

St. Lawrence Iroquoians and Pan-Iroquoian Social Network Analysis

Susan Dermarkar, Jennifer Birch, Termeh Shafie,
John P. Hart, and Ronald F. Williamson

St. Lawrence Iroquoians have long been seen as being culturally separate from other Iroquoian groups, a position supported by their disappearance in the mid-sixteenth century. In this paper, Social Network Analysis of Iroquoian ceramic collar motifs and two characteristic St. Lawrence ceramic types repositions this group, most fundamentally the Jefferson County Iroquoians, as a central and integral constituent of a highly fluid pan-Iroquoian ceramic social signalling system that, we argue, reflects changing socio-political relationships. Specifically, we suggest that the strong social ties of the late fifteenth century may be reflected in subsequent distinct movements and integrations of St. Lawrence Iroquoian peoples with Ancestral Wendat and Haudenosaunee (Iroquois) communities.

Introduction

The ongoing and prolonged debate over the apparent “disappearance” of Iroquoian populations from the St. Lawrence River valley is now being refocused on questions concerned with the dynamics of their incorporation into other Iroquoian communities and nations in the context of the wider geopolitical realignments of the fifteenth and sixteenth centuries. Here, graphing and statistical network analyses are used to investigate this issue employing a large dataset of pottery collar decoration similarity values from 214 archaeological sites, dating from ca. A.D. 1350 through to A.D. 1650 and encompassing all of northern Iroquoia.

After A.D. 1450, the archaeological record attests to the coalescence of Iroquoian villages into large, fortified towns, along with an increase in regional violent conflict (Birch and Williamson 2013). These developments appear to have catalyzed the formation of tribal nations in the sixteenth century, eventually leading to the development of the political confederacies present at European contact (Williamson 2014:14-15).

This current investigation seeks to increase

understandings of the dynamics of the interactions of Iroquoian populations in Jefferson County (a part of New York state that borders the eastern end of Lake Ontario) and the lower St. Lawrence River valley with populations elsewhere in northern Iroquoia. It asks how these interactions changed over time and seeks to provide inferences concerning the role of St. Lawrence Iroquoians in pan-Iroquoian signalling networks, the dispersal of St. Lawrence Iroquoian populations, and their articulation with the aforementioned political consolidation during the fifteenth through seventeenth centuries.

Social Signalling and Ceramic Collar Attributes

From A.D. 1350 onward, Northern Iroquoian pottery is characterized by collared rims, typically decorated with motifs in horizontal bands comprised of geometrical patterns of incised and/or stamped lines (Figure 1). Some 3,000 years of pottery use in the region indicates that collars were not necessary or useful for pots to function well for cooking or storage purposes (Taché and Craig 2015). The extra effort expended in collar

construction and ornamentation suggests these decorations were active signals, easily decoded by contemporaneous members of signalling networks, perhaps mirroring other signals, such as tattoos, body painting, and hair styles (Hart and Engelbrecht 2012). Matrifamily alliance, ethnicity,

and other group-level traits may have been messages signalled by pottery decoration.

Social Network Analysis in Archaeology

Social Network Analysis (SNA), explores the presence and strength of inter-personal and group

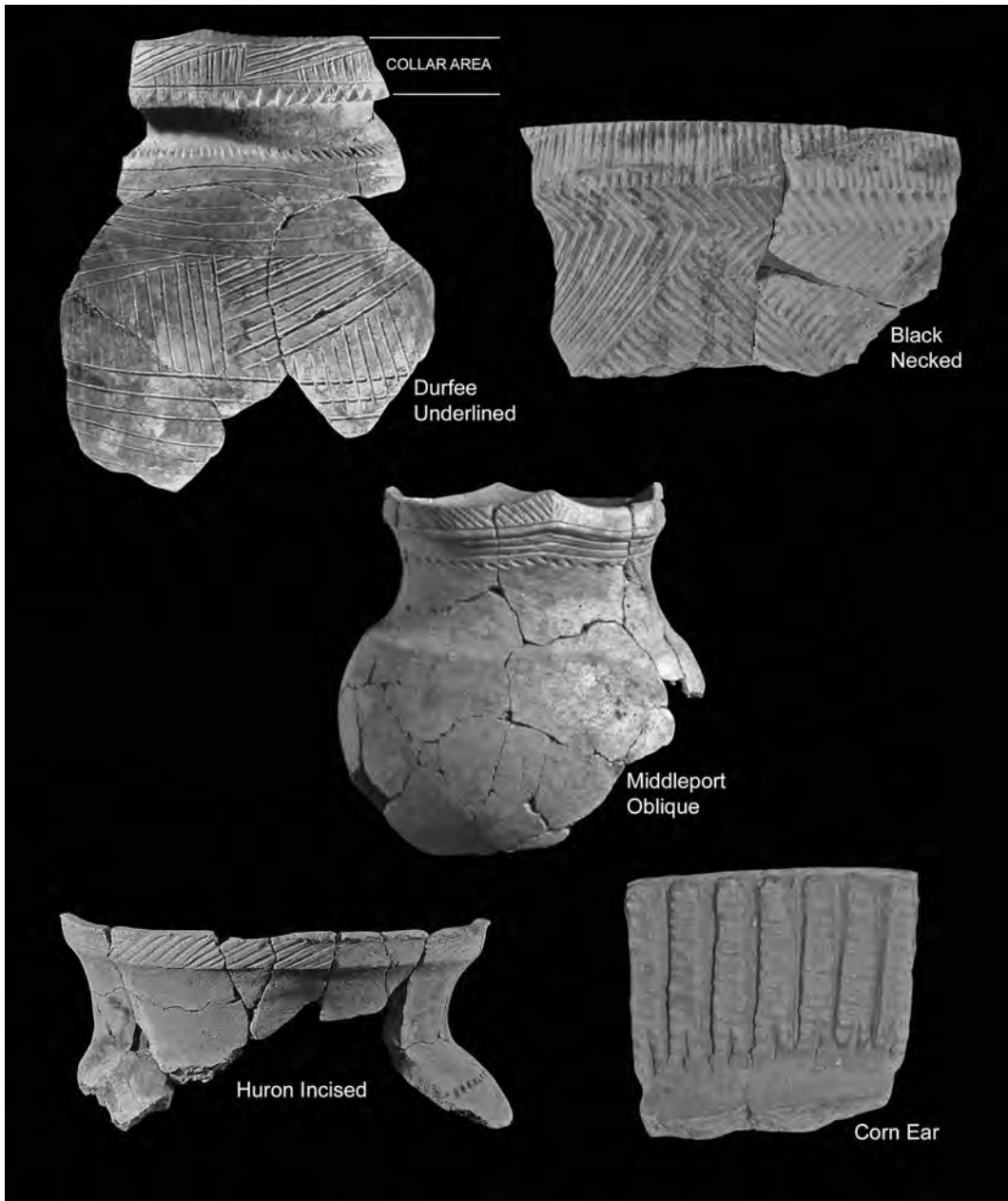


Figure 1. Examples of collar decoration on ceramic vessels.

ties essential to the construction and maintenance of social structure through the transmission of behaviour, information, and goods across networks (e.g., de Nooy et al. 2011). SNA has long been employed in the social sciences, and a recent proliferation of archaeological studies demonstrates its utility in understanding social relations in past societies (e.g., Brughmans 2013; Collar et al. 2015). These relationships are visualized in graphs through the presence of ties (relationships) linking pairs of nodes (individuals or groups of people). In this study, nodes represent the collective assemblage of vessel collar motifs from individual Iroquoian village sites. A tie is created between two nodes when a Brainerd-Robinson similarity coefficient (BR) (Robinson 1951) threshold above a given value is reached. Thus, the relation of each pair of nodes reflects a level of similarity equal to, or above, the chosen BR value. Network statistics aid in the evaluation of the role, strength, and nature of ties within the

network. In this analysis, the lowest value binding all nodes, BR 106, is used in order to enable inclusion of all 216 collections.

