NORTHERN IROQUOIAN HORTICULTURE AND INSECT INFESTATION: A CAUSE FOR VILLAGE REMOVAL

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Abstract

Employing ethnological, historical, and entomological data, this paper examines the issue of insect infestation of cultivated fields among Northern Iroquoians as a cause for village removal. It is concluded that by adding another systemic variable to the issue of shifting villages among such groups our understanding of the complexities of the adaptive process of horticulture is enhanced.[1]

Describing, understanding, and interpreting the details of the well-known periodic relocation or removal of Northern Iroquoian villages has long been a part of Iroquois studies. We suggest that first and foremost, such data have been applied most often to settlement pattern studies and culture histories (cf. Ritchie and Funk 1973; Tuck 1971; Lenig 1977). In addition, they have played an integral part in cultural geographies (Heidenreich 1971), studies of adaptation (cf. White 1961, 1963; Trigger 1965; Snow and Starna 1980), and recently, demography (Snow 1980; Starna 1980). Invariably, discussions of village removals can be found in the ethnographic and ethnohistoric literature (cf. Fenton 1978; Trigger 1976; Tooker 1964; Abler 1970).

Northern Iroquoians practiced a system of shifting or slash and burn (swidden) horticulture. This form of horticulture is often characterized by "(1) partial or complete clearance of forest vegetation by cutting and burning; (2) temporary cultivation of crops in the cleared areas; (3) abandonment of the plot to fallow for a longer period than it was cultivated, to allow for forest regeneration" (Sykes 1980:45; Harris 1973).

To a considerable extent, the periodicity of village movements was predicated upon soil productivity. That is, a decrease in crop production related to the exhaustion of arable lands would be a reason for a village's moving to a new location in order to take advantage of either previously uncultivated land or that which had lain fallow. However, the factor of soil exhaustion is but one employed to explain village movements. Other "causes" to be found include the depletion of local sources of firewood, the deterioration of houses and palisades, conflagrations, chronic warfare, the accumulation of refuse, the scarcity of game, and ideological concerns such as dreams. There is considerable variability in our empirical data used to explain village removal.

There is also variability regarding the periodicity of village movements. A standard figure of 10 to 12 years, derived ultimately from seventeenth century sources, appears most frequently in the literature (cf. Fenton 1978; Trigger 1976; Abler 1970; Heidenreich 1971; Tooker 1964), although this has been questioned

(cf. Sykes 1980). In support of Sykes' (1980) work, we note that later historic Mohawk villages were occupied for as long as fifty or more years, while in the Onondaga tribal area village occupations of 80 to 100 years have been cited (Tuck 1971; Starna 1980). The issue remains open.

In this article using several independent lines of evidence derived from a variety of sources, one more variable to be considered as a factor that may have necessitated village removal—the infestation of crop lands and fields by insects or "worms" is presented.

Northern Iroquoians were more than aware of insects, worms, and other such vermin. In their anthropocentric and anthropomorphic universe, Iroquoians, as "real Man-beings," interact socially with other man-beings whose principal forms are those of animals, plants, and other natural phenomena. Among the most powerful and potentially dangerous of man-beings are sorcerers, wizards, and witches. Charactertistically, their nonhuman forms are those of serpents, who in their malevolent aspect are associated with all manner of vermin, pests, and other obnoxious crawling creatures. Such beings are amply illustrated in fiction, legend, and myth. For example, in the fictional story "The Woman Who Married a Great Serpent," a serpent enters a woman's house and asks her to hunt in his head for vermin. She finds a large number of bloodsuckers, angleworms, and "other noisome insects," that in times past people believed were to be found in the medicine pouch or chest of sorcerers (Hewitt 1918:87, 791 n8). The malevolence of the grasshopper is the theme in "The Great Snake Battle." Several snakes had been tormented by a man named "*Djisdaah,*"[2] translated "grasshopper" (Hewitt 1918:792 n30). Eventually, *Djisdaah* is killed by the snakes who then tell the village chief "we will go home if you agree that as long as the world stands you will not call any man Djisdaah and will not mistreat my people" (Hewitt 1918:118). In the story "*Ganyadjigowa*" (Hell-diver or Mud-hen), this individual is asking questions of *Gaasyendiet'ha* (Fire-dragon or Meteor Man-being), saying

> Well, do you believe the old people who say that Hinon [the thunderer] makes rain?...Do you believe the old folks who say that trouble comes to those who do not answer? Do you believe the old people who say that Hanisheonon is alive (Hewitt 241)?

