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FAUNAL AND FLORAL MATERIAL FROM A KANSAS CITY HOPEWELL SITE: ANALYSIS AND INTERPRETATION

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Three centers of Hopewell development are extant in the Midwest: in Ohio, along the Illinois River valley, and in the Kansas City region. Hopewell, as a religious phenomenon, has long been known in Ohio and the Illinois River valley, but little is understood of it as a cultural entity (Shetrone, 1920, 1924, 1926; Cole and Deuel, 1937). Most of the major excavations in Hopewell sites during the first half of this century were in burial mounds containing numerous graves and quantities of "exotic" grave goods (items traded into and not native to the area). The complex trade network developed to maintain the supply of alien goods has been termed by Stuart Struever (1964), "The Hopewell Interaction Sphere." However, during the last 20 years, excavations of village sites, particularly in the Illinois River valley (McGregor, 1952, 1957, 1958; Struever, 1962, 1968), have recovered data on the more mundane life of the Hopewell people. Although no synthesis of Hopewell culture in either Ohio or Illinois has been published, several articles on various aspects of the culture, especially on subsistence and economy, are in print (Hill, 1966; Struever, 1968; Asch *et al.*, 1972) or in press (Hill). These reports describe the Hopewell as a Middle Woodland group dependent on hunting and gathering techniques plus supplemental horticulture for subsistence. Their economic situation was, in turn, reflected in their settlement pattern, their utilization of river valley resources, their tools, and a variety of other archaeologically derivable patterns.

The complex termed Kansas City Hopewell has been the most recent Hopewell manifestation to be investigated, and the history of archaeological research into this florescence has been somewhat the

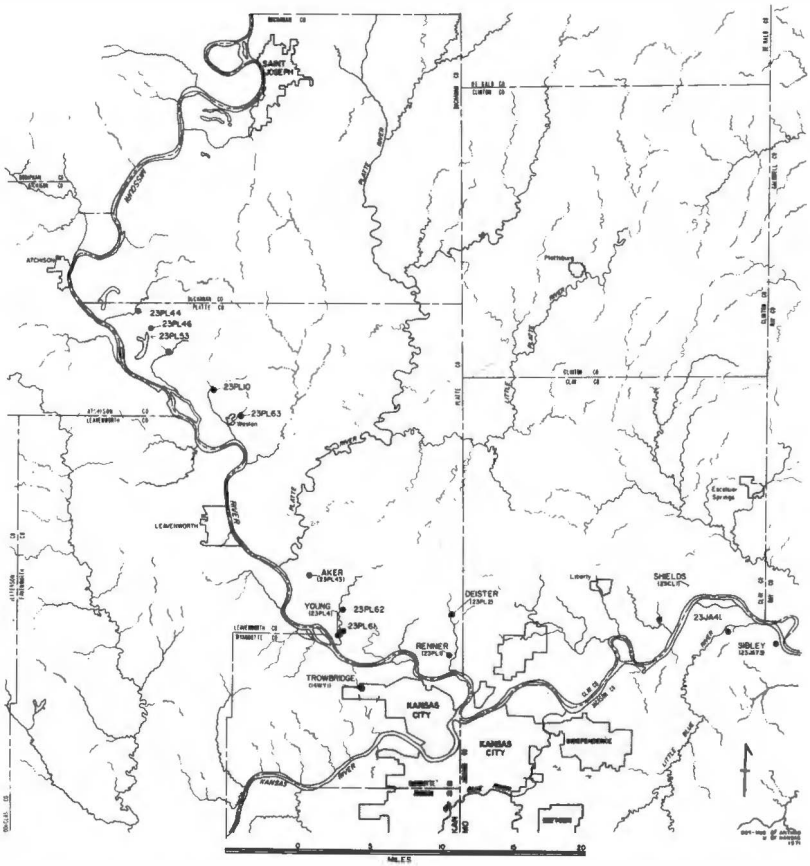

FIG. 1.—Map showing location of Kansas City Hopewell sites between Kansas City and St. Joseph.

reverse of that of the Ohio and Illinois Hopewell. Religious traits of the Kansas City Hopewell are little known due to vandals' destruction of the burial mounds in the area (Wedel, 1943). On the other hand, controlled excavations of village sites by archaeologists have been conducted since the 1930's (Wedel, 1943). Known sites cluster around the junction of the Missouri and Kansas rivers, with extensions north to the Nebraska border along the Missouri River, and west to central Kansas along the Kansas River (Wedel, 1959:547). Most of the sites are located on tributary streams of the Missouri or Kansas rivers, or on the floodplains of these two rivers. Intensive research during the last 10 years by field parties from the Museum of Anthropology, University of Kansas, has made possible the formulation and testing

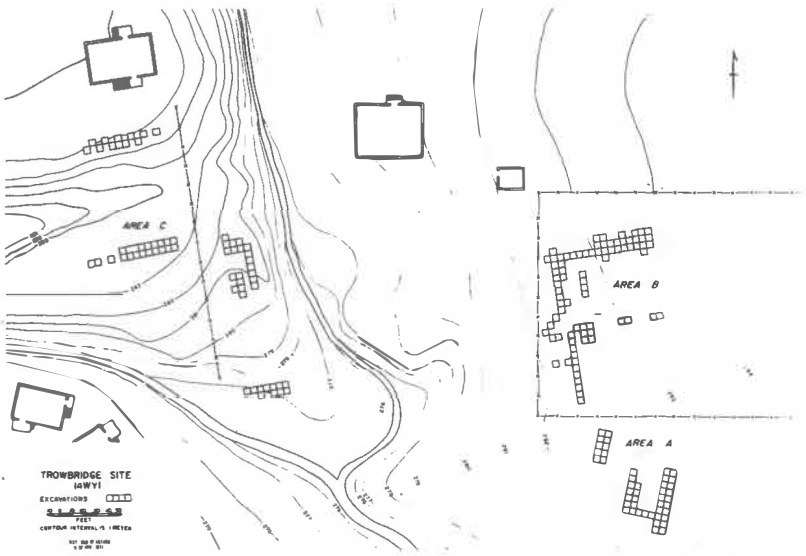

FIG. 2.—Map showing location and relationships of the three excavated areas of Trowbridge (14WY1).

of various hypotheses concerning Kansas City Hopewell, as well as an analysis leading to the establishment of a ceramic chronology.

One of the Kansas City Hopewell villages excavated within the last 10 years is the Trowbridge site (14WY1), located within the Brenner Heights housing tract of the Quindaro district of Kansas City, Kansas. On the Parkville Missouri-Kansas Quadrangle map (U.S.G.S., 7.5 series, 1964) the site is within the SW 1/4 of the SW 1/4 of Section 27, Township 10S, Range 24E. The site is situated on the bluffs at the junction of two intermittent creeks that drain into Brenner Heights Creek, which is a tributary of the Kansas River (see Fig. 1).

Because the ceramic temporal framework is just now being developed (A. E. Johnson, personal communication), the results are not available for this study. Without a chronology, either relative or absolute, the features must be considered together as a single unit of time, with neither an early nor a late period. When the temporal framework is established, the features can be placed in their proper time periods. Statements concerning the features, the material within the features, and the relationships between features then can be more specific and time oriented than is possible for this study.

The present research was directed at reconstruction of the subsistence system (that is, hunting, gathering, and horticulture patterns) and the local environment at the time of occupation at Trowbridge.

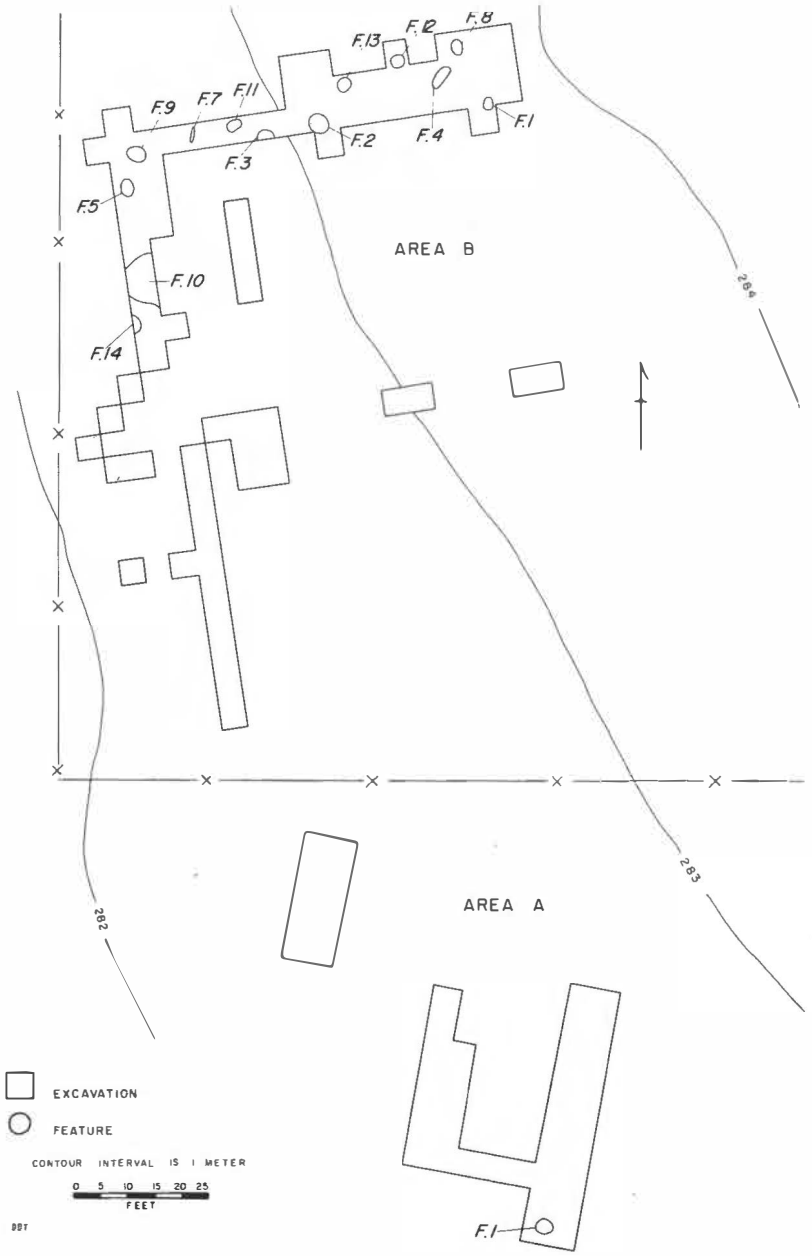

FIG. 3.—Map of Area A and B of Trowbridge (14WY1) showing location and relationships of analyzed features.

