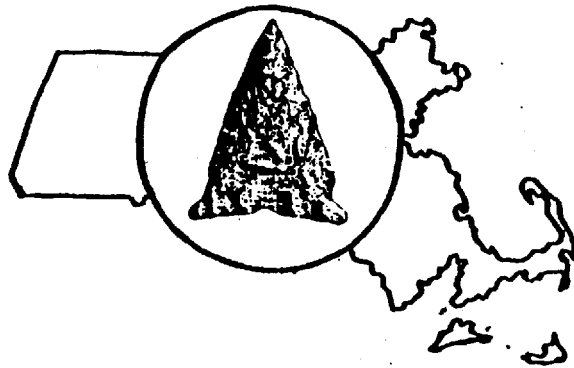


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FROM CEDAR SWAMP, WESTBOROUGH,
WORCESTER COUNTY, MASSACHUSETTS

ANDERS G.J. RHODIN



W. Elmer Ekblaw Chapter
WORCESTER, MASSACHUSETTS

MASSACHUSETTS ARCHAEOLOGICAL SOCIETY

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ANDERS G.J. RHODIN
MUSEUM OF COMPARATIVE ZOOLOGY, HARVARD UNIVERSITY

As part of the on-going investigation into the prehistoric remains found at Cedar Swamp in Westborough, Worcester County, Massachusetts, this paper provides an analysis of the turtle bones excavated to date by the W. Elmer Ekblaw Chapter of the Massachusetts Archeological Society under the auspices of the Westborough Historical Commission. Several Cedar Swamp archaeological sites have previously been described by Hoffman (1984, 1985) and Warfield (1986). Briefly, they represent an approximately 900 to 3200 year old Late Archaic to Middle Woodland habitation on a small bluff in the center of Cedar Swamp at the headwaters of the Sudbury River in the Concord River drainage basin.

To date, primarily the Cedar Swamp-3 site has yielded turtle bone, with a few fragments also coming from the Cedar Swamp-2 and Cedar Swamp-4 sites. The approximate total weight of animal bone fragments recorded thus far from Cedar Swamp-3 is about 78.2 gm., and of this total about 17.9 gm. (23%) is turtle bone (Warfield, 1986).

Using comparative skeletal materials from both the Herpetology Department at the Museum of Comparative Zoology at Harvard University and my own reference collection, I have identified the turtle bone fragments.

The total assemblage of turtle remains thus far recorded from Cedar Swamp consists of 211 fragments of bone. Of these, 209 are from the Cedar Swamp-3 site, one from the Cedar Swamp-2 site, and one from the Cedar Swamp-4 site. Nearly all the fragments are calcined bone less than 1.0 cm. in size, with most being less than 5 mm. Of the 211 fragments, only 34 (16.1%) are identifiable to species. The low percentage of identifiable fragments is directly attributable to the very small size and relatively poor condition of the remains. In an analysis of Concord Shell Heap, a much better preserved site with larger fragments, Rhodin and Largy (In Prep.) were able to identify about 45% of about 700 fragments. However, Huntington and Shaw (1982) were only able to identify about 5% of their 1017 turtle fragments from the Flagg Swamp Rockshelter.

Of the 211 turtle fragments recovered, 153 (72.5%) are from two Cedar Swamp-3 features, #6 and #12 (see Table 1). The two features are shallow red earth features probably representing middens (Warfield, 1986). Feature 6 has been dated at 970 +/- 70 B.P.; no dates are available on Feature 12. Within these two features, 118 fragments (77.2%) came from the red earth feature soil, and only 20 (13%) from topsoil or non-feature subsoil. The other 15 (9.8%) are from mixed feature and nonfeature subsoils. Overall, within the excavated quadrants (one meter squares) of Cedar Swamp-3 site, 136 fragments (65.7%) are from the red earth feature subsoil, 35 (16.9%) from topsoil or nonfeature subsoil, and 36 (17.4%) from mixed feature and nonfeature subsoils.

Most of the turtle bone was found in what have been iden-

tified as probable midden deposits. Of the 184 fragments recovered from features that have been identified by Warfield (1986), 175 (95.1%) are from shallow red earth features identified as middens, with only 9 (4.9%) from deep red earth pits which may have been storage areas (Warfield, 1986).

