New Approaches to Oxyrhynchite Topography *

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Network analysis, until now primarily the domain of social scientists and mathematicians, has considerable implications for the social history of Greco-Roman Egypt as well, because it helps us analyze the relationships between both people and places.[1] As Katja Müller's pioneering work on the Fayum has shown, for regions where topographical attestations are abundant, network analysis provides new tools to analyze the connections between the region's many settlements.[2] My goal here, with network analysis of Oxyrhynchite topography, is to gain a ground-level view of the region's social geography, and to produce a quantitative model for the landscape and mental horizons of the typical resident of the Oxyrhynchite nome.

Towards these ends, this paper discusses a series of computer analyses I have carried out on the published Oxyrhynchite topographical attestations. We will look at the number of attestations of each toponym, the connections between those toponyms, and the strength of those connections. We will determine whether these results follow a bell-curve or a power-law

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1 Network theory, which in its pure form is simply the mathematics describing the connectivity of various nodes or points on a graph, has spread to a wide variety of academic disciplines. See the three recent surveys: Watts 2003, Barabási 2002, and Buchanan 2002. In the field's first generation, a number of European anthropologists led the way: Barnes, Bott, Boissevain, Mitchell, and Epstein all published articles working out some of the basic ideas of social network analysis in the 1950s and 1960s. The true codification of the field began with Boissevain and Mitchell 1973 and Boissevain 1974. Wasserman and Faust 1994 will likely remain a standard textbook on network analysis for some time. See Milgram 1967 for the origin of the "six degrees of separation" cliché which has made network theory widely known in popular parlance. Throughout this paper, I have kept citations to a minimum in the interests of a simplified bibliography, citing where possible only non-technical introductions which themselves include further technical references.

2 See Müller 2002, 2003a, 2003b, with more extended discussion at note 4 below.

distribution,[3] and consider these results in light of central-place theory and its corollary, the rank-size rule.[4] We will then analyze whether the legal status of a settlement or such administrative divisions as *pagus* and toparchy had any impact on that settlement's connectivity patterns.

The topography of the Oxyrhynchite nome in the Greco-Roman period is exceptionally well documented.[5] By my own count of Pruneti's topographic

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[3] Most distribution-graphs of natural phenomena follow the so-called bell-curve. In a bell-curve distribution, a data set has a large central group of typical members, and only a few scattered outliers. But networks whose members all share a typical level of connectivity are very diffuse: a high number of steps is necessary to connect everyone in the network to everyone else. Researchers have found that networks exhibiting "small world" characteristics follow a power-law distribution, in which most nodes have very few links, but those links connect them on a gradually increasing scale to a fewer and fewer number of master-nodes, whose higher levels of connectivity draw the entire network together. Distributions of this sort appear as a straight line of slope -1 when graphed on a log-log scale. This has direct relevance to topographical issues. For instance, urban populations of the United States of America show a power-law distribution, as does the system of airport connectivity: see Barabási 2002, 69-72 and references at 242. Take power-law topography in light of Fonseca (1988), who is a mathematical geographer, not a network theorist. For more explanation, see Barabási 2002: chapter six, and his co-authored works cited on page 242; see also *e.g.* Buchanan 2002 chapter three, "Small Worlds."

[4] Central-place theory, typically the intellectual property of geographers, has much in common with power-law network theory. Generally speaking, central-place theory presents a hypothetical model of settlement distribution across a flat plain devoid of any topographical differentiation. It predicts the distribution and number of smaller settlements in relation to the region's larger central place, and is typically accompanied by analysis through the rank-size rule, which asserts that a settlement's size is inversely proportional to its rank: the smaller the population of a given village, the more villages there will be like it of that size in a region.

Katja Müller's 2002 contribution to the *Archiv für Papyrusforschung* is to my knowledge the first application of central-place theory and network analysis to Greco-Roman Egypt. The most extended application of central-place theory to antiquity generally has been an analysis of settlement distribution in later Roman Palestine: Lapin 2001. For other applications of central-place theory in an ancient context, see Millett 1990, Alcock 1993, and Woolf 1997, who remarks (5) on the absence of figures permitting rank-size analysis in Egypt on a province-wide level, but does not deal with the potential at the nome level. See now Tacoma 2003, a dissertation which includes an attempt, independent of Müller's work, to derive some province-wide rank-size population figures. The author does not seem aware of Woolf's objections.