Results of the Present Study

In the present analysis, more than 60,000 ceramic vessels with decorated collars from 216 sites (Figure 2, Table 1), each with a minimum of 25 vessels, in southern Ontario, New York, and western Quebec, are examined. The region chosen represents the historical territories of Iroquoian-speaking people, with the exception of two sites in the Hudson River valley and one adjacent to Lake Huron that are in the territories of historical Algonquian-speaking people. The database is a collection of previously published and unpublished ceramic data, including the original coding forms of R.S. MacNeish (1952), all of which were recorded for this project following the collar motif code established by Engelbrecht (1971, 1994). The BR similarity matrix was

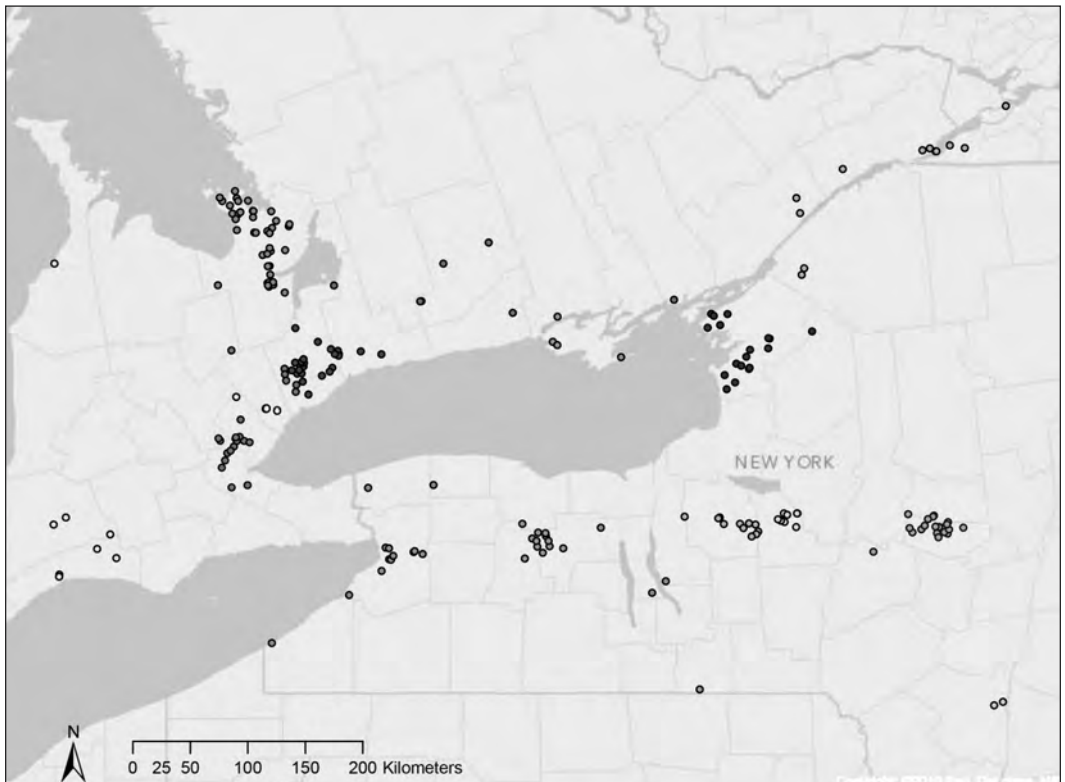


Figure 2. Location of sites included in the present study.

Table 1. *Location and dates of sites included in the present study.*

Group	Time period (A.D.) and Sites		
	t1, 1350–1400	t2, 1400–1450	t3, 1450–1500
Mohawk	•Deowongo •T.H.O.W.		•Garoga •Getman •Otstungo •Smith
Oneida			•Buyea •Goff •Nichols Pond
Onondaga	•Cabin •Furnace Brook •Howlett Hill •Kelso		•Bloody Hill •Burke •Cemetery
Cayuga		•Clifton Springs	•Klinko
Seneca	•Farrell •Footer		•Long Point
Erie			
Susquehannock			•Engelbert
Jefferson County		•Carlos •Fort Drum •Potaki •Putnam	•Chaumont •Durfee •Durham •Frank •Freeman •Heath •Matteson •Morse •Mud Creek •Nohle •St Lawrence •Swarthout •Talcott Falls •Whitford
Milton	•Campbell •Chypchar •Crawford Lake •Drumholm •Messenger •Nodwell •Pipeline •Rife •Serena •Unick •Van Eden	•Finch •Ivan Elliot •Milton •Pound •Raymond Reid •Southwold	•Lawson •Nott
Hudson River			
St. Lawrence Iroquoian	•CameronQ •Gogo •Mailhot-Curran •Sugarbush •Berry	•Arbor Ridge •Beckstead •MacDougald •Pointe-du-Buisson	
Simcoe County (Wendake)	•Barrie •Dykstra •Gregor •Holly •Webb •Wellington •Wiacek	•Baumann •Copeland •Dunn 1 •Heron •Hubbert •Lalonde •Lougheed •Second Lake •Starr •Train	•Carson •Dunsmore •Fournier
Rouge River–Duffins Creek	•Alexandra •Bathurst •New •Robb	•Best •Pugh	•Draper •Spang
Credit River	•Antrex	•Penguilly •River	
Don River		•Baker •Hope •Jackes •McGaw •McNair •Risebrough •Walkington 2	•Boyle-Atkinson •Hidden Springs •Jarrett-Lahmer •Keffer •O-M-G
Lynde Creek–Oshawa		•Grandview	•Joseph Picard
Trent River	•Gibson •Snodden •Wilson	•Ames •Bark •Hardrock	•Quackenbush
Humber River		•Black Creek •Logan	•Damiani •Parsons
Prince Edward County		•Hillier	•Lite •Payne •Waupoons
Tionontaté			