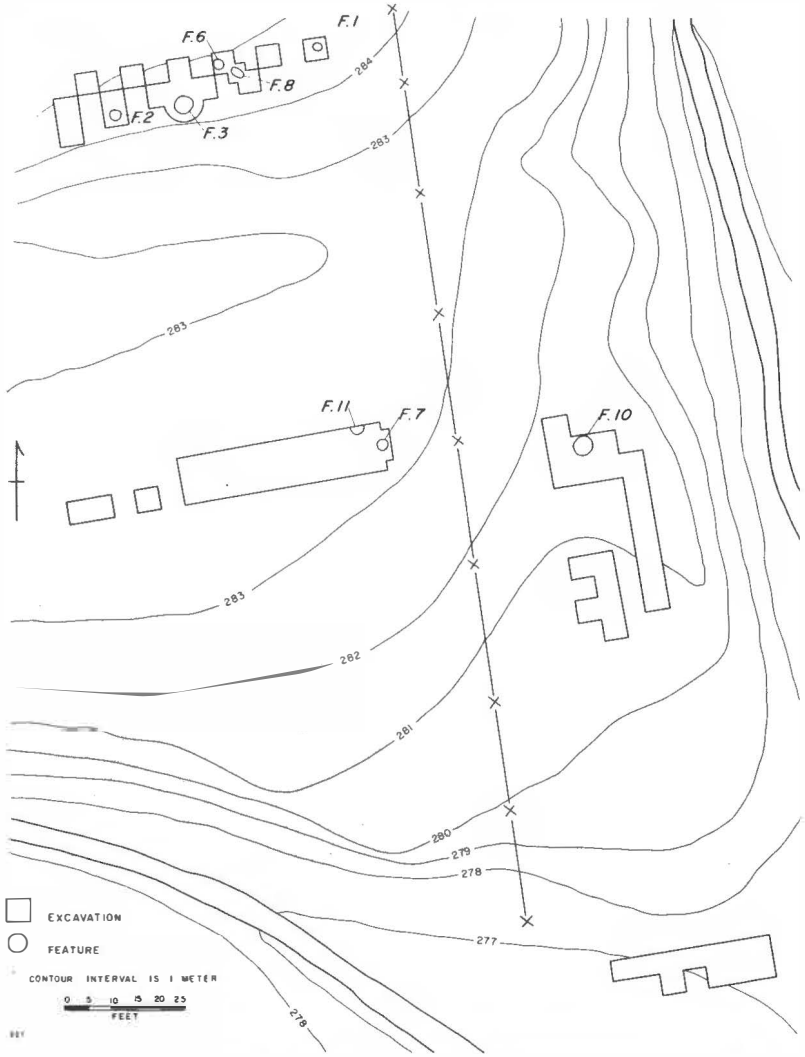

FIG. 4.—Map of Area C of Trowbridge (14WY1) showing location and relationships of analyzed features.

The extended time period covered by the analysis should be kept in mind. Statements concerning economy or ecology cannot, of necessity, be specific but must be generalizations. The materials treated in the analysis are floral and faunal remains from the features (see Figs. 2-4). The material recovered in no way represents the total amount of foodstuffs consumed. Complete excavation of the site, with total recovery, would improve the possibilities, but other factors, such as specialized

hunting or gathering camps away from the village may have been a part of the subsistence practices. Also, tradition occasionally may have governed the disposal of certain kinds of bones or animals (Guilday, 1970). However, based on materials recovered, the economic importance of various plants and animals can be determined; this should prove useful in creating hypotheses applicable to other Kansas City Hopewell sites. If patterns similar to those delineated at Trowbridge are represented at other sites, the reconstruction can be expanded and developed to give an overall view of Kansas City Hopewell subsistence patterns and of the local environment during Hopewell occupation.

One of the reasons for the analyses of the floral and faunal remains was the general assumption that there was an essentially unchanging local environment and economic pattern throughout Hopewell occupation. If the environment remains the same, there may be no impetus to change economic patterns. The Hopewell were primarily a hunting and gathering people who used horticultural products as a secondary source of food. If the environment had become more favorable for growing maize, horticulture may have increased in importance, or vice versa. However, this does not take into account cultural factors, such as food preferences, taboos, or the dissemination of ideas, which influence the subsistence system. Because the occupation is treated as a single unit, economic or environmental changes, if any, are not discernible. Rather, the Trowbridge economic pattern described is a generalized one. Statements concerning the environment also are generalizations. However, the possibility of change in the local environment from the Hopewell period to the modern day is explorable and will be investigated. Likewise, when working within a temporal framework, changes through time, if any, should be discernible.

VERTEBRATES

Mammals

Odocoileus sp.—Eight adult and four juvenile deer are represented in the Trowbridge material, based on distal ends of tibiae. One fawn is represented by a humerus and two vertebrae. Animals are considered adult if the epiphyseal plate of the bone is fused to the shaft, and juvenile, if the plate is unfused. Species identification is not definite because characteristic elements (complete skull or antler rack) were not recovered. The two species that inhabit North America today, *O. virginianus* (white-tailed deer) and *O. hemionus* (black-tailed or mule deer), have overlapping ranges in Kansas, although

their habitats differ. The postcranial skeleton is not generally considered diagnostic and identifications made without the skull must be based on range distribution alone. Although the area of the Trowbridge site is included within the present day range of *O. virginianus*, it may not have been a part of their range 1500 to 2000 years ago due to the fluctuating border of the plains and woodlands. Presently, the range of *O. hemionus* does not overlap that of *O. virginianus* in the Kansas City area, but is confined to western Kansas. However, in 1804 when Lewis and Clark were exploring the Missouri River, they described the general area of the Trowbridge site as prairie and reported bison close to the juncture of the Missouri and Kansas rivers (Quaife, 1916:89). Furthermore, Taylor (1956:347) reported that "in the early historic period the mule deer extended across the Great Plains to the edge of the woodland of the Missouri Valley." Today, the plains are far to the west and the area of northeast Kansas is well wooded. If the plains extended to the Missouri (and beyond) in 1804, the range of *O. hemionus* also probably extended to the Missouri (Taylor, 1956), as this is a plains-oriented animal in Kansas (Cockrum, 1952; Hall, 1955). *O. virginianus* may have been confined to the gallery forests along the Missouri (Anderson, 1964). During this time, then, the ranges of the two species may have overlapped, and both animals could have been available to the aborigines of the area. The proximity of the plains to the Trowbridge site during Hopewell occupation is not known, so the utilization of both species cannot be ruled out. Therefore, without diagnostic elements, the identification of this material can be made to genus only.

Deer are by far the most numerous animals represented at Trowbridge, accounting for 51.50 per cent of the identified remains. In all likelihood, a majority of unidentifiable bone scrap is also that of deer. Of the 13 deer recovered, one was found to be 16 months of age; one, 19 months to 2½ years; two, 2½; one, 2½ to 3½; and one, 3½ to 4½. Age was determined by tooth eruption and wear patterns as described by Severinghaus (1949). Black-tailed fawns are born in late June or early July, whereas white-tailed fawns are born in May or early June (Cahalane, 1958:25, 36). Therefore, deer from the Trowbridge site probably were born sometime between May and early July. The 16-month-old deer probably was killed sometime between September and November, whereas the individual 19 months to 2½ years old was killed between November and February. The other four were killed between November and January. From this evidence, Trowbridge was occupied at least from late summer or early autumn (September) through late winter (February).

However, this method of aging deer has been criticized as being only 50 per cent accurate (Keiss, 1969; Robinette *et al.*, 1957). Aging errors result from the "influence of . . . nutrition, type of forage, abrasives and individual variation upon tooth eruption and wear" (Robinette *et al.*, 1957:152). Newer methods, (Low and Cowan, 1963; Gilbert, 1966; Keiss, 1969), based on cementum deposition, have been developed since Severinghaus' (1949) study. This aging technique has not been used on the Trowbridge deer due to lack of time, funds, and necessary equipment.

The Trowbridge deer material was examined, using criteria established by Guilday *et al.* (1962), for evidence of butchering practices. These criteria are: 1) cut marks have to occur in similar places on identical elements; 2) there has to be an anatomical reason for marks to occur at a particular point (Guilday *et al.*, 1962:63). These two criteria governed the treatment of bone breakage also. Although all pelvises and ulnae show consistent bone breakage at strategic points, only 28 identified elements have cut marks.

