

SERIES No. Three

Volume # 80.01, Part III

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An Ecological Study of the Bog Turtle
Clemmys muhlenbergii, Schoepff, (Reptilia,
Testudines, Emydidae) in New Jersey, Part III

Submitted as Part of a Research Contract
Between the
New Jersey Department of Environmental Protection
Endangered and Nongame Species Project,
Federal - Aid Program
and
Herpetological Associates

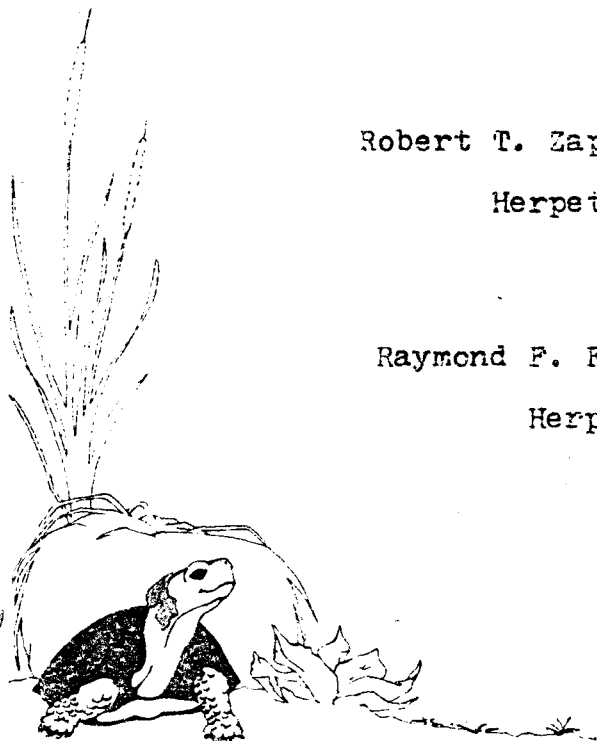
Submitted January 31, 1980

by

Robert T. Zappalorti, Executive Director
Herpetological Associates

and

Raymond F. Farrell, Research Associate
Herpetological Associates



DEDICATION

*The authors and staff of Herpetological
Associates wish to dedicate this progress
report to the memory of our dear lost friend*

RICHARD J. HOLUB, (1945 - 1977)

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of the sites are listed in Volume 10, Parts 1, 2, 3 and 4 under the county by county survey maps and locality data. Volume 10 is classified information and may only be viewed by qualified persons.

The data presented in these papers are only progress reports and should not be considered complete works. As new observations are made, or as additional supportive data is gathered, the information will be incorporated into future reports and conclusions will ultimately be drawn.



Figure # 1, The bog turtle, *Clemmys muhlenbergii*, one of the six endangered herptiles of New Jersey. Photograph by R.T. Zappalorti.

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Acknowledgements

This herpetological project is an ongoing one which began in 1977 up to the present date, and we are truly grateful to the New Jersey Department of Environmental Protection, Division of Fish, Game and Wildlife, Endangered and Nongame Species Project and the Federal - Aid Program under the 1973 Endangered Species Act for their continued confidence in Herpetological Associates and the funding for this important research. Special thanks goes out to Paul D. McLain and JoAnn Frier of the Endangered Species Projects for all their help.

Throughout this project many individuals who are associated with various state and federal agencies have cooperated with HA staff and the authors in a variety of ways. Professional herpetologist from the tri-state area have also been helpful. In particular, we would like to thank Dr. Roger Conant who graciously supplied much data on locality records from his personal files as well as those from the Philadelphia Zoo and various museums. We are also indebted to Mr. Raymond Stein, Chairman of the Department of Science at the Trenton State Museum for providing museum records, specimen jars and a copy of his data on the herptiles of the Delaware Water Gap. Messrs. Ken Gosner and Irving Black from the Newark Museum provided locality data on various herptiles.

Several persons from the U. S. Department of the Interior, Fish and Wildlife Service have also been cooperative in some ways. Most notably was Charles J. Kulp, Thomas H. Hupf and Clifford Day from the Absecon office in Atlantic County, New Jersey. Permits were issued to HA staff to conduct our studies on Federal Park lands in New Jersey as well and we thank Mr. Albert A. Hawkins, Superintendent of the Delaware Water Gap for his cooperation. Thanks is also extended to Mr. Jack L. Fillio,

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Refuge Manager of the Great Swamp National Wildlife Refuge in Morris County, New Jersey for providing collecting permits onto the area to conduct field work.

Mr. David Smart, biologist with the United States Soil Conservation Service, Somerset County, New Jersey, provided several volumes of county soil survey maps which have been extremely helpful in our work; especially in our habitat descriptions and comparative studies of critical habitats throughout the state. We extend special thanks to Morton Cooper of the Ocean County Environmental Agency for all the locality records on pine barrens treefrogs.

Many other persons were helpful in a variety of ways and it would be impossible to thank them here. Nevertheless, we are grateful for the cooperation and help of all those persons who were not specifically thanked in this acknowledgement.

