1980), was that provided on the taxonomy section by Dr. J.B. Iverson of Earlham College who had authored the most recent taxonomic work prior to this study.

Unaware of the OES review, we had earlier invited Dr. Iverson, along with others, to a meeting at Texas A&M University on 23 January to evaluate the taxonomic analyses which had been conducted prior to their presentation at the public meetings. Dr. Iverson reviewed the results and agreed that the data that had been collected and analyzed up to that time were valid and did not support the recognition of *spooneri* as a valid subspecies. However, he suggested several additional multivariate analyses were necessary before definite conclusions were drawn. He did not indicate that he had recently reviewed the draft report.

Results of our analyses and supporting data were presented at the public meetings on 30-31 January. At the first of these meetings, one of the nine reviewers of the January draft report, Dr. Lauren Brown, presented his review of the report, variously characterizing it as "biased", "improperly conducted" and not a "free inquiry". From our perspective, it was at this point that the listing process became an emotionally-charged controversy. The belief that objectivity was not

being maintained by the OES was reinforced by the content of certain OES file letters concerning the project.

In response to such allegations, we submitted our report (this time complete) to a different set of turtle experts, all well known in their field for their expertise and integrity. The results of these reviews were quite different from the previous ones, being generally favorable or at least objective. Results from these and the previous reviews were responded to with an addendum (Bickham and Gallaway, 1980) to the Final Report which had been presented at the public meetings. All data were submitted to OES by 6 March 1980. As noted by Dodd (1982), Monsanto also suggested in March 1980 that all the data on hand be evaluated by an independent review panel of qualified scientists prior to any decision about the listing, given the criticism of the data which had occurred. The comment period was closed in late March.

OES proceeded with the listing, approving the final rule by 29 April 1980. However before approving the rule, the Director of USFWS, acting upon Monsanto's suggestion, requested the assistance of the National Academy of Sciences in evaluating all the data which were on hand concerning the listing. Whereas the LGL data showed the turtle to be more secure and less unique than claimed in the status report, the validity of the LGL data had been challenged as described by Dodd (1982). The Academy responded by recommending a number of turtle biologists and statisticians that would be qualified to conduct such a review, not being able to organize a panel and respond themselves, given the restrictive time frame (Dodd, 1982). To Monsanto, the recommendation of a scientist as qualified to serve on such a review panel by the Academy equated to an endorsement. The six member panel was chaired by the Chief of USFWS's Wildlife Ecology Research Division, David Trauger. It included a program participant not from LGL, Dr. J.L. Christiansen, and a program critic, Dr. Iverson, in addition to four scientists who had not participated in the studies or their previous review.

The panel was given five questions to respond to, and a copy of the entire Panel Report is reproduced in Figure 1. As can be seen, the status report was given a less favorable review than the LGL report by this independent group. Whereas there remains room for differences in opinions as to how the data should be interpreted, there should be no basis for continued references to questions about the validity of (or even the existence of) adequate supporting data on which our interpretations and conclusions were based.

On 11 June 1980, a memorandum written by Trauger but signed by Richard N. Smith, Associate Director - Research, FWS, concluded (Dodd, 1982):

"Based on the report of the Review Panel, insufficient information is available on the Illinois Mud Turtle to justify listing it as a threatened or endangered species by the U.S. Fish and Wildlife Service at this time. There is a need to

conduct further research to clarify the complex taxonomic relationship and to estimate the total population of this subspecies. The Illinois Mud Turtle is considerably more abundant and widely distributed than previously thought. Local and private efforts should be encouraged to promote its conservation and to protect its habitat. The Panel favored this strategy as the one most likely to succeed."

Following this memorandum, the Director of the USFWS withdrew the final rule which had been held up pending a decision. The notice withdrawing the Illinois mud turtle from consideration as a candidate for endangered status was published in August 1980, over the objection of OES.

DISCUSSION AND CONCLUSIONS

Dodd (1982) suggested that Monsanto's opposition to the listing might have been automatic stemming from a belief that environmental regulations are a luxury in a society facing economic problems. We do not believe this to be the case. Monsanto was prepared not to oppose the listing had the results of the studies suggested federal protection was warranted. Based upon the results of the studies, however, in combination with the protection the turtle and its habitat were already receiving, they honestly did not believe that federal protection was necessary. They felt, with good cause, that the information that they had gathered was not being seriously considered or given fair treatment, particularly as compared to the Brown and Moll (1979) status report.

We fail to see the basis for Dodd's (1982) statement that "Almost the entire controversy focused on one particular area. Big Sand Mound, and indeed, only on 20% of Big Sand Mound." The major finding of the study that most affected the listing was that the turtle was much more widespread and abundant than formerly believed--it had not largely disappeared from its former range (Bickham et al., 1984). This finding was based upon surveys of selected sites within appropriate habitats over a three-state area, not just the results of ecology studies at Big Sand Mound.

These critical surveys were supported only by Monsanto, but this fact in no way slights IIGE and state activities involving protection of the turtle, as stated by Dodd (1982). The activities of IIGE and the states (and Monsanto) are, in fact, the keystone to the idea that, although threatened, the mud turtle is already well protected and is without dire need for assistance from the federal government.