The 34 identifiable fragments of turtle bone from the Cedar Swamp sites represent six different species of turtle: *Chrysemys picta* (painted turtle), *Clemmys guttata* (spotted turtle), *Chelydra serpentina* (snapping turtle), *Terrapene carolina* (box turtle), *Sternotherus odoratus* (musk turtle), and *Clemmys insculpta* (wood turtle) (see Table 2).

The most common turtle species found at the Cedar Swamp sites is the painted turtle (*Chrysemys picta*), represented by 14 fragments. Eastern Massachusetts is a zone of partial intergradation between the eastern painted turtle (*C. picta picta*) and the midland painted turtle (*C. picta marginata*). It is impossible to tell from the fragments represented which of the two subspecies was present at Cedar Swamp. The painted turtle is a small aquatic species averaging 5 to 6 inches in carapace length. It is an abundant, highly gregarious species, often seen basking in great numbers on logs and rocks. In Massachusetts, it is active from about April to October, and does not estivate during the warm summer months.

The second most common turtle species is the snapping turtle (*Chelydra picta*), represented by 14 fragment. Of the turtle species recorded at Cedar Swamp, it is the largest, with individuals reaching 12 to 15 inches in carapace length. It is a highly aquatic species which does not bask, but can often be found close to shore in mud shallows. Large individuals can weigh from 30 to 50 pounds and yield a good quantity of delicious meat which is still consumed in our society today. It is active from April to October, and is often found wandering on land during nesting season in June.

The third most common turtle species is the spotted turtle (*Clemmys guttata*) represented by five fragments. The spotted turtle is a small species, averaging 4 to 5 inches in carapace length. It is a relatively common and often locally abundant turtle, usually found in cranberry bogs and other shallow ponds and marshes with extensive vegetation. In Massachusetts, it is active from about March to October, usually with a period of inactive estivation during the warmest summer months. It emerges earlier in the spring than the painted turtle, and is often replaced by the painted turtle in the same habitat during late spring and early summer as the temperatures rise. Of the 5 fragments of spotted turtle bone found, two are interesting enough to warrant further comment. The first fragment is from Cedar Swamp-3 Feature 5/9, quadrant S99W29 layer B2. It is a left hypoplastron fragment from the medial posterior corner of the bone which shows the impression of the medial anterior corner of the overlying femoral scute, where four distinct peripheral growth zones can be seen, in addition to the suture between the femoral and abdominal scutes. Of these four growth zones, the most recent one is ca. 1 1/2 to 2 times as wide as each of the three preceding ones. This means that the turtle had grown more rapidly in its most recent growing season, and also that the animal had probably been caught at the very end of this very active growing season. This can mean that it was either caught late in the fall just before hibernation, or

early in the spring, just before starting a new growth zone. It is unlikely that it was captured in the middle of the summer, as one would then expect to see a growth zone of a much lesser width. Due to the fact that spotted turtles are most easily captured in the early spring when they emerge from hibernation, it appears most likely that this animal was captured in about March or April. The second fragment is from Cedar Swamp-2 surface material. This is a nearly identical fragment of hypoplastron showing five growth zones with the latest one wider than the others, indicating the same type of seasonality implied by the first fragment.

Two species of turtle at Cedar Swamp are represented by three fragments each. The first of these is the box turtle (*Terrapene carolina*). In Massachusetts the subspecies is the eastern box turtle (*T. carolina carolina*), and is here at the extreme northern limit of its range. It is a moderately common, though solitary, small terrestrial species, averaging 4 to 6 inches in carapace length. It typically occupies woodlands and fields, but can also be found in marshes and swamps. It tends to emerge from hibernation somewhat late in the spring, usually after painted turtles in April, and often partially estivates during hot periods in the summer.

The second turtle species represented by three fragments is the musk turtle (*Sternotherus odoratus*). It is a common, small aquatic species, averaging 3 to 4 inches in carapace length. It is the smallest turtle found at Cedar Swamp, with very little edible meat. It is also known as the stinkpot turtle and exudes an extremely foul smelling musk when handled. It is active from about April to October and is most easily encountered in marshes or shallow still bodies of water with extensive aquatic vegetation.

The last turtle species found at Cedar Swamp is the wood turtle (*Clemmys insculpta*), represented by a single fragment found on the surface (in the backdirt of a woodchuck burrow) of Cedar Swamp-4. The wood turtle is a moderately common, solitary, medium sized terrestrial species, averaging about 6 to 8 inches in carapace length. Its habitat is similar to the box turtle, and it is active from about April to October.