Herpetological Associates Staff:

Had it not been for our many colleagues and their expertise, this project would not have been as successful as it has. HA staff has contributed their time and talents to various aspects of the project and did so generously, with little compensation other than the knowledge that they are aiding in the protection of the creatures which we all are interested in. Some are professional, others amateur. All are dedicated and involved in one phase or another in the study of herpetology. They donate their time, skill and expertise to this ongoing project which we all feel is highly worthwhile. They collected specimens and made locality surveys of critical habitats in order to evaluate lands. Others conducted various research projects and gathered important data on temperatures and behaviors. We are grateful for all their help and support. These persons are:

Scientific Advisors

<u>Name and Affiliation</u>	<u>Area of Responsibility</u>
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J. Kevin Bowler, Curator, Philadelphia Zoo, Pennsylvania	Scientific Advisor All species
Professor Otto A. Heck Trenton State College, Trenton, New Jersey	Scientific Advisor All species

Senior Advisors

Raymond Farrell, N.Y.H.S.	Turtles All species
Ernst G. Hofmann, N.Y.H.S.	Lizards and Snakes All species
Dave Hulmes, N.Y.H.S.	Amphibians All species

Research Associates

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James Bockowski, H.A.	Field Surveys All species
Robert L. Brandner, Bronx Zoo N.Y.H.S.	Field Research Sea turtles and all species
Bill Callaghan, N.Y.H.S.	Field Surveys All species
James Danch, Deputy C.O.	Law Enforcement All species

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Research Associates -- (cont'd.)

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Robert Fengya, N.Y.H.S.	Field Surveys All species
Dennis W. Herman, Atlanta Zoo Atlanta, Georgia - Southern Correspondent	Field Research All species
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Edward Johnson, Staten Island Zoo N.Y.H.S.	Field Research All species
Joe Kahn, N.Y.H.S. and N.Y.T.T.S.	Field Surveys All species
Helena Laugsten, Staten Island Zoo N.Y.H.S.	Field Surveys All species
Ziggy Leszczynski, Staff Photographer	Field Research All species
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Gregory Stelnick H.A.	Field Surveys Turtles

VII

Research Associates --- (cont'd.)

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Lou Zanelli, N.Y.H.S.	Field Research Turtles

We are grateful to all the above fellow staff members who have contributed to this project and helped make these reports possible.

Respectfully submitted,

Robert T. Zappalorti,
Executive Director

and

Raymond F. Farrell,
Research Associate

HERPETOLOGICAL ASSOCIATES

HA Report # 80.01

The Ecology of the Bog Turtle, Clemmys
muhlenbergii, Schoepff, (Reptilia, Testudines,
Emydidae) in New Jersey, Part III

Abstract

An ecological study of the bog turtle was begun in New Jersey in the spring of 1977. Populations were located in sphagnum bogs and marshy meadows at various localities and an intensive study was initiated at "study bog" No. one in Sussex County. A total of 64 bog turtles were marked and data was gathered on reproduction and movements within home-range. The study was continued in 1978 and 4 new bog turtle colonies were discovered throughout Monmouth and Sussex Counties. A total of 173 bog turtles were captured or observed in New Jersey during the 1978 field season. Of these, 52 were recaptures which had been marked by HA staff in previous years of the study. Continuation of the investigation in the 1979 season produced additional data on the ecology of this secretive species and 8 new colonies were found which were previously unknown. Three in Sussex County, 2 in Monmouth County, 1 in Hunterdon County, 1 in Somerset County and 1 in Warren County. Ecological studies were continued in "study bog" one (Sussex County) and in "study bog" two (Monmouth County), and has resulted in a high frequency of recaptured marked turtles. This provided information on population structure, breeding habits, growth, activity, sex ratio, movements within home-range and hibernation data. No bog turtles were found at any of the historic sites visited and several were destroyed in Bergen County and one was destroyed in Monmouth County. We feel the status of endangered is correct.

Introduction:

Intensive field studies and research began in the spring of 1977 and was continued in 1978. The results of the two year study can be seen in Parts I and II, which were submitted to the N.J.D.E.P. in 1978 and 1979. The reader is referred to these for a full account of the history, general morphology, breeding habits and other behaviors as well as the results of our mark-recapture research in Sussex and Monmouth Counties; Zappalorti and Zanelli, (1978).

The work conducted in 1979 added much new data to our files and produced the finding of 8 new colonies during our county by county surveys. HA observation sheets which had been distributed to all State and Federal Agencies as well as universities, museums and zoos, produced a few of these locations. These were reported by reliable sources. Field checks will be made in 1980 to update the current status of the population and evaluate their habitat. HA staff discovered a new colony on state land in Sussex County. This area also supports wood turtles, Clemmys insculpta with a large population living in the stream; 12 individuals were marked.

Objectives in 1979:

As outlined in our agreement with the Endangered and Non-game Species Project, HA's main objective was to continue our ecological studies and to seek new populations on both state and privately owned lands. Additional information was gathered on specific habitat requirements and important habitat components. Reproductive behavioral studies were continued and 51 eggs were gathered of which 37 were hatched in the laboratory. All were released back into the wild at the bogs where the eggs or adult females were taken; Zappalorti, Farrell and Zanelli, (1979).

Methods and Materials:

The same basic methods and materials were used in 1979 as were used in previous years of this study. The reader is referred to Part I of this report for a full description of these. A sample data sheet has been provided on page 3-A. All data was recorded in our note books and later transferred to HA data sheets in the laboratory. New specimens found were marked with a file and full measurements were taken. After all pertinent information was logged, the specimens were released at their exact point of capture. Gravid females were held in the laboratory and additional hard data was recorded on egg and clutch size as well as hatchling information. U.S.G.S. topographic maps, U.S.D.A. soil survey maps and Hagstrom County Road maps were used for the county by county surveys.