Because of the small sample, the techniques used in completely butchering a deer are unknown. Although all skeletal elements are represented in the collection, the foreleg and hind leg sections composed two units that were dealt with in a standard manner. Elements of the foreleg showing evidence of butchering are the scapula, humerus, radius, and ulna. Three of the 18 scapulae are scored on the posterior border of the neck below the glenoid cavity (Fig. 5, cut 1); and one of the six proximal ends of humeri has a series of vertical cut lines along the head (Fig. 5, cut 2). Cut marks on the scapula and the proximal end of the humerus are a result of cutting through the triceps brachii to disarticulate the upper limb at the shoulder.

Five of the 20 distal ends of humeri are scored along the condyles and four of the 13 proximal ends of radii are scored along the anterior surface (Fig. 5, cuts 3, 4), as a result of severing the lateral ligament and the common and lateral extensor muscles. All 16 of the proximal ends of ulnae have the olecranon broken off (Fig. 5, cut 5). The cut marks along the distal end of the humerus and the proximal end of the radius, as well as the breakage of the proximal end of the ulna, are all involved with the disarticulation of the lower foreleg from the humerus at the elbow.

Evidence of butchering is seen on the hind leg of deer in patterns of cut marks and bone breakage of the pelvis, tibia, and astragalus. Both the ilium and the ischium of all 21 innominates are broken off (Fig. 5, cuts 6, 7), probably as the several muscles attached to the tuber coxae and the tuber ischii were severed (Frison, 1970:16). Cut 6 on the

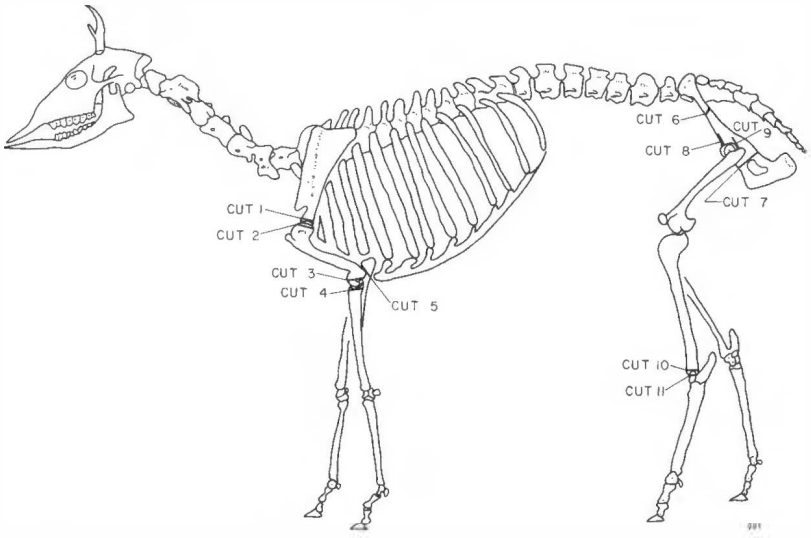

FIG. 5.—Diagramatic skeleton of a deer showing position of butchering marks (modified from Guilday *et al.*, 1962:73).

pelvis probably served two purposes, that of disarticulating the hind leg from the spinal column (Guilday *et al.*, 1962:74) and severing the muscle attached to the tuber coxae. Four of the innominates are scored along the ridges of the fossa for the origin of the rectus femora muscle (Fig. 5, cut 8). According to Guilday *et al.* (1962:74), "these were probably made when the hindquarter was being defleshed and not during the initial butchering." However, one of the four innominates also is scored around the acetabulum (Fig. 5, cut 9), severing the ligamentum teres to disarticulate the thigh from the pelvis.

Cut 10 across the malleoli of the distal end of the tibia (four of 25 examples) and cut 11 across the medial and lateral ridges of the astragalus (four of 15 examples) allowed the disarticulation of the tibia from the tarsals, severing the various associated tendons when removing the foot.

Essentially a standard pattern was followed in dealing with the fore and hindquarters of the deer at Trowbridge, although not necessarily in the following order. The foreleg was freed from the body at the shoulder joint (Fig. 5, cuts 1, 2). The forearm then was separated at the elbow (Fig. 5, cuts 3, 4, 5). The pelvis was split (Fig. 5, cuts 6, 7), detaching the hind leg from the spinal column and the body. In one instance, this was accomplished by cutting the hind leg from the hip joint (Fig. 5, cut 8). The hind leg was then dismembered at the hock.

Although there is no evidence for such, the knee joint probably was severed, similar to the cut through the elbow. The carpal joint of the foreleg may have been treated like that of the hind leg. Four meaty sections then were removed from the bones.

Techniques employed by the Hopewell people at the Trowbridge site for butchering the fore and hindquarters of deer are similar to those reported for the Hopewell at the Macoupin site in the Illinois valley (Hill, n.d.). The Macoupin Hopewell also separated the legs at the shoulder and hip joints, the elbow and knee joints, and at the wrist and ankle joints.

Cervus elaphus.—One adult elk is represented by a right posterior maxilla, a navicular, and two phalanges. No attempt has been made to age this individual, because the tooth replacement and wear technique for aging elk requires mandibles (Murie, 1951; Swanson, 1951; Quimby and Gaab, 1957), and the annuli-counting method is at present limited to incisors (Keiss, 1969).

Because of its wide range across the United States, a characteristic habitat for elk is difficult to define. Regional herds are adapted to local conditions, although elk generally are considered to be mountain and woodland oriented animals (Murie, 1951). Elk also are migratory, the Rocky Mountain elk (*C. e. nelsoni*) moving from the mountains to the plains in winter. According to Murie (1951), herds have been so large and widely distributed that the plains have been occupied also in the summer.

Canis familiaris.—One domestic dog is represented at Trowbridge, based on an incomplete skeleton. This animal was found lying on its right side in a flexed position in a pit. The articulated, but incomplete, skeleton shows no signs of butchering. The bones, disturbed by modern plowing, show many fresh breaks and are in poor condition. All that remains of the skull are two incomplete mandibles.

It is extremely difficult to separate postcranial elements of dogs, coyotes, and wolves, except for those of adult wolves, which are much larger than either coyotes or aboriginal dogs. The best distinguishing characteristics are those of the skull and teeth. Lawrence and Bossert (1967) attempted to discriminate between the three species based on a series of skull measurements and ratios. However, inasmuch as the skull of the Trowbridge dog was not recovered, identification was based on the lower first molar. On the basis of its small adult size, the specimen is not that of a wolf. Dogs and coyotes cannot be distinguished on the basis of size, but can be separated on the basis of tooth structure. According to Lawrence and Bossert (1967:47), the "M_1 [of dogs/and wolves] has the metaconid only moderately de-

veloped and . . . the hypoconid, the outer cusp of the heel, appears much better developed than the entoconid, . . . these are characters which help distinguish dog/wolf from coyote." On this basis, the lower first molar of the canid found at Trowbridge is that of a dog.

Illinois Hopewell groups are known to have had domestic dogs (Hill, n.d.), which compare in size to the one from Trowbridge. Available measurements of various bones of the skeleton of the Trowbridge specimen in millimeters are (left followed by right): length of tibia,—, 133.00; maximum transverse of proximal end of tibia, 26.50, 23.50; maximum anteroposterior of proximal end of tibia, 27.90, 27.20; length of femur, —, 132.00; length of ulnar notch, 13.10, —; diameter of humerus head, 31.00, —; maximum transverse diameter proximal end of humerus, 21.00, —. Schlotthauer and Janes (1952) developed a method for aging dogs based on rate of epiphyseal closure, but the technique is limited to juveniles. The epiphyses are closed on the Trowbridge dog and it can be aged only as being older than 10 months.

A radius, tibia, phalanx, and premolar in the collection are identified as *Canis* sp.

Urocyon cinereoargenteus.—One gray fox is represented by the presence of a left frontal and the anterior portion of a left maxilla. The skulls of red and gray foxes are quite distinct and easily identified. Also referable to this species are the proximal ends of a left ulna and radius.

Age classes based on wear patterns of upper first molar have been developed for the gray fox (Wood, 1958). Based on this method, the specimen was 15 to 26 months old. The gray fox prefers a woodland habitat, and is known to climb trees on occasion (Hall, 1955).

Procyon lotor.—Two raccoons are represented by left mandibles in the Trowbridge material. Based on wear pattern described by Schwartz and Schwartz (1959:237), one raccoon was one to two years old, the other, two to three. Because the age categories are so broad, nothing can be determined about month of capture. Raccoons inhabit woodland habitats, especially areas along streams, lakes, and springs (Schwartz and Schwartz, 1959).

Sylvilagus floridanus.—One eastern cottontail rabbit is represented by a tibia, left and right femurs, and one incisor. The rate of epiphyseal closure for the long bones, as well as certain dental attributes, have been used for age classification (Dice and Dice, 1941; Thomsen and Mortensen, 1946; Hale, 1949; Schwartz and Schwartz, 1959). The epiphyses of the various leg bones close at different times, probably varying within a month (Hale, 1949), so that while the

epiphyseal line is barely present on the tibia in the collection, the line has disappeared on the femurs. Because the line is almost nonexistent on the tibia, the rabbit is probably nine to 10 months old (Thomsen and Mortensen, 1946; Hale, 1949). Because this cottontail has an extended breeding season (Cahalane, 1958) the month or season of kill cannot be determined.

Eastern cottontails inhabit the ecotone or border area between the woodlands and open ground or bushy areas that provide adequate protection (Cahalane, 1958).