The name *Hanisheonon* is "at present" applied to the "imported idea," "devil," which is also the name given to the muckworm, an insect pest (Hewitt 1918:795 n 93). In the same story there is an old man named *Ganenaitha*, translated "the locust," or, literally, "corn-ripener" (Hewitt 1918:241, 795 n98). His head is cut off by *Ganyadjigowa.* Also in this story, *Ganyadjigowa* encounters an old man who lives in the ground. He is given the name *Onoqgontgowa* (Great Bumble Bee) by *Ganyadjigowa*, who describes him as "bad-looking." At this remark, the old man cries, i.e., "buzzes," and is described as "a winged Djihonsdonqgwen," a winged ant (Hewitt 1918:249, 796 n103).

In the lengthy fictional story "*Doonongaes* and *Tsodiqgwadon*" (Giant Horned Serpent and Copperhead Snake), there are a number of references to insects. For example, at one point in the story an old man is in his lodge. Another old man sets fire to it. In the lodge, the trapped old man burns some tobacco and calls on *Hasdeaundyet'ha* to cause it to rain so hard as to extinguish the fire. *Hasdeaundet'ha,* "correctly" written *Hăsdeauñdiē't'hă'*, is an

epithet applied to *Hí'ᵑnoᵑ'*, the Thunderer. "Here it may possibly refer to a species of worm which beârs this name" (Hewitt 1918:306, 800 n156). Farther in the story, *Doonongaes* and *Tsodiqgwadon* approach a lodge at night in which many old men are living. *Doonongaes* assumes the form of these old men, called *Gendagahadenyatha,* who are singing a war song. He enters their lodge and sings a different song causing the old men to become angry and accuse him of being an enemy whom they should scalp. *Doonongaes* then turns into a serpent, frightening the old men, and makes good his escape. *Gĕⁿ'dagaādeniă'* is the common name of the scarab beetle, usually called the tumblebug (Hewitt 1918: 331, 802 n231). At another point in the story, a large man called *Nanisheonon* tells *Doonongaes* and *Tsodiqgwadon* to fight and to "say bad words to each other and scold." *Nanisheonon* (*Ne'hanis'he'onoᵑ'*) is translated "He who dwells in the earth or ground" and is the name of the muckworm, the larva of the scarab beetle (*Lygyrus relictus*) (Hewitt 1918:332, 803 n233). Among several references to grasshoppers is the "Degatengowa people," for *Degatĕᵑ'⁶gōwa*, a name for the large dust-colored grasshopper (Hewitt 1918:336, 804 n255). Later, *Doonongaes* and *Tsodiqgwadon* are told that as they approach an opening in the earth under a door in the center of the blue sky, they will find a man whose name is *Shagoewatha (S⁶hagoewat'⁶hă⁹)*, "he punishes them (mankind)," the name of the muckworm (Hewitt 1918:339, 805 n285). Finally, there is mention of an old man named *Sadjawski (Sadjā'wĭskĭ)*, the thousand-legged worm (Hewitt 1918: 339, 805 n289). This reference to a thousand-legged worm is repeated in the legend *"Deoyadastat'he* and *Hadjowski,"* where the latter individual (the worm) is a man who was unfaithful to his wife and eventually killed (Hewitt 1918:406, 808 n353).