Results of 1979 Research

As stated above, various reliable sources contributed data on exact locations where new bog turtles had been found. Completed HA observation sheets were turned in and this data was analyzed and evaluated as to how accurate it may be, and follow-up checks were made when the data was doubtful. The new colonies are listed below by county and source of data.

Table # 1 - New Bog Turtle Locations 1979

County	No. of turtles found	Data Source
Hunterdon *	1 specimen	F. Carlson, N.J.D.E.P.
Hunterdon	1 specimen	D. Martin, HA data
Monmouth *	17 specimens	B. Doyle, R. Farrell, R. Zappalorti
Monmouth *	30 specimens	B. Doyle, R. Farrell, R. Zappalorti
Monmouth *	8 specimens	R. Farrell, R. Zappalorti, et al

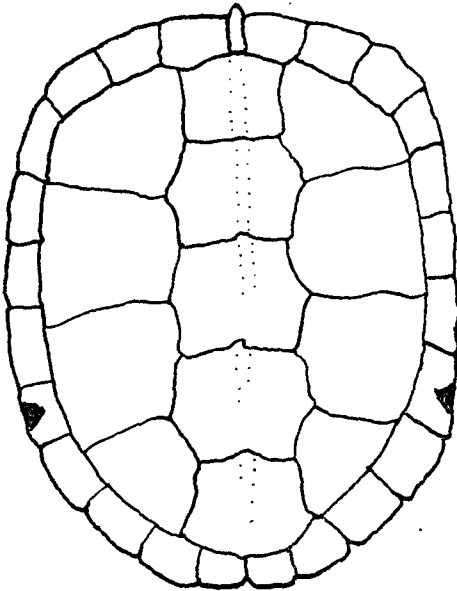
(sample)

Bog Turtle Research Data Sheet
Herpetological Associates, Inc.

Turtle No. 77.24 Marginal No. 8.8 Locality Study Bog #1 Sex ♀
Sussex County

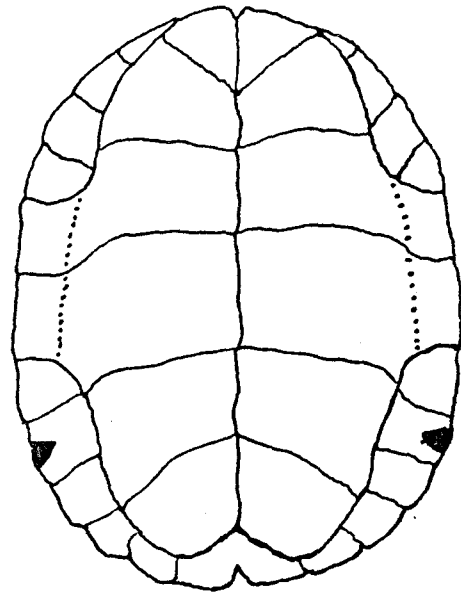
State: <u>New Jersey</u>	Initial Capture	1st Recapture	2nd Recapture	3rd Recapture	4th Recapture
Date <u>Date:</u>	<u>May 24, 1977</u>	<u>June 13, 1978</u>	<u>July 30, 1978</u>		
Time <u>Time:</u>	<u>12:40 hrs.</u>	<u>12:40 hrs.</u>	<u>13:50 hrs.</u>		
Cloacal Temp.	<u>26.1 °c</u>	<u>17.1 °c</u>	<u>21.2 °c</u>		
Water or Sub- strate Temp.	<u>27.4 °c</u> ^{H₂O}	<u>18.4 °c</u> ^{H₂O}	<u>25.2 °c</u> ^{H₂O}		
Air Temp.	<u>29.1 °c</u>	<u>18.0 °c</u>	<u>21.2 °c</u>		
Weight in Grams	<u>88.9 gm</u>	<u>100.8 gm</u> (gravid)	<u>93.1 gm</u> without eggs		
Plastron Length	<u>70.0 mm</u>	<u>70.5 mm</u>	<u>—</u>		
Plastron Width	<u>40.9 mm</u>	<u>41.0 mm</u>	<u>—</u>		
Right Abdominal Scute Length	<u>L: 8.3 mm</u> <u>W: 11.0 mm</u>	<u>L: 15.5 mm</u> <u>W: 24.6 mm</u>	<u>—</u> <u>—</u>		
No. of Annuli	<u>~ 9</u>	<u>~ 10</u>	<u>—</u>		
Approximate Age	<u>~ 16 years</u>	<u>~ 17</u>	<u>—</u>		
Carapace Length	<u>80.6 mm</u>	<u>80.8 mm</u>	<u>—</u>		
Carapace Width	<u>56.6 mm</u>	<u>56.7 mm</u>	<u>—</u>		
Shell Height	<u>39.4 mm</u>	<u>39.7 mm</u>	<u>—</u>		
Where Turtle Was Found	<u>Main rivulet of nesting area, under SKUNK cab.</u>	<u>Between Willow and Red-Maple Area's</u>	<u>Willow/Alder Area 120', 8' S.E. Stan. #5</u>		
What Turtle Was Doing When Found	<u>Basking in shallow water</u>	<u>Submerged in muddy water "Probed"</u>	<u>Basking attempted to dig into mud.</u>		
Distance Moved in Meters	<u>?</u>	<u>~ 200 meters east near Red Cedar tree.</u>	<u>~ 150 cm south next to rivulet</u>		
Collector	<u>J.W.B.</u>	<u>E.M.Z.</u>	<u>E.M.Z.</u>		
Weather conditions :	<u>hot and overcast</u>	<u>warm and sunny</u>	<u>hot, sunny breezy</u>		
Relative Humidity:	<u>85%</u>	<u>83%</u>	<u>61%</u>		

Marginal number and shell abnormalities
of Clemmys muhlenbergi



Carapace

8.8



Plastron

Is shell worn smooth?: Yes ~ 9 annuli visible.