Castor canadensis.—The Trowbridge collection contains a radius, tibia, right and left ulna, and two incisors of one juvenile beaver. There is possibly a second animal if variations in epiphyseal closure are considered. Different bones in the same individual ossify at different rates. The two ulnas, with no epiphyseal line visible, and the one radius with an epiphyseal line visible, could be from the same adult animal, whereas, the tibia, with its completely unfused epiphysis may represent a second, younger beaver. However, because rates of epiphyseal closure for each bone within the beaver skeleton are unknown, no more than one beaver can be definitely assumed.

From the work of Robertson and Shadle (1954) with tibiae, the Trowbridge specimen appears to have been more than two, but less than three, years old. This is still a young beaver, because complete epiphyseal closure of the tibia occurs during the fourth year (Robertson and Shadle, 1954:203). Beaver, being aquatic animals, live in and around woodland rivers, creeks, and lakes.

Geomys bursarius.—Two palates (one complete, the other incomplete), one mandible and one molar of the plains pocket gopher are represented in the collection. All specimens recovered are from water-washed soil samples taken from various pits. Pocket gophers are among the animals listed by White (1953) as being large enough to be a food source for man; however, there is not enough evidence to determine the role of gophers in the food economy of the Trowbridge people. The animal probably lived at the site, but this does not preclude the possibility of its being eaten if caught. The plains pocket gopher prefers deep, moist soils of prairie grasslands (Schwartz and Schwartz, 1959:158).

Cf. *Perognathus hispidus.*—One juvenile hispid pocket mouse was identified on the basis of the anterior portion of a left mandible with incisor. Coyotes are known to prey on pocket mice, and dogs also may have fed on them (Cahalane 1958:438). This species probably lived at the site. Historically, the Hidatsa are known to have had trouble keeping mice out of their storage pits; when the problem in-

creased, storage pits were emptied, refilled with village midden, and new pits were dug (Wilson, 1917:95). The hispid pocket mouse favors open prairie, tunneling underground for a den (Hall, 1955:111). The specimen was recovered from a water-washed soil sample.

Cf. *Oryzomys palustris*.—An anterior section of a left mandible, with incisor, is referrable to the rice rat. Rice rats may have lived on or near the site, as they are found usually in areas of tall grass or with brushy cover. However, the preferred habitat seems to be marshes and wet meadows, where the many green plants that make up its diet grow in profusion (Cahalane, 1958:480). This specimen was recovered from a water-washed soil sample.

Neotoma floridana.—A left upper molar of an eastern woodrat was recovered from a soil sample. As in the case of some other small rodents, this species may have been a food source for man or dog. This rodent may not have lived at the site, inasmuch as it usually avoids areas of human habitation (Schwartz and Schwartz, 1959:201). Coyotes are known to hunt woodrats (Rainey, 1956:598), and it is not unlikely that aboriginal dogs also did. On the other hand, White (1953) listed this rodent ("packrat") in his table of animals large enough to be an important food source for man. The preferred habitat for the eastern woodrat in eastern Kansas is along limestone outcrops within woodlands; these provide protection from its many predators (Hall, 1955:140).

Sciurus niger.—Two mandible fragments and a molar of a fox squirrel are present in the Trowbridge material. All specimens were recovered from a water-washed soil sample. Although not listed by White (1953) as a food source, fox squirrels certainly fall within the size range of his small mammals, inasmuch as they weigh from 1 to 3 pounds (Schwartz and Schwartz, 1959:142). They probably were a food source. Oak-hickory woodlands are its preferred habitat in the northern and western part of its range (Cahalane, 1958:412).

Birds

Meleagris gallopavo.—The humeri of five wild turkeys are represented in the collection. The turkey appears to have been the principal bird hunted, because only one other bird appears in the collection. No migratory waterfowl are represented, although the Missouri River has long been a major flyway (Lincoln, 1939). Floodplain woodlands are the preferred habitat of the wild turkey (Johnston, 1965:19).

Bonasa umbellus.—Two ruffed grouse are represented by two left coracoids in the Trowbridge material. Ruffed grouse inhabit a pre-

dominately woodland environment, often in association with the wild turkey (Milne and Milne, 1969:105).

Reptiles

Cf. *Sternothaerus odoratus*.—A nuchal bone of the stinkpot turtle is present in the collection. The stinkpot turtle is generally a bottom dweller in quiet waters of slow-moving rivers and streams and in ponds. It avoids a temporary or fluctuating water supply (Smith, 1956:127; Carr, 1952:84).

Terrapene ornata.—Two ornate box turtles are represented by two nuchals. Additional remains include postcranial elements and carapace fragments. Illinois Hopewell people often modified the box turtle's carapace into a cup or bowl (Hill, n.d.), but no such artifacts were recovered at Trowbridge. Although principally an inhabitant of the prairie, it sometimes occurs in open woodlands (Pope, 1946:141).

Chrysemys sp.—Two sliders are represented by two incomplete plastrons and carapace fragments. The two species of *Chrysemys*, *scripta* (red-eared turtle) and *floridana* (Missouri slider), that inhabit Kansas, would be difficult to distinguish from the incomplete specimens in the Trowbridge collection. Although one species, *C. floridana*, does not occur today in the area, it is found in Miami County, 25 miles to the south, and may have occurred in the Kansas City locality 1500 years ago. *C. floridana* and *C. scripta* favor similar habitats of permanent bodies of quiet water, such as slow-moving rivers, lakes, and ponds, with muddy bottoms (Carr, 1952:310; Smith, 1956:151). Their geographic ranges overlap in eastern Kansas.

Graptemys sp.—The incomplete plastron of a map turtle was found. Also referrable to this genus are carapace fragments and the proximal end of a femur. Again, two species of *Graptemys*, *geographica* (map turtle) and *pseudogeographica* (false map turtle), range into eastern Kansas. The plastron is too incomplete for species identification. Habitat preferences are similar for the two species. They live in large bodies of permanent, quiet water, such as lakes and slow-moving rivers. Rivers with mud bottoms and dense vegetation along the banks are preferred (Smith, 1956:145).

Trionyx sp.—One softshell, represented by five plastron fragments, is present in the Trowbridge collection. Both *T. muticus* (smooth softshell) and *T. spinifer* (Western spiny softshell) occur in eastern Kansas, and distinction between the two was not possible with the fragments found. Both species prefer permanent bodies of water, either rivers or streams, with soft, sandy or muddy bottoms, free of rocks and gravel (Pope, 1946:319; Smith, 1956:161).

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ably the same as today, although the average temperature may have been slightly warmer (Smith, 1965).

The main animal contributors to the diet were deer, elk, catfish, and turkey. The principal portions of the deer which were utilized, based on butchering evidence, were the fore and hind legs. These were cut into four sections, ready for roasting and stewing. Too few plant remains were recovered to determine their dietary importance.

The site, according to time of animal capture and plant harvest, was occupied either from late spring through late winter or in late spring and again in the autumn through late winter. During this time, the inhabitants utilized five habitats found within the 10-mile distance from Trowbridge to the Missouri and Kansas rivers.

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amaranth may have grown on or near the site. The area surrounding the site was an ecotone of woodlands and open land. Deer, rabbit, and box turtles were present. Two possible habitats of a woodland environment are suggested by both faunal and floral remains. The two intergrading zones are the floodplain-valley floor and the uplands. Trees of the floodplain-valley floor would have been pawpaw, black walnut, pecan, bitternut hickory, other hickories, hazelnut, oaks, elms, maples, and willows. Grapes, ragweeds, bulrushes, and amaranths also grow in this habitat. Oxbow lakes among the floodplain forests could have supported stands of bulrushes with amaranths and willow trees growing along the edges. The fauna of this ecotype would have included deer, elk, gray fox, raccoon, beaver, squirrel, rice rat, turkey, and grouse. Various turtles, fish, and mussels, as well as beaver, would have been found in the rivers and streams. The oxbow lakes would also support various fish populations.

Data for Hopewell utilization of the uplands is limited. Trees of the uplands would have included black walnut, hazelnut, slippery elm, sugar maple, dwarf prairie willow, hickories, and oaks. Associated animals would have included deer, elk, gray fox, fox squirrel, woodrat, and snakes.

Five possible, varying microenvironments are represented by the faunal and floral remains at Trowbridge. The habitats include the cleared area around the site, the border area of the woodlands clearing, upland woods, floodplain-valley bottom forest, and the riverine area—the river, tributary streams and oxbow lakes. Although the Trowbridge inhabitants utilized each habitat, the intensity of utilization is unknown. Most of the Trowbridge fauna can occur in as many as four of the zones, and data on the floral material, especially the trees, are too generalized. Trowbridge today is within 10 miles of both the Missouri and the Kansas rivers. All of the animals killed; the plants, seeds, and nuts collected; and all of the possible five habitats utilized can be found within this 10-mile radius. The Hopewell people of Trowbridge probably utilized resources from both the Kansas and Missouri river valleys.