[5] For important work on the topography of the Oxyrhynchite, see: Pruneti 1981; Calderini 1983 *s.v.*; Krüger 1990; Gomaá 1991; Rowlandson 1996. For recent work on the topography of the city itself, see Alston 2001, and the rich entry in Calderini 2003, *s.v.* For further notes on the placement of certain sites within specific *pagi*, see Pruneti 1989.

register, nearly 1180 papyri attest to just over 600 place-names throughout the nome.[6] This work records all the attestations, both complete and fragmentary, of Oxyrhynchite toponyms in the papyrological evidence published before 1981. Each entry includes the place name, relevant variants, a list of texts attesting the place name, the date of the text where possible, the toparchy and *pagus* of the site if known, and so forth. Pruneti's data on the topography of the Oxyrhynchite can be converted into electronic form with relative ease.

To have confidence in any analyses we perform on this data, we must account for possible distortions introduced into the record by nome-wide documents such as tax registers and village lists.[7] These documents, which may name the top dozen most important places in the nome, do not really reflect any social connection between the settlements in question, and thus skew our results rather considerably. We can introduce a corrective by simply removing the top ten most settlement-rich texts.[8] For the purposes of this paper, I will discuss only the analyses performed on this corrected data.

1) First, we look at the number of attestations of each toponym, and measure how many settlements appear at each level of attestation.[9] A

[6] Based on Pruneti's register (1981). See my Oxyrhynchite data-file of that register online, at http://www.grr9.net/oxyrhynchos/Pruneti.txt. This is a bipartite graph linking toponyms indirectly through the papyri attesting them. I analyze this data-file on a computer program called UCINET (Borgatti et al.), after using its "affiliations" function to turn the data into a one-mode network.

[7] Müller (2003b) 200 addresses just this issue, and deals with it in a method analogous to the one I develop here: she removes from her network all texts listing more than five settlements.

[8] Those texts are *P.Oxy.* 10.1285, 14.1659, 15. 1747, 16.2032, 18.2182, 19.2244, 24.2422, 43.3109, 44.3170, and P.Mich.inv. 412. Generally speaking, they are accounts of village payments, *e.g.* of grain, of beef and pork, of the crown-tax, and so on.

[9] Future work should aim to determine whether any of these following measurements serve as a proxy for population size. Dominic Rathbone and Bruce Nielsen have both approached the issue from a different perspective. Rathbone's groundbreaking 1990 article on villages, land, and population in Greco-Roman Egypt included an insightful analysis of the village payments recorded in *P.Oxy.* 10.1285 and *P.Oxy.* 24.2422. He included a chart of the relative size of payments in 10.1285, and noted (page 129) that a "regular skewed distribution is apparent… it seems that most Oxyrhynchite villages were relatively small while a few were much larger." He is here describing a power-law distribution curve. Nielsen advances the applications of the Lorenz curve and the Gini coefficient by deriving comparanda useful for determining the nature of the assessments in *P.Oxy.* 46.3307. His

graph of this distribution, Table 1, gives us a classic rank-size curve, similar to those found by Katja Müller in the Fayum and Hayim Lapin in Palestine.[10] (The graph on top is in standard linear scale, that on the bottom in a logarithmic scale designed to enhance the level of detail.)

2) Second, we measure a settlement's degree strength,[11] or the number of connections it has to other settlements. (Settlement X may appear in the papyrological record with ten other sites, giving it a degree strength of ten. If Settlement Y appears with twelve other sites, it has a greater degree strength.[12]) As we see in Table 2, the distribution of settlement degree strength in the Oxyrhynchite does not appear to follow a rank-size curve as neatly as attestation strength. However, the absence of a bell-curve does suggest the existence of some sort of rank hierarchy.
3) Third, we measure tie strength, or the number of connections between nodes. The data-file used to store the Pruneti register is in its most basic form an index of over 360,000 potential settlement links, namely, a grid of all possible ties between the roughly 600 recorded toponyms in the Oxyrhynchite nome. The vast majority of these potential ties are unattested in Pruneti's documentation.[13] But a relatively small number of pairs, some 5309 all told, have a tie-strength of one or higher, indicating that the papyrological corpus records joint appearances of each of those toponym pairs in one text or more. Some settlement pairs have as many as a half dozen attested ties between them.

conclusion suggests that the distribution of size settlements will show considerable variance depending on time and place.

[10] See Müller 2002, 2003a, 2003b, and Lapin 2001.