Parasites and injuries: None apparent

Food analysis: _____

Structure of habitat: _____

Is specimen gravid? Yes Date eggs laid _____ No. of eggs laid _____

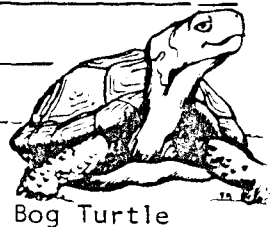
Size of eggs: (mean) Length _____ Width _____ Weight _____

Incubation period _____ (mean) Date of hatching _____

Size of hatchlings:

Plastron	Length _____
Plastron	Width _____
Weight _____	(mean)

Other notes of interest: _____



Bog Turtle

Table # 1 - New Bog Turtle Locations 1979
(cont'd.)

County	No. of turtles found	Data Source
Somerset *	2 specimens	W. Jones, Somerset Co. Parks
Gloucester	2 specimens	R. Grant, Phil. Academy Science
Sussex	1 specimen	R. Eriksen, N.J.D.E.P.
Sussex *	3 specimens	P. Danch, R. Fenyga, HA
Warren	2 specimens	R. Stein, Trenton Museum

Note: * = Area was field checked by HA staff.

The specific locations of the new sites are listed in HA Report # 79.10, Part 1 - A. This data can only be viewed by qualified persons.

Field surveys were conducted in several other counties as well and some highly potential habitats were observed but, no bog turtles were found. Therefore, these areas are not listed. Most notably was the intensive surveys made in Passaic, Middlesex and Morris Counties, New Jersey in 1979; Zappalorti HA data.

Sussex County Progress Report

Hibernation Data:

Our study population in Sussex County was searched on a steady basis throughout the entire year. Frequent wintertime checks were made to monitor individual bog turtles in hibernation. The important data gathered has given HA a better understanding of the habitat requirements of the study population and the specific requirements which they need for successful hibernation. Each site that produced a hibernating turtle

was assigned a number, i.e. hibernaculum # 1 etc., while most hibernaculums produced single specimens a few were used by more than one individual. The most found at a hibernation site was 5 turtles of which there was 1 sub-adult ⁰, 3 juveniles and 1 hatchling (this was at hibernaculum # 2). Another hibernation site produced 4 adult individuals. These were 2 males and 2 females (hibernaculum # 1). Two other sites had 2 specimens hibernating together and 8 other specimens were found hibernating by themselves. The total number of individuals found hibernating was 21. Several of these were recaptured at the same hibernaculum two years in a row and one female (marginal no. 3.11), was recaptured at the same hibernaculum three consecutive years, and always in the same spot. The hibernaculum is always situated in a subterraneous rivulet or seepage area where the water continuously flows due to underground springs. The study bog is riddled with small streams which all flow in a south-westerly direction. In certain portions of the bog there are areas which are dominated with sphagnum moss. Growing through the sphagnum are young red maple trees and swamp alder. The deeper streams have cattail and sedge growing along with some skunk cabbage, swamp rose and cinnamon fern. The hibernaculum is located right under a small red maple tree and a larger swamp alder bush. The alder's roots pass downward into the mud below the rivulet and the tussock which the plant grows from is covered with a thick mat of green sphagnum moss. It is believed that the moss acts as an insulator and the continuously flowing spring water prevents the turtle from freezing. We have taken temperature data on the turtle throughout the entire winter. The cloacal temperatures taken during hibernation is presented on the following page. Zappalorti and Zanelli, HA hard data, (1977 - 1979).

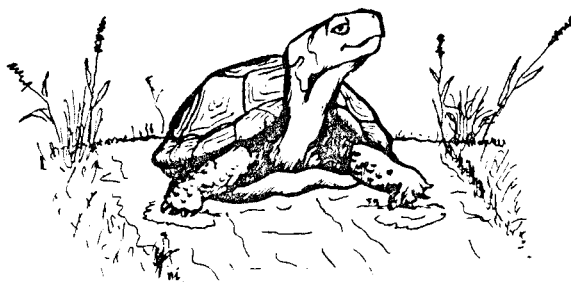


Table # 2 - Hibernation Data on # 3.11

Date of Capture	Time of Capture	Cloacal Temp.	Substrate Temp.	Air Temp.
11-05-77	12:55 hrs	12.0°C	12.0°C	14.2°C
10-15-78	15:31 hrs.	11.2°C	12.0°C	8.0°C
10-20-78	15:00 hrs.	11.8°C	9.2°C	16.6°C
10-29-78	15:18 hrs.	9.0°C	8.8°C	17.0°C
11-05-78	14:50 hrs.	7.8°C	8.4°C	9.0°C
01-28-79	11:50 hrs.	1.4°C	2.0°C	-3.0°C
10-06-79	13:00 hrs.	15.1°C	19.5°C	14.5°C
10-13-79	13:20 hrs.	10.8°C	10.1°C	15.2°C
10-21-79	12:45 hrs.	12.3°C	11.8°C	21.1°C
11-24-79	15:20 hrs.	9.6°C	8.8°C	16.2°C
01-13-80	14:15 hrs.	2.0°C	1.6°C	0.0°C

The specimen was recaptured 11 times while in hibernation. It was almost always found under moving water in mud, lying next to the roots of the alder bush. In addition, the specimen was captured 7 times at various points in the bog during the spring and summer. The farthest she was captured from the hibernaculum was about 55 meters east. She always returned to the same place for hibernation.