Summary

Floral and faunal remains from the Trowbridge site indicate a setting essentially the same as that of the Kansas City locality today. Further study of the occurrences and habitats of the three animals and one tree that have different ranges today is necessary before the significance of their presence in the collection can be determined. The environment and climate during the Hopewell occupation were prob-

TABLE 2.—*Continued.*

*Gastropods		
Gastrocopta armifera	15	22.03
Gastrocopta contracta	1	1.69
Heliocodiscus parallelus	21	35.59
Anguispira sp.	1	1.69
Hawaiia minuscula	7	11.86
Retinella electrina	1	1.69
Retinella sp.	2	3.38
Zonitoides arboreus	4	6.77
Striatura milium	2	3.38
Vallonia parvula	4	6.77
Vallonia sp.	1	1.69
Stenotrema hirsutum	1	1.69
Stenotrema sp.	1	1.69
Total identifiable	59	99.92
Plants		
Bulrush (*Scirpus fluviatilis*)	20	15.68
Grape (*Vitis* sp.)	7	5.49
Ragweed (*Ambrosia artemisiifolia*)	22.5	17.64
Amaranth (*Amaranthus* sp.)	1	.78
Pawpaw (*Asimina triloba*)	19	14.90
Walnut (*Juglans nigra*)	1	.78
Pecan (*Carya illinoinense*)	(frags)	
Hickory (*Carya* sp.)	(frags)	
Hazelnut (*Corylus* sp.)	37	29.01
Acorn (*Quercus* sp.)	1	.78
Squash (*Curcurbita pepo*)	1	.78
Marshelder (*Iva annua*)	18	14.11
Total identifiable	127.5	99.95

*Not considered a food item.

struction must remain general and sketchy because it is based on a single site. When more Kansas City Hopewell sites are excavated and the material analyzed, reconstruction can be refined, including such significant data as economic importance of various animals and plants and changes in the local environment. A reconstruction, offered by Struever (1968:306; Zwacki and Hausfater, 1969), of the resources available to the Illinois Valley Hopewell can serve as a model for these future studies.

The present reconstruction is based on the known habitats of the faunal and floral forms recovered at Trowbridge. The data can be divided into two sections, one for the site area and a second for the surrounding Kansas City locality. The presence of gophers and pocket mice suggests that the site was in an open area, probably a clearing in the open woodlands of the bluffs. Various species of ragweed and

TABLE 2.—*Summary of faunal and floral remains from analyzed features at Trowbridge site (14 WY1), including number of identified elements per species, per cent of identified elements per species to total identified elements, and minimum number of individuals per species.*

Species	No. elements	%	Min. no.
Mammals			
Rabbit (*Sylvilagus floridanus*)	4	.40	1
Fox squirrel (*Sciurus niger*)	3	.30	1
Pocket gopher (*Geomys bursarius*)	4	.40	2
*Pocket mouse (*Perognathus hispidus*)	1	.10	1
Beaver (*Castor canadensis*)	5	.50	1
Rice rat (*Oryzomys palustris*)	1	.10	1
Woodrat (*Neotoma floridana*)	1	.10	1
*Dog (*Canis familiaris*)	219	22.03	1
Canid (Canidae)	4	.40	1
Gray fox (*Urocyon cinereoargenteus*)	4	.40	1
Raccoon (*Procyon lotor*)	6	.60	2
Elk (*Cervus elaphus*)	5	.50	1
Deer (*Odocoileus* sp.)	512	51.50	13
Birds			
Turkey (*Meleagris gallopavo*)	34	3.42	5
Ruffed grouse (*Bonasa umbellus*)	2	.20	2
Reptiles			
Stinkpot (*Sternothaerus odoratus*)	1	.10	1
Box Turtle (*Terrapene ornata*)	49	4.92	2
Slider (*Chrysemys* sp.)	4	.40	2
Softshell (*Trionyx* sp.)	4	.40	1
Map turtle (*Graptemys* sp.)	7	.70	1
*Colubrid snake (Colubridae)	1	.10	1
*Viperid snake (Viperidae)	1	.10	1
Fish			
Catfish (*Ictalurus* sp.)	24	2.41	4
Flathead (*Pylodictis olivaris*)	69	6.94	1
Buffalo (*Ictiobus* sp.)	4	.40	1
Gar (*Lepisosteus* sp.)	15	1.50	3
Pelecypods			
Pink heel-splitter (*Proptera alata*)	2	.20	2
Plain pocketbook (*Lampsilis ovata*)	1	.10	1
Fat mucket (*Lampsilis radiata*)	1	.10	1
Papershell (*Leptodea* sp.)	2	.20	2
Hickory nut (*Obovaria olivaria*)	1	.10	1
White heel-splitter (*Lasmigona complanata*)	1	.10	1
Maple-leaf (*Quadrula quadrula*)	1	.10	1
Total identifiable	994		
Total unidentifiable	4085		
Grand totals	5079	99.92	61

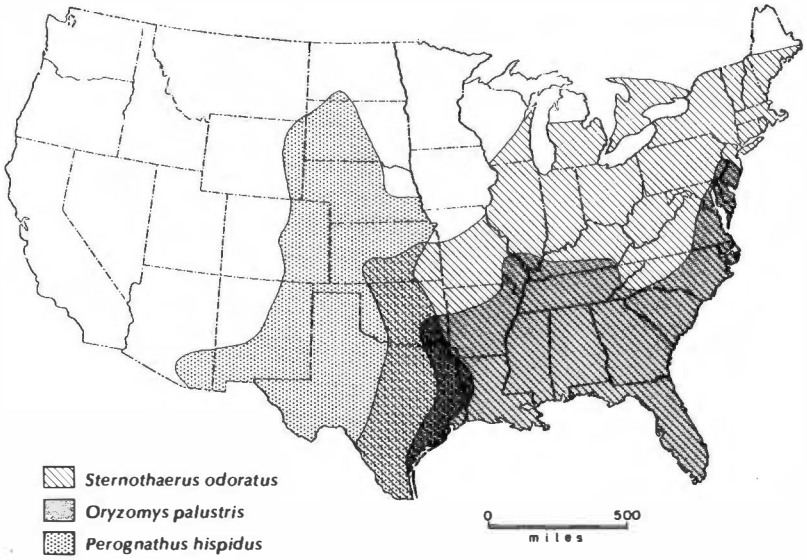

FIG. 6.—Presently known geographic distribution of three species of vertebrates no longer occurring in northeastern Missouri.

botany and archaeology is necessary before the significance of the *C. cornuta* occurrence can be ascertained.

The known range of the stinkpot turtle extends to within a few miles of Wyandotte County (10 miles), so the turtle easily could have been part of the local fauna at the time the Trowbridge site was occupied. As for the hispid pocket mouse, its present range is uncertain and it may occur in the eastern part of Kansas (Hall, 1955:111). Only the rice rat and perhaps the beaked hazelnut have experienced range changes since the Hopewell occupation. Smith (1965), studying the range shrinkage of the rice rat over North America, suggested that the reduction was due to a small, but constant climatic shift. During the last 1000 years, the climate has been cooling gradually. Average temperatures during the period of Hopewell occupation, then, would have been somewhat warmer than the average temperatures today. However, if this gradual cooling of the climate has been occurring, it has not affected greatly the flora and fauna of the Kansas City locality.

Environmental Reconstruction

A general reconstruction of the available natural resources of the Kansas City locality has been attempted, based on the floral and faunal remains in the Trowbridge collection (Table 2). The recon-

reoccupied during autumn and winter (September to February), and reabandoned in early spring (March and April).

Historically, during the months of March and April the Missouri flooded. Villages may have been abandoned during this time period with the inhabitants going to spring camps. The Trowbridge occupants, although protected from floods by being on the bluffs, perhaps followed the cultural tradition of spring camps and abandoned the village during the flood season. This, of course, is only speculation and presently cannot be proven or disproven. Other major Kansas City Hopewell villages, such as Renner, Young, and Aker, need to be analyzed in order to determine if these villages were abandoned in early spring.

Range Changes

In general, the animals and plants identified in the Trowbridge collection occurred in Wyandotte County and northeastern Kansas historically. However, three of the animals, *Perognathus hispidus* (hispid pocket mouse), *Oryzomys palustris* (rice rat), and *Sternothaerus odoratus* (stinkpot turtle), and one tree, *Corylus cornuta* (beaked hazelnut), no longer occur in northeastern Kansas. The presently known ranges of the animals are illustrated in Fig. 6. The rice rat no longer occurs in the state of Kansas, the closest locations being central Arkansas and southeastern Missouri (Hall and Kelson, 1959:556). One possible occurrence of rice rat was reported in 1859 at Neosho Falls, Kansas (Cockrum, 1952:281; Hall, 1955:246). The rice rat, formerly, had a more extensive range, shown by finds in archaeological sites (Parmalee, 1957, 1967; Guilday and Mayer-Oakes, 1952; Hill, n.d.). The distributional limits of the beaked hazelnut are undetermined, but it is not known to occur in Kansas. The specimens reported by Gates (1940:224) for Leavenworth and Anderson counties are actually *Corylus americana* (H. A. Stephens, personal communication). Specimens reported for Butler and Bollinger counties in Missouri also have been reidentified as *C. americana* (Steyermark, 1963:526). According to Stephens, *C. cornuta* is found today in various counties of North and South Dakota, as well as in Colorado Springs, Colorado. There are three possible explanations for occurrence of *C. cornuta* at the Trowbridge site. First, the two specimens really are undersized *C. americana*; second, the nuts were traded into the Kansas City area from the northern plains; and third, the specimens are *C. cornuta*, indicating a drastic climatic change since the Hopewell period (Janet Bâre, personal communication). There are too few nuts to make definite statements. More work in both

TABLE 1.—*Summary of data on probable time of capture or harvest.*

	March	April	May	June	July	August	September	October	November	December	January	February
Deer							X	X	X	X	X	X
Catfish										X	X	X
Gar										X	X	X
Pawpaw								X				
Black walnut								X				
Hazelnut							X					
Hickory							X	X				
Pecan								X	X			
Acorn							X	X				
Marshelder						X	X	X				
Persimmon						X	X	X				
Squash						X	X	X				
Grape					X	X	X	X				
Ragweed						X	X	X	X			
Amaranth						X	X	X	X			
Bulrush				X	X	X	X	X	X			
Mussel				X	X	X	X	X				
Turtle			X	X	X	X	X	X				
Snake			X	X	X	X	X	X				

Water temperatures during winter would have prevented the occupants of Trowbridge from staying long periods in the water. During spring, river flooding would pose a problem. Squash, probably planted in late May or early June, needs little tending. Maize, on the other hand, planted in May, needs a great deal of attention (Wilson, 1917: 22; Munson *et al.*, 1971:428). Trowbridge, then, may have been occupied from late May through February. It must be kept in mind, however, that presently it cannot be demonstrated that the seasons of occupation are contiguous.