[11] Closely tied to degree centrality. For a formal definition, see Wasserman and Faust 100-107 for the concept of degree, and 178-180 for degree centrality.

[12] For our purposes it does not matter how many texts are required to attest to those connections. For instance, Village X can be in one text with 6 villages, and in another with 4, while Village Y can be in one text with 12 other villages, and thus have a higher degree.

[13] For instance, to take two names from the top of the alphabet, Agathammonos has no direct papyrological tie to Aienou. Both toponyms appear only once, in texts that do not name the other: *P.Col.* 7.191 and *P.Oxy.* 16.2025. This pair thus has a tie-strength of zero.

A bell-curve distribution of the settlement pairs from our corrected set in relation to their tie-strength would indicate the existence of a characteristic connectivity: if two settlements are connected in Pruneti's data, their level of connectivity would fall into a predictable range. A power-law distribution by contrast would suggest that some settlements are disproportionately connected to each other: those ties form elite connections in the midst of more poorly connected pairs throughout the nome. The frequency of settlement pairs of a given tie-strength (Table 3) does not in fact follow a bell-curve, very closely approaching what we would expect from a power-law curve. The unevenness we witness when plotting tie-strength distribution on a logarithmic graph is typical of "real-world" power-law curves, which follow a straight line only for a limited period before tapering off.[14]

The consistent lack of a bell-curve distribution in these three analyses of the Oxyrhynchite topographical network implies the existence of a hierarchy of social and economic connectivity throughout the nome. The settlements with the highest degree must have been disproportionately more important, and thus disproportionately more connected, than the next runners-up. These giants of topographic connectivity link to hundreds of other sites in the Oxyrhynchite nome. Takona, for instance, links to 199 other settlements, one-third of the nome's total. This need not imply that such sites were the most populous, but high connectivity might well be correlated to size. At the other end of the spectrum, living in the social and economic shadows of these few hyper-connected nodes, hundreds of lesser sites had little connectivity at all. Over two hundred toponyms in Pruneti show attested links to only twenty settlements or fewer. Over a hundred have only one such link, or none at all. The same disproportionate hierarchy appears in the strength of ties between specific pairs of settlements. 88% of the attested ties between two settlements appear only once. A mere 12% of the settlement ties show a strength of two or more. Yet one hyper-connected pair (Sesphtha and Takona) appear together in my corrected Pruneti data-set no less than seven times.

[14] Müller's discussion of the "lower-limb problem" (2002: 111ff) is directly applicable here. In a pure rank-size distribution, smaller settlements would always be more numerous than larger ones. But as Müller points out, "some settlement patterns tend towards nucleation. In these cases, hamlets would be more numerous than single farmsteads." A similar phenomenon is probably at work in the Oxyrhynchite data. Lapin's section on regional integration discusses further implications of these curves (2001: 68-77).

But the fact that these distributions do not all show a true power-law curve suggests that real-world factors are at work to alter the nature of the model. Potentially, limits on the growth of water and land resources placed a hold on the growth of the larger villages, and thus ultimately on their connectivity as well. Equally, we must be mindful of spatial considerations. Sesphtha at the nome's northern end can well have ties to Athuchis at its southern end,[15] but even the most hyper-connected node cannot reach everywhere throughout the nome in equal strength, a consideration missing from a mathematically pure power-law. Moreover, the absence of Oxyrhynchos itself from our model might represent a distorting factor causing the curve to deviate from true form. Including the city itself in our data-set as an implicit tie, by virtue of the find-site of the majority of these texts, would disproportionately favor the well-attested sites, and potentially pull our curve more closely towards a true power-law distribution.

The legal category of each settlement provides another category of analysis, shown in Table 4. The Oxyrhynchite data-set is robust enough to determine whether an *epoikion* is statistically likely to have different connectivity patterns from a *kome*, and so forth.[16] Comparing the degree strength of *komai* against *epoikia*, it is no surprise that the villages do better, but the race is close: twelve of the top twenty settlements by degree strength are villages, with Skutalitidos and Euangeliou, the strongest *epoikia* by degree, placing second and sixth respectively.[17] When we measure the strength of ties between settlements, the victory of the village is more pronounced. Thousands of pairs exist amongst *komai* and *epoikia*, but the strongest seven ties are between pairs of *komai*. The strongest connection between two *epoikia* (once again, Skutalitidos and Euangeliou) ties for 6th place; the strongest connection between a *kome* and an *epoikion* (Sko and

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[15] And indeed, Pruneti attests four such ties: *P.Oxy*. 10.1285, 14.1659, 43.3109, 44.3170, all from the third century CE.