t4, 1500–1550	t5, 1550–1600	t6, 1600–1650
<ul style="list-style-type: none"> •Cayadutta •Cromwell •Ganada •Wormuth 	<ul style="list-style-type: none"> •Barker •Dockerstader •Elwood •Klock •Martin •Rice's Woods •Schenck 1 •Wagners Hollow 	<ul style="list-style-type: none"> •Brigg's Run •England's Woods
<ul style="list-style-type: none"> •Atwell •Barnes •Temperance House 	<ul style="list-style-type: none"> •Bach •Diabie •Chase 	<ul style="list-style-type: none"> •Thurston •Wayland-Smith •Pompey Center
	<ul style="list-style-type: none"> •Genoa Fort 	
<ul style="list-style-type: none"> •Belcher •Richmond Mills 	<ul style="list-style-type: none"> •Adams •Cameron 	<ul style="list-style-type: none"> •Cornish •Dutch Hollow •Warren •Factory Hollow •Power House
<ul style="list-style-type: none"> •Buffum 	<ul style="list-style-type: none"> •Eaton •Goodyear •Green Lake •Kienuka •Newton-Hopper •Ripley •Shelby •Simmons 	<ul style="list-style-type: none"> •Ellis •Kleis •Silverheels •Smokes Creek
<ul style="list-style-type: none"> •Hanes 	<ul style="list-style-type: none"> •Bradt 	<ul style="list-style-type: none"> •Christianson •Hamilton •Hood
	<ul style="list-style-type: none"> •Hurley •Kingston 	
<ul style="list-style-type: none"> •Maynard-McKeown •Pine Hill •Roebuck •Washburn 		
<ul style="list-style-type: none"> •Augoutenc •Goodeve 	<ul style="list-style-type: none"> •Cooper •Deshambault •Drury •Hunter's Oro 17 •Molson 	<ul style="list-style-type: none"> •Alonzo •Auger •Bernault •Bidmead •Cedar Point •Charleblois •Chew •Ellery •Farlain Lake •Forget •NeLe Caron •Orr Lake •Robitaille •Vints •Warminster
<ul style="list-style-type: none"> •Aurora •Mantle 		
<ul style="list-style-type: none"> •Emmerson Springs 		
<ul style="list-style-type: none"> •Coulter •Kirche 	<ul style="list-style-type: none"> •Benson 	
<ul style="list-style-type: none"> •Seed-Barker •Woodbridge 		
	<ul style="list-style-type: none"> •Sidey-Mackay 	<ul style="list-style-type: none"> •Kelly-Campbell •Plater Martin

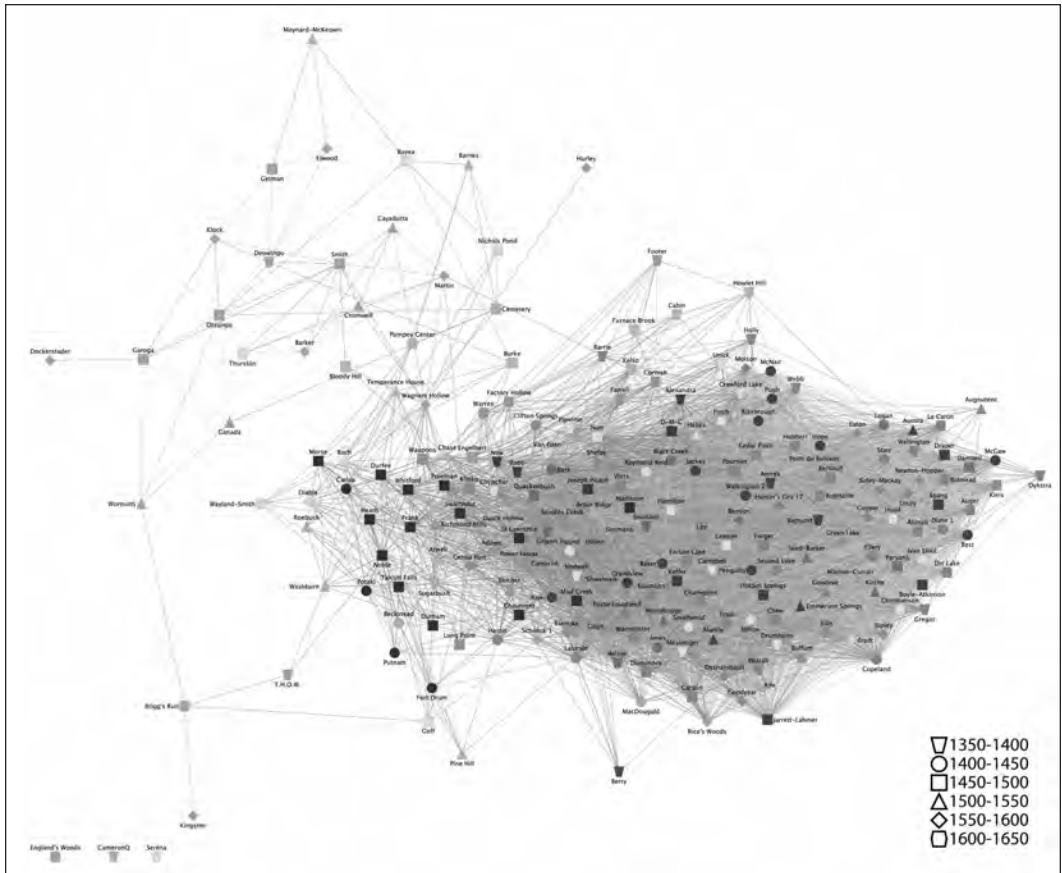


Figure 3. Pan-Iroquoian network, all groups and time periods, A.D. 1350–1650.

adjusted for sample size using a randomly seeded pairwise Monte Carlo simulation of 1,000 trials (Kintigh 2006). The sites are separated into six 50-year time divisions (t_1 – t_6), spanning the period A.D. 1350–1650, and into 20 geographic areas (Table 1). Ancestral Wendat sites are grouped by drainage basin or site cluster, and New York sites are grouped according to traditional historic ethnic territories. Jefferson County St. Lawrence Iroquoian sites are geographically distinct and have traditionally been treated as a separate cultural unit, and are treated as separate groups here (e.g., Abel 2002; Engelbrecht 1995). Plain collars have not been included in this study, as their role as social signals remains unclear.

In the first step of this research, network analysis of all Northern Iroquoian sites was performed to illustrate the relationship of the St. Lawrence Iroquoian sites with all non-St.

Lawrence Iroquoian sites. The resulting graph (Figure 3) with ties based on a BR threshold ≥ 106 reflects medium to strong similarities among the vessel collar motifs and clearly shows the intermediate position of Jefferson County sites within the greater network. Nodes located to the right side of the graph primarily represent sites located in Ontario, while those to the top and left are mainly located in New York.

In order to investigate the strong influence of Jefferson County sites, we created node-oriented neighbourhood networks which visualize the closest direct links of specific nodes (Figure 4), using distinct geographical site clusters in Jefferson County—Clayton, Rutland Hollow, Dry Hill, and Sandy Creek/Ellisburg. The resulting graphs support the position that each of these clusters was important in the pan-Iroquoian signalling system. The Clayton cluster sites in the north (Figure 4a),