Historically, such Plains groups as the Pawnee abandoned their villages in late June for the summer bison hunt. After twice weeding their maize fields, the fields went unattended until their return in September (Weltfish, 1966:130). A summer occupation for Trowbridge is circumstantial; the animals and plants could have been taken in late summer or early autumn (September). The skeletal elements that were aged indicate autumn and winter captures, whereas such animals as turtles may have been captured in the summer (Table 1), but not necessarily. Trowbridge, then, may have been occupied for a short time in late spring (May and June) to plant squash and maize, abandoned in summer (late June to August) for an annual bison hunt,

have been opened months after harvest and filled with ashes and assorted garbage from a fireplace, or with village refuse.

Animal remains are perhaps more reliable because the bones would have been deposited in the village during the season of capture. However, as with the floral remains, the bones might not have been deposited in a pit during the season of capture. The animal remains may have been hauled to the village dump or left in the butchering area. Some sections of meat, such as the thigh, could retain the bone, to be disposed of later. When a pit needed to be filled, perhaps months later, then some of the animal bones might be buried. The time of capture of an animal may be determined, but this time period is not necessarily the same time as that when a refuse pit was open.

The determination of how pits were filled is crucial to the problem of seasonality. If pits were filled either with the back dirt of a newly excavated pit or long-accumulating village midden, the time the pit actually was open cannot be determined. If, on the other hand, pits were used as daily trash receptacles, receiving current garbage, seasonality of the pits could be determined. If more than one season is represented by the refuse, this may mean that pits were open over a long time period, filling slowly, or that the site may have been abandoned for a season, or that the pit may have fallen into disuse for a period. Some questions involved in this problem are the placement of the pits in relation to structures, activity areas and traffic patterns of the village, the rate of filling, and the excavation techniques used. Pits need to be excavated very carefully, either in natural layers (if present) or in small, standard levels, with the provenience of all uncovered material recorded. The entire fill of a pit should be floated. If all pits from a site are excavated in a similar manner, then, through comparisons of the results both within each pit (from level to level) and between pits, patterns of filling may become evident.

Seasonal occupation of a site, but not necessarily the seasonal use of any pits, can be determined through the faunal and floral remains recovered. Furthermore, even when all four seasons are represented, it does not prove necessarily that the seasons are contiguous, that is, year-round occupation, or that a site was occupied at the same season every year.

Table 1 summarizes the various times of animal capture and plant harvest for the site. Turtles and snakes hibernate from mid-October to April (Carr, 1952; Smith, 1956) but would be available from May to early October. A number of factors would limit mussel gathering to summer and autumn. During winter, the mussels are dormant and difficult to locate as they are covered by silt (van der Schalie, 1938).

Struever, 1963:8). Only one seed was recovered from Trowbridge. Casual usage is probably an incorrect interpretation, however, because the evidence of extensive utilization by the Illinois Hopewell suggests that the Kansas City Hopewell probably also relied heavily on the wild plant harvest. Future extensive excavations and analyses are necessary for elucidation of the role of wild plants in Kansas City Hopewell economy.

The same unclear picture of utilization is found when dealing with the cultigens at Trowbridge. With only one squash and 18 marshelder seeds, statements regarding degree of horticultural activity are futile. The most positive statement to be made is that the Kansas City Hopewell people practiced horticulture, in which marshelder and squash were grown. They also may have grown maize and beans, if Wedel's identifications are correct (Wedel, 1943:26). At the Renner site, Wedel recovered "a few charred kernels of maize and some beans, all of which crumbled and were lost before they had dried sufficiently to be treated with preservative" (Wedel, 1943:26). The Trowbridge marshelder and squash discoveries, then, are the only extant examples of cultigens for Kansas City Hopewell. Floral remains from other Kansas City Hopewell sites have not been analyzed yet. Maize has been reported from three Ohio Hopewell sites and two Illinois Hopewell sites. However, the cultural affiliation of the Illinois material is in question (Griffin, 1960:24; Yarnell, 1964:105). Struever, in his excavations, has not recovered maize, but squash (*Curcurbita pepo*) and bottle neck gourd (*Lagenaria siceraria*) have been found at Brangenberg, another Illinois Hopewell site (Yarnell, 1964:106). With the possible exception of Renner, beans are unknown in Hopewell sites.

Seasonality

Often information from animal and plant remains can be used to determine seasonality of occupation (Winters, 1969; Baerreis, 1970; Munson *et al.*, 1971; Hill, n.d.). Difficulties arise in using vegetal remains as seasonal indicators because such items as seeds and nuts can be stored for future use. An excavated storage pit might contain large quantities of seeds or nuts. This type of pit probably would have been open at the time of harvest to receive surplus material for later use. A refuse pit, on the other hand, might contain only a few seeds or nuts, perhaps carbonized and fragmented. Such seeds and nuts could have fallen into a fire during processing or while someone was eating them. Remains such as grape seeds or acorn shells do not represent actual foodstuffs, but only the inedible parts. Refuse pits could

Discussion

Dietary Information

Inasmuch as the site borders on the plains and woodlands, both environments may have been utilized in hunting. The archaeological record from the storage and refuse pits at Trowbridge indicates that the riverine and adjacent woodland environments were favored for hunting. Even the black-tailed deer and elk inhabit the woods and thickets during winter, the apparent time of capture at Trowbridge. However, the extent of utilization of the plains environment is unknown. Bison remains are present (personal observation) at the Aker, Young, Neiman, and Diester sites and reported for Renner (Wedel, 1943:27). All are Hopewell sites along the Missouri River between Kansas City and St. Joseph and are approximately contemporaneous with the Trowbridge site. The plains area obviously was hunted, but bison remains may not be represented in the Trowbridge pits because of processing practices (bringing back only the meat) or bone disposal practices (away from the site). In this way, only a few bison remains may be recovered from Hopewell sites, although the animal may have been an important food source.

Plant remains were not numerous at Trowbridge. This may be due to the sampling techniques, differential preservation (see Munson *et al.*, 1971:426-427, for a discussion of chance preservation of vegetal remains), or lack of intensive plant utilization. The heavier the reliance on vegetal products, the greater chance of preservation in the site. Illinois Hopewell sites have yielded large quantities of wild seeds and nuts, and subsistence patterns assumed by earlier workers have had to be altered considerably to include intensive wild plant exploitation (Struever, 1968:358).

Degree of wild plant utilization by the Trowbridge inhabitants is inconclusive. Extensive testing is necessary, using microrecovery techniques, before extent of utilization can be discussed and evaluated (Struever, 1968:299; Munson *et al.*, 1971:410-411). Estimation of hickory nut harvests (Asch *et al.*, 1972) for Horizon 6 of the Koster site demonstrates that even when great quantities of remains are recovered (120,000 fragments), the results still may be less than satisfactory. The paucity of nuts and seeds in the analyzed material from Trowbridge suggests only a casual use of these products. The less than 100 hickory shell fragments represent only a handful of nuts (Asch *et al.*, 1972). Between two and six pawpaw fruits could account for the total number of seeds recovered (personal observation). Amaranth seeds are numerous in many sites in eastern North America, and the plant may have been a cultigen (Jones, 1954:92;

leaved willow), *S. interior* (sandbar willow), and *S. humilis* (dwarf prairie willow). The first four species are found in river valley bottoms along streams, ponds, and oxbow lakes in muddy alluvial soil or on gravel and sand bars of rivers. The dwarf prairie willow prefers the drier environment of open woods, rocky slopes, and prairies (Steyermark, 1963:494-500).

Quercus spp.—Four of the seven features contained wood charcoal from oak trees. The entire sample from Feature 12, Area B, was oak; Feature 9, Area B, had mostly *Quercus* of the white oak group. According to Stephens (1969:75), "the oaks are divided into two groups —white oaks and red oaks. The white oaks have rounded ends to the lobes of the leaves, and the flowers are fertilized and mature into acorns in one season." Four species, *Q. alba* (white oak), *Q. stellata* (post oak), *Q. macrocarpa* (bur oak), and *Q. muehlenbergii* (chestnut oak), of the white oak group grow in the region today, and all occur in Wyandotte County. Approximately half of the wood sample from Feature 5, Area B, and one-third of the sample from Feature 2, Area B, were oak. The habitats of the various oaks are discussed above.

Ulmus spp.—Wood charcoal of elm was found in four of the seven samples. Elm was identified from Feature 9, Area B, whereas about a third of the sample from Feature 2, Area B was elm. The sample from Feature 5, Area B was about half elm, and from Feature 1, Area B, all elm. Three species of elm grow in the surrounding region: *U. americana* (American elm); *U. thomasi* (rock elm); and *U. rubra* (slippery elm). Although all three species occur along streams, the American and rock elms prefer the moist low ground of the floodplain forest. The slippery elm grows in rocky woods and along bluffs (Steyermark, 1963:554-555).