[16] Such an analysis would have implications for comparing the Oxyrhynchite nome to its peers: Bruce Nielsen's comparative analysis (1997) shows that the Oxyrhynchite appeared to have a higher proportion of epoikia than other nomes, and that its proportion of epoikia increased during the fourth century, supporting "the notion that, at least from the fourth century on, the Oxyrhynchite nome was more large estate characterized than the Hermopolite and Arsinoite nomes" (764).

[17] I performed this analysis on an altered network in which every settlement not explicitly attested as either a *kome* or an *epoikion* had been removed. I counted as a *kome* a settlement which appeared in the papyrological record as both a *kome* and an *epoikion* at different times.

Monimou respectively) is weaker, tied for 12th on the list of most closely tied pairs.[18]

Next we ask whether divisions into *pagus* and toparchy affect the nome's connectivity. Table 5 shows the attested ties between each *pagus*, derived by summing the ties between all settlements of a known *pagus*.[19] The results are striking: eight out of the ten *pagi* have more attested ties to settlements in their own *pagi* than they do to settlements in others. Barely 20% of the ties between two settlements of a known *pagus* are ties between settlements of a different *pagus*. When we perform the same analysis by toparchy (see Table 6), for which we have more complete information, the results are even more pronounced: all six toparchies have more attested ties to settlements in their own toparchies than they do to settlements in others. Only 35% of the ties between two settlements of a known toparchy are ties between settlements of a different toparchy. But proximity does not seem to matter much for the external ties: of the ties between settlements in different toparchies, over 53% of them are between settlements in non-neighbouring toparchies. Of the ties between settlements in different *pagi*, over 50% of them are between settlements in non-neighbouring *pagi*.

These conclusions are interesting for a number of reasons. On the one hand, if there had been statistical significance to the toparchies and *pagi* a settlement was connected to, it might then be possible to assign a toparchy or *pagus* number to many of the settlements currently lacking them. This does not seem to have been the case. On the other hand, we have reached a positive conclusion: top-down administrative structures such as the *pagus* and toparchy do seem to have corresponded to settlement connectivity to some degree, but do not appear to have inhibited connectivity to more distant sites, still less eliminated it altogether.[20]

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[18] Skutalitidos and Euangeliou are tied with five other settlement pairs, all ranking sixth with a tie-strength of five. Sko and Monimou are tied with twenty-nine other settlement pairs, all ranking twelfth with a tie-strength of four.

[19] It was first necessary to take my original Pruneti network and use Pajek (packaged with UCINET 6.0: Borgatti et al.) to remove all villages of unknown pagus.

[20] These results are radically different from those we obtain if we do not remove the top ten texts, as we did at the beginning of the discussion. In the uncorrected data-set, seven of the ten *pagi* and all of the toparchies had more ties to settlements outside of their own administrative region. 47% of the ties between two settlements of a known pagus were ties betweem settlements of a different pagus, and 70% of the ties between two settlements of a known toparchy were ties between settlements of a different toparchy. Further, in analyses of the uncorrected data, the prominence among external ties of those to non-neighbouring

One can object to many of these techniques on the grounds of provenance: namely, we might at first guess imagine that the discovery of nearly all the relevant texts at the site of ancient Oxyrhynchos itself suggests distortion in the record, through which toponyms closer to Oxyrhynchos might be better attested, and vice versa. But consider at the figures in Table 7. Here, we list eleven Oxyrhynchite settlements with known modern equivalents, and include both their attestation and degree strengths, and their distance from modern Bahnasa, Oxyrhynchos itself.[21] No correlation either positive or negative between attestation or degree strength and distance can be found with the data available to us.[22] If anything, these data lead to the impressionistic conclusion that distance from the nome capital makes little difference in how well Oxyrhynchite toponyms are attested.[23]

A few words in conclusion. I should stress that the connectivity this paper discusses is social in nature, and does not necessarily have any geographic implications.[24] Nor is this analysis of Oxyrhynchite topography complete by

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pagi and toparchies was still quite pronounced. Thus, correcting for distortions in our data-set gives us a more authentic look at local connectivity, at the same time verifying that connectivities over a longer distance remain part of the overall pattern.