The legend of the "Great Worm and *Hinon,*" tells of a caterpillar that is fed by two young boys, eventually growing to prodigious proportions. It attacks the boys' village eating many of its inhabitants. Finally, the survivors call upon *Hinon*, the Thunderer, who strikes the worm with lightning, killing it (Hewitt 1918:420-421).

In a tale reported by Erminie Smith (1883) entitled "The Thunderer," an immense and destructive grub is killed with a great bolt of lightning hurled by supernaturals. This creature is described as being like a cutworm, i.e., it attacks young garden plants, but is a thousand thousand times as big.

In Parker's (1923:182) "Two Feathers and Turkey Brother," an evil sorcerer, after ingesting an emetic, disgorges "all manner of foul lizards, toads and worms he had eaten."

Clearly, in the instances cited above, insects or "worms" are not held in high regard by Northern Iroquoians, and are universally considered as evil, a constituent of evilness, or certainly, nonbeneficial.

The historic sources also illustrate considerable distress regarding insects or worms, not only from the Indian's perspective, but also the European's. From Le Jeune's Relation of 1633 we learn

> The barley corn is finer than in France; and I have no doubt that, if this country were cleared, very fertile valleys would be found. The woods are troublesome; they retain the cold, engender the slight frosts, and produce great quantities of vermin, such as grasshoppers, worms, and insects, which are especially destructive in our garden (*Jesuit Relations* 6:29).

and

> Let us proceed systematically, and consider the nature of the soil; these two years all the vegetables, which come up only too fast, have been eaten by insects, which come either from the neighborhood of the woods, or from that land which has not yet been worked and purified, nor exposed to the air. In midsummer these insects die, and we have very fine vegetables (JR 6:75).

In 1635, Le Jeune notes

> Since our arrival, there has been a very great abundance (of corn) throughout the whole country, although in the Spring it was necessary to sow three times by reason of white frosts and worms (JR 8:97-99).

In Le Jeune's Relation of 1636, the discussion is concerned with "sorcerers." An Indian informant is asked how drought is explained.

> Raising the objection to him who told me the tale, "whence, then, came dryness?" he replied that it came from the caterpillars. . .(JR 10:195).

Once again from his 1636 Relation Le Jeune observes

> It is true that the nearness of the forests, and so much rotten wood, of which the land is, as it were, formed and nourished, engender, at times, insects which gnaw everything; as these animals die during the heat of summer,. . .(JR 9:163).

From the Relation of 1640 there is additional mention of insects.

> Last year, the caterpillars, grasshoppers, and other insects eating all that came out of the earth, some processions and public prayers were made on this account; strange to say, the following day these little animals died, and disappeared so entirely, that a certain person reaped more than thirty puncheons of grain, though not expecting over ten bushels (JR 18:85).

Returning to Le Jeune, in this instance his 1637 Relation, grasshoppers are the culprits.

> And very recently, when I was returning from Ossossane, a woman who was coming from her field caught a grasshopper and brought it to me, begging me earnestly to teach her some contrivance for killing these little creatures that eat the corn, . . . (JR 14:105).

In the 1646 Relation Lalemont briefly comments that a procession "was made against the caterpillars" after vespers (JR 28:219). Worms are mentioned in the Relations of the Mission du Sault, 1679.

> An island near the village had been lately cleared; it was full of worms, which ate the whole planting three times in succession. . .

and

> —although the plantings had elsewhere been made sooner than there; and although the corn had not been eaten by the worms, as was the case throughout the spring on the island (JR 63:207).

John Josselyn's "Two Voyages to New England,. . .1638, 1663," provides a detailed description of insect pests there and a remedy.