The percentage composition of the Cedar Swamp turtle fauna is recorded in Table 3 and compared to two other inland eastern Massachusetts prehistoric turtle assemblages. All three of these archaeological sites are within the Concord River drainage basin. The eight species listed compose essentially the entire present freshwater and terrestrial turtle fauna of Massachusetts. Only two other species could potentially be included: the coastal estuarine diamondback terrapin (*Malaclemys terrapin*) which is presently confined to a few isolated localities on Cape Cod, and the freshwater bog turtle (*Clemmys muhlenbergi*) which is extremely rare and exists only in one small disjunct population in western Massachusetts. Two species found at Concord Shell Heap have not yet been recorded from Cedar Swamp: the redbelly turtle (*Pseudemys rebriventris*) and the Blanding's turtle (*Emydoidea blandingi*). Both of these species are rare or uncommon with limited, disjunct distributions in New England, and have only infrequently been recorded from local prehistoric sites (Rhodin and Largy, 1984, in Prep.; French, In Press).

Of particular note in comparing the three turtle assem-

blages are the relative percentages of painted (*Chrysemas picta*) vs. spotted (*Clemmys guttata*) turtles. Because of the habits of these two species, it sometimes becomes possible to infer patterns of seasonal site usage based on their relative frequencies in Massachusetts prehistoric faunal assemblages. Within a given natural habitat where the two species are locally microsympatric (i.e. occur together), spotted turtles are extremely common and easily captured in the early spring from March to about May, and then become increasingly difficult to locate as they begin to estivate for the warm summer months. During the same time intervals, painted turtles are scarcer in the early spring months when spotted turtles are abundant, and then become increasingly common as the weather warms and remain active and conspicuous during the summer while most spotted have disappeared into estivation. By comparing the percentages of painted vs. spotted turtles in an assemblage it may be possible to predict whether the site was utilized in the early spring or mid-summer.

For example, the Flagg Swamp Rockshelter in Marlboro was a winter habitation site subsequently abandoned for the summer (Huntington, 1982). Of the turtle fragments identified by Huntington and Shaw (1982), 74% represent spotted and only 20% painted. This supports the conclusion that Flagg Swamp was a winter site where the inhabitants probably began collecting spotted turtles in the early spring as soon as they began to emerge in March, but probably stopped collecting and moved to a summer habitation site before painted turtles became more common in the later spring months.

In contrast, the Concord Shell Heap Site has 38% painted turtles and only 1% spotted. This would suggest that the site was probably primarily a summer habitation, not occupied until the late spring when the weather was warm enough to cause most of the spotted turtles to disappear into estivation. Alternatively, it is also possible that the site was also used in the early spring, but that no suitable spotted turtle habitat was found in the area. This hypothesis would appear less likely since spotted turtles are presently relatively common in the Concord area.

The percentages for Cedar Swamp are intermediate between those for Flagg Swamp and Concord Shell Heap. Painted turtles accounted for 41% and spotted turtles 15%. This may suggest that the site was neither exclusively a winter to early spring habitation nor strictly a summer site. Instead, the percentages support the probability that Cedar Swamp was an all-year habitation, where spotted turtles were collected in the early spring months and then primarily painted turtles in the later spring and summer months. The two spotted turtle plastron fragments found with visible growth zones support the probability that spotted turtles were being collected at the site during the early spring months. The higher percentage of painted turtles support the probability that the site was also being actively used during the summer months. These findings support Warfield's (1986) conclusion that Cedar Swamp was a relatively permanent habitation, where the inhabitants had created a structured site with a complete social group subsisting on a wide local resource base.