Table # 3 - Temperature Range of # 3.11

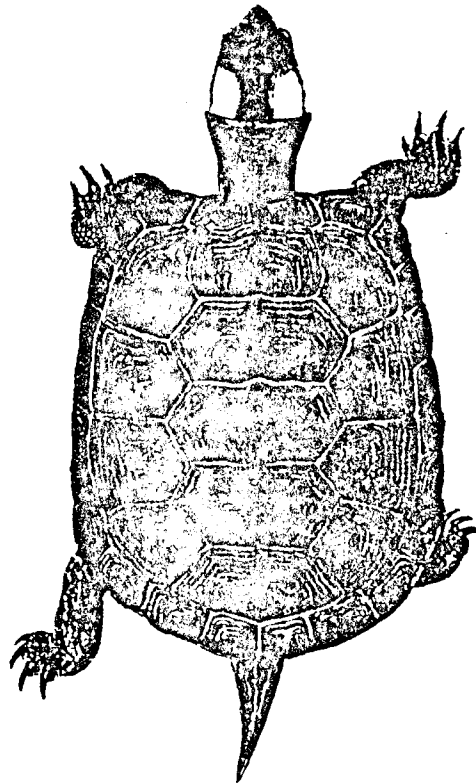
Temperatures	Lowest	Highest	Mean
cloacal	1.4°C	15.1°C	9.3°C
substrate	1.6°C	19.5°C	9.4°C
air	-3.0	21.1°C	11.7°C

Note: These temperatures represent those taken only while the specimen was in hibernation and inactive.

Aside from the hibernation data collected during the winter months, field work was conducted during the spring and summer and additional information was taken on movements, growth and reproduction. Three gravid females were found in June, but these were not taken from the field. Most of our ecological work was conducted in Monmouth County in 1979.

Additional Records in Sussex County:

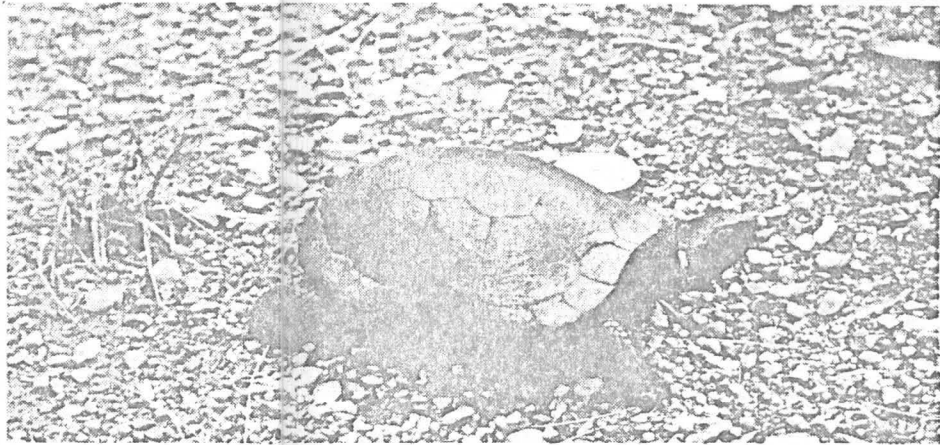
Fred Space captured an adult female near his farm in Beemerville, New Jersey. This is a location which was already known by the authors and the location was shown to us by the late Richard Holub, pers. comm. (1976). The data was reported to N.J.D.E.P. in HA Report #78.01, Part I of the exact locations. See newspaper clipping on page 8.



Top view of female bog turtle, Clemmys muhlenbergii.
Drawing by Harold L. Babcock, from Field Guide to
New England Turtles.

1979

Sunday Herald - Sussex County



RARE AND SELDOM-SEEN — Muhlenberg's (or Bog) Turtle was captured, photographed and released recently by Fred Space, of Space Farms Zoo and Museum in Sussex. The four-inch diameter, orange-eared creature is on the "endangered species list." Note the half-dollar for size perspective of this full-grown female turtle.

Bog turtle discovered near Space Farms

SUSSEX — An extremely rare member of the "endangered species list," the Muhlenberg's (or Bog) Turtle was recently captured, photographed and released here.

The Turtle, a female, was caught by Fred Space near Space Farms Zoo and Museum, on acres reserved by the Space family for wild creatures that inhabit the area.

As a boy, Space, now 49, often caught these unique four-inch in diameter creatures for pets. He never realized the orange-eared turtles would someday be threatened with extinction.

An activist in preservation and conservation, Space lectures and teaches at the zoo and in school visits about the sanctity of the wildlife of America.

The Muhlenberg's Turtle once inhabited

large marsh areas in the northeast United States, but due to reshaping of natural lands for agricultural purposes, like in the Pine Island area; or dredging and damming lakes for residential and recreational uses, the Turtle has nearly become extinct.