> The Earth-worm, these are very rare and as small as a horse hair, but there is a Bug that lyes in the earth and eateth the seed, that is somewhat like a Maggot of a white colour with a red head, and is about the bigness of ones finger and an inch or an inch and half long. There is also a dark dunnish Worm or Bug of the bigness of an Oaten-straw, and an inch long, that in the spring lye at the Root of Corn and Garden plants

> all day, and in the night creep out and devour them; these in some years destroy abundance of *Indian* Corn and Garden plants, and they have but *one* (emphasis ours) way to be rid of them, which the English have learnt of the *Indians*; And because it is somewhat strange, I shall tell you how it is, they go out into a field or garden with a Birchen-dish, and spudling the earth about the roots, for they lye not deep, they gather their dish full which may contain about a quart or three pints, then they carrie the dish to the Sea-side when it is ebbing-water and set it a swimming, the water carrieth the dish into the Sea and within a day or two if you go into your field you may look your eyes out sooner than find any of them (Josselyn 1885:91).

Worms and grubs continued to be a problem into the eighteenth century, as observed by John Bartram.

> here I observed for the first time in this journey, that the worms which had done much mischief in several parts of our Province, by destroying the grass and even corn for two summers, had done the same thing here, and had eat off the blade of their maize and long white grass, so that the stems of both stood naked 4 foot high; I saw some of the naked dark coloured grubs half an inch long, tho' most of them were gone, yet I could perceive they were the same that had visited us two months before (Bartram 1751:31).

Other concerns expressed about corn and associated insects are manifested in ritual and ceremony. For example, Parker (1968b:119-120) mentions the corn-bug, *gane'onttwut*, as being a charm-member of a secret medicine society, whose evil influence can be negated or neutralized only by ceremonies. William M. Beauchamp, in his unpublished *Antiquities* (James Bradley, personal communication), describes a cure where an ill individual is instructed to deposit his vomitus on a corn husk, wrap it, and place it between the logs of his house. Several days later, the corn husk was removed and opened, and "caterpillars" were discovered inside. (These "Caterpillars" are most likely blow-fly maggots, *Calliphoridae*). Caterpillars and worms are often mentioned in the literature as being inside someone and causing discomfort or sickness. There are also the corn medicines, discussed in detail below, and the previously described ceremony observed by Josselyn (1885:91).

The techniques and methods of planting corn and other crops appear consistent among not only the Northern Iroquoians, but also for the Algonquians of southern New England (cf. Tooker 1964; Heidenreich 1971; Trigger 1976; Fenton 1978; Salwen 1978; Delabarre and Wilder 1920). A field was first cleared by cutting down, stacking, and then burning brush and trees. Trees were girdled, fires set at their bases, and then cut down, by Indians using stone axes. With contact, metal tools would have been used. Heidenreich (1971:175) notes that there is little evidence to suggest that wholesale burning of fields and forests occurred since there was no way that the Iroquoians could control such burning. However, fields were fired in order to clear them of brushwood, weeds, and plant remains from the previous growing season (Heidenreich 1971; JR 12:155). Remaining tree stumps, usually described as about 3 feet high, were further reduced in size by burning. Once an area was cleared, planting could begin. Earth hills or mounds were first constructed generally 4 to 5 feet apart, although distances as close as 2 to 3 feet are described (cf. Tooker 1964:61; Heidenreich 1971:176; Delabarre and Wilder 1920). These were most often placed in rows as straight as possible given the constraints of the topography and obstacles, such as stumps. In these hills of earth were placed kernels of corn. Planted in the same hills were beans, so as to allow their vines to use the growing

cornstalk as a pole. Squash, gourds, and tubers, specifically the Jerusalem artichoke, were planted in the space remaining between corn hills.

Sagard's observations, repeated in subsequent works (cf. Tooker 1964; Heidenreich 1971), are important in considering the question of infestation, detailed below. He notes "and every year they sow their corn thus in the same holes and spots..." (Sagard 1939:104). A similar observation is reported in southern New England. "The corn is planted in the same spot each successive year, and the soil is gradually brought up to the size of a little hill by the annual additions" (Delabarre and Wilder 1920:209). This practice of planting corn in the same hill or spot year after year is echoed in the contemporary Iroquois literature. Shimony notes:

> The method of garden cultivation followed by most women (Iroquois) today is as follows: Get aman to plough the plot in fall, although there is general agreement that in olden times the method of planting was to pull out the old corn-stalks and plant the new corn in the holes in spring (Shimony 1961:154-155n).