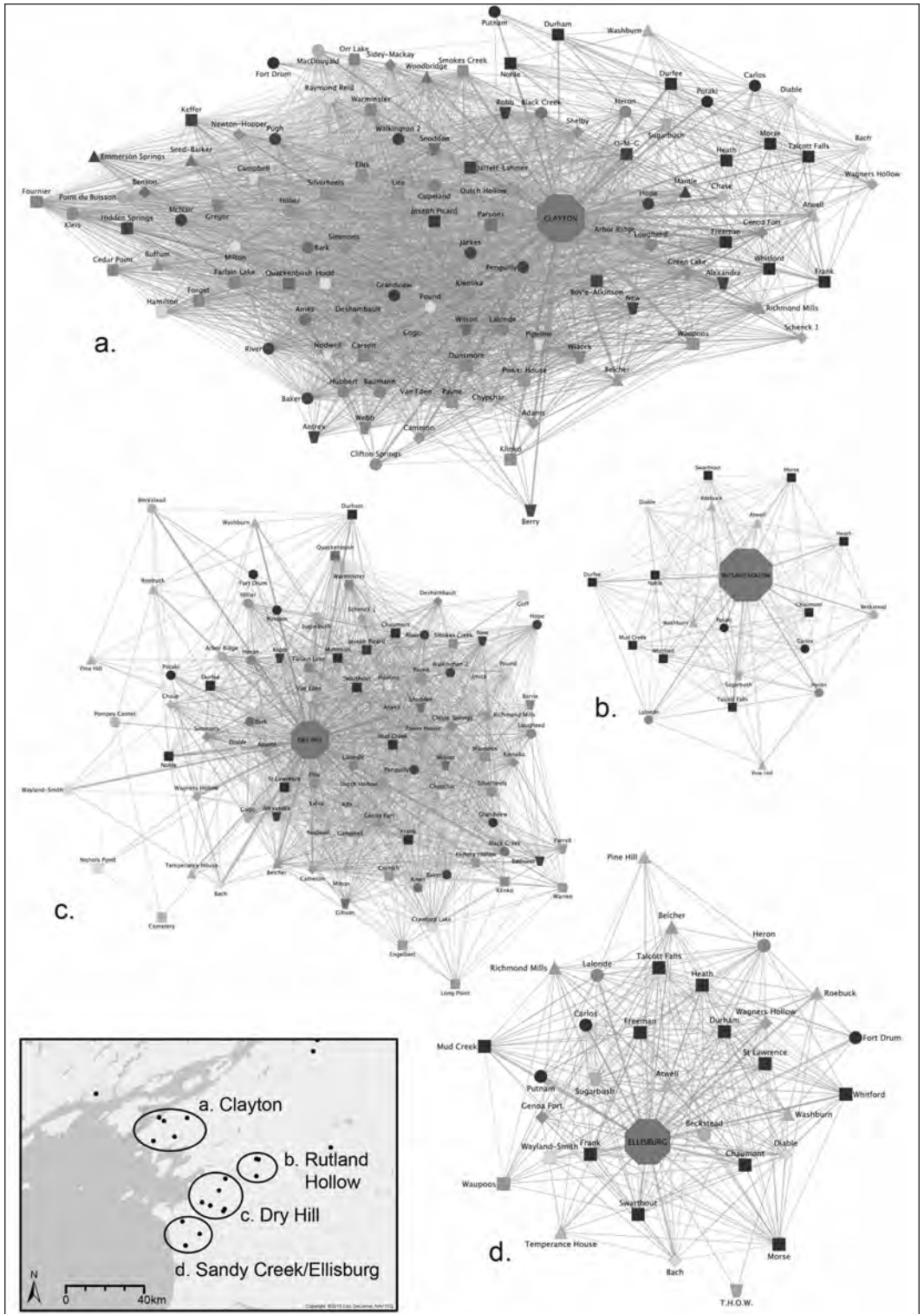


Figure 4. Networks induced by neighbours of specific Jefferson County St. Lawrence Iroquoian site clusters. (a) Clayton; (b) Rutland Hollow; (c) Dry Hill; (d) Sandy Creek/Ellisburg.

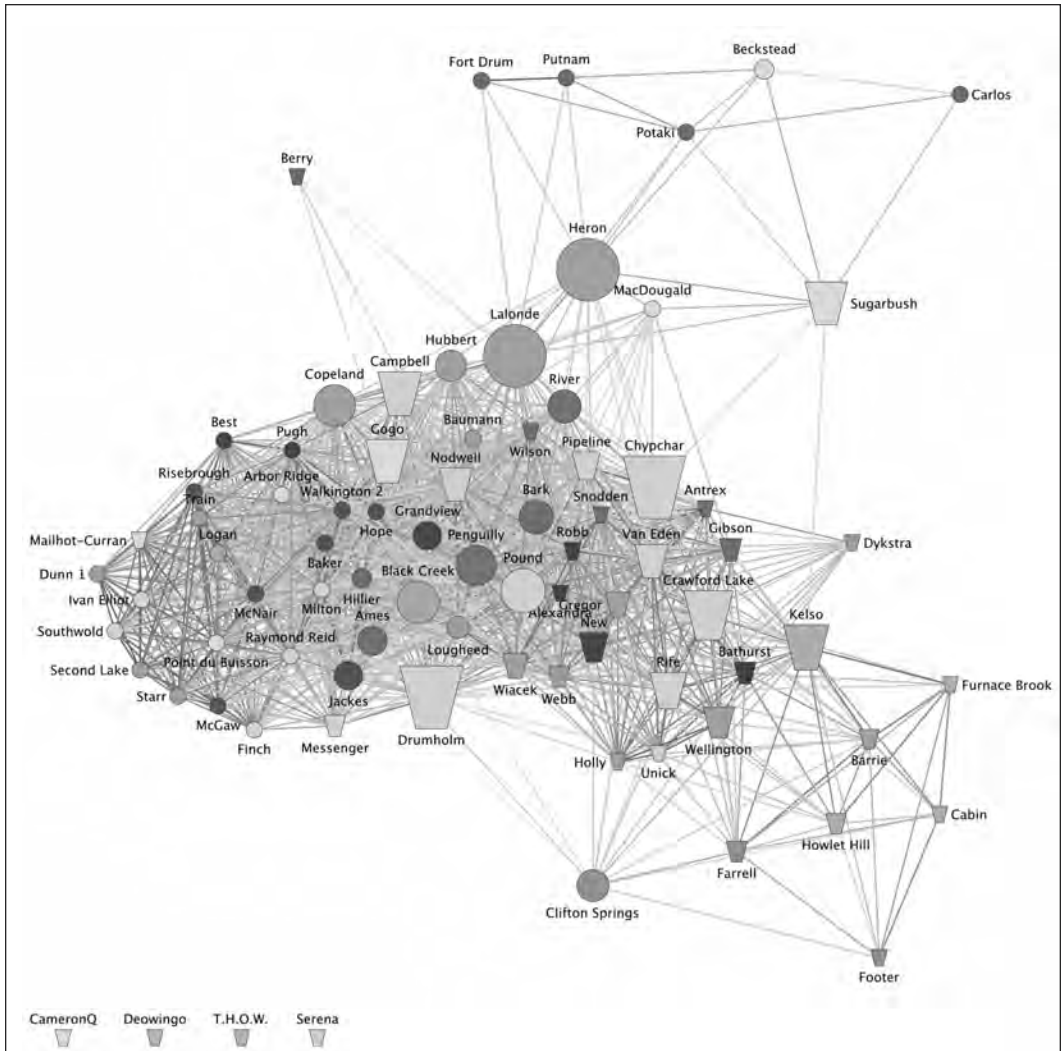


Figure 5. Pan-Iroquoian networks by time period. (a) $t1-t2$, A.D. 1350–1450; (b) $t2-t3$, A.D. 1400–1500; (c) $t3-t4$, A.D. 1450–1550; (d) $t4-t5$, A.D. 1500–1600; (e) $t5-t6$, A.D. 1550–1650. Node sizes reflect the magnitude of the betweenness centrality.

though spatially separated from other Jefferson County sites, are highly integrated within the region and in the wider temporal and spatial signalling network, having ties to later Prince Edward County sites (the peninsula that juts out into the north shore of Lake Ontario); across several areas of Ontario; and, to a lesser extent, with other New York sites. The smaller networks of the Sandy Creek and Rutland Hollow clusters seem to be more directly linked with St. Lawrence valley sites to the east.