Lake Mohawk, Culver Lake, Holiday Lakes — and many others — were natural habitats for the tiny creature. Now, only a few locations (in southeast Pennsylvania, a small area of Sussex County, and near the Montezuma Wildlife Refuge in northwest New York State) still harbor the 'endangered specie.'

"Someday this Turtle may disappear entirely from the earth, 'unless' some precautions are taken to preserve its habitat," Fred Space warns.

*Bog Turtle
Progress Report
Monmouth County*

INTRODUCTION :

Hard data was combined for 1978 and 1979 in Monmouth County. Specimens were collected at 6 different bogs from April through September and 81 bog turtles were captured or observed over the two year period.

REPRODUCTION DATA:

Gravid females were captured in the field and held in the laboratory until they laid eggs. A total of 27 clutches were hatched out of which 3 were found in the field, the others were laid in holding tanks in the lab. The results of these experiments is presented below.

TABLE # 4- COMBINED EGG DATA 1978/1979

EGG DATA					
<u>Number of Clutches</u>		<u>Total Number of Eggs</u>		<u>Number of Eggs per Clutch</u>	
27		82		Mean 3.0	Range 2 — 5
<u>Length of Eggs</u>		<u>Width of Eggs</u>		<u>Weight of Eggs</u>	
<u>Mean</u>	<u>Range</u>	<u>Mean</u>	<u>Range</u>	<u>Mean</u>	<u>Range</u>
29.6mm	25.7 — 36.5mm	15.3mm	13.3 — 18.6mm	4.2grams	3.3 — 6.5grams

three clutches were found in field.

INCUBATION DATA:

Each egg-clutch was placed in a one gallon, wide mouthed jar that contained about 8cm of vermiculite and water. The jars were kept at about 26.0 C, and hatched from 48 to 58 days.

TABLE # 5- PERCENTAGE OF EGGS HATCHED

INCUBATION DATA 1978/1979		
	Number of Eggs	Percentage of Eggs Hatches
Infertile	19	23%
Died during Incubation	3	4%
Hatched	60	73%
	82	100%
INCUBATION PERIOD		
	Mean 55 Days	Range 48 — 58 Days

TABLE # 6- MEASUREMENTS OF HATCHLINGS

DATA ON HATCHLINGS		
	Mean	Range
Weight	3.1 grams	2.2 — 4.7 grams
Plastron Length	18.7mm	15.2 — 23.0mm
Plastron Width	10.6mm	9.2 — 13.3mm
Carapace Length	23.1mm	19.6 — 28.4mm
Carapace Width	17.6mm	12.2 — 24.8mm
Shell Height	11.1mm	9.8 — 13.3mm

FREQUENCY OF CAPTURES & ACTIVITIES:

During our preliminary field surveys of Monmouth County, several historic locations were field checked, Conant & Bailey, (1936), Anderson, et al. (1976). Although the habitat still looked suitable, no bog turtles were found. However, Bud Doyle, a member of HA staff discovered a new colony in Wall Township which proved to be a major find, Doyle, pers. comm. (1978). Additional searches in this bog produced a high number of captures throughout our 2 year field study, Zappalorti, Farrell & Zanelli, (1979). Various flood plains were searched throughout the area and other small colonies were found in Monmouth County. A total of 6 separate bog turtle populations were found. The exact locations of these are listed in HA Report # 79.10, which was submitted on December 13, 1979, Zappalorti, (1979). The number of turtles found in each bog, along with frequency of captures by month is presented below.

TABLE # 7- STUDY BOGS & MONTHLY ACTIVITIES

MONTHLY ACTIVITY BY STUDY AREA								
1978/1979								
Study Areas	Turtles Found	%	April	May	June	July	Aug.	Sept.
Buds Bog	38	48%	1	16	8	5	6	2
Park Bog	19	24%	—	8	10	1	—	—
Wildlife Bog	18	21%	—	5	4	4	4	1
Reservoir Bog	2	2%	—	2	—	—	—	—
Tennis Bog	2	2%	—	1	—	—	—	1
Freehold Bog	2	2%	—	1	—	—	—	1
Total	81	100%	1	33	22	10	10	5

Our hard data has shown a trend towards peak activity periods in close correlation with the time of day and month. Bog turtles break hibernation around mid-April and become highly active in May, Zappalorti, (1976). The turtles are easy to find because the plant growth is very low in the spring. As the vegetation grows higher, the turtles are much harder to find because the vision of the collector is obscured. In summer they are seldom active during the hottest part of the day.

TABLE # 8- FREQUENCY OF CAPTURE

FREQUENCY OF CAPTURE BY MONTH AND HOUR								
Time	April	May	June	July	Aug.	Sept.	Total	%
7-7:59	0	0	0	1	1	0	2	3%
8-8:59	0	5	3	2	1	0	11	14%
9-9:59	0	2	7	2	1	0	12	15%
10-10:59	0	14	3	3	0	1	21	26%
11-11:59	1	4	1	1	5	1	13	17%
12-12:59	0	2	5	0	2	0	9	11%
13-13:59	0	2	0	0	0	2	4	5%
14-14:59	0	3	0	0	0	0	3	4%
15-15:59	0	0	0	0	0	1	1	-
16-16:59	0	0	2	1	0	0	3	4%
17-17:59	0	1	1	0	0	0	2	2%
Totals	1	33	22	10	10	5	81	
	1%	41%	28%	13%	13%	4%		100%