[21] For the identifications of ancient settlements with modern sites, see Rowlandson xiii. To calculate their distances from Oxyrhynchos, I simply determined their latitude and longitude (which can be done online at *e.g.* http://www.traveljournals.net/explore/egypt/locations/a/index/1.html) and turned to other online sites (*e.g.* http://jan.ucc.nau.edu/~cvm/latlongdist.html) to handle the math.

[22] Measuring the correlation between attestation and degree strength on the one hand and distance from Oxyrhynchos on the other shows relatively weak positive correlations (Pearson's *r* of 0.205 and 0.138 respectively). Admittedly, the data are sparse, and produce unacceptably poor levels of significance (0.545 and 0.685 respectively); more equivalents between ancient sites and modern are needed to resolve this problem with complete confidence.

[23] Another interesting corrective approach, proposed on page XX above, can be applied to future work. We can treat Oxyrhynchos itself as the primate settlement by assigning to Oxyrhynchos a rank equal to the number of papyri found there. This crude approach assumes that each papyrus found at Oxyrhynchos is by virtue of that provenance itself a reference to Oxyrhynchos.

[24] Katja Müller has recently (2003b) applied MDS and MCS visualization techniques to create abstract settlement maps of the Fayum. I am not yet convinced that such techniques would work for the Oxyrhynchite nome, largely because of the extent to which physical features such as canals create short-cuts permitting certain settlements to be more connected than a featureless geography might otherwise dictate. Administrative geography can also introduce distortions: the granary at Sinaru, for instance, served to bring settlements socially closer to Sinaru than would have been the case otherwise. Drawing geographic conclusions

any means. So far, these analyses ignore the chronological element.[25] This may introduce any number of distortions into the data, by ignoring the effects of ample evidence from the third century but relative silence in the fifth, by ignoring the possible rise and fall of certain settlements over time, and so forth. Further work may draw useful comparisons between settlement distributions in the Oxyrhynchite and other nomes. For instance, it is clear that Hermopolite settlement distribution follows some sort of rank-size rule.[26] Future work may also use these techniques to derive a population model for the Oxyrhynchite nome.[27] The analyses we have presented have obvious implications for Egyptian social history. The hierarchical distribution of tie-strengths suggests that a small settlement was less likely to have ties to another small settlement than to a larger village which served as an entrepot between a wider variety of sites.[28] It suggests that the social geography of the nome was not centered on the nome capital itself, but was somewhat diffuse, centered instead around a cloud of lesser regional centers, all of which retained ties to more distant sites.

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from this network analysis may introduce a tautological flaw: settlements will appear to be geographically proximate to one another simply because we assume that papyrological ties imply geographic proximity, an assumption these physical and administrative features prohibit.

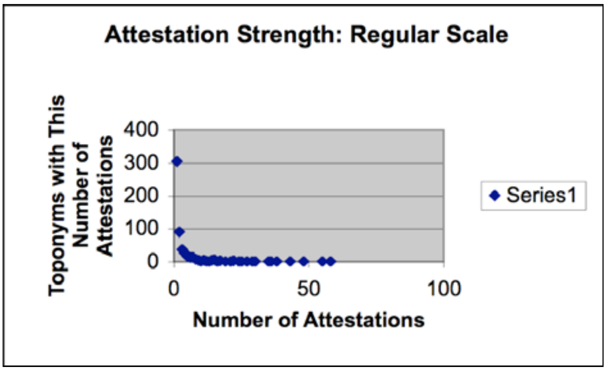
[25] A problem perhaps made more acute by Nielsen's conclusions: see notes 9 and 16 above.

[26] A brief survey of *e.g.* the tax liabilities for the seventy villages recorded in *P.Col.* 9.247 makes this reasonably clear: a small number of settlements have disproportionately large liabilities, while the bulk of the settlements have relatively small ones. It is for this reason that the average and median figures given in the summary tables (pp. 116-117) are not particularly meaningful: in a scale-free network, the average has no significance. Since these figures serve as proxies for land area under the control of each settlement, it is worth wondering further whether they correspond to settlement population as well.

[27] Müller uses Ptolemaic tax registers (from *P.Count*, Thompson et al., forthcoming) to determine whether settlements in the Fayum fit the rank-size rule. Population figures do not exist to permit us to attempt Müller's approach for the Oxyrhynchite nome, but I hope to show in later work that some of these forms of network analysis can provide adequate substitutes.