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TABLE ONE

PROVENIENCE OF TURTLE BONE FRAGMENTS FROM CEDAR SWAMP SITES

FEATURE #	TYPE & AGE	# FRAGS/FEAT.	QUAD. & LEVEL	# FRAGS/QUAD.
CS-3:2	DEEP PIT 2200+/-85 B.P.	1	S100E02:B2	1
CS-3:3	SHALLOW MIDDEN	3	S89E10:B1 S89E10:B2	1 2
CS-3:4	SHALLOW MIDDEN	15	S100W18:A3 S100W18:B2 S99W19:B2 S100W19:A3 S100W19:B2	1 1 1 2 10
CS-3:5/9	DEEP PIT 2130+/-70 B.P.	8	S99W29:B2 S100W28:B1 S100W29:A3	1 5 2
CS-3:6	SHALLOW MIDDEN 970+/-70 B.P.	82	S107W29:B2 S107W30:A3 S107W30:B1 S107W30:B2 S108W29:B2	35 15 1 30 1
CS-3:12	SHALLOW MIDDEN	71	S98E11:B S99E11:B S99E11:B1 S99E11:B2	12 2 4 53
CS-3:15	SHALLOW PIT	11	S69W20:A3 S69W20:B2	1 10
CS-3:20	SHALLOW MIDDEN	3	S109W39	3
CS-3:21	SHALLOW MIDDEN	1	S89W19	1
CS-3:22	SHALLOW MIDDEN	2	S69W40:B2	2
CS-3:24	SHALLOW PIT	4	S119W39:A3 S119W39:B1 S119W39:B2	2 1 1
CS-3:Nf	NON-FEATURES	8	S89W09 S89W49 S119W00 SURFACE	3 2 1 2
CS-2:Nf		1	SURFACE	1
CS-4:Nf	ANIMAL BURROW	1	SURFACE	1

1
SEE WARFIELD (1986) FOR DESCRIPTION OF FEATURES AND QUADRANTS
A3=TOPSOIL; B1=NORMAL SUBSOIL; B2=RED EARTH FEATURE SUBSOIL;
B=INDISTINCT SUBSOIL; NF=NON-FEATURE.

TABLE 2
IDENTIFIED TURTLE BONE FRAGMENTS FROM CEDAR SWAMP SITE

<u>SPECIES</u>	<u>FEATURE</u>	<u>QUADRANT</u>	<u>ELEMENT</u>
<u>CHRYSEMYS PICTA</u> (painted turtle)	CS3-NF	S119W0	plastron margin
	"	S89W49	left hyoplastron
	CS3-4	S100W19-B	costal
	CS3-6	S107W29-B2	right hypoplastron
	"	"	marginal
	"	"	left epiplastron
	"	S107W30-A3	marginal
	"	S107W30-B2	costal
	"	"	seventh neural
	"	"	marginal
	"	"	right epiplastron
	"	"	marginal
	CS3-12	S98E11	xiphiplastron
	CS3-15	S69W20-B2	entoplastron
	<u>CHELYDRA SERPENTINA</u> (snapping turtle)	CS3-NF	SURFACE
"		"	marginal
CS3-4		S100W19-B	left maxilla
"		"	left postorbital
CS3-12		S99E11-B2	marginal
"		"	scapula
CS3-15		S69W20-B2	costal
"	S69W20-A3	costal	
<u>CLEMMYS GUTTATA</u> (spotted turtle)	CS2-NF	SURFACE	hypoplastron
	CS3-5/9	S99W29-B2	left hypoplastron
	CS3-6	S107W30-A3	left third marginal
	CS3-12	S99E11-B2	right first costal
	"	"	right seventh marginal
<u>TERRAPENE CAROLINA</u> (box turtle)	CS3-6	S107W29-B2	left second costal
	CS3-12	S98E11	xiphiplastron
	"	S99E11-B2	epiplastron
<u>STERNOTHERUS ODORATUS</u> (musk turtle)	CS3-6	S107W29-B2	right seventh marginal
	"	S107W30-B2	right second marginal
	CS3-12	S99E11-B2	right fifth costal
<u>CLEMMYS INSCULPTA</u> (wood turtle)	CS4-NF	SURFACE	left hyoplastron

TABLE 3
 NUMBER OF IDENTIFIABLE FRAGMENTS AND PERCENTAGE COMPOSITION OF
 PREHISTORIC INLAND EASTERN MASSACHUSETTS TURTLE ASSEMBLAGES

SPECIES	Cedar Swamp		Flagg Swamp		Concord Shellheap	
	N	%	N	%	N	%
CHRYSEMYS PICTA (painted)	14	41	10	20	118	38
CLEMMYS GUTTATA (spotted)	5	15	36	74	4	1
CHELYDRA SERPENTINA (snapper)	8	23	0	0	13	4
TERRAPENE CAROLINA (box)	3	9	1	2	35	12
STERNOTHERUS ODORATUS (musk)	3	9	0	0	60	20
CLEMMYS INSCULPTA (wood)	1	3	2	4	5	2
PSEUDEMYMYS RUBRIVENTRIS (redbelly)	0	0	0	0	56	21
EMYDOIDEA BLANDINGI (Blanding's)	0	0	0	0	7	2
TOTALS	34	100	49	100	307	100

¹ Calculated from Huntington and Shaw (1982)

² Rhodin and Lary (in preparation)