Acer spp.—Two of the seven samples examined contained wood charcoal from maple trees. Some remains of maple were found in the sample from Feature 9, Area B. The sample from Feature 3, Area B, had some *Acer* of the soft maple group, possibly *A.* cf. *negundo* (box elder). Two species, *A. negundo* and *A. sacharinum* (silver maple), of the soft maple group grow in the Kansas City region. Both occur in river floodplains along streams and in low, wet woods (Steyermark, 1963:1018). One other species of maple, *A. saccharum* (sugar maple) grows in the area. It prefers a drier habitat, at the base of escarpments of bluffs, rocky woodlands, and slopes, but it is found also along streams (Steyermark, 1963:1012).

and early autumn is the best harvesting time. Hazelnut trees grow in the woodlands of valleys or uplands (Steyermark, 1963:524). Two fragments of carbonized nut meat and numerous shell fragments have been identified as *Corylus* sp. *C. americana* is a common tree throughout eastern Kansas.

Corylus cf. *cornuta*.—Two nuts were referred to the beaked hazelnut. Nuts of this species also are available in September, and the tree grows in a habitat similar to that of *C. americana* (Gates, 1940:224; Steyermark, 1963:524). *C. cornuta* is not known to have grown in Kansas (H. A. Stephens, personal communication).

Quercus sp.—One carbonized nut meat and several shell fragments were identified as acorn. Numerous species of oak inhabit the surrounding region of the site. Among these are *Q. alba* (white oak), *Q. rubra* (red oak), *Q. velutina* (black oak), *Q. muehlenbergii* (chestnut oak), and *Q. macrocarpa* (bur oak). Acorns are ripe in September and October and are edible after leaching of the tannic acid.

Oak trees occupy a number of habitats, from dry upland slopes and rocky hillsides to valley bottoms and stream and river bottom meadows (Steyermark, 1963:535-551; Stephens, 1969:56-75). Various species of oak are common throughout eastern Kansas.

Cultigens

Curcurbita pepo.—One squash seed was recovered from the Trowbridge material. A cultigen since the Early Woodland period (Yarnell, 1965:77), squash ripens in the summer.

Iva annua.—Eighteen seeds were identified as marshelder. A possible cultigen (Yarnell, 1965), marshelder could have been planted in late spring along with the squash and ready for harvest in late summer or early autumn.

Wood Charcoal

Carya spp.—Wood charcoal from hickory trees was found in three of the seven features examined. In Feature 3, Area B (Fig. 3), a majority of the samples were *Carya*, whereas in Feature 2, Area B, hickory accounted for about one-third of the material. The entire sample from Feature 8, Area B, was hickory. The habitats of the various hickories have been discussed previously.

Salix spp.—Some wood charcoal of willow was found in one of the features (Feature 3, Area B). Numerous species of willow grow in the surrounding region. Among these species are *S. nigra* (black willow), *S. caroliniana* (carolina willow), *S. amygdaloides* (peach-

summer through autumn. This tumbleweed grows on waste ground and along sandy or gravelly stream banks. The water hemps grow on the floodplains of large rivers, on mud flats or sand bars, and along banks of oxbow lakes (Steyermark, 1963:621, 624, 626).

Asimina triloba.—Nineteen seeds and 42 seed fragments were identified as pawpaw. The pawpaw tree is common in eastern Kansas and western Missouri, growing in rich soils of low bottom woods, wooded slopes along streams, and at the base of bluffs (Steyermark, 1963:671; Stephens, 1969:101). The pawpaw tree flowers in April and May, and fruits are ripe in October. The seeds are not edible, but the fruit itself resembles a banana in appearance and taste.

Diospyros virginiana.—One seed was identified as persimmon, a species growing today along the Missouri River in the Kansas City area where it tolerates a wide variety of habitats (Steyermark, 1963: 1174). The persimmon fruits are available from late summer to early autumn.

Nuts

Juglans nigra.—One nut and shell fragments of black walnut were identified. The nuts are ready for harvest in October. A common tree in eastern Kansas and western Missouri, the black walnut grows along streams and in rich soils of upland woods or bluff bases (Steyermark, 1963:510; Stephens, 1969:37).

Carya spp.—The genus *Carya* includes the numerous species of hickories as well as the species of pecan. A few of the nut fragments have been identified as *C.* cf. *illinoinense* (pecan) and as *C. cordiformis* (bitternut hickory). The remaining fragments were identified as *Carya* sp. of the hickory group. Pecan trees favor the alluvial soils of floodplains and streams. The bitternut hickory also grows in the alluvial soils along streams or in rich soils at the base of bluffs (Steyermark, 1963:514, 516; Stephens, 1969:38, 40). Other hickories, such as *C. ovata* (shagbark hickory), *C. laciniosa* (kingnut hickory), and *C. tomentosa* (mockernut hickory), growing today in the region, prefer a habitat similar to that of pecan and bitternut, or favor dry upland woods (Steyermark, 1963:517-518). All of the various hickories growing in the region at the time of the Trowbridge occupation probably were harvested, inasmuch as all are edible. Pecan nuts are available from October to November, and bitternut hickories are ripe in October. Other hickories are available from September to October. The autumn months are best for harvesting the *Carya* nuts.

Corylus americana.—Twelve whole and 42 half shells plus fragments have been identified as hazelnut. The nuts ripen in September,

fications increase the knowledge of a particular group's utilization of the flora in the area (Yarnell, 1964; Ford, 1968; Munson *et al.*, 1971; Asch *et al.*, 1972).

SEEDS

Scirpus cf. *fluviatilis.*—Nineteen seeds of river bulrush were identified. This plant flowers between May and September and seeds would have been available from early summer through autumn. It occurs in shallow waters of oxbow lakes in river floodplains and along large rivers such as the Missouri and Kansas (Steyermark, 1963:294). In addition to *S. fluviatilis*, five other native species of *Scirpus* occur in Wyandotte County and the surrounding region (Gates, 1940:30): *americanus* (chairmaker's rush), *acutus* (great bulrush), *validus* (great bulrush), *atrovirens* (common bulrush), and *lineatus* (bulrush). All of these species flower at the same time as *S. fluviatilis* and grow in a similar environment. One seed was identified as *Scirpus* sp.

Vitis cf. *riparia* or *cinerea.*—Six seeds were identified as wild grape, referrable either to river-bank grape or grayback grape. Fruits of the river-bank grape are available from July to September; those of the grayback grape from September to October. Both grapes grow in low woods and along streams in alluvial soil (Steyermark, 1963: 1037-38). One seed was identified only as *Vitis* sp.

Ambrosia artemisiifolia.—Twenty-one and one-half seeds were identified as common ragweed. Very common throughout Kansas and Missouri, it grows on waste and open ground and rocky glades. Ragweed flowers from July to November, the seeds ripening from late summer through winter. Three other species grow in Wyandotte County today—*A. coronopifolia* (western ragweed), *A. trifida* (horse weed); and *A. bidentata* (lance-leaf ragweed) (Gates, 1940:91). These species flower from July to October so that seeds are ripe from late summer to autumn. *A. trifida* grows in the alluvial soils of river bottom woods, along streams and ponds, and on waste ground. *A. bidentata* also grows along ponds and on waste ground and is found in prairies. *A. coronopifolia* grows in the dryer habitat of rocky prairies, glades, and loess hills (Steyermark, 1963:1537-1538, 1540). One seed was identified only as *Ambrosia* sp.

Amaranthus sp.—One seed was identified as a species of *Amaranthus.* Three native species occur today in the region: *A. tuberculatus* (water hemp), *A. tamariscinus* (water hemp); and *A. graecizans* (tumbleweed). *A. tuberculatus* and *A. tamariscinus* are known to occur in Wyandotte County (Gates, 1940:54). These three species flower from June to October, and seeds would be available from late

Stenotrema hirsutum.—One shell of *S. hirsutum* was recovered. Basically a woodland form, it is "a characteristic snail of humid, forested regions" (Leonard, 1959:86). One shell fragment was identified to the genus *Stenotrema*, of which two additional species, *leai* and *stenotrema*, inhabit eastern Kansas. In general, all species of *Stenotrema* live either in woodlands or woodland border situations (Leonard, personal communication).

In recent years as awareness of the importance of microfaunal and floral remains to archaeological interpretation has increased, the recovery and identification of gastropod remains have assumed greater importance (Baerreis, 1969*a*, 1969*b*, 1970; Jaehnig, 1971). Many gastropod species are sensitive to local environmental changes. By knowing the species that occurred on a site during human habitation and the habitats of the species, local conditions at a site during occupation can be reconstructed. The gastropods were not taken into account in calculation of the faunal percentages as they are too minute to have been economically important. Gastropods simply lived on the site contemporaneously with the Kansas City Hopewell people and reflect local site conditions. Both modern and "Hopewell" snail faunas were recovered, representing the same species. All species recovered are terrestrial gastropods, common in eastern Kansas and Wyandotte County today. Inasmuch as the same species were living on the site during the Kansas City Hopewell period as are living there today, environmental conditions were probably similar to those of modern times.

Plants

Refined archaeological recovery techniques such as water and chemical separation methods yield not only microfaunal remains, but minute plant remains as well. At some sites, the quantities recovered add significantly to the knowledge of the economy (Struever, 1968; Munson *et al.*, 1971). Trowbridge floral remains, with the exception of the hazelnuts and pawpaw seeds from Feature 8, Area B (Fig. 3), were recovered from soil samples by water separation. All were carbonized. Nine of the pits yielded plant remains including seeds, nuts, carbonized nut meats, and wood charcoal. Not all remains are identifiable, due to either fragmentary or damaged condition. A total of 124½ seeds and nuts have been identified, as well as numerous nut shell fragments, 3 nut meats, and 14 samples of wood charcoal.