We have identified more than 25 kinds of insects native to New York State that attack corn (cf. Metcalf and Flint 1962, Davidson and Lyon 1979, for all references to insects). There are somewhat fewer numbers that affect either beans (*Phaseolus)* or squash *(Cucurbitas).* Three major insect pests do not survive New York winters. A number of pests build up their populations over several years, thereby infesting fields and surrounding areas, unless they are controlled by chemicals. These include grasshoppers, cutworms, wireworms, stalk borers, seed corn maggots, and several others.

By far, those insects most destructive to corn include the cutworms, earworms, armyworms, corn rootworms, stalk borers, white grubs of June beetles, and wireworms. The most serious pests for the cucurbits are the striped cucumber beetle, the squash bug, and the squash vine borer. The bean leaf beetle causes the most damage to bean crops. Several insect species are generalized feeders, attacking corn, beans, and squash. These include the cutworms and the spotted cucumber beetle.

Identifying the insect species mentioned in the ethnological and ethnohistorical sources, except in a very limited number of cases, is virtually impossible. For example, the term "cutworm" is a general one applied to the larvae of a large number of species of the family Phalaenidae (=Noctuidae). These larvae are quite similar in appearance so that even expert taxonomists experience difficulty in determining species. This is because in most insect groups the taxonomic treatment is based largely upon adult characteristics.

Three of the previously listed references from the *Jesuit Relations* (JR 6:29, 6:75, 9:163), and that from Josselyn (1885:91), include comments or observations which could readily be related to cutworm or armyworm infestation. Specifically mentioned is that the woods, forests, or adjacent uncleared lands appeared to be a breeding place or produced great quantities of insects which then spread to nearby corn fields, wreaking destruction. In fact, several species of cutworms are commonly encountered in forested areas and often move out into adjacent cleared areas. The same behavior holds for the armyworms. The young worms find shelter in the soil within clumps of grass or under forest litter. When they have exhausted their local food supply, they will shift to, and attack, nearby fields, moving in hordes or armies.

The reference to dryness seemingly brought on by caterpillars could also be related to the cutworm (JR 10:195). Several species thrive, appearing in huge numbers, under drought conditions, and can damage crops severely at such times.

The thesis that corn rootworms might also be involved has considerable appeal since the repeated planting of corn in the same fields and corn hills, a practice discussed previously, would favor their maintenance. In addition, the adults would also be likely to feed on the squash which was planted adjacent to the corn. The two instances cited where planting was repeated three times due to frost and insect damage might have involved this species (JR 8:97-98, 63:207).

The documents shed little light on the kinds of crop damage done by insects generally; therefore, it is difficult to determine precisely which of the above mentioned insects were involved. For example, cutworms and others physically destroy and consume crops, while a slow wilting and poor growth characteristics result from the corn rootworm infestation. Where white grubs are involved (cf. Bartram 1751; Josselyn 1885) the corn will come up, but the plants cease growing after reaching heights from 8 inches to 2 feet. Contemporary entomological research indicates that crop destruction is variable. For example, corn cutworms can destroy 5 to 50% of a stand of corn in the course of one season. In the worst of years, corn earworms will attack 70 to 98% of the ears of field corn and destroy 7 to 8% of the total crop (Metcalf and Flint 1962:476, 498). In addition, corn rootworms often totally destroy a crop and wireworms can cause the complete failure of seeds to germinate (Metcalf and Flint 1962:510, 506). The range and extent of crop destruction by a myriad of insects is considerable.