Dodd (1982) next turned to the question of professional ethics in the controversy, noting that "Data misrepresentation, omission, or overstatement has no place in scientific circles", and that the peer review system is designed to insure "accuracy and competence of data and its interpretation." He went on to state that all publications used by USFWS had been submitted to peer review and published by reputable journals prior to the OES decision in 1980 to proceed with the listing.

He then noted that all reports opposing the listing, "admittedly with LGL's qualifications concerning data analysis" were severely criticized by the majority of the reviewers and only one paper had been submitted and accepted for publication. What was omitted here, is that the critical reviews in question appear to be those which related to the incomplete draft report of January 1980, and that the initial publication referenced (Houseal et al., 1982) presents the results of the taxonomic studies--the most criticized aspect of the program based upon the initial reviews of the incomplete draft report. The implication is that most of the LGL findings were of dubious quality and not of a publishable nature. At present, the key findings concerning the distribution and range of the turtle are published (Bickham et al., 1984), as are the results of the predator removal program (Christiansen and Galloway, 1984) and a note on reproduction in the species (Christiansen et al., 1984). Papers on natural history and behavior (Christiansen et al., in press) and population estimates are in press (Gazey and Staley, in press). The validity of the key results of the program have been, and are continuing to be established via their publication in reputable scientific journals. We also submit that the Panel Review in 1980 represented a rigorous peer review.

The responsibility of a scientist regarding subsequent use of published information was an issue raised by Dodd (1982). He stated "...extreme care must be used whenever one's name is on a report or paper to insure that the contents are not misused, as was done with Springer and Galloway (1979)." The responsibility of a scientist, when doing any research, is to produce the most accurate data possible and to interpret those data in an unbiased manner. The final report was a document that was purchased by the contractor, and the contractor has a right to decide how the document will be used. To suggest that an author is somehow responsible for the use to which his published work is put is ludicrous. Further, we dispute Dodd's (1982) implication that Monsanto "misused" the report. Dr. Dodd was an employee of a highly visible government agency (OES) and should have understood that lobbying is one way our political system works. Such activity should not surprise government employees or the public.

Dodd stated that Monsanto's implication of a National Academy of Science endorsement of the USFWS Review Panel is unethical. Given that the review panel was selected by the USFWS from a list of scientists judged to be qualified to evaluate the studies which was provided by the National Academy of Science, we do not agree with Dodd's assessment. This appears to be a case of hair-splitting.

Dodd (1982) claimed that the USFWS stalled the listing, focusing on the false issue of taxonomy. It should be noted that the taxonomy issue was a relatively minor one until results of the initial review solicited by Dodd focused on this aspect in such a critical way. For example, one of the reviewers claimed to have been "shocked" that we had dismissed the subspecies without any presented data and that it was becoming increasingly clear to him that we had set out in the beginning to sink the taxon in our own best interest. Dodd (1983) stated that the subspecific status of the Illinois mud turtle was undisputed until Houseal et al.

(1982) questioned its taxonomic validity. This is clearly untrue because Brown and Moll (1979) suggested the form may be a distinct species in the original status report, as we pointed out earlier in this paper. Thus, the issue of distinctness of the turtle was raised prior to the Monsanto studies.

Further, Dodd (1983) stated "There is considerable controversy over the suitability and interpretation of the statistical techniques used by Houseal et al. (1982) and it appears unlikely that the taxonomic question will be settled in the near future." He does not cite the source of the controversy but we first became aware of technical criticisms by John B. Iverson at the Public Meeting in Iowa. It is pointless to debate such issues here but the statistical methodologies employed by Houseal et al. (1982) have been used numerous times in the literature and, indeed, the UPGMA cluster analysis is a standard method used in most multivariate analyses of geographic variation. OES funded an independent study (Berry and Berry, 1984) that repeated our study and found almost precisely what Houseal et al. (1982) found--the taxon *K. f. spooneri* was invalid.

The real issue stemming from this example concerns the question of how much must be known before proposing a species as endangered and whether affected parties have the right to conduct studies challenging endangered classifications when these appear to be based upon scanty data. Such studies should be welcomed by agencies charged with making a determination. Further, if studies are conducted, who should evaluate conflicting findings--those making the proposal or a qualified third party? Additionally, at what point is federal protection required if local and state protection is being provided, and who should make this decision? In some cases, the decision regarding the need for federal protection is clear (e.g., California condor); but others are not (e.g., Illinois mud turtle). Although painfully derived, perhaps the procedure of an independent third party review in controversial cases represents a good approach.

Dodd (1982) stated that the proposal was withdrawn because of intense political controversy. We disagree, believing that the USFWS withdrew the listing because of their stated reasons which were biological in nature and took into consideration the protection the turtle was being provided at the state and local level. The "political" aspects of the controversy were only directed towards gaining the opportunity to be heard and to be fairly evaluated. All other doors to the OES were closed.

The mud turtle is actively protected by state and local organizations and all that can be done within reason is being done or contemplated. It is not presently in need of federal protection. Should the existing state and local commitments to its protection change, it once again, and rightfully, can be considered for federal protection. In the Illinois mud turtle controversy, no human may have benefitted but the turtle certainly did. It gained a national versus regional exposure, and its status will be closely monitored.

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