TABLE # 9- ACTIVITY WITHIN HABITAT

BEHAVIOR AND HABITAT PREFERENCE 1978/1979		
	Number of Turtles	Percent of Population
Crossing dry land	5	6%
Submerged in mud	6	7%
In Burrow, below surface	5	6%
Basking at entrance of burrow	1	1%
Basking on mud, sedge, sphagnum	43	49%
In rivulet, walking or foraging	27	31%
	87	100%

TABLE # 12- WEIGHT BREAKDOWN OF SAMPLE

**WEIGHT BREAKDOWN OF STUDY POPULATION
1978/1979**

	Number of Turtles	Weight In Grams	
		Mean	Range
Juvenile	1	25.3	
Subadult male	4	84.2	77.4 — 91.2
Subadult female	5	91.1	82.5 — 103.5
Adult male	12	110.4	96.0 — 137.4
Adult female	25	117.6	97.0 — 142.6

SUMMARY & CONCLUSION:

HA study bog in Sussex County continues to be the largest known bog turtle colony known to science in New Jersey. However, it is on privately owned land and could be lost due to habitat destruction or pollution from various encroachments by man. HA strongly recommends that the N.J.D.E.P. buys at least 50 acres of this land and set it aside as a bog turtle sanctuary.

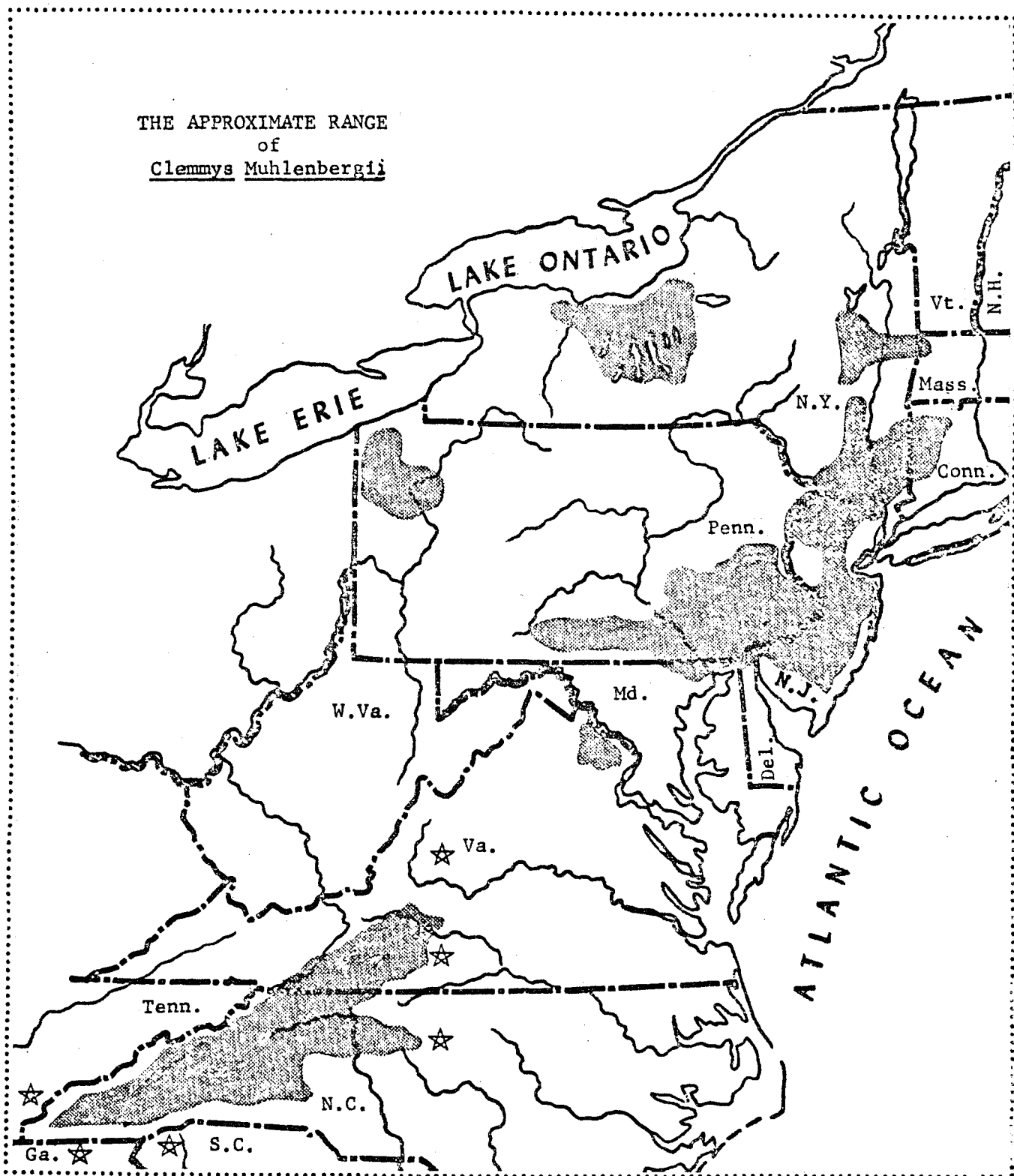
The Monmouth County bogs are small populations scattered throughout the various flood plains, some of which are on State lands and others on private holdings. Pollution from insecticides and fertilizers may have long term adverse impacts on the food chain and the ecosystem within the flood plains. Additional field surveys are needed throughout Monmouth County to determine the most critical habitats which support large colonies of bog turtles. These areas can be evaluated and private holdings which are important habitats can be considered for purchase by the State.