In the past few years, the identification of wood charcoal from archaeological sites has become a standard practice, as techniques for recovering vegetal remains have become more widespread. The identi-

lives in a rather moist, forest floor habitat but may live in open prairie habitats (A. B. Leonard, personal communication).

Gastrocopta contracta.—One shell of *G. contracta* was recovered. It occupies habitats similar to those of *G. armifera.*

Heliocodiscus parallelus.—Twenty-one shells of *H. parallelus* were recovered. Five were of modern snails living on the site during the excavations. According to Leonard (personal communication) this snail is found usually in a woodland or forest border habitat. In a forest border zone, it is not uncommon to find *H. parallelus, G. armifera,* and *G. contracta* together.

Anguispira sp.—One fragmentary shell was identified to the genus *Anguispira.* This may be *A. alternata,* as this is the only species of *Anguispira* that inhabits Kansas today. *A. alternata* also tends to be associated with a woodland environment, being found on floodplains and under logs, brush piles, and leaf litter (Leonard, 1959:130).

Hawaiia minuscula.—Seven shells of *H. minuscula* were identified. It has a wide habitat tolerance, from open prairies to deep forests (A. B. Leonard, personal communication).

Retinella electrina.—One modern snail was identified as *R. electrina.* Requiring a moist environment, it is found along streams and in upland wooded areas (Leonard, 1959:112). Two immature snails from the prehistoric occupation period were identified to the genus *Retinella.* These could be the remains of either *R. electrina* or *R. indentata.* The latter is found in habitats similar to those of *R. electrina.*

Zonitoides arboreus.—Four shells were identified as *Z. arboreus.* This snail commonly lives in wooded areas under the loose bark of fallen trees. It is found also on bluffs along streams and in grasslands (Leonard, 1959:123). *Z. arboreus* often is found in association with *R. electrina* and *R. indentata* (Leonard, 1959:114).

Striatura milium.—Two shells of *S. milium* were identified. Although collected only from Anderson County during Leonard's (1959) study of Kansas gastropods, it probably ranges over a wider area of eastern Kansas (Leonard, personal communication). *S. milium* lives in leaf litter in woodlands (Leonard, 1959:125). A forest border or a low terrace along a creek is indicated inasmuch as it was found in association (Feature 2) with *G. armifera* (Leonard, personal communication).

Vallonia parvula.—Four shells of *V. parvula* were recovered, but one shell was identified only to the genus *Vallonia.* Only *V. parvula* is found in Kansas today. Although inhabiting a wide variety of environments, *V. parvula* generally is associated with woodlands and woodland borders (Leonard, personal communication).

as far north as the Kansas River, it favors muddy or rocky bottoms of either fast-moving or still water (Murray and Leonard, 1962: 126, 128). It also occurs in the Missouri River in the Kansas City Hopewell area.

Lampsilis ovata.—The right valve of one plain pocketbook is present in the collection. This mussel has a distribution similar to that of the pink heel-splitter, but favors gravelly bottoms in shallow water (Murray and Leonard, 1962:154). It also has been found in the Missouri River.

Lampsilis radiata.—The left valve of a fat mucket was found. With a distribution similar to that of the preceding mussels, the fat mucket prefers the muddy bottoms of quiet waters (Murray and Leonard, 1962:151) and is known to occur in the Missouri River.

Leptodea sp.—Two paper shells (based on two right valves) are present in the collection. Two species, *L. fragilis* (fragile paper-shell) and *L. laevissima* (paper-shell), occur in the area. The fragile paper-shell occurs in the rivers and streams of southeastern Kansas north to the Kansas River. It inhabits quiet, shallow to deep waters with rocky, sandy, or muddy bottoms (Murray and Leonard, 1962:122). The paper-shell occurs in the eastern half of Kansas, on sandy or muddy bottoms of rivers with swift currents. It may also occur in quiet waters (Murray and Leonard, 1962). Both species occur in the Missouri River.

Cf. *Obovaria olivaria.*—One hickory-nut is indicated in the collection by a left valve. Although no longer occurring in Kansas today, it was once a common mussel in the rivers of eastern Kansas, preferring sandy bottoms and moderate depths of water (Murray and Leonard, 1962:162). It is known also to have inhabited the Missouri River.

Lasmigona complanata.—One white heel-splitter is represented by a single right valve. Having a distribution fimilar to that of the pink heel-splitter, the white heel-splitter prefers soft, muddy bottoms. However, it is found also in rocky areas in quiet pools (Murray and Leonard, 1962:90). It occurs in the Missouri River.

Quadrula quadrula.—One maple-leaf, represented by a single left valve, was found at Trowbridge. Common in streams and rivers of eastern Kansas, as well as in the Missouri, it occurs in a variety of habitats, including rocky, gravelly, sandy, and muddy bottoms of shallow to deep water (Murray and Leonard, 1962:53).

Gastropods

Gastrocopta armifera.—Fifteen specimens of *G. armifera* were identified in the Trowbridge collection. This species most commonly

Ictalurus sp.—Based on a combination of skeletal elements, Four catfish of the genus *Ictalurus* are represented. Two blue catfish, *I. furcatus*, were determined from two left pectoral spines and two parasphenoids, as well as other skeletal material. No age determinations of these two catfish have been attempted, as vertebrae could not be identified definitely as *I. furcatus.* However, of the four vertebrae identified as *Ictalurus* sp., three are ageable. They represent three different catfish, ages 6, 8, and 11 years. Two of the vertebrae may be either from the skeletons of the two blue catfish or from other individuals. However, between the identified skeletal elements and the aged vertebrae, there are at least three catfish represented.

Fragments of opercle, premaxilla, and pectoral girdle have been referred to *I. furcatus* or *punctatus* (channel catfish) and, therefore, are thought to represent a fourth specimen. Up to the early part of this century, both blue and channel catfish were common in Kansas streams (Cross, 1967).

Ictiobus sp.—Fragments of a pharyngeal arch of a buffalo were recovered from a water-washed soil sample. Three species, *cyprinellus* (big-mouthed buffalo), *niger* (black buffalo), and *bubalus* (small-mouthed buffalo), inhabit the Kansas River today. Occurring mainly in the larger rivers of eastern Kansas, the black buffalo prefers the swift currents of deep and narrow channels. The other two species favor quieter water (Cross, 1967:174).

Lepisosteus sp.—Based on skeletal material and aged scales, at least three gars are represented. One long-nosed gar, *L. osseus*, is represented by a right mandible, the identification being based on mandibular length. The mandible of *L. osseus* is proportionately longer than that of *L. platostomus* (short-nosed gar). The presence of the other two gars is based on aged scales. Of the fourteen scales recovered from water-washed soil samples, six are usable for aging. The other scales are broken or edge-damaged. One gar is one year old; another, two years old; and a third, three years old. All were killed during the winter.

Both *L. osseus* and *L. platostomus* occur in the Kansas and Missouri rivers. They prefer similar habitats of quiet pools or less turbulent parts of streams. Inhabiting surface waters in summer, the gar retires to the bottom of deep pools in the winter (Cross, 1967:44).

INVERTEBRATES

Pelecypods

Proptera alata.—The left valves of two pink heel-splitters are represented in the collection. Common in the southeast rivers of Kansas

Colubridae (genus undetermined).—One colubrid snake is represented in the collection. Of the two identifiable vertebrae, one is identifiable only to the family Colubridae, whereas the other is referrable either to *Carphophis* or *Diadophis.* Representatives of both genera, *C. amoenus* (worm snake) and *D. punctatus* (prairie ringneck snake) occur in the area of the site today. Both are nonpoisonous and their habitats are similar in eastern Kansas. They prefer hillsides in moist woodlands where they are found under stones and fallen logs (Smith, 1956:215-216).

Viperidae (genus undetermined).—One snake belonging to the family Viperidae is represented by a single vertebra. Both the northern copperhead, *Agkistrodon contortrix*, and the timber rattlesnake, *Crotalus horridus*, occur in eastern Kansas, and both are poisonous. They inhabit similar environments. Wooded hillsides with exposed rock, particularly limestone, are favored (Smith, 1956:293, 303).

Fish

Pylodictis olivaris.—One flathead catfish is represented by an incomplete skeleton in the Trowbridge material. A majority of the remains are cranial, with assorted vertebrae accounting for the rest of the material. Catfish, as well as many other types of fish, can be aged by counting annual growth rings laid down in such bones as vertebrae and pectoral spines (Applegate and Smith, 1950; Sneed, 1950; Marzolf, 1955; Chugunova, 1963; de Roth, 1965; Voorhies, 1969). Whereas the pectoral spine needs to be sectioned in order to observe growth rings, the rings of the vertebrae can be counted microscopically without special specimen preparation.

> In temperate regions the alternation of rapid growth in the spring and summer with slow growth or complete stoppage of growth in the winter gives rise to checks or unconformities in scales . . . and to rings of bone of different density and color in vertebrae . . . and spines . . . [Furthermore] In modern *Ictalurus* . . . the winter growth stoppage is indicated by the dark bands while rapid summer growth is represented by the white bands. The winter rings are typically marked by grooves on the surface of the vertebra in both modern and fossil catfish. (Voorhies, 1969:48-49)

The occipital vertebra of the Trowbridge specimen has 13 rings including the last ring at the edge; the fish was 13 years old and died in the winter.

The flathead is common in eastern Kansas rivers, streams, and lakes, and it particularly favors deep holes in the river bed. The flathead also inhabits the Missouri River between Kansas and Missouri (Cross, 1967).