In several instances, precise identifications of insect species associated with corn are possible. Chafe (1967:80) lists a Seneca word *ʔoshɔ́ʔyohtaʔ*, "a gray worm with a black head that attacks immature corn at the root." This description generally fits that of the cutworm. However, there is an alternative and more accurate meaning for this word. Within *ʔoshɔ́ʔyohtaʔ* is the root for blister, boil, or carbuncle (Marianne Mithun, personal communication). Rather than being a referent to the cutworm, it is our contention that the word root blister or boil may instead relate *ʔoshɔ́ʔyohtaʔ* with a moth larva known as the saddleback caterpillar *(Sibine stimulea)* (Metcalf and Flint 1962:23, 25). This larva feeds primarily on forest trees, but is commonly found on corn foliage. Although it is a moth larva, its body form and mode of locomotion is somewhat different from that of the typical caterpillar. The general appearance of the larva, being convex, light greenish with a central purplish-brown spot, might be suggestive of a well-developed boil or carbuncle. On the other hand, and related to the word root blister, there is a dermatitis of varying severity which results from handling this caterpillar. Once there is contact with human skin a poison is released which can cause a serious skin eruption followed by intense itching and intestinal disturbance. Their striking appearance and the fact that there are relatively few to be found at any one time, coupled with their ability to cause discomfort to humans, might explain their providing the generic term for worm or worms associated with corn.

Two other insects are of interest—that called the "corn ripener" *(Ganenaitah)*, identified by Hewitt (1918:795 n98) as the locust, and the "corn-snapper" *(kanéːitha?)*, or cicada, listed in Chafe (1967:69). Cicadas oviposit and feed

almost exclusively on woody plants. The periodical cicadas occur as adults in 13 to 17 year cycles and appear when corn is quite small or young. The annual or "dog-day" cicadas appear at about the same time that corn is ripening and will persist for several weeks thereafter. They are large and noisy insects, easily seen and recognized. Their association with corn in this context is very likely due to this chance seasonal or temporal association. Hewitt's presumed relationship between the corn ripener and the locust may be incorrect. We also suggest that the association of the cornsnapper with the cicada may likewise be erroneous. The corn-snapper probably refers to the click beetle, the adult stage of the wireworm, a noted corn pest. When these beetles are placed or accidentally fall on their backs, they right themselves by flipping the middle part of their body against a surface, which produces a loud "click," hence their name.

The above interpretations are somewhat muddled by the linguistic data. The word *ganenaitah*, recorded by Hewitt as the corn ripener or locust, is the same as that listed as corn snapper or cicada in Chafe's dictionary. Hewitt's translation as corn ripener is apparently closest to the mark, even though both Hewitt's and Chafe's informants provided a different meaning or entomological identification.

Prior to the adoption of plow agriculture, effective measures to control insects were technically out of reach of the Iroquoians or were generally futile. Only a few control measures may have had a limited impact on insect pests. For example, some species of cutworms, particularly those which produce only one generation per year, may be reduced to low population levels by spring tillage. Nevertheless, given the minimal extent to which the Iroquoians actually "tilled" land, it is doubtful whether any positive effect was realized. Both corn rootworms and cutworms can, to some extent, be controlled by crop rotation, a practice common to Iroquoians. However, the rotation or shifting of fields is always explained as a factor of depleted soils and the need to seek those more fertile. Such field rotation may have only incidentally affected insect infested croplands, and then, to an unknown extent. Even so, against certain insects, no measures would have been effective. For example, Metcalf and Flint (1962:511) note that there is no method by which soil infested by the larvae of the corn rootworm, the most significant of all corn pests, can be cleared.

Several "corn medicines" are described in the literature, one or two of which may have functioned as control measures for both insects and bird pests. Commonly, prior to planting, seed corn was soaked in water to which had been added various herbs. After a period of time, the corn was drained, placed in baskets, and allowed to remain so until it began to sprout (Waugh 1916; Parker 1968a, 1968b). The same practice is known to modern Iroquois (Reginald Henry, personal communication; Shimony 1961:153-54). Waugh (1916:18-19) identifies one medicine as being derived from the rootstocks of a marsh grass, *Phragmites communis (u'sa'gä'ĕda')*, and another as *Hystrix patula*, or bottlebrush grass *(gusdisda''nĭ)*. Other plants used in making corn medicines include wild rye *(Elymus canadensis)*, mandrake or may apple *(Podophyllum peltatum)*, and the elder *(Sambucus canadensis)*. Parker (1968a:26) notes that hellebore *(Veratrum viride)* was often used, and calls the corn medicines *o'sagan'dă'* and *o'sdĭs'dani* (Parker 1968b:54).