Increase of toxic chemicals into the environment may have serious impacts on the water quality, and the flora and fauna which depends on pure, clean water for their survival. N.J.D.E.P. must monitor the various rivers and streams throughout the State to insure that endangered species habitats are not lost due to pollution.

MAN-HOURS SPENT ON PROJECT:

HA staff spent a total of 650 man hours on the bog turtle research in 1979. This includes field surveys, habitat evaluations, searching for new colonies, rechecking old known sites, collecting specimens, laboratory work refining hard data and the writing of this report. The combined distance traveled by all HA staff was over 3000 miles. The cost of gasoline has risen considerably and additional funding is needed for traveling in 1980.

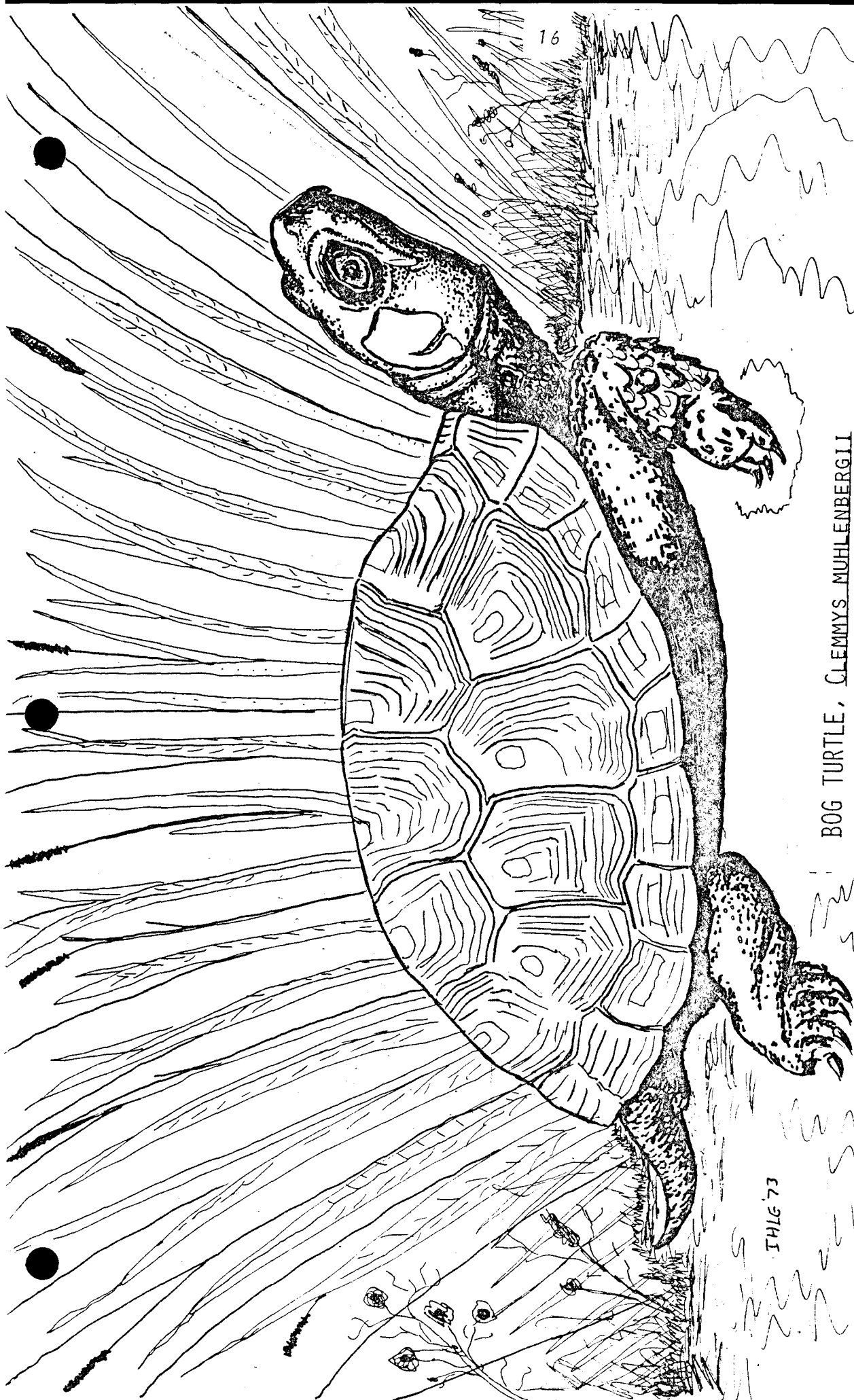
THE APPROXIMATE RANGE
of
Clemmys Muhlenbergii



☆ = possible location

Map by Ernst Hofman
and Florence Bramley

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BOG TURTLE, CLEMMYS MUHLENBERGII

JHLG '73

Note: Drawing is double that of the actual size of a real bog turtle.

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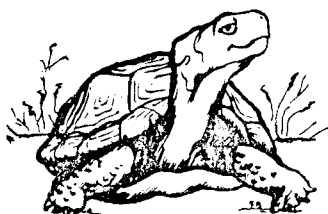
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