Next, the 50-year time divisions were paired into five temporal groups, each composed of two consecutive periods: $t1-t2$, $t2-t3$, $t3-t4$, $t4-t5$, and $t5-t6$. As shown in Figure 5a–e, networks with nodes (representing sites) sized proportional to their betweenness centrality (BC, roughly defined as the number of shortest paths passing through a node [Freeman 1977]) were then produced. Nodes with higher betweenness centrality have greater relative influence on the transmission of behaviour, information, and goods

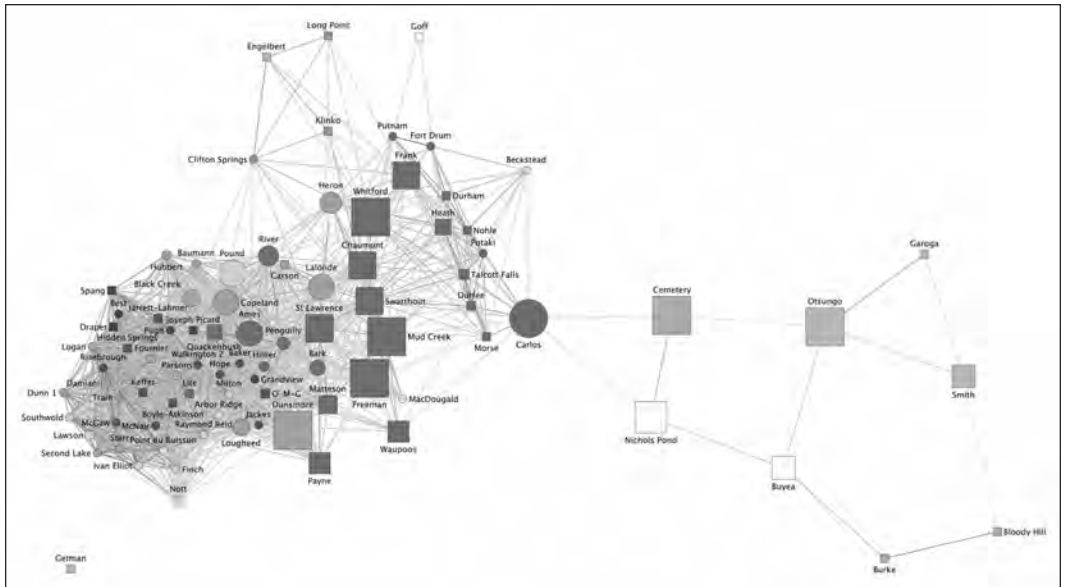


Figure 5b.

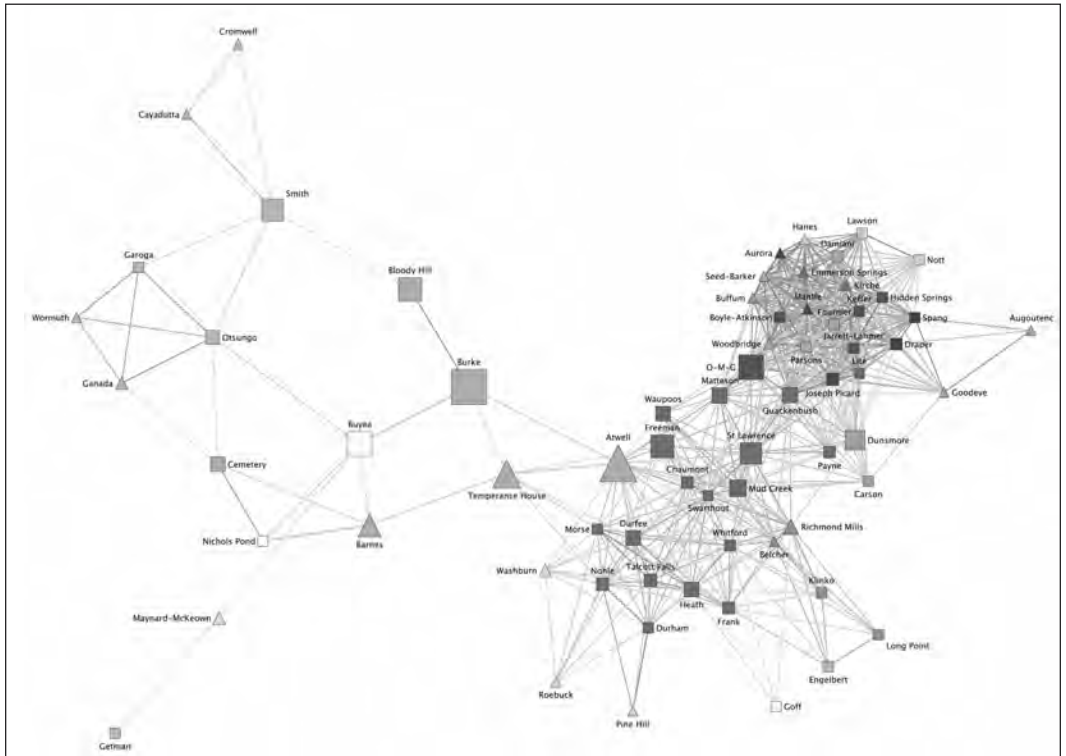


Figure 5c.

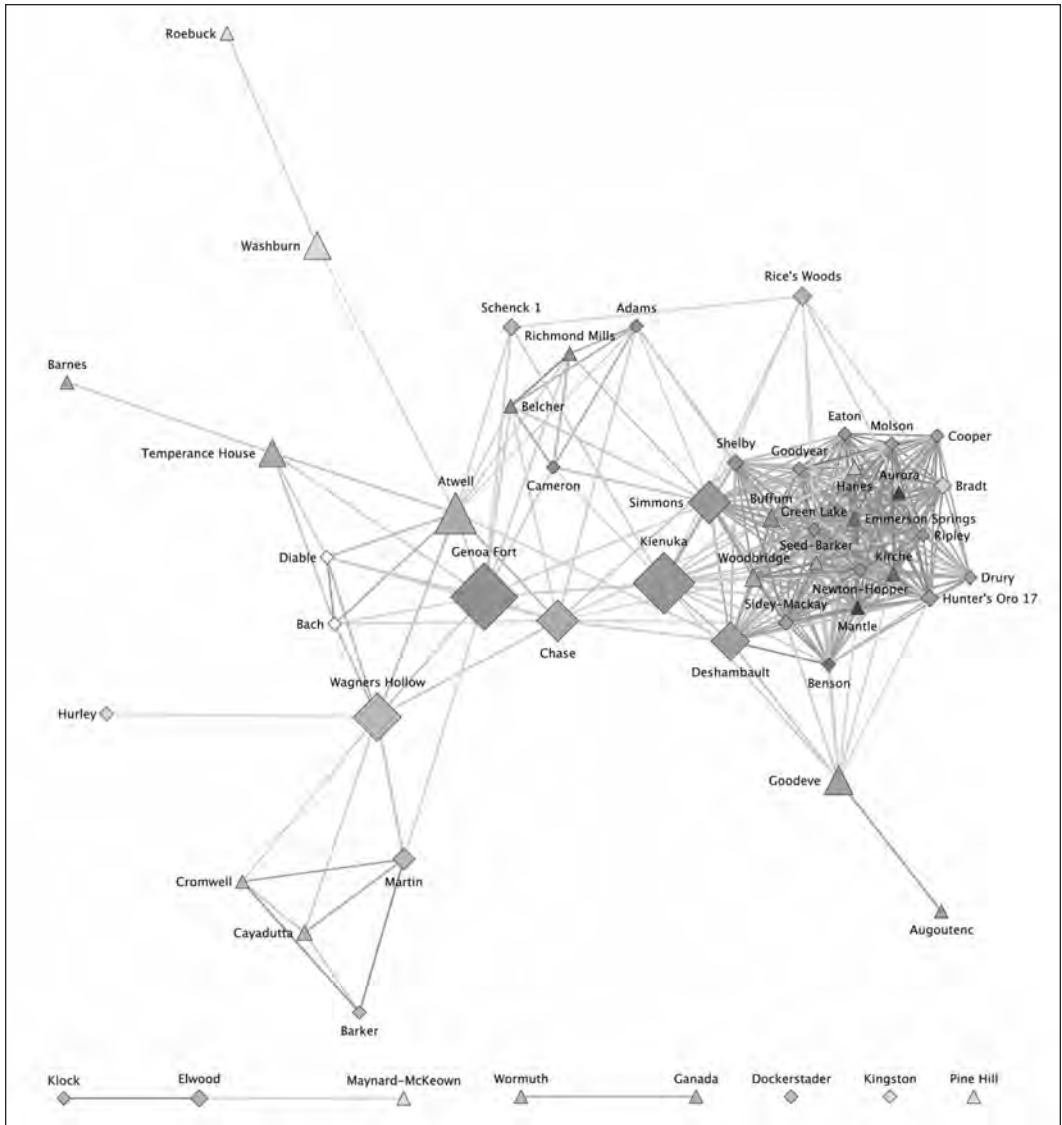


Figure 5d.

in the network. Grouping sites into 100-year networks (e.g., t1–t2, etc.) allowed us to examine relationships between larger groups of related sites than could be observed with single-period samples.

In t1–2, A.D. 1350–1450 (Figure 5a), sites are clearly arranged by time period, with north shore Ontario sites more highly clustered than the much more dispersed sites of the St. Lawrence River valley and eastern New York. The Jefferson

County sites are weakly connected outliers. By t3, A.D. 1450–1500, (Figure 5b), the Jefferson County sites become highly central and closely related to the tightly grouped t2 and t3 north shore sites, linking them with loosely connected eastern New York sites. In t3–t4, A.D. 1450–1550 (Figure 5c), Wendat-territory sites remain tightly aggregated. Later Onondaga-territory sites link the highly scattered earlier Mohawk- and Oneida-territory sites with the centrally located late Jefferson

County villages, while other St. Lawrence valley sites remain peripheral. Coinciding with the disappearance of the Jefferson County occupations in t4–t5, A.D. 1500–1600 (Figure 5d), the more western Erie-territory sites link the highly consolidated Wendat-territory sites with increasingly dispersed eastern and western New York sites. By t5–t6, A.D. 1550–1650 (Figure 5e), all Wendat- and Neutral-territory sites form a tight network with Erie-territory sites. Yet at this same time all New York sites remain very loosely tied in ceramic motif signalling patterns.

The graphs clearly illustrate the growing importance of the St. Lawrence valley and Jefferson County sites through the second (t2–t3, A.D. 1400–1450) to fourth (t4–t5, A.D. 1500–1550) periods. Early St. Lawrence Iroquoian sites such as Sugarbush, with its high betweenness centrality score, and MacDougald, in t1–t2 (A.D.

1350–1450), link Jefferson County sites with early central Ontario sites. Those of northern New York at this time remain quite removed in signalling terms from the occupation in Jefferson County. Jefferson County sites become very central to the network in the fifteenth century and form the major link between the southern Ontario and the New York sites. The intermediate centrality strength of the Clayton Cluster sites may be indicative of their intermediate network position as a signalling conduit, facilitating contact between these New York sites and the t3–t4 Ontario sites to the west. The later St. Lawrence Iroquoian sites in Ontario from t4 link exclusively with these earlier t3 sites in Jefferson County, perhaps suggesting that St. Lawrence Iroquoian people were becoming socially isolated in the later period. This is borne out in the next period, t4–t5, when non-Jefferson County St. Lawrence

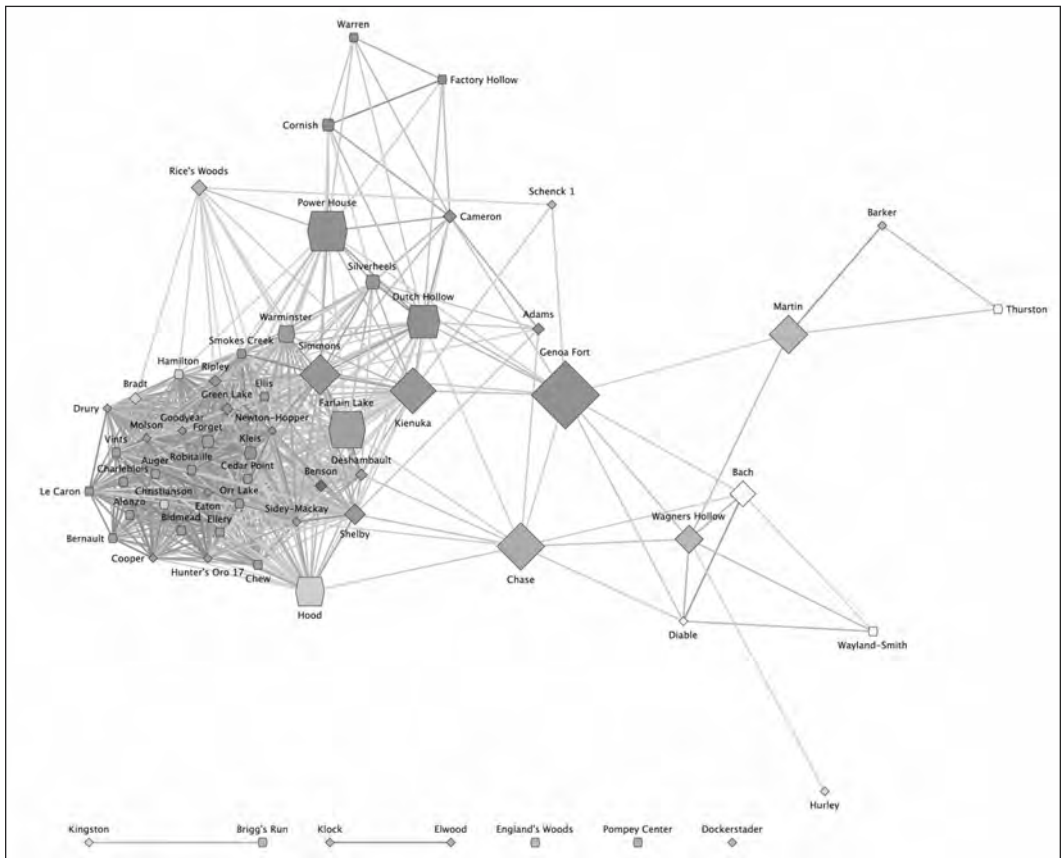


Figure 5e.

Iroquoian sites are far removed from the main cluster. Then, after A.D. 1500, occupation of Jefferson County ceases completely. The central location, and high centrality, of Jefferson County sites in the t_3 – t_4 period suggest these people had a strong effect on the signalling networks of surrounding and later populations. Their relative importance may be related to active processes of physical and political realignment as they moved out of Jefferson County and into adjacent areas: northward and eastward across the St. Lawrence River; southward to the Mohawk, Onondaga, and Oneida territories in New York; and westward into central Ontario.

Dynamic change over time in network topology is apparent in the altering shape of the five graphs that correspond to discrete time periods (Figures 5a–e). The observed changes raise questions regarding the role of all St. Lawrence Iroquoian sites in flows of information throughout the network. The average path length (APL), measuring the length of all the shortest paths between nodes in the network, was calculated for time periods 3 and 4 in order to discern whether the removal of the St. Lawrence Iroquoian sites from the network would affect the average number of nodes needed to travel between all nodes (that is, villages). The results suggest that flow through the network was hindered by the exclusion of St. Lawrence Iroquoian sites and facilitated by their inclusion (Table 2). Thus, St. Lawrence Iroquoian sites appear to have been important nodes in social networks through which social signalling in the form of ceramic motifs was transmitted between the Ontario and New York sites of A.D. 1450–1550.

Finally, network analyses of the presence and absence of specific decorative motifs originating

among St. Lawrence Iroquoian populations provide additional data for evaluating social signals related to those groups within the pan-Iroquoian network. In this case, we interpret the presence of two ceramic vessel types long considered indicative of St. Lawrence Iroquoians to be direct evidence of St. Lawrence Iroquoian–derived influences. The Corn Ear type (Figure 1), a typical St. Lawrence Iroquoian ceramic originating in eastern Ontario (Pendergast 1966) and Durfee Underlined (Figure 1), originating in the St. Lawrence River valley/Upper New York area (MacNeish 1952) are defined almost entirely by their distinctive collar motifs. Larger nodes in the networks (Figure 6) mark the presence of these types. Distribution of the Corn Ear type is spatially restricted throughout time, originating in the St. Lawrence River valley and spreading in small numbers west to the Humber River valley in t_2 – t_3 and northwest up the Trent River valley to Simcoe County (Wendake) in t_4 – t_6 . The Corn-Ear motif is seen in New York, only in Oneida territory, during the consolidation of the Iroquois Confederacy (t_5 – t_6), after the abandonment of the St. Lawrence River valley and Jefferson County. Changes in the patterns of motif signalling may indicate changes in social networks, changes in the symbolic meanings of the motifs, or population movements. Additional archaeological research is required in order to substantiate these scenarios.

The Durfee Underlined type appears in New York simultaneously with its appearance at St. Lawrence valley sites, including Jefferson County, by t_2 and throughout southern Ontario in t_3 , the period of coalescence. It remains relatively widely distributed in low numbers across those areas with the continuing Northern Iroquoian occupation.

Table 2. Network statistics, t_3 – t_4 (A.D. 1450–1550), with and without St. Lawrence Iroquoian sites included.

Network	Number of nodes	Number of ties	Network density	Clustering coefficient	Average path length
With	69	556	0.23	0.76	2.87
Without	48	311	0.28	0.89	3.0

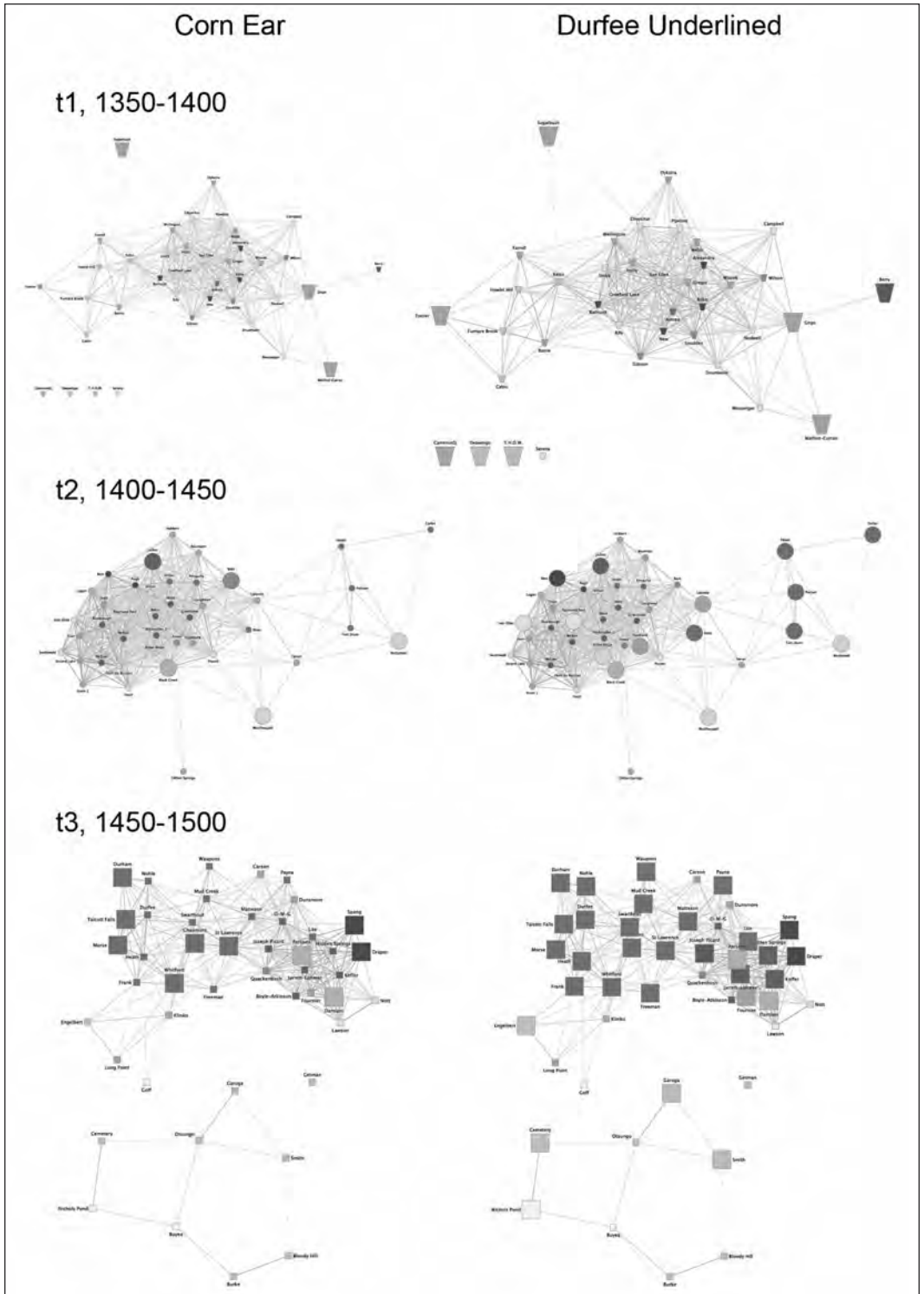


Figure 6. Networks denoting presence and absence of St. Lawrence Iroquoian-derived ceramic types in the pan-Iroquoian network. (a) A.D. 1350–1500; (b) A.D. 1500–1650.

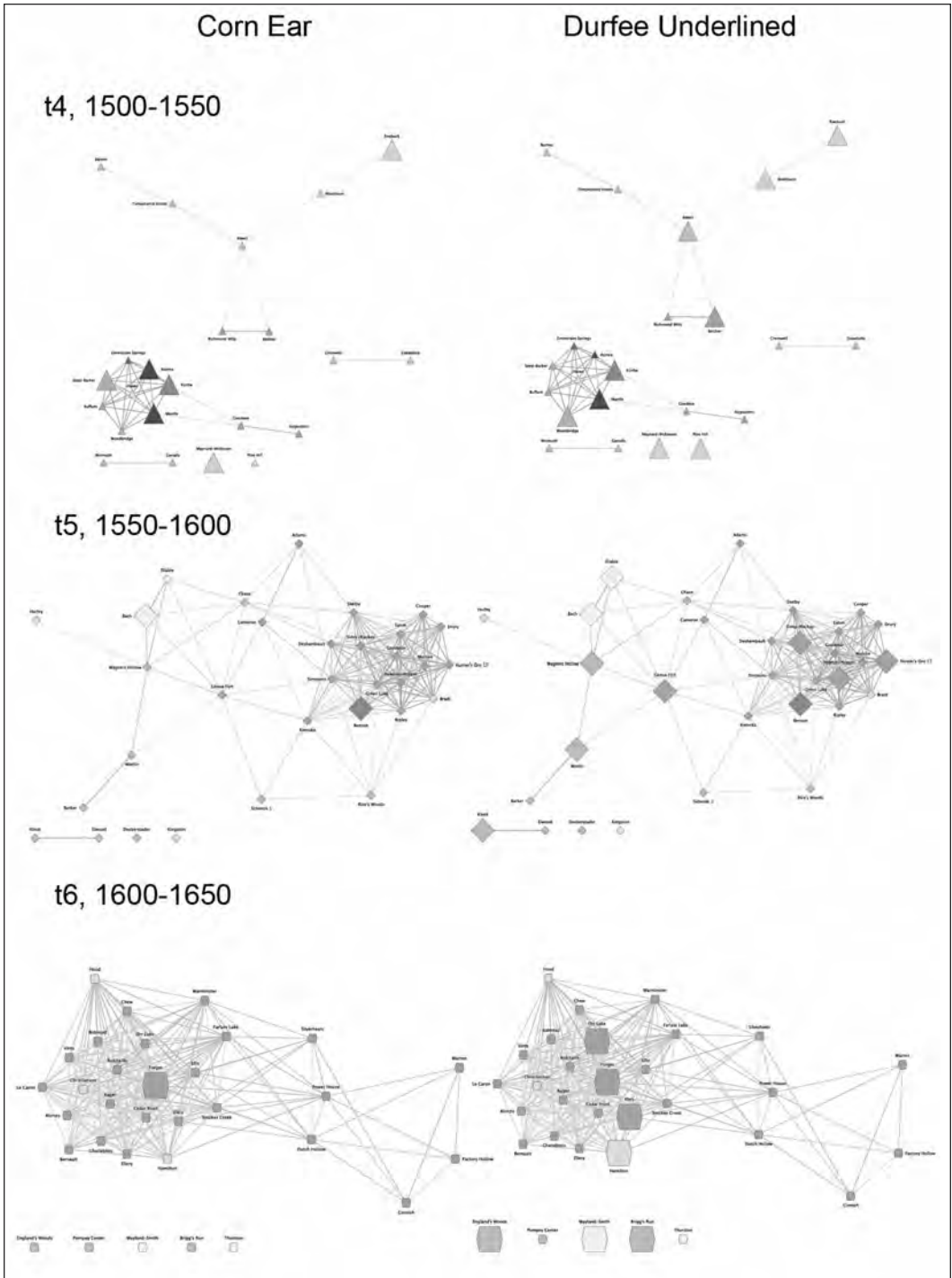


Figure 6b.

The temporal persistence and geographic distribution of Durfee Underlined suggest that the social signals affiliated with it remained important until the mid-seventeenth century. These two types evidently have unique origins, communities of practice, and trajectories of signalling, and they may be indicative of different signalling network histories—thus illustrating at a small scale the complexity of the overall interaction patterns.

Discussion and Conclusion

The application of SNA to the distribution of social signals encoded in Iroquoian ceramic vessel collar motifs has been successful in addressing the questions posed concerning the nature of St. Lawrence interactions. Hints regarding the nature and directionality of selective social ties pertaining to the peoples of Jefferson County and the St. Lawrence River valley are illustrated in the networks of signalling ties displayed in network graphs and statistics of the earliest time periods and in the changing strength and direction of these ties through the next five 50-year time periods.

From A.D. 1350 to 1400, St. Lawrence Iroquoian sites were linked to early central Ontario and New York sites. Ties between these areas increased in importance from A.D. 1400 to 1550, with particularly strong links existing between clusters of sites in Jefferson County and populations to the north, south, and west in the period A.D. 1450–1550. Early sites in the Clayton cluster display ties with later Prince Edward County sites located across the eastern end of Lake Ontario, and Sandy Creek sites appear closely linked to later St. Lawrence Iroquoian sites located in Ontario, across the St. Lawrence river and immediately east. It is clear that St. Lawrence Iroquoian populations were integral to pan-Iroquoian signalling networks ca. A.D. 1450–1500.

In the period A.D. 1500–1550, some eastern St. Lawrence valley sites retain ties with Jefferson County sites (some of which may have been abandoned by this time), and by A.D. 1550–1600 they become isolated when Jefferson County was abandoned. This growing isolation from other Iroquoian groups suggests a change in these

communities' participation in signalling networks.

Our analyses have shown the important position the St. Lawrence Iroquoians played in signalling networks in northern Iroquoia. Following signalling theory, we believe that matrifamily alliances, ethnicity, and other group-level traits, signalled by pottery decoration, show that very fluid and complex identity-based networks existed in all periods. SNA holds great promise to produce nuanced portrayals of interactions within and between various areas of northern Iroquoia.

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Les Iroquoiens du Saint-Laurent ont longtemps été vus comme étant culturellement séparés des autres groupes iroquoiens, une opinion soutenue par leur disparition au milieu du seizième siècle. Dans cet article, l'analyse des réseaux sociaux (Social Network Analysis) de motifs sur des renflements de céramique iroquoise et de deux types spécifiques de céramique du Saint-Laurent repositionne ce groupe, en particulier les Iroquoiens de Jefferson County, en tant que composante centrale et intégrante d'un système social de signalisation de céramique paniroquoien très fluide qui, il est soutenu, reflète les relations sociopolitiques changeantes. Précisément, il est proposé que les liens sociaux serrés de la fin du quinzième siècle pourraient se refléter dans les mouvements ultérieurs et différents et dans les intégrations des peuples iroquoiens du Saint-Laurent aux communautés ancestrales de Wendat et de Haudenosaunee (Iroquois).

Susan Dermarkar
Department of Anthropology
University of Toronto at Mississauga
s.dermarkar@mail.utoronto.ca

Jennifer Birch
Department of Anthropology
University of Georgia
jabirch@uga.edu

Termeh Shafie
Department of Computer & Information Science
University of Konstanz
termeh.shafie@uni-konstanz.de

John P. Hart
Research and Collections Division
New York State Museum
jph_nysm@nysed.gov

Ronald F. Williamson
Archaeological Services Inc.
rwilliamson@asiheritage.ca