[28] For possible analogies throughout the Roman east, see Woolf's discussion (1997) of the impact of empire on urban hierarchies, especially pp. 6-7 and 10-11.

Table 1: Distribution of Attestations



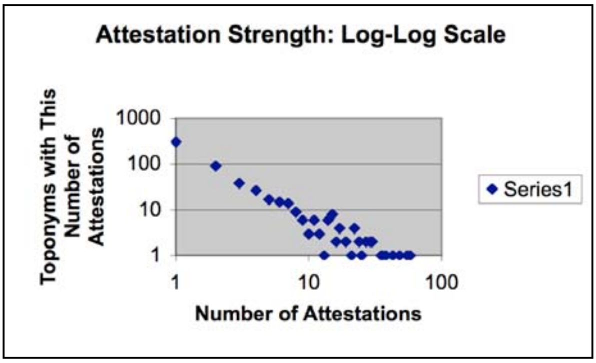
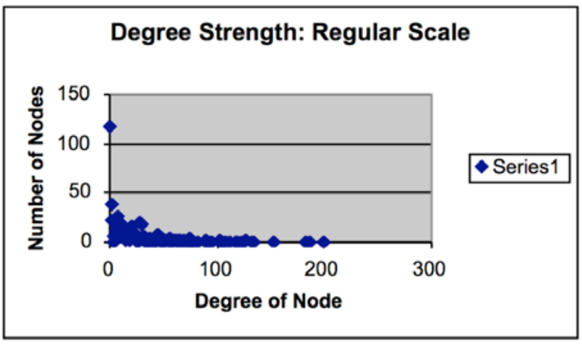


Table 2: Distribution of Degree Strength



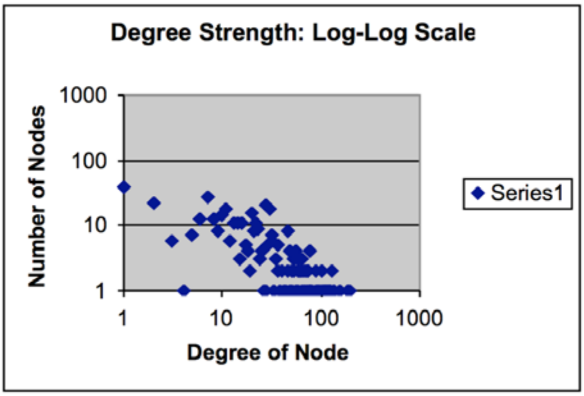
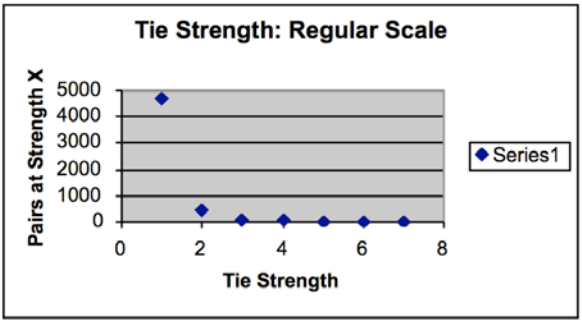


Table 3: Distribution of Tie Strength Between Settlement Pairs



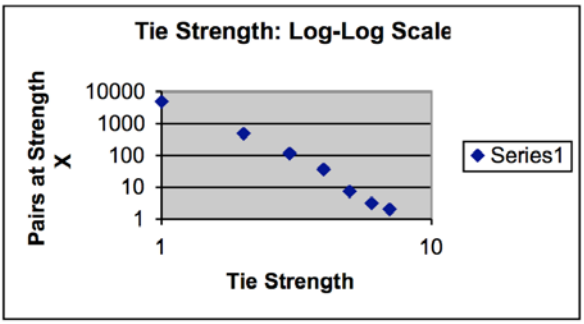


Table 4: Degree and Tie Strength, *komai* versus *epoikia*

Settlement	Degree	Type
Takona	144	kome
Skutalitidos	139	epoikion
Teruthis	133	kome
Tampeti	110	kome
Ophis	107	kome
Euangeliou	94	epoikion
Talao	93	kome
Taampemou	88	kome
Tarousebt	84	epoikion
Pangouleeiou	83	epoikion
Seruphis	83	kome
Sinaru	81	kome
Sepho	79	kome
Partheniados	76	epoikion
Palosis	73	kome
Tarouthinou	73	epoikion
Dositheou	69	epoikion
Petne	68	kome
Senokomis	66	kome
Nesou Leukadiou	66	epoikion