Hellebore *(Veratrum viride)* is known to have insecticidal qualities (Verne Pechuman, personal communication) and may well have acted to inhibit a

number of insect pests. The other plants mentioned do not appear to have similar qualities. We would add that tobacco *(Nicotiana rustica)*, a plant not mentioned above, contains nicotine, a substance that is a well known pesticide (Davidson and Lyon 1979:87). However, it does not appear that tobacco was planted as a companion crop with corn, beans, and squash (Tooker 1964:60 n92), thus limiting its possible effect on insect pests. Parker (1968a:26) observes that in reality the medicines acted as a "poison for crows and other field pests which might eat the seed corn. A bird eating this 'doctored' corn becomes dizzy and flutters about the field in a way which frightens others." It is difficult if not impossible to gauge the impact of these corn medicines on plant pests.

Extensive burning of fields in preparation for planting, a practice that appears to have been common among Northern Iroquoian horticulturalists (Heidenreich 1971), would not have been a completely effective insect control measure. Although burning will reduce insect infestation in plant residues, weed patches, or grassy areas, that is, light surface growth, it would not have a similar effect on subsurface insects. Brush fires or surface burns move quickly and are therefore of short duration and minimal intensity. Most of the heat generated is dissipated into the atmosphere. The heat from such fires would not deeply penetrate soil, and thus would not destroy the larvae of many common corn pests. To illustrate, grasshopper eggs are found at depths of 5 inches in the soil, the pupae of corn earworms, 2 to 6 inches, and the white grub, a foot or more. Corn rootworms are found deep within the root system of the plant (Metcalf and Flint 1962). These insects would be protected from any surface heat generated from field burns. Thus, a cultural control that would prove effective against one kind of insect might be useless against others because of a difference in habits and behavior. It must also be remembered that many insect pests either moved to cultivated fields from adjacent woodlots or forests, or flew into the area from distant points.

Although birds may have had somewhat of an effect on flying insects, they would not have had easy access to the more destructive subsurface larvae or those feeding on the interiors of plant parts. Neither would they have fed on the most pernicious of insects, the cutworm, a night feeder. Instead, it appears that birds themselves may have caused significant damage to seed crops as they approached maturity, rather than function as an effective deterent to insects.

From our research, there is little doubt that insects of various sorts that affected crops were of considerable concern to Northern Iroquoian populations. This concern is reflected in the ethnological and ethnohistorical literature in addition to being expressed through fiction, legend, myth, ritual and language. The impact of insects on corn and other domesticates is easily demonstrated. That fields would eventually become infested with insect pests, which in conjunction with other factors, might force a village to shift location, thereby allowing access to uninfested fields, can also be established. Projecting such information and conditions into the past can be accomplished with relative security, although quantification of aspects of this issue is not possible, e.g., we cannot determine the periodicity of moves, nor do we have access to data concerning the details of land use. It is doubtful whether or not methods and techniques of archaeology can be of assistance. Nevertheless, explicating, and thus adding another systemic variable to the issue of village removal among Northern Iro-

quoians, can assist us in fine-tuning our understanding of the complexities of the adaptive process of horticulture.

Notes

1. This is a revised version of papers presented at the 1982 Conference on Iroquois Research, held in Rensselaerville, New York, and the Thirtieth Meeting of the American Society for Ethnohistory, Nashville, Tennessee, 1982.
2. The linguistic orthography is not standardized. Refer to the sources cited.

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