Settlement Pair	Tie Strength	Types
Nesla, Isieion Panga	7	komai
Takona, Sesphtha	7	komai
Takona, Sepho	6	komai
Talao, Sinaru	6	komai
Tampeti, Sepho	6	komai
Palosis, Kesmouchis	5	komai
Seruphis, Senekeleu	5	komai
Skutalitidos, Euangeliou	5	epoikia
Tampeti, Spaniaa	5	komai
Tampeti, Takona	5	komai
Tarousebt, Nesou Leukadiou	5	epoikia
Paomis, Kesmouchis	4	komai
Paomis, Palosis	4	komai
Partheniados, Orthoniou	4	epoikia
Senokomis, Pela	4	komai
Sepho, Palosis	4	komai
Seruphis, Kerkethuris	4	komai
Seruphis, Petne	4	komai
Seruphis, Senokomis	4	komai
Sinaru, Senepta	4	komai
Sko, Monimou	4	both

Table 5: Attested Ties Between Each *Pagus*

Pagus	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**Total**	**Internal**	**External**	**Bordering**	**% External**	**% External & Bordering**
1	19	0	2	1	3	0	0	1	0	0	26	19	7	0	0.2692308	0
2	0	34	0	0	5	0	0	1	0	0	40	34	6	0	0.15	0
3	2	0	19	4	4	0	0	3	1	1	34	19	15	8	0.4411765	0.533333333
4	1	0	4	51	5	0	2	9	1	2	75	51	24	9	0.32	0.375
5	3	5	4	5	69	0	0	8	4	2	100	69	31	9	0.31	0.290322581
6	0	0	0	0	0	1	0	0	0	0	1	1	0	0	0	0
7	0	0	0	2	0	0	30	12	0	0	44	30	14	12	0.3181818	0.857142857
8	1	1	3	9	8	0	12	626	22	8	690	626	64	34	0.0927536	0.53125
9	0	0	1	1	4	0	0	22	32	6	66	32	34	28	0.5151515	0.823529412
10	0	0	1	2	2	0	0	8	6	35	54	35	19	6	0.3518519	0.315789474
Total	26	40	34	75	100	1	44	690	66	54	1130	916	214	106	0.1893805	0.495327103

Table 6: Attested Ties Between Each Toparchy

Toparchy	**ano**	**apeliotou**	**thmoisepho**	**kato**	**libos**	**mese**	**Total**	**Internal**	**External**	**Bordering**	**% External**	**% External & Bordering**
ano	405	48	18	31	68	53	623	405	218	99	0.3499197	0.45412844
apeliotou	48	263	11	44	60	32	458	263	195	140	0.4257642	0.717948718
thmoisepho	18	11	186	38	19	22	294	186	108	60	0.3673469	0.555555556
kato	31	44	38	485	48	44	690	485	205	38	0.2971014	0.185365854
libos	68	60	19	48	479	63	737	479	258	191	0.3500678	0.740310078
mese	53	32	22	44	63	413	627	413	214	117	0.3413078	0.546728972
Total	623	458	294	690	737	627	3429	2231	1198	645	0.349373	0.538397329

Table 7: Attestation and Degree Strength and a Site's Distance from Oxyrhynchos

Bahnasa: 30.65833 E, 28.53528 N

Ancient	**Modern**	**Longitude**	**Latitude**	**Degree Strength**	**Attestation Strength**	**Distance from Bahnasa**
Talao	Tala	30.85139	28.87917	328	41	42.6699 km
Sinary	Shinara	30.77	28.78361	387	48	29.7176 km
Tammorou	Dahmaru	30.81389	28.69028	19	3	22.9956 km
Palosis	Bilhasa	30.80417	28.67528	235	21	21.1191 km
Petne	Itnih	30.81667	28.66111	275	25	20.8732 km
Tampitei	Tambidi	30.78333	28.63333	452	28	16.3838 km
Pthochis	Abtuga	30.75056	28.5344	173	6	9.0202 km
Psuchis	Absug	30.5875	28.5306	2	1	6.9465 km
Senokomis	Shulqam	30.70944	28.55	359	30	5.2597 km
Senekeleu	Saqula	30.6844	28.57528	273	20	5.1307 km
Seruphis	Ashruba	30.69944	28.5222	360	62	4.